

***Mycale alagoana* sp.nov. and two new formal records of Porifera (Demospongiae, Poecilosclerida) from the shallow-water reefs of Alagoas (Brazil)**

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**Abstract:** The Porifera occurring at Alagoas State reefs (north-eastern Brazil) are still little-known, with few species listed and even fewer formally described. From a total of 48 species recorded from the state, only eight belong to the Poecilosclerida, including those (re)described in this study. Here we describe a new species, *Mycale (Mycale) alagoana* sp.nov., and redescribe two species: *Lissodendoryx (Lissodendoryx) isodictyalis* (Carter, 1882) and *Mycale (Naviculina) diversisigmata* Van Soest, 1984, both first formal redescrptions from the Southwestern Atlantic. Additionally, *Mycale (Aegogropila) escarlatai* Hajdu et al., 1995 is here reported from Alagoas for the first time, in discussing the difficulties inherent to recognition in the field of small crustose Mycalids with neatly reticulated surfaces.

**Keywords:** faunistics, *Lissodendoryx*, coral reef, sandstone reef, taxonomy.

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**Resumo:** Os poríferos dos recifes do Estado de Alagoas (nordeste do Brasil) são ainda pouco conhecidos, com poucas espécies formalmente descritas. Dentre as 48 espécies de Demospongiae registradas para o estado, apenas oito pertencem à Ordem Poecilosclerida, incluindo o material (re)descrito aqui. No presente estudo se descreve uma espécie nova *Mycale (Mycale) alagoana* sp.nov., e duas espécies são redescritas: *Lissodendoryx (Lissodendoryx) isodictyalis* (Carter, 1882) e *Mycale (Naviculina) diversisigmata* Van Soest, 1984, ambas, primeiras redescrções formais para para o Sudoeste do Atlântico. Adicionalmente, *Mycale (Aegogropila) escarlatai* Hajdu et al., 1995 é registrada aqui para Alagoas pela primeira vez, na discussão das dificuldades inerentes ao reconhecimento em campo de pequenos Mycalídeos incrustantes com superfícies claramente reticuladas.

**Palavras-chave:** faunística, *Lissodendoryx*, recife de coral, recife de arenito, taxonomia.

## Introduction

Several taxonomic studies were carried out on marine poriferans occurring along the northeastern Brazilian shelf, beginning in the second half of the 19<sup>th</sup> century with the expedition of the H.M.S Challenger (Poljjaeff 1884, Ridley & Dendy 1887, Schulze 1887, Sollas 1888), and revealing the high diversity of Porifera in this region. Nevertheless, only a small portion of the sponges occurring along the northeastern Brazilian shelf has been the subject of detailed taxonomic study, as important contributions to the assessment of this fauna include only brief descriptions (e.g. Boury-Esnault 1973, Hechtel 1983, Muricy et al. 2007, 2008). As pointed out earlier by Hajdu et al. (1996), these sponges await to be discovered, were discovered but await to be (re)described, or authors preferred to list, instead of listing and (re)describing them in some extent (Muricy & Moraes 1998, Moraes et al. 2006, Cedro et al. 2007).

Alagoas state has a coastline 230 km long, with main reef areas located in its central and northern portions. These reefs are predominantly built by coralline algae and sandstones, but rich concentrations of hermatypic corals can also be seen in many places (Correia 2010). Together with reefs of southern Pernambuco State, those of northern Alagoas belong to the Environmental Protection Area known as "APA Costa dos Corais" (Brasil 1997). The complex system of coastal reefs, mangroves and coastal lagoons is mostly a consequence of shifting sea levels during the last 7000 years of the Quaternary (Correia & Sovierzoski 2009). Main biogeographic affinities of the shallow reef poriferan fauna are Tropical western Atlantic, with important Caribbean and Brazilian endemic components (Hechtel 1976, Sarmento & Correia 2002, Cedro et al. 2007).

Hundreds of sponges have been collected along the Alagoas State coastline in the last years, but the faunistic inventory from the area lacks a detailed taxonomic basis. This study describes a new species and redescribes two poecilosclerid species that had never been formally described from the Southwestern Atlantic.

## Materials and methods

Collecting localities were situated along Alagoas State coast, at the state's capital Maceió (Jatiúca, Ponta do Meirim and Piscina dos Amores) and to its south (Marechal Deodoro, Praia do Francês), between the coordinates 09° 32' 32.22" S - 035° 36' 49.80" W and 09° 45' 54.35" S - 035° 50' 08.22" W (Figure 1). Collected specimens were split between the LABMAR (UFAL) and MNRJ (UFRJ) sponge collections. The collection was conducted manually, by snorkeling in shallow tide pools (mini-lagoons). Specimens were photographed in situ prior to fixation in 96% ethanol. Conservation was later obtained in ethanol 80%. Description was based on preparations of thick sections and dissociated spicules, the latter examined under light, as well as scanning electron microscopes. Means presented were obtained from 30 measurements unless stated otherwise.

## Results

Class Demospongiae Sollas, 1885  
Order Poecilosclerida Topsent, 1928

FAMILY COELOSPHAERIDAE DENDY, 1922

Genus *Lissodendoryx* Topsent, 1892

*Lissodendoryx* (*Lissodendoryx*) *isodictyalis* (Carter, 1882)

Figures 2a, 3a-f, Table 1

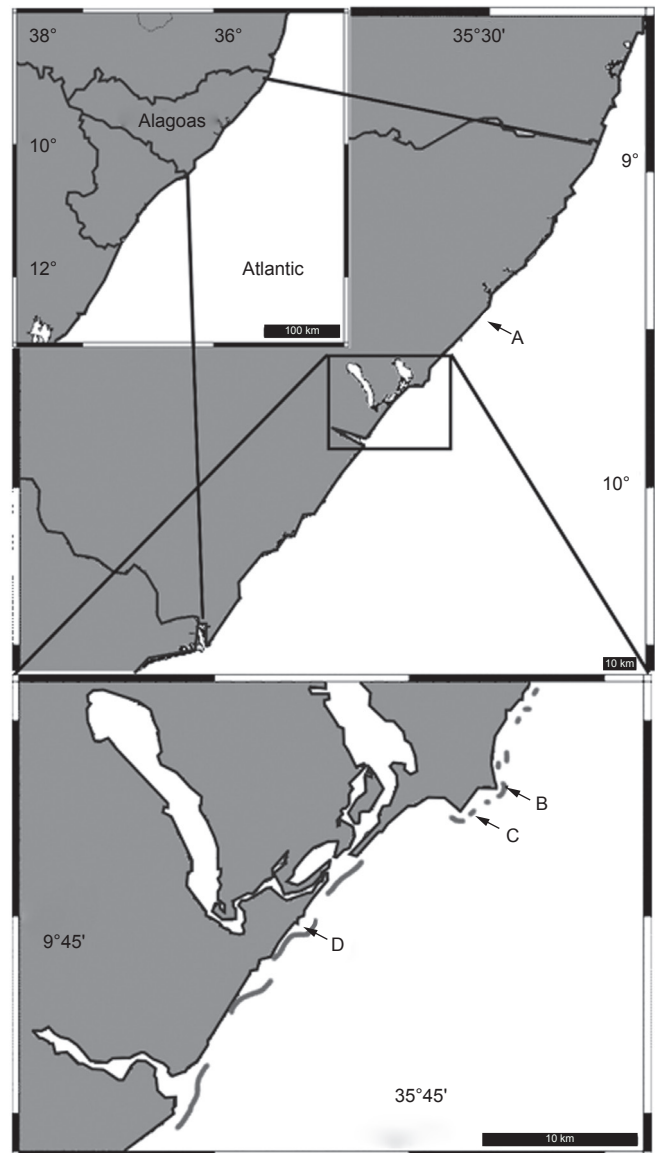
Synonymy cf. Rützler et al. (2007)

Studied material: MNRJ 14277, Ponta do Meirim (coral reef, ca. 09° 32' 32.22" S - 035° 36' 49.80" W), Maceió (AL, Brazil), 0.5-1 m depth, coll. E. Hajdu, 30/i/2010.

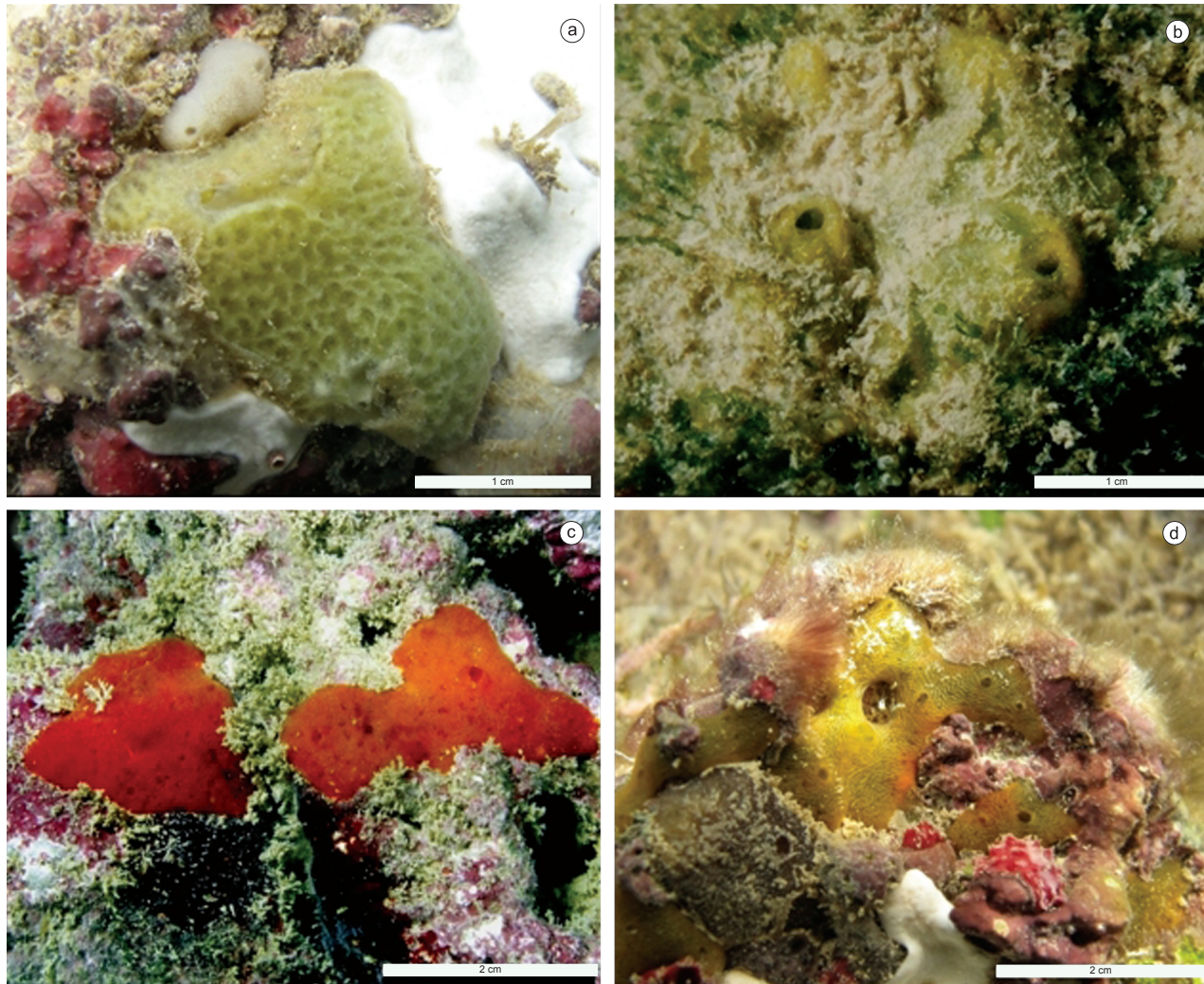
Description: Small sponge (ca. 2.5 cm in its greatest diameter, 5 mm thick), soft, smooth, green alive (Figure 2a), white in ethanol. Underneath its translucent ectosomal membrane, a honey-combed pattern is apparent in the live sponge. Ectosomal skeleton composed by brushes of tyloles, evenly spaced, penetrating the subectosomal region in the form of tracts of tyloles (Figure 3a). Microscleres scattered and abundant. Choanosomal skeleton a neat isodictyal reticulation of single styles, with scattered microscleres (Figure 3b).

Spicules (Table 1, Figures 3c-f): Megaspicules. Tyloles (ectosomal), straight, smooth, with pronounced heads (Figure 3c). Styles (choanosomal), slightly curved, sharp apex (Figure 3d). Microscleres. Isochela, arcuate, length of terminations ca. 33% the total microsclere length (Figure 3e). Sigmas, smooth, C- and S-shaped (Figure 3f).

Distribution: Tropical western Atlantic - Gulf of Mexico (Rützler et al. 2009); Caribbean (Bermuda, Florida, Bahamas,



**Figure 1.** Map showing Alagoas (upper left corner insert) and the collecting localities off Maceió (A, Ponta do Meirim; B, Ponta Verde; C, Piscina dos Amores) and Marechal Deodoro (D, Praia do Francês). Scales: 100 km (upper) and 10 km (middle and bottom). Maps generated by [http://www.aquarius.geomar.de/make\\_map.html](http://www.aquarius.geomar.de/make_map.html) (internet resource no longer available).



**Figure 2.** In situ photographs of species redescribed in this study. a) *Lissodendoryx isodictyalis* (Carter, 1882) (MNRJ 14277 at Piscina dos Amores). b) *Mycale (M.) arenaria* Hajdu & Desqueyroux-Faúndez, 1994 (MNRJ 4629 at Praia do Francês). c-d) *Mycale (Naviculina) diversisigmata* Van Soest, 1984. c) (MNRJ 4721 at Piscina dos Amores). d) (UFAL-POR 0122 at Ponta do Meirim). Scales: A-B, 1 cm; C-D, 2 cm.

**Table 1.** Comparative micrometric data for *Lissodendoryx (Lissodendoryx) isodictyalis* (Carter, 1882). Values are in micrometers, expressed as smallest – average – largest.

**Tabela 1.** Dados micrométricos comparativos para *Lissodendoryx (Lissodendoryx) isodictyalis* (Carter, 1882). Valores em micrômetros, expostos como menor – médio – maior.

	Tylotes (length / axis width / tyle width)	Styles	Sigmas	Arcuate isochelae
MNRJ 14277 - Alagoas	182-200.6-211 / 2.5-4.8-6.3 / 3.2-6.3-7.6	170-184.9-211 / 5.1-5.8-7.6	18-20.3-24	23-25.5-28
MZUSP unregistered (sensu De Laubenfels, 1956) - Pernambuco	158-179.6-192 / 3.8-5.1-6.3 / 5-6.3-7.6	152-159.9-180 / 3.8-5.1-7.6	20-24.5-28	23-26.7-29
Hechtel (1965) - Jamaica	188-223	152-188 / 3-7	27-37	22-28
Wiendenmayer (1977) - Bahamas	180-223 / 2-4	130-180 / 2-5	20-27	18-29
Pulitzer-Finali (1986) - Bahamas	185-200 / 2.5-4	145-155 / 3-4.5	21-24	19-21
Zea (1987) - Colombian Caribbean	185-199.1- 209 / 2.4-3.8-5.7	147-165.5-190 / 1.9-4.5-7.1	24- 28.1-32	21-24.3-28
Rützler et al. (2007, lectotype) - Venezuela	181-202.8-216 / 2.8-4.2-5.5	150-168.3-175 / 3.4-4.8-5.7	17.6-20.5-24.9	21-23.7-27

Panama, Belize, Jamaica, Cuba, Colombia, Venezuela — Zea 1987, Díaz 2005, Rützler et al. 2007). Brazil (Pernambuco, Alagoas — de Laubenfels 1956, present study). Records from other parts of the world need verification (Rützler et al. 2007).

Ecology: The observed specimen encrusted the underside of a dead coral boulder in a shallow tidal pool subject to high temperatures and considerable salinity fluctuation. Similar ecological resilience was observed in Caribbean mangrove specimens by Rützler (1995).

Remarks: Albeit registered for Brazil long ago (De Laubenfels 1956), the species never had its identity confirmed through a comprehensive redescription. This is done here. The Alagoas specimen conforms in every respect to the excellent redescription provided in Rützler et al. (2007), as is apparent from the spicule micrometries contrasted in Table 1. Spicule overall morphology is shown in Figure 3, which perfectly fits the variability illustrated in Rützler et al. (Op. Cit.) Figure 2. The latter authors did not confirm the Brazilian record of the species, limiting its distribution range to 10° 28' N–32° 19' N. This range is expanded here to 09° 32' S – 32° 19' N. De Laubenfels (1956) citation for Pernambuco has been verified from a fragment of the original unregistered material housed in the Museu de Zoologia of São Paulo University (MZUSP). Its micrometric values differ only slightly from those obtained for the Alagoas specimen, and even less from the known variability reported from the Caribbean region. The specimen from Pernambuco has the shortest tylotes among those listed in Table 2, but this appears quite unimportant to us due to a lack of congruence with additional diagnostic features. As currently understood, *Lissodendoryx* (*L.*) *isodictyalis* is a Tropical western Atlantic endemic.

#### FAMILY MYCALIDAE LUNDBECK, 1905

Genus *Mycale* Gray, 1867

#### *Mycale* (*Mycale*) *alagoana* sp.nov.

Figures 2b, 4a-p, Table 2

*Mycale arenaria* Hajdu & Desqueyroux-Faúndez, 1994; sensu Muricy & Hajdu, 2006: 63 (non *M. arenaria* of authors). ? *Mycale* aff. *arenaria* Hajdu & Desqueyroux-Faúndez, 1994; sensu Moraes et al., 2006: 168 (checklist – no description).

Holotype. MNRJ 4624, Praia do Francês (sandstone reef, ca. 09° 45' 54.35" S - 035° 50' 08.22" W), Marechal Deodoro (AL, Brazil), 1–3 m depth, coll. E. Hajdu, 04/ix/2001. Paratype. UFAL-POR 0139,

Piscina dos Amores reef (coral reef, 09° 40' 09.24" S - 035° 42' 14.16" W), Pajuçara Reef, Maceió (AL, Brazil), 0–2 m depth, coll. E. Hajdu, 05/ix/2001.

Comparative materials: *Mycale* (*Mycale*) *arenaria* Hajdu & Desqueyroux-Faúndez, 1994 (UFRJPOR 2431, holotype; MNRJ 2436–2438, paratypes).

Diagnosis: The only *Mycale* in the *immitis*-group with rosettes of anisochelae-I and -II, as well as sigmas in three size categories.

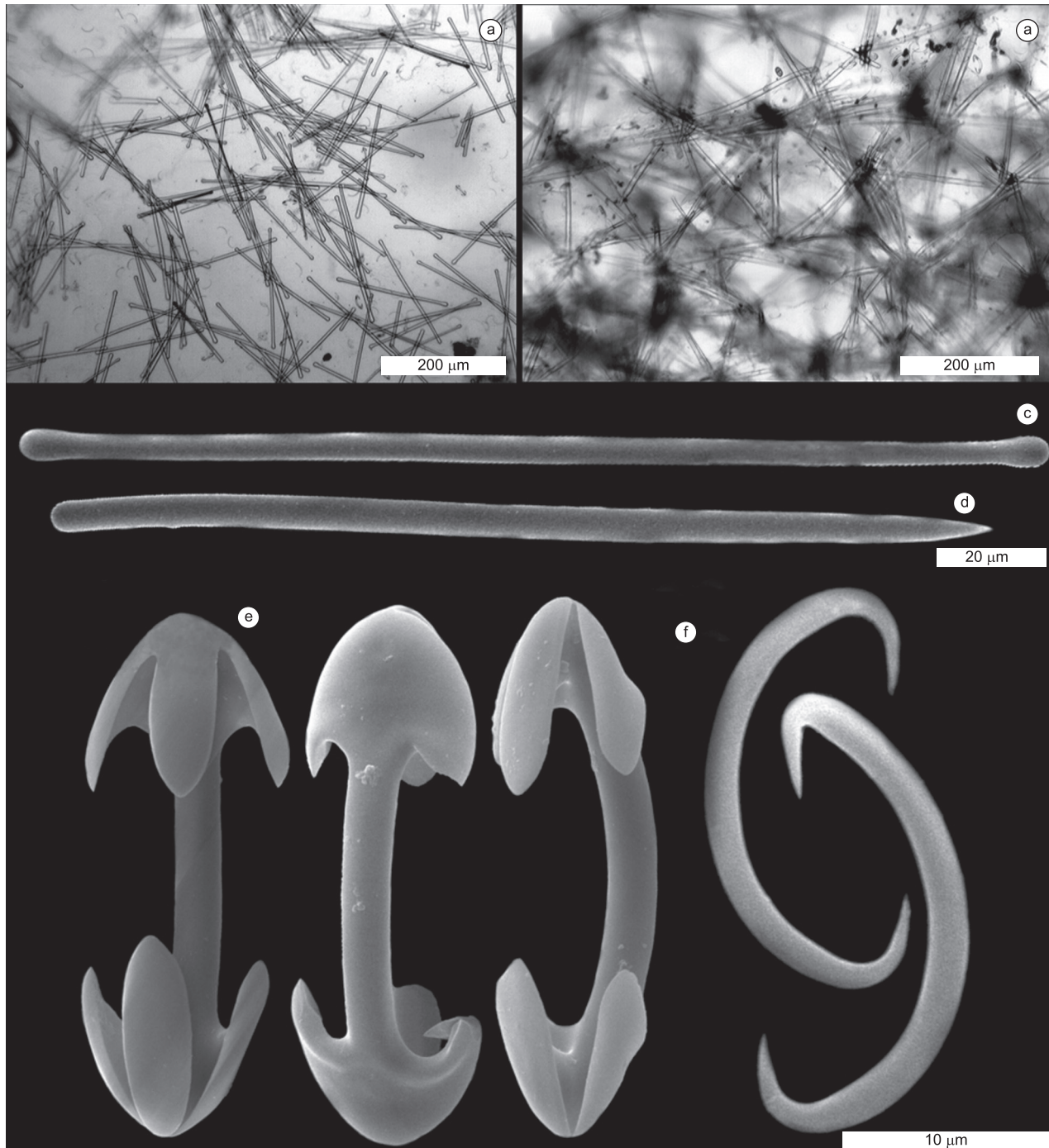
Description: Small sponges (rarely over 3 cm in maximum diameter) forming thick cushion-shaped incrustations on hard substrate. Color alive greenish-yellow (Figure 2b), turning into beige in ethanol. Surface with coarse sediment embedded, elevated into volcaniform projections topped by oscula (usually 1–2 mm diameter). Pore grooves form short, conspicuous meandering canals on the surface. Consistency is fragile, easily torn apart. Ectosomal skeleton a loose reticulation of mycalostyles, both single and in short paucispicular bundles (Figure 4a). Every microsclere category is common or even abundant (anisochelae III and trichodragmas, Figure 4b), but for the anisochelae I, which occur only here and there, and not forming rosettes. Foreign particles, as sand grains, occur randomly too. The choanosomal architecture is markedly cavernous, with multispicular bundles of mycalostyles (80–230 µm in diameter) running longitudinally and spreading slightly into bouquets in the subectosomal region. Rosettes of anisochelae I are abundant in the subectosomal region (up to 3mm deep in the sponge) attached to the multispicular bundles (Figure 4c). Trichodragmas also abound in this area. Spongin not clearly visible either in the ectosome or the choanosome.

Spicules (Table 2, Figures 4d-p): Megascleres. Mycalostyles I (ectosomal), slightly curved, sharp apex (Figure 4e). Mycalostyles II (choanosomal), straight, sharp apex (Figure 4d). Microscleres. Anisochelae I (largest), in rosettes, palmate, curved in side view, with open head (frontal alae forming obtuse angle with shaft, about 25% the entire spicule height) and foot alae prolonged basally forming a round pore (Figure 4f-h). Anisochelae II (intermediate, uncommon), one ectosomal rosette seen, palmate, well developed head and foot alae prolonged basally forming a round pore, the former about 60% the entire spicule height (Figure 4i-j). Anisochelae III (smallest), palmate, well developed head comprising 60% the entire spicule height, rudimentary foot bearing a basal spur (Figure 4k-l). Sigmas I (largest), shallow curve, smooth, apices sharp (Figure 4m). Sigmas II

**Table 2.** Comparative micrometric data for *Mycale* (*Mycale*) *alagoana* sp.nov., *M. (M.) arenaria* Hajdu & Desqueyroux-Faúndez, 1994 and *M. (M.) beatrizae* Hajdu & Desqueyroux-Faúndez, 1994. Values are in micrometers, expressed as smallest – average – largest (N encountered if different from 30).

**Tabela 2.** Dados micrométricos comparativos para *Mycale* (*Mycale*) *alagoana* sp.nov., *M. (M.) arenaria* Hajdu & Desqueyroux-Faúndez, 1994 and *M. (M.) beatrizae* Hajdu & Desqueyroux-Faúndez, 1994. Valores em micrômetros, expostos como menor – médio – maior (N encontrado se diferente de 30).

	Mycalostyles	Anisochelae	Sigmas (s) & Trichodragmas (t)
<i>Mycale</i> ( <i>M.</i> ) <i>alagoana</i> sp.nov. (holotype, MNRJ 4624)	I, 406-451-508 / 9.6-13.7-15.6 II, 497-581-691 / 7.2-9.6-14.4	I, 37.4-64.3-68.4 II, 25-26 (3) III, 18-24 (8)	s I, 38-43.5-48 s II, n.f. s III, 11-12.5-14 (12) t, 65-78-100
<i>Mycale</i> ( <i>M.</i> ) <i>alagoana</i> sp.nov. (paratype, UFAL-POR 0139)	I, 400-430.6-541 / 8.1-11.6-13.8 II, 325-509.0-590 / 9.2-13.1-16	I, 51-62.8-67 II, 30 (2) III, 16-19.5-23 (13)	s I, 64-65.0-67(3) s II, 30-40.0-46 s III, 11.5-15.4-26 (3) t, 60-76.6-104
<i>Mycale</i> ( <i>M.</i> ) <i>arenaria</i> Hajdu & Desqueyroux-Faúndez, 1994 (type series compiled)	I, 323-440.8-588 / 4.4-11.5-17 II, 546-645.5-754 / 7-12.3-17	I, 50-58.4-69 II (rare, I-like), 40 III, 17-26.8-41	s, 28-35.0-43 t, 55-88.4-113 / 4.6-10.6-20
<i>Mycale</i> ( <i>M.</i> ) <i>beatrizae</i> Hajdu & Desqueyroux-Faúndez, 1994 (holotype, UFRJPOR 4244)	284-360.0-384 / 8-10-12	I, 38-40-44 II, 25-27 III, 16-17-20	s I, 36-40-44 s II, 12-15-16



**Figure 3.** *Lissodendoryx (Lissodendoryx) isodictyalis* (Carter, 1882) (MNRJ 14277). a) tangential section of ectosomal skeleton. b) transverse section of choanosomal skeleton. c-d) megascleres. c) tylole. d) style. e-f) microscleres. e) arcuate isochelae. f) sigmas. Scales: a-b) 200 µm; c-d) 20 µm. e-f) 10 µm.

(intermediate), deep curve, smooth, apices sharp (Figure 4n). Sigmas III (smallest), deep curve, smooth, apices sharp (Figure 4o). Raphides, straight, smooth (Figure 4p).

Distribution: Brazilian endemic (Alagoas State).

Ecology: The species has been observed on semi-exposed surfaces, subject to considerable sedimentation and epibiosis, on rather shallow habitats. These are subject to wide fluctuations in environmental parameters such as temperature and salinity.

Remarks: *Mycale (M.) alagoana* sp.nov. is the second species belonging to the “*immitis*-group” (*sensu* Hajdu, 1995), and only the third belonging to that author’s “curved assemblage” to be found

along the Brazilian coast. The other species in the *immitis* species group is *Mycale (M.) arenaria* Hajdu & Desqueyroux-Faúndez, 1994, originally reported from the Brazilian southeast, Rio de Janeiro and Espírito Santo States. Both species can be set apart in view of the anisochelae-II of distinct morphology (less anisochela-I like), which may occur in rosettes, and sigmas in three size-categories observed in the new species. *Mycale (M.) arenaria*, on the contrary, possesses exceedingly rare anisochelae-II quite comparable to its anisochelae-I in having a markedly curved shaft in side view, never seen to form rosettes, and sigmas in a single homogeneous size-category, roughly equivalent to the new species’ intermediate category.



**Figure 4.** *Mycale (Mycale) alagoana* sp.nov. (MNRJ 4624, holotype). a) tangential section of ectosomal skeleton. b) detail of ectosome showing abundant trichodragmas. c) subectosomal architecture with rosettes of anisochelae I around the ascending multispicular tracts. d-e) megascleres. d) mycalostyle I. e) mycalostyle II. f-p) microscleres. f-h) anisochelae I. f) side view. g) oblique frontal view. h), detail of base showing conspicuous basal pore. i-j) anisochelae II. i) frontal view. j) side view. k-l) anisochelae III with basal spur. k) frontal view. l) side view. m) sigma I. n) sigma II. o) sigma III. p) raphid. Scales: A, 500  $\mu$ m; B-E, 100  $\mu$ m; f-p), 20  $\mu$ m.

Moraes et al. (2006) reported *Mycale* aff. *arenaria* from Brazilian oceanic islands, but provided no formal description of the studied material. These samples have to be studied in detail before acceptance of this large range extension for the southeastern Brazilian species, especially because the diagnostic traits to recognize the new species proposed here derive from characters that may be quite uncommon.

Distinction of *Mycale* (*M.*) *alagoana* sp.nov. from *M.* (*M.*) *beatrizae* is much easier, as the latter species has a single category of considerably shorter mycalostyles, smaller anisochelae-I with relatively stouter heads, unspurred anisochelae-III, sigmas in two size categories roughly equivalent to the new species' categories II and III, and is devoid of raphides and/or trichodragmata.

Hajdu (1995) revised the whole "curved-assemblage" – 32 species, wherefrom it appears that no other *Mycale* approaches the new species as closely as *Mycale* (*M.*) *arenaria*, which has already been contrasted to the new species above. The latter is thus judged confidently distinguished from other closely related species.

*Mycale* (*Naviculina*) *diversisigmata* van Soest, 1984

Figures 2c-d, 5a-i, Table 3

*Mycale* (*Aegogropila*) *diversisigmata* Van Soest, 1984: 21.  
*Mycale diversisigmata*, Cedro et al., 2007: 236.

Studied material: MNRJ 4721, Piscina dos Amores (coral reef, 09° 40' 09.24" S – 035° 42' 14.16" W), Pajuçara Reef, Maceió (AL, Brazil), 1m depth, coll. E. Hajdu, 05/ix/2001. UFAL-POR 0122, Jatiúca (coral reef, ca. 09° 39' 14.50" S - 035° 41' 45.41" W), Maceió (AL, Brazil), 0.5-1 m depth, coll. M.D. Correia, 09/ix/2003. UFAL-POR 0183, Ponta do Meirim (coral reef, 09° 32' 32.22" S-035° 36' 49.80" W), Maceió (AL, Brazil), ca. 0.5 m, coll. E.Hajdu, 30/i/2010.

Description: Thinly encrusting sponges usually smaller than 3 cm in their widest portion and 2 mm where thickest. Color alive has been observed to be bright yellow or vermilion red (Figures 2c-d), becoming white to beige in ethanol. The sponge surface is neatly reticulated to the naked eye, bearing scattered oscules about 1 mm in diameter, and surrounded by short chimney-like membranes. Consistency rather soft and fragile, easily torn. Ectosomal skeleton a neat reticulation of paucispicular bundles (3-4 spicules across) forming mostly triangular meshes (120-550 µm in diameter, Figure 5a). Spongin is not clearly visible, but microscleres are everywhere. Anisochelae I form conspicuous rosettes, mostly seen attached to the tangential paucispicular bundles of megascleres, but also right in the middle of the meshes. Naviculichelae of both categories are rather abundant in the meshes, around the pores

(20-100 µm in diameter). Sigmas, normal-shaped (C and S) and flageliform (U-shaped), are less abundant, but are clearly visible too. The choanosomal architecture could not be made out from the material in hand due to its rather thinly incrusting habit and somewhat macerated condition.

Spicules (Table 3, Figures 5b-i): Megascleres. Mycalostyles, nearly straight (only slightly sinuous), fusiform, sharp apex (Figure 5b). Microscleres. Anisochelae (mostly in rosettes), palmate, slightly curved in side view, foot alae prolonged basally forming a round pore (Figure 5c-e). Naviculichelae I (largest), head about 85% the entire spicule height (Figure 5f). Naviculichelae II (smallest), head about 75% the entire spicule height (Figure 5g). Sigmas I, U-shaped, smooth, sharp apices (Figure 5h). Sigmas II, U-shaped, smooth, sharp apices (Figure 5h). Sigmas III, C- and S-shaped, smooth, sharp apices (Figure 5i). Sigmas IV, C- and S-shaped, smooth, sharp apices, absent in one specimen.

Distribution: Tropical western Atlantic - Caribbean (Curaçao — Van Soest, 1984). Brazil (Alagoas — Cedro et al., 2007).

Ecology: This is a sciophilous sponge found only underneath coral boulders of variable dimension. In general, its ecological requirements match those reported above for the other species redescribed here, as its habitat is also subject to considerable fluctuations in temperature and salinity.

Remarks: This is the first redescription of this species from outside its type locality in Curaçao. (Netherlands Antilles, southern Caribbean). The species is nearly indistinguishable from *Mycale* (*Aegogropila*) *escarlatai* Hajdu et al., 1995 in the field, which has also been collected in the reefs of Maceió. Obvious crustose mycalids with neat ectosomal reticulations were relatively common in Maceió reefs. Of fourteen collected specimens, six turned out to be *M. (N.) diversisigmata* (also from Mirante da Sereia, ca. 09° 33' 56" S - 035° 38' 42" W; and Guaxuma, ca. 09° 35' 26" S - 035° 39' 55" W), seven were *M. (A.) escaarlatai* (red), and one is an unidentified *M. (Naviculina)* (dull-yellow). *M. (N.) diversisigmata*, which had its distribution range expanded from the single locality record in Curaçao, at about 12° 16' N - 069° 07' W to 09° 40' S. Texas and sigmas IV were reported by Van Soest (1984) to be rare in the type material. They were not found in all specimens studied here, and the sigmas IV observed in MNRJ 4721 were rather smaller than those of the type material. This is suggestive that additional Caribbean material should be studied to better characterize variability in that area, thus permitting sounder assignment of Brazilian putative conspecific populations.

**Table 3.** Comparative micrometric data for *Mycale* (*Naviculina*) *diversisigmata* Van Soest, 1984. Values are in micrometers, expressed as smallest – average – largest.

**Tabela 3.** Dados micrométricos comparativos para *Mycale* (*Naviculina*) *diversisigmata* Van Soest, 1984. Valores em micrômetros, expostos como menor – média – maior.

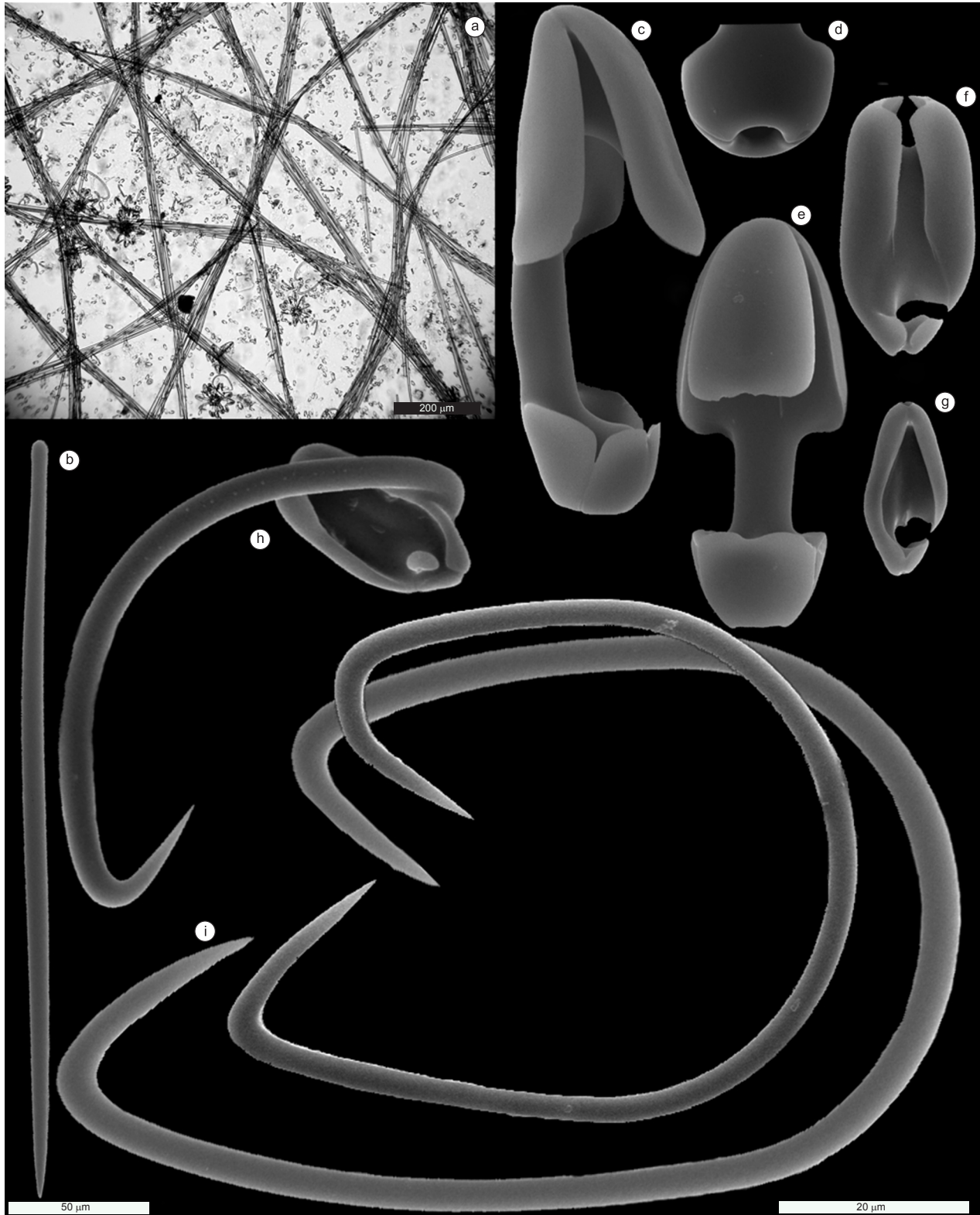
	Mycalostyles	Anisochelae (a) & Naviculichelae (n)	Sigmas & Toxas (numbers of spicules measured when different from 30)
MNRJ 4721 – Alagoas	299-363-385 / 5-6.5-9	a, 31-36.5-42 n I, 22-26.2-30 n II, 12-14.4-18	s I (U-shaped), 78-132.9-218 s II (U-shaped), 53-57.2-68 s III (C & S-shaped), 68-72.5-90 s IV (C & S-shaped), 11-12.7-14 t, not found
UFAL-POR 0122 – Alagoas	299-339.7-403	a, 31-36.5-41.5 n I 18-21-23 n II, 14-16.5-18	s I (U-shaped), 85-115.5-125 s II (U-shaped), 55-57.2-68 s III (C & S-shaped), 68 - 72.5 - 90 s IV, not found t, not found
Van Soest (1984, holotype) – Caribbean	335-373.6-393 / 5.5-6.7-7.5	a, 32-38.0-42 n I, 19-22.9-26 n II, 12-15.1-17	s I (U-shaped), 152-198 s II (U-shaped), 45-80 s III (C & S-shaped), 143-178 s IV (C & S-shaped), 53-69 t, 70-180 (rare)

**Table 4.** List of the Porifera recorded up to now from Alagoas State, organized according to the classification of Hooper & Van Soest (2002). References used for the compilation are as follows: a) Poléjaeff (1884); b) Ridley & Dendy (1887); c) Schulze (1887); d) Sollas (1888); e) Boury-Esnault (1973); f) Sarmento & Correia (2002); g) Muricy & Hajdu (2006); h) Cedro et al. (2007); i) Hajdu & Lopes (2007), j) Muricy et al. (2008) and k) present study.

**Tabela 4.** Lista das espécies de poríferos registradas até o presente do Estado de Alagoas, organizadas conforme a classificação de Hooper & Van Soest (2002). As referências utilizadas nesta compilação foram as seguintes: a) Poléjaeff (1884); b) Ridley & Dendy (1887); c) Schulze (1887); d) Sollas (1888); e) Boury-Esnault (1973); f) Sarmento & Correia (2002); g) Muricy & Hajdu (2006); h) Cedro et al. (2007); i) Hajdu & Lopes (2007), j) Muricy et al. (2008) e k) presente estudo.

Phylum Porifera Grant, 1836	FAMILY DESMACELLIDAE RIDLEY & DENDY, 1886
Class Demospongiae Sollas, 1885	<i>Biemna microacanthosigma</i> Mothes et al., 2004 <sup>H</sup>
Order Spirophorida Bergquist & Hogg, 1969	FAMILY IOTROCHOTIDAE DENDY, 1922
FAMILY TETILLIDAE SOLLAS, 1886	<i>Iotrochota birotulata</i> (Higgin, 1877) <sup>H</sup>
<i>Cinachyrella alloclada</i> (Uliczka, 1929) <sup>F,H</sup>	FAMILY RASPAILIIDAE DENDY, 1922
<i>Cinachyrella apion</i> (Uliczka, 1929) <sup>H</sup>	<i>Echinodictyum dendroides</i> Hechtel, 1983 <sup>H</sup>
Order Astrophorida Sollas, 1887	FAMILY TEDANIIDAE RIDLEY & DENDY, 1886
FAMILIA ANCORINIDAE SCHMIDT, 1870	<i>Tedania (T.) ignis</i> (Duchassaing & Michelotti, 1864) <sup>F,H</sup>
<i>Penares anisoxia</i> Boury-Esnault, 1973 <sup>E</sup>	Subordem Mycalina Hajdu, van Soest & Hooper, 1994
FAMILY GEODIDAE GRAY, 1867	FAMILY MYCALIDAE LUNDBECK, 1905
<i>Geodia corticostylifera</i> Hajdu, Muricy, Custódio, Russo & Peixinho, 1992 <sup>H</sup>	<i>Mycale (Aegogropila) escarlatai</i> Hajdu et al., 1995 <sup>K</sup>
<i>Geodia neptuni</i> (Sollas, 1886) <sup>D,I</sup>	<i>Mycale (M.) alagoana</i> sp.nov. [formerly as <i>M. arenaria</i> and <i>M. aff. arenaria</i> ] <sup>G,H,K</sup>
<i>Geodia papyracea</i> Hechtel, 1965 <sup>H</sup>	<i>Mycale (Naviculina) diversisigmata</i> van Soest, 1984 <sup>H,K</sup>
FAMILY PACHASTRELLIDAE CARTER, 1875	<i>Mycale (Naviculina) sp.</i> <sup>K</sup>
<i>Characella aspera</i> Sollas, 1886 <sup>D,I</sup>	Order Haplosclerida Topsent, 1928
<i>Thenea fenestrata</i> (Schmidt, 1880) <sup>D,I</sup>	Subordem Haplosclerina Topsent, 1928
Lithistid sponges	FAMILY CHALINIDAE GRAY, 1867
FAMILY CORALLISTIDAE SOLLAS, 1888	<i>Chalinula molitba</i> (De Laubenfels, 1949) <sup>H</sup>
<i>Corallistes typus</i> Schmidt, 1870 <sup>D,I</sup>	<i>Haliclona (Reniera) manglaris</i> Alcolado, 1984 <sup>H</sup>
Order Hadromerida Topsent, 1894	<i>Haliclona (Rhizoniera) curacaoensis</i> van Soest, 1980 <sup>H</sup>
FAMILY CLIONAIDAE D'ORBIGNY, 1851	<i>Haliclona (Soestella) melana</i> Muricy & Ribeiro, 1999 <sup>F,H</sup>
<i>Cliona celata</i> complex Grant, 1826 <sup>H</sup>	<i>Haliclona</i> sp. 1–4 <sup>F</sup>
<i>Cliona varians</i> (Duchassaing & Michelotti, 1864) <sup>F,H</sup>	FAMILY NIPHATIDAE VAN SOEST, 1980
FAMILY PLACOSPONGIIDAE GRAY, 1867	<i>Amphimedon aff. complanata</i> Duchassaing, 1859 <sup>F,H</sup>
<i>Placospongia aff. melobesioides</i> Gray, 1867 <sup>H</sup>	<i>Amphimedon compressa</i> Duchassaing & Michelotti, 1864 <sup>F</sup>
FAMILY SPIRASTRELLIDAE RIDLEY & DENDY, 1886	<i>Amphimedon viridis</i> Duchassaing & Michelotti, 1864 <sup>F,H</sup>
<i>Spirastrella coccinea</i> (Duchassaing & Michelotti, 1864) <sup>H</sup>	<i>Niphates erecta</i> Duchassaing & Michelotti, 1864 <sup>H</sup>
<i>Spirastrella hartmani</i> Boury-Esnault et al., 1999 <sup>H</sup>	Order Dictyoceratida Minchin, 1900
FAMILY TETHYIDAE GRAY, 1867	FAMILY DYSIDEIDAE GRAY, 1867
<i>Tethya aff. maza</i> Selenka, 1879 <sup>F</sup>	<i>Dysidea etheria</i> De Laubenfels, 1936 <sup>F,H</sup>
<i>Tethya</i> sp. <sup>H</sup>	FAMILY IRCINIIDAE GRAY, 1867
Order Chondrosida Boury-Esnault & Lopès, 1985	<i>Ircinia strobilina</i> (Lamarck, 1816) [as <i>Stelospongius longispinus</i> (Duchassaing & Michelotti, 1864), misspelled as <i>Stelospongius l.</i> ] <sup>A,1</sup>
FAMILY CHONDRILLIDAE GRAY, 1872	FAMILY SPONGIIDAE GRAY, 1867
<i>Chondrilla aff. nucula</i> Schmidt, 1862 <sup>F,H</sup>	<i>Hyattella cavernosa</i> (Pallas, 1766) <sup>J</sup>
<i>Chondrosia</i> sp. [as <i>Chondrosia collectrix</i> (Schmidt, 1870)] <sup>H</sup>	<i>Spongia</i> sp. <sup>F</sup>
Order Halichondrida Gray, 1867	FAMILY THORECTIDAE BERGQUIST, 1978
FAMILY AXINELLIDAE CARTER, 1875	<i>Cacospongia levis</i> Poléjaeff, 1884 <sup>A,1</sup>
<i>Dragmacidon reticulatum</i> (Ridley & Dendy, 1886) <sup>H</sup>	Order Verongida Bergquist, 1978
<i>Phakellia connexiva</i> Ridley & Dendy, 1887 <sup>B,1</sup>	FAMILY APLYSINIDAE CARTER, 1875
FAMILY DICTYONELLIDAE VAN SOEST, DIAZ & POMPONI, 1990	? <i>Aplysina archeri</i> (Higgin, 1875) [as <i>Aplysina tenuissima</i> (Hyatt, 1875)] <sup>F,H</sup>
<i>Scopalina ruetzleri</i> (Widenmayer, 1977) <sup>H</sup>	Class Hexactinellida Schmidt, 1870
Order Agelasida Hartman, 1980	Subclass Amphidiscophora Schulze, 1886
FAMILY AGELASIDAE VERRIL, 1907	Order Amphidiscosida Schrammen, 1924
<i>Agelas dispar</i> Duchassaing & Michelotti, 1864 <sup>H</sup>	FAMILY PHERONEMATIDAE GRAY, 1870
Order Poecilosclerida Topsent, 1928	<i>Pheronema carpenteri</i> (Thomson, 1869) <sup>C,1</sup>
Subordem Myxillina Hajdu, van Soest & Hooper, 1994	Subclass Hexasterophora Schulze, 1886
FAMILY COELOSPHAERIDAE LÉVI, 1963	Order Lyssacinosa Zittel, 1877
<i>Lissodendoryx (L.) isodictyalis</i> (Carter, 1882) <sup>K</sup>	FAMILY EUPLECTELLIDAE GRAY, 1867
	<i>Euplectella suberea</i> Thomson, 1877 <sup>C,1</sup>





**Figure 5.** *Mycale (Naviculina) diversisigmata* Van Soest, 1984 (MNRJ 4721). a) tangential section of ectosomal skeleton. b) mycalostyle. C-I, microscleres. c-e) anisochelae I. c) side view. d), detail of base showing conspicuous basal pore. e) frontal view. f) naviculichela I. g) naviculichela II. h) normal sigma and naviculichela II. i) flageliform sigmata. Scales: a) 200 µm; b) 50 µm; c-i) 20 µm.

## Discussion

The updated list of sponges known from the State of Alagoas comprises now 48 species (Table 4). Only a small fraction of these has been formally described on the basis of Alagoas' materials, and as such, knowledge of the state's sponge biota is even meager than it seems. This list is likely to represent less than 20% of the sponge fauna occurring in the state's coast, as is already indicated by the large numbers of species not yet identified, housed in the LABMAR and MNRJ collections, all derived from wading and snorkeling at low tide. Alagoas belongs to the North-eastern Brazilian ecoregion, which has a major tropical character, Caribbean in affinity. This is reflected in the observation that 29 out of 48 species (60%) registered for the state are tropical western Atlantic endemics, reported from the Caribbean too, and in many cases from distinct localities along the Brazilian coast. This is the case of rather common species such as *Cinachyrella alloclada*, *Dragmacidon reticulatum*, *Scopalina ruetzleri* and *Tedania ignis*; but also observed in more uncommon species as *Geodia papyracea* and *Mycale escarlatei*. Five species are so far Brazilian endemics, viz. *Biemna microacanthosigma*, *Characella aspera*, *Echinodictyum dendroides*, *Mycale alagoana* sp.nov. and *Penares anisoxia*. Nine species have supposedly wider, disjunct distributions, at least some of which in need of revisionary study. These are *Cacospongia levis*, *Chondrilla* aff. *nucula*, *Cliona celata* complex, *Corallistes typus*, *Euplectella suberea*, *Phoronema carpenteri*, *Placospongia* aff. *melobesioides*, *Tethya* aff. *maza* and *Thenea fenestrata*. The remaining five species are incompletely identified and need further taxonomic study to determine their status as known or new species.

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## References

- BOURY-ESNAULT, N. 1973. Campagne de la Calypso au large des cotes Atlantiques de l'Amerique du Sud (1961-62) I, 29. Res. Scient. Camp. Calypso 10:263-295.
- BRASIL. 1997. Ministério do Meio Ambiente. Decreto Federal de 23 de Outubro de 1997. Dispõe sobre a criação da Área de Proteção Ambiental da Costa dos Corais, nos Estados de Alagoas e Pernambuco, e dá outras providências.
- CEDRO, V.R., HAJDU, E., SOVIERZOSKI, H.H. & CORREIA, M.D. 2007. Demospongiae of the shallow coral reefs of Maceió, Alagoas State, Brasil. In Porifera research: biodiversity, innovation and sustainability (M.R. Custódio, G. Lôbo-Hajdu, E. Hajdu & G. Muricy, eds). Museu Nacional, Rio de Janeiro, p.223-237. (Série Livros 28).
- CORREIA, M.D. & SOVIERZOSKI, H.H. 2009. Ecossistemas Costeiros de Alagoas – Brasil. Technical Books, Rio de Janeiro.
- CORREIA, M.D. 2010. Scleractinian Corals from reef ecosystems on the Alagoas Coast, Brazil. J. Mar. Biol. Assoc. UK in press. doi:10.1017/S0025315410000858.
- DE LAUBENFELS, M.W. 1956. Preliminary discussion of the sponges of Brazil. Contrib. avulsas Inst. Oceanogr., Univ. São Paulo 1:1-4.
- DÍAZ, M.C. 2005. Common sponges from shallow marine habitats from Bocas del Toro region, Panama. Carib. J. Scien. 41:465-475.
- HAJDU, E. 1995. Macroevolutionary patterns within the demosponge order Poecilosclerida. An integrated approach to biogeography of the marine realm, with new data derived from the cosmopolitan demosponge genus Mycale. PhD Thesis, University of Amsterdam, Centrale Drukkerij, Universiteit van Amsterdam.
- HAJDU, E. & DESQUEYROUX-FAÚNDEZ, R. 1994. A synopsis of South American *Mycale* (Poecilosclerida, Demospongiae), with description of three new species and a cladistic analysis of Mycalidae. Rev. Suisse. Zool. 101(3):563-600.
- HAJDU, E. & LOPES, D.A. 2007. Checklist of Brazilian deep-sea sponges. In Porifera research: biodiversity, innovation and sustainability (M.R. Custódio, G. Lôbo-Hajdu, E. Hajdu & G. Muricy, eds). Museu Nacional, Rio de Janeiro, p.353-359. (Série Livros 28).
- HAJDU, E., MURICY, G., BERLINCK, R.G.S. & FREITAS, J.C. 1996. Marine poriferan diversity in Brazil: through knowledge to management. In Biodiversity in Brazil: a first approach (C.E.M. Bicudo & N.A. Menezes, ed.). CNPq, São Paulo, p.157-172.
- HECHTEL, G.J. 1965. A systematic study of the Demospongiae of Port Royal, Jamaica. Bull. Peabody Mus. Nat. Hist. 20:1-103.
- HECHTEL, G.J. 1976. Zoogeography of Brazilian marine Demospongiae. In Aspects of sponge biology (F.W. Harrison & R.R. Cowden, ed.). Academic Press, Nova Iorque, p.237-260.
- HECHTEL, G.J. 1983. New species of marine Demospongiae from Brazil. Iheringia, Zool. 63:59-89.
- HOOPER, J.N.A. & VAN SOEST, R.W.M. 2002. Systema Porifera. A guide to the classification of sponges. Kluwer Academic; Plenum Publishers, New York, v.1.
- MORAES, F.C., VENTURA, M., KLAUTAU, M., HAJDU, E. & MURICY, G. 2006. Biodiversidade de esponjas das ilhas oceânicas brasileiras. In Ilhas Oceânicas Brasileiras – da pesquisa ao manejo (R.J.V. Alves & J.W.A. Castro, orgs). MMA-SBF, Brasília, p.147-178.
- MURICY, G. & MORAES, F.C. 1998. Marine Sponge of Pernambuco State, NE Brazil. Rev. Bras. Oceanogr. 46(2):213-217.
- MURICY, G. & HAJDU, E. 2006. Porifera Brasilis. Guia de identificação das esponjas marinhas mais comuns do Sudeste do Brasil. Museu Nacional, Rio de Janeiro. (Série Livros 17).
- MURICY, G., HAJDU, E., OLIVEIRA, M.V., HEIM, A.S., COSTA, R.N., LOPES, D.A., MELÃO, M., RODRIGUEZ, P.R.D., SILVANO, R.G., MONTEIRO, L.C. & SANTOS, C.P. 2007. Filo Porifera. In Atlas de invertebrados marinhos da região central da Zona Econômica Exclusiva brasileira - Parte I (H.P. Lavrado & M.S. Viana, org.). Museu Nacional, Rio de Janeiro, p.25-57. (Série Livros 25).
- MURICY, G., ESTEVES, E.L., MORAES, F.C., SANTOS, J.P., SILVA, S.M., KLAUTAU, M. & LANNA, E. 2008. Biodiversidade marinha da Baía Potiguar. Museu Nacional, Rio de Janeiro. (Série Livros 29).
- POLÉJAEFF, N.N. 1884. Report on the Keratosa collected by the H.M.S. Challenger during the years 1873-76. Report on the Scientific Results of the Voyage of H.M.S. 'Challenger', 1873-1876. Zoology 11:1-88.
- PULITZER-FINALI, G. 1986. A collection of West Indian Demospongiae (Porifera). In appendix, a list of the Demospongiae hitherto recorded from the West Indies. Ann. Mus. Civ. Stor. Nat. "Giacomo Doria", Genova 86(18):1-216.
- RIDLEY, S.O. & DENDY, A. 1887. Report on the Monaxonida collected by H.M.S. 'Challenger' during the years 1873-1876. Report on the Scientific Results of the Voyage of H.M.S. 'Challenger', 1873-1876. Zoology 20(59):1-275.
- RÜTZLER, K. 1995. Low-tide exposure of sponges in a Caribbean mangrove community. Mar. Ecol. 16:165-179.
- RÜTZLER, K., PIANTONI, C. & DÍAZ, M.C. 2007. *Lissodendoryx*: rediscovered type and new tropical western Atlantic species (Porifera: Demospongiae: Poecilosclerida: Coelosphaeridae). J. Mar. Biol. Assoc. UK 87(6):1491-1510.

- RÜTZLER, K., VAN SOEST, R.W.M. & PIANTONI, C. 2009. Sponges (Porifera) of the Gulf of México. In Gulf of Mexico origin, waters and biota. Biodiversity (D.L. Felder & D.K. Camp, eds). Texas A&M University Press, College Station, v.1, p.285-313.
- SARMENTO, F.J.Q. & CORREIA, M.D. 2002. Descrição de parâmetros ecológicos e morfológicos externos dos poríferos no recife de coral da Ponta Verde, Maceió, Alagoas, Brasil. Rev. Bras. Zoocienc. 4(2):215-226.
- SCHULZE, F.E. 1887. Report on the Hexactinellida Collected by H. M. S. "Challenger" During the Years 1873-1876. Report on the Scientific Results of the Voyage of the H. M. S. Challenger during the Years 1873-1876. Zoology 21: 1-514.
- SOLLAS, W.J. 1888. Report on the Tetractinellida collected by H.M.S. Challenger, during the years 1873-1876. Report on the Scientific Results of the Voyage of H.M.S. Challenger, 1873-1876. Zoology 25(63):1-458.
- VAN SOEST, R.W.M. 1984. Marine sponges from Curaçao and other Caribbean localities. Part III: Poecilosclerida. Stud. fauna Curaçao other Caribb. isl. 66(192):1-167.
- WIEDENMAYER, F. 1977. A monograph of the shallow-water sponges of the Western Bahamas. Experientia suppl. 28. Birkhäuser Verlag, Basel und Stuttgart.
- ZEA, S. 1987. Esponjas del Caribe Colombiano. INVEMAR, Bogotá.

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