

A new species of *Erylus* (Geodiidae, Demospongiae) from Brazilian oceanic islands

Fernando Moraes^(*), Guilherme Muricy

Departamento de Invertebrados, Museu Nacional - Universidade Federal do Rio de Janeiro. Quinta da Boa Vista, s/no. São Cristóvão, Rio de Janeiro - RJ, Brazil 20940-040. fmoraes@mn.ufjf.br, muricy@acd.ufjf.br

Abstract: Despite its biogeographical importance, the sponge fauna of Brazilian oceanic islands has been poorly studied. In this study we describe a new species of *Erylus* Gray (Demospongiae, Astrophorida) from two of the most isolated Brazilian oceanic islands, viz., Trindade Island and São Pedro e São Paulo Archipelago (formerly Saint Paul's Rocks). The new species is characterized by the presence of short-shafted plagiotriaenes, elongate aspidasters, two categories of oxyasters, and one category of strongylasters. This is the first description of a sponge from Trindade Island, and it increases the number of valid species of *Erylus* in Brazil to seven: *E. formosus*, *E. corneus*, *E. transiens*, *E. diminutus*, *E. toxiformis*, *E. soesti*, and *Erylus latens* sp. nov.

Keywords: Brazil, *Erylus latens* sp. nov., Geodiidae, oceanic islands, Porifera, taxonomy

Introduction

Due to their isolation and comparatively small size, oceanic islands are interesting areas for taxonomic, ecological, biogeographical, evolutionary, and conservation biology studies, both of terrestrial and of marine infralittoral habitats (e.g., Briggs 1966, MacArthur and Wilson 1967, Case and Cody 1987, Paulay 1994). In Brazil, there are five groups of oceanic islands: Fernando de Noronha Archipelago, Atol das Rocas, São Pedro e São Paulo Archipelago (formerly Saint Paul's Rocks), Trindade Island, and Martin Vaz Archipelago. Despite the great environmental, biogeographic, economic, and strategic importance of these islands, their sponge fauna has received little attention (Hyatt 1877, Carter 1890, Edwards and Lubbock 1983, Mothes and Bastian 1993, Esteves *et al.* 2002, Moraes *et al.* 2003, Moraes and Muricy 2003). Recent studies demonstrated that the sponge fauna of these islands is very rich and diverse, with a high percentage of new and endemic species (Moraes *et al.* 2006). Most of these studies, however, had faunistic or ecological approaches and contain only species lists, not descriptions. Furthermore, such lists contain many species identified only to genus or family levels, making it difficult to estimate precisely endemism rates and biogeographical affinities (e.g. Muricy *et al.* 2006, Moraes *et al.* 2006). It is therefore important to describe the sponges from Brazilian oceanic islands, particularly the species new to science, to have a better knowledge of their diversity and biogeography.

In an extensive survey of the sponge fauna of Brazilian oceanic islands, Moraes *et al.* (2006) listed 138 species, including an undescribed species of *Erylus* Gray, 1867, which is the subject of this study. The genus *Erylus* is characterized by the combination of ortho- or plagiotriaenes with microscleres including more-or-less flattened sterrasters (aspidasters)

and centrotylote microrhabds together with small euasters (oxyasters, strongylasters, tylasters) in one or more categories. Both inhalant and exhalant orifices are uniporal (Uriz 2002). Several species of *Erylus* produce compounds with interesting pharmacological activities, such as cytotoxic, antitumoral, antifungal, inhibitory of neuraminidase, thrombin receptor antagonist, and inhibitory of human platelet aggregation *in vitro* (Carmely *et al.* 1989, Gulasavita *et al.* 1994, Stead *et al.* 2000, Takada *et al.* 2002, van Altena *et al.* 2003, Sandler *et al.* 2005, Okada *et al.* 2006). Some of these substances also show ecological importance, such as the triterpene glycosides produced by *Erylus formosus*, which deterred fish predation, microbial attachment, and fouling by invertebrates and algae (Kubaneck *et al.* 2000, 2002).

The genus *Erylus* contains approximately 60 valid species, 17 of which occur in the Atlantic and Caribbean (Adams and Hooper 2001, Mothes and Lerner 2001, Lehnert *et al.* 2006). So far, six species were described from Brazil: *E. formosus* Sollas, 1886, *E. alleni* de Laubenfels, 1934, *E. corneus* Boury-Esnault, 1973, *E. diminutus* Mothes *et al.*, 1999, *E. toxiformis* Mothes and Lerner, 1999, and *E. soesti* Mothes and Lerner, 2001 (Sollas 1886, 1888, Boury-Esnault 1973, Mothes-de-Moraes 1978, Solé-Cava *et al.* 1981, Mothes and Bastian 1993, Mothes and Lerner 1999, 2001, Mothes *et al.* 1999, 2004). The record of *E. topsenti* von Lendenfeld, 1903 by Mothes-de-Moraes (1981) was synonymized with *E. soesti* by Mothes and Lerner (2001), and that of *E. oxyaster* von Lendenfeld, 1910 by Mothes-de-Moraes (1978) was synonymized with *E. diminutus* by Mothes *et al.* (1999). *Erylus alleni* was considered a junior synonym of *E. transiens* (Weltner, 1882) by van Soest and Stentoft (1988), but not by Mothes *et al.* (1999), based on the presence of one *versus* two size categories of oxyasters. The distinction of microsclere size categories is often very subtle in sponges, and therefore

we agree with van Soest and Stentoft (1988) that the two species are synonymous, with priority to the older name *E. transiens*.

In this study, we describe a new species of *Erylus* from the oceanic islands of Trindade and São Pedro e São Paulo Archipelago, Brazil. The new species increases to seven the number of species of *Erylus* described from Brazil.

Material and methods

Study area

São Pedro e São Paulo Archipelago is located on the São Paulo Fracture Zone (0°55'N-29°21'W), 1,010 km NE from the city of Natal, Rio Grande do Norte State, NE Brazil (Fig. 1). São Pedro e São Paulo is highly isolated from other shallow areas, lying in the middle of the Atlantic basin, which ranges from 2,000-4,000 m depth. With only 400 m across and 20 m of maximum height, it is one of the smallest isolated archipelagos of the world (Figs. 2A, 3A). In contrast to other Atlantic islands, its origin is plutonic and not volcanic, with ultrabasic rocks resulting from the uplift of the upper mantle (Tilley 1947, Melson *et al.* 1972). Six sites were sampled, but the new species was found in only two (Figs. 2A, 3B): **Cove**: a small bay, relatively sheltered, ranging from 3–18 m depth, with rock and rubble bottoms dominated by the green alga *Caulerpa racemosa* (see Villaça *et al.* 2006), the zoanthid *Palythoa* sp., and sponges; and **Vertical Wall of Belmonte Island**: a deep vertical wall > 100 m depth with many crevices, on the western side of the archipelago. Trindade Island (20°30'S-29°20'W) is located at the eastern edge of the Vitória–Trindade Chain, 1,140 km E off Vitória, Brazil (Fig. 1). It has an area of approximately 8 km², with sandy beaches, rocky coasts and tide pools (Castro and Antonello 2006). Nine sites were sampled, but the new species was found in only three (Figs. 2B, 3C, D): **Ponta do Paredão**: rocky

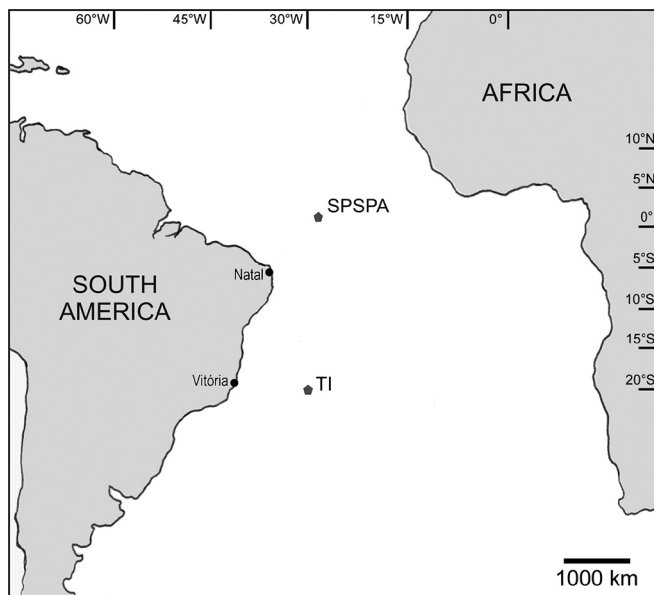


Fig. 1: Location of São Pedro e São Paulo Archipelago (SPSPA) and Trindade Island (TI).

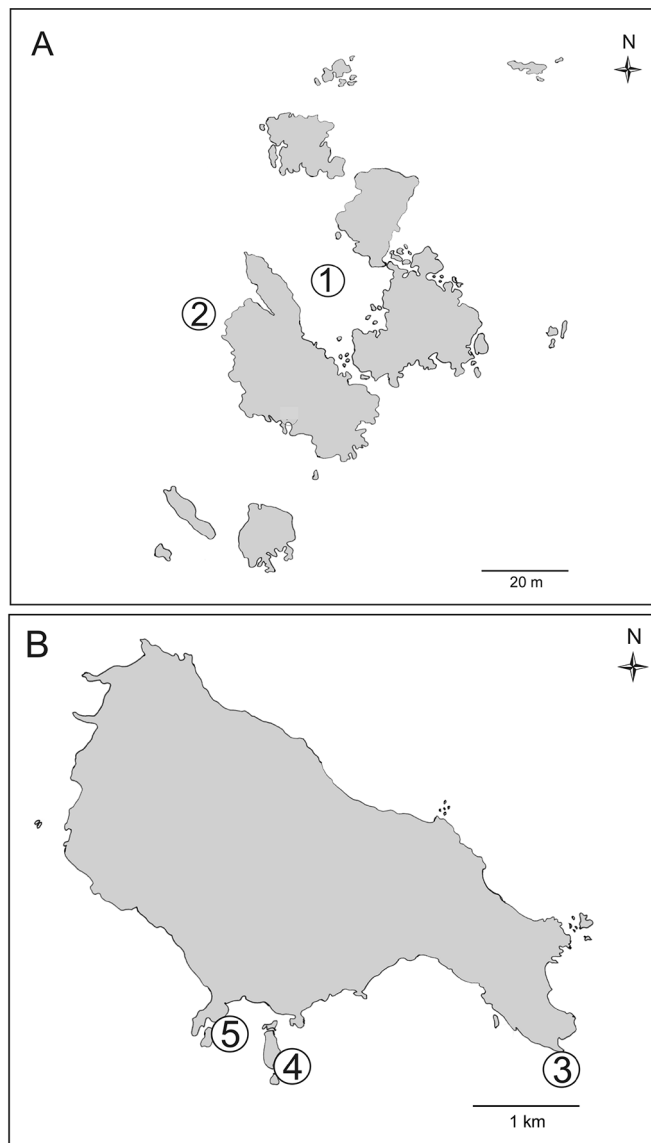
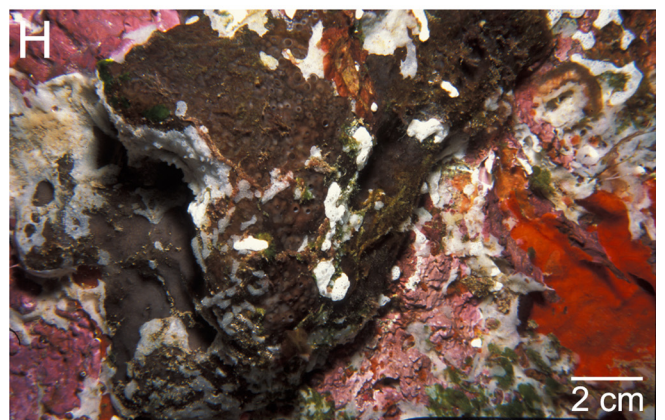
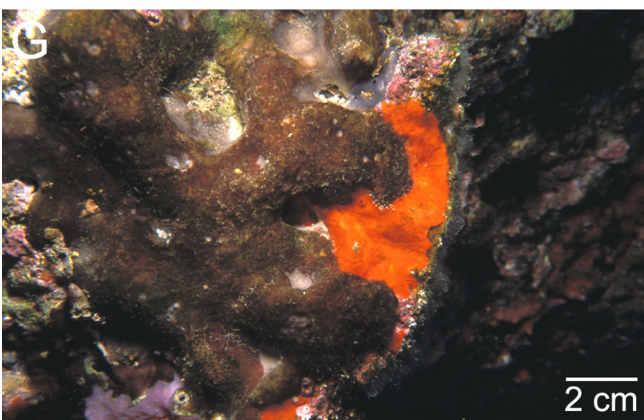
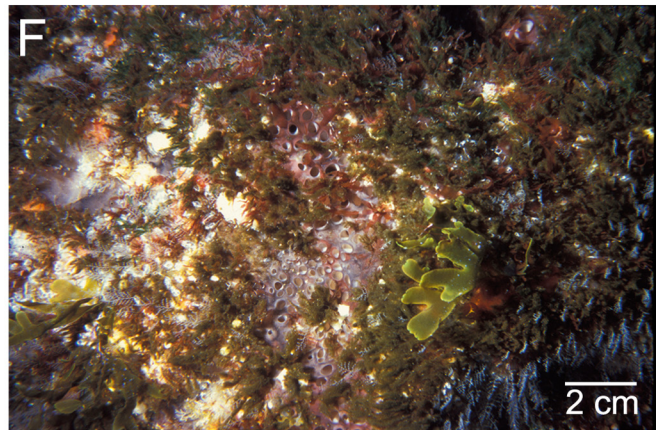
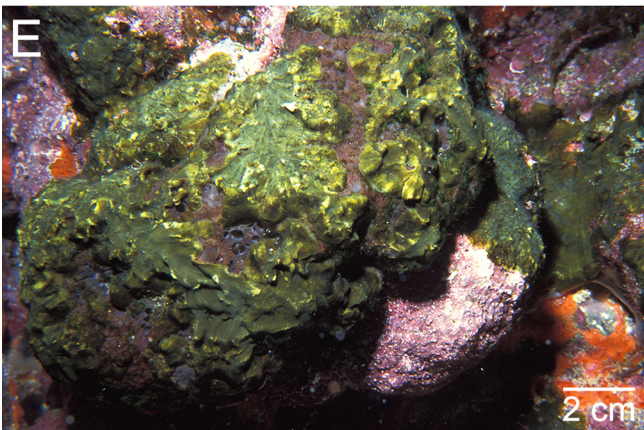
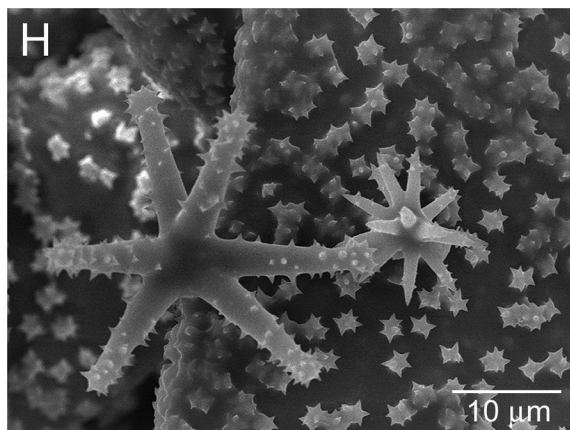
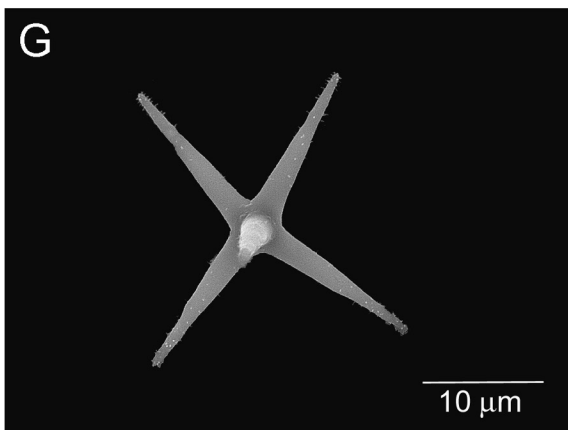
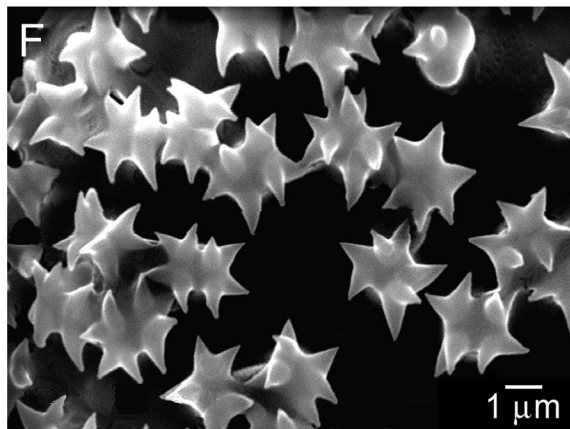
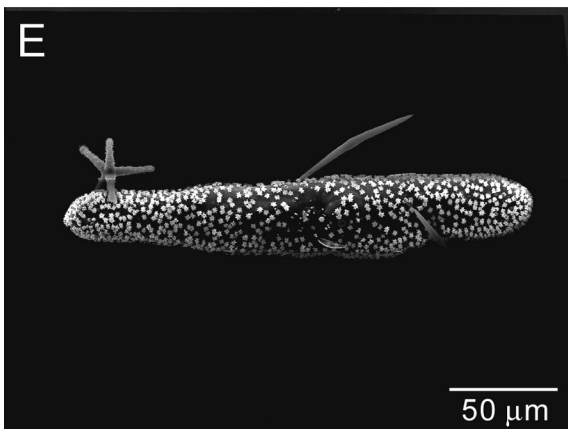
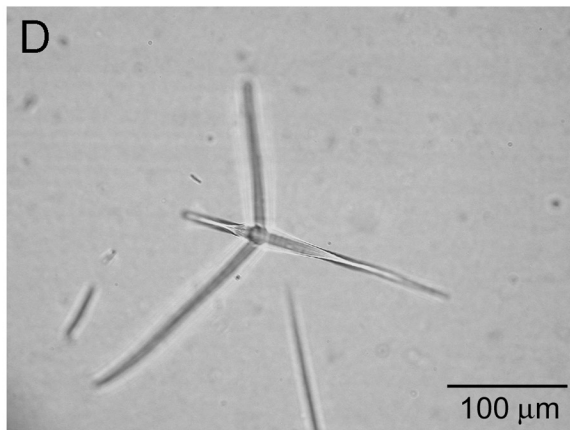
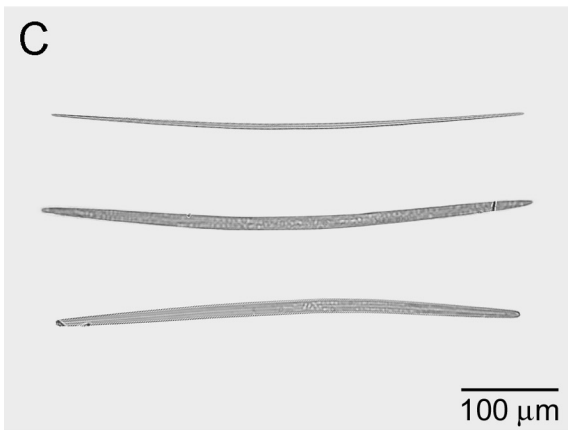
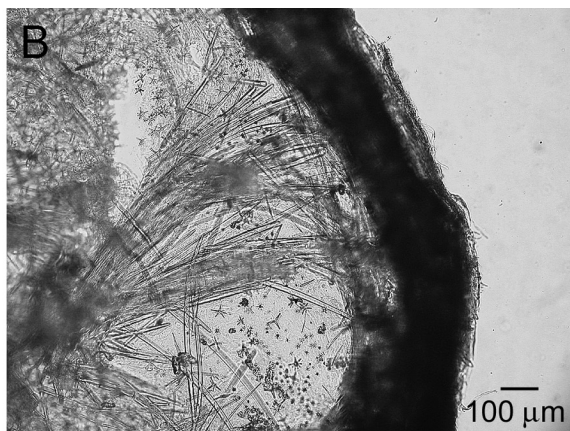


Fig. 2: São Pedro e São Paulo Archipelago (A) and Trindade Island (B), showing the location of the collection sites: 1, Cove; 2, Vertical Wall of Belmonte Island; 3, Ponta do Paredão; 4, Ilha do Sul; 5, Ponta dos Farrilhões.

vertical wall, with many small caves, 30 m depth; **Ilha do Sul**: large boulders forming small caves close to the bottom, 25 m depth; and **Ponta dos Farrilhões**: rocky vertical wall, with small caves close to the bottom, 30 m depth.

Fig. 3: Collection sites and external morphology of *Erylus latens* sp. nov. **A.** São Pedro e São Paulo Archipelago, East Shore; **B.** Cove in São Pedro e São Paulo Archipelago; **C-D.** Trindade Island, North Shore; **E-F.** Living specimens of *Erylus latens* sp. nov. (greyish-brown) from São Pedro e São Paulo Archipelago, partially covered by green and brown algae; **G-H.** Living specimens of *Erylus latens* sp. nov. (brown) from Trindade Island, partially covered by other sponges.





Collection and identification

Sponge samples were collected by snorkeling and SCUBA diving, from 0-25 m depth, in four expeditions: October 2000, August 2001 (São Pedro e São Paulo Archipelago), February 2003, and August 2003 (Trindade Island). The specimens were preserved in 70% ethanol and deposited in the Porifera collection of the Museu Nacional, Universidade Federal do Rio de Janeiro, Brazil (MNRJ). *In situ* photographs were taken with a Nikonos V camera with 35 mm and close-up lenses. Photographs were digitalized using a Nikon Coolscan IV ED scanner. Spicule slides were prepared by dissociation of a small fragment of sponge in boiling nitric acid. Thick sections of the skeleton were observed under light microscope. Depending on spicule abundance, 5-20 spicules of each type were measured per sponge specimen. Measurements are given as minimum-mean-maximum length x minimum-mean-maximum width (in μm). For identification, specimens were compared with the other described species of *Erylus* in the literature and with museum specimens whenever possible. Other abbreviations used: MNHN, Muséum National d'Histoire Naturelle, Paris; BMNH, The Natural History Museum, London.

Systematics

Class Demospongiae Sollas, 1885
Order Astrophorida Sollas, 1888
Family Geodiidae Gray, 1867

Genus *Erylus* Gray, 1867

Definition: Geodiidae with short-shafted triaenes (ortho- or plagiotriaenes); sterrasters usually more-or-less flattened (aspidasters). The somal microsclere is a centrotylote microrhabd. Uniporal inhalant and exhalant orifices (Uriz 2002).

***Erylus latens* sp. nov.**
(Figs. 3, 4)

Synonyms: *Erylus* cf. *formosus* sensu Edwards and Lubbock 1983: 63 (non: *Erylus formosus* Sollas, 1886 and all other authors). *Erylus* sp. nov., Moraes *et al.* 2006: 167.

Diagnosis: *Erylus* with short-shafted plagiotriaenes, large diactines ranging from oxeas to strongyles, centrotylote microxeas, elongate aspidasters, two categories of oxyasters, and strongylasters.

Fig. 4: Morphology of *Erylus latens* sp. nov. **A.** preserved specimen (Holotype, MNRJ 7397); **B.** transverse section showing the cortex and the choanosome; **C.** large diactines; **D.** short-shafted plagiotriaene; **E.** aspidaster, strongylaster, and centrotylote microxea; **F.** detail of aspidaster showing the star-shaped spines; **G.** oxyaster 1; **H.** strongylaster (left) and oxyaster 2 (right) (E-H, MEV).

Etymology: The species name refers to the algae often overgrowing this species, which makes the specimens difficult to see (from Latin: *latens* = hidden).

Material examined: Trindade Island, Brazil (20°30'S-29°20'W): Holotype MNRJ 7397, 17/VIII/2003, 15 m depth, Ilha Sul, coll. F. Moraes and G. Muricy; Paratypes MNRJ 7375, 17/VIII/2003, 25 m depth, Ponta do Paredão, coll. G. Muricy; MNRJ 7399, 17/VIII/2003, 20 m depth, Ponta do Paredão, coll. G. Muricy; MNRJ 7407, 17/VIII/2003, 17 m depth, Ponta do Paredão, coll. F. Moraes; MNRJ 7409, 17/VIII/2003, 15 m depth, Ilha Sul, coll. G. Muricy; MNRJ 7419, 18/VIII/2003, 22 m depth, Ponta dos Farrilhões, coll. F. Moraes. São Pedro e São Paulo Archipelago, Brazil (0°55'N - 29°21'W): Paratypes MNRJ 3572, 26/X/2000, Cove, 3 m depth; MNRJ 3571, 27/X/2000, Vertical Wall of Belmonte Island, 16 m depth; MNRJ 4742, 15/VIII/2001, Cove, 5 m depth MNRJ 4748, 28/VIII/2001, Cove, 13 m depth; all coll. F. Moraes.

Comparative material: *Erylus corneus* Boury-Esnault, 1973: MNHN LBIM-NBE 975 (schyzotype), Brazil, coll. R.V. Calypso; *Erylus formosus* Sollas, 1886, BMNH 1889.1.1.77, Brazil, coll. H.M.S. 'Challenger'.

Description: massive or subspherical sponge, up to 12 x 6 x 8 cm (Figs. 3E-H, 4A). Color brown, greyish brown, or dark grey to almost black externally and beige internally, both *in vivo* and in 70% ethanol. Surface uneven, rough, microhispid, often covered by algae, hydroids, and other sponges. Oscules circular, 0.5-5.0 mm in diameter, flush, frequently in clusters. Consistency hard, inelastic.

Skeleton: cortex dense, 210-392-500 μm thick, formed by abundant aspidasters and microxeas vaguely perpendicular to the surface (Fig. 4B). Choanosome with multispicular tracts of large diactines, 100-141-175 μm thick, vaguely radial, which expand and become plumose below the cortex (Fig. 4B); the cladomes of the triaenes form a very sparse tangential layer in the subcortical region. Dispersed diactines are common between the tracts. Oxyasters and strongylasters are randomly dispersed in the choanosome; microxeas are restricted to the cortex.

Spicules: large diactines ranging from oxeas to strongyles, straight or slightly curved: 282-518-720 x 2-10-17 μm (Fig. 4C). Plagiotriaenes (Fig. 4D) short-shafted, rare to absent, with a reduced, conical, often telescopic rhabdome (100-155-180 x 5-7-10 μm), and sinuous clads which may be unequal or irregularly bifurcated (90-118-150 x 5-9-12 μm). Microxeas centrotylote, smooth, with acerate endings: 39-56-70 x 1-3-5 μm (Fig. 4E). Aspidasters elongate, with rounded endings and star-shaped spines: 160-222-302 x 20-44-70 μm (Fig. 4E, F). Oxyasters 1 rare to absent, with thin, apparently smooth rays, but with very small spines, ray tips blunt or acerate (Fig. 4G): 17-24-40 μm in diameter. Oxyasters 2 with a small centrum and spined, acerate rays, with spines larger at the distal end (Fig. 4H): 8-13-25 μm in diameter. Strongylasters, with rays spined and with rounded endings: 24-35-50 μm in diameter (Fig. 4H).

Ecology: *Erylus latens* sp. nov. was found between 3-25 m depth, usually on vertical hard substrate, either exposed to light, in crevices, or under shaded overhangs. Several species

Table 1: Spicular characteristics of Brazilian *Erylus*. All measurements are in micrometers.

Characters	<i>E. formosus</i>	<i>E. corneus</i>	<i>E. transiens</i>	<i>E. diminutus</i>	<i>E. toxiformis</i>	<i>E. soesti</i>	<i>E. latens</i> sp. nov.
Triaxone type	long-shafted orthotriaenes	short-shafted orthotriaenes	short-shafted orthotriaenes	short-shafted dichotriaenes	short-shafted orthotriaenes	dichotriaenes and rare plagiotriaenes	short-shafted plagiotriaenes
Rhabdome	180-625/ 9-24	126-380/ 11.5	171-665/ 4.6-5.6	256-304/ 38-57	199-389/ 11-23	805-1380/ 47-95	100-180/ 5-10
Cladome	171-446	238-428	119-617	684-855	361-636	713-1058	90-150
Diactine type	Oxea	Oxea	Oxea	Strongyles	Oxea with rare strongyles	Oxea	Oxeas and strongyles
Diactine size	475-989/ 7-28	494-680/ 8-19.5	437-950/ 4.6-21	460-920/ 9.5-24	897-1817/ 9-25	2093-3220/ 33-57	282-720/ 2-17
Centrotylote microdiactine	smooth microstrongyles	smooth microxoea	smooth microxoea, rarely blunt	smooth microstrongyles, rare microxeas	smooth microstrongyles	microspined microstrongyles, rarely smooth	smooth microxoea
Microdiactine size	39-83/ 2.3-4.6	27.6-57/ 1-3.5	30-71/ 1-7	39-48-59/ 3.5-6.9	50-97/ 2-7	37-76/ 4.6-9.2	39-56-70/ 1-3-5
Aspidaster	Digitiform	Elliptical	Elliptical or disk-shaped	Elliptical or disk-shaped, irregular	disk-shaped or elliptical, sterraster-like	Variable, disk-shaped to lobate, very irregular	Elongate, with rounded endings
Aspidaster size	95-305/ 11-55	119-153/ 69-87	35-145/ 50-114	159-228/ 105-151	207-506/ 184-414	46-128/ 39-92	160-302/ 20-70
Oxyaster 1	16-64	-	23-60	24-54	34-97	-	17-40
Oxyaster 2	-	9-23	7-27.6	-	-	9-21 (spheroxyaster)	8-25
Strongylaster	7-23	-	-	-	-	-	24-50
Diactinal aster	-	-	-	-	73-103	-	-
References	Sollas 1886, Boury-Esnault 1973, Solé-Cava <i>et al.</i> 1981, Mothes <i>et al.</i> 1999	Boury-Esnault 1973, Mothes <i>et al.</i> 1999	de Laubenfels 1934, van Soest and Stentoft 1988, Mothes <i>et al.</i> 1999	Mothes-de-Moraes 1978, Mothes <i>et al.</i> 1999	Mothes and Lerner 1999	Mothes-de-Moraes 1981, Mothes and Lerner 2001	Present study

of algae and other sponges were found on the surface of most specimens studied, making it difficult to locate and identify the specimens in the field (Fig. 3E-H).

Distribution: Endemic from Brazil: São Pedro e São Paulo Archipelago and Trindade Island (Moraes *et al.* 2006).

Discussion

Six valid species of *Erylus* have been previously described from Brazil: *E. formosus*, *E. corneus*, *E. transiens* (as *E. alleni*, by Mothes *et al.* 1999), *E. diminutus*, *E. toxiformis*, and *E. soesti* (Sollas 1886, 1888, Boury-Esnault 1973, Mothes-de-Moraes 1978, Solé-Cava *et al.* 1981, Mothes and Bastian 1993, Mothes and Lerner 1999, 2001, Mothes *et al.* 1999, 2004). Most of these species are known only from one or a few museum specimens collected by dredging, and sometimes only by fragments (e.g., *Erylus toxiformis* and *E. soesti*; Mothes and Lerner 1999, 2001). The only exceptions are *E. formosus* and *E. latens* sp. nov., which have been collected through SCUBA diving (Solé-Cava *et al.* 1981; present study). External morphological characters, particularly color *in vivo* and oscular characteristics, are therefore of little usefulness to discriminate among Brazilian species. The skeletal architecture of the choanosome is similar in all species, with radial bundles or isolated oxeas and triaenes whose cladomes form a tangential subcortical layer; microscleres are randomly dispersed between the megasclere bundles. The ectosome is always a cortex of microscleres, with centrotylote microrhabds in the external layer and densely packed aspidasters in the internal layer, but the orientation of the microrhabds varies from tangential to oblique or perpendicular, thus representing a good taxonomic character. Spicule composition and details of their ornamentation are however the best characters to identify Brazilian species of *Erylus* (Table 1).

Erylus latens sp. nov. shares the short-shafted triaenes with *E. corneus*, *E. transiens* and *E. toxiformis*, and the elongate aspidasters with *E. formosus*. *Erylus corneus* however has orthotriaenes instead of plagiotriaenes, elliptical aspidasters, only one category of oxyasters, and no strongylasters (Boury-Esnault 1973, Mothes *et al.* 1999). *Erylus transiens* also has no strongylasters, but it has only one or two categories of oxyasters; furthermore, its aspidasters are disk-shaped and some specimens have dichotriaenes in variable abundance in addition to the short-shafted orthotriaenes (Weltner 1882, de Laubenfels 1934, van Soest and Stentoft 1988, Mothes *et al.* 1999). The record of *E. transiens* from Azores (Topsent 1892) probably belongs to a different species: its shape is pedunculate, ramose; its tetraxons are exclusively dichotriaenes (short-shafted plagio- or orthotriaenes are absent); and its microstrongyles are shorter (up to 23 μm) and rarely centrotylote. *Erylus toxiformis* differs from *E. latens* sp. nov. by having orthotriaenes instead of plagiotriaenes, sterraster-like aspidasters, and the peculiar toxiform asters diagnostic of the species (Mothes and Lerner 1999). *Erylus formosus* can be easily distinguished from the new species by its large, long-shafted orthotriaenes, smaller strongylasters, and by the presence of a single large oxyaster category, as opposed to smaller short-shafted plagiotriaenes, larger strongylasters, and two smaller categories of oxyasters in the new species (Table 1). Edwards and Lubbock (1983)

recorded *Erylus* cf. *formosus* from São Pedro e São Paulo Archipelago; although the specimens studied by Edwards and Lubbock (1983) were not reexamined, extensive collections in the archipelago failed to find *Erylus formosus*, revealing instead a relatively great abundance of *Erylus latens* sp. nov. The record of Edwards and Lubbock (1983) of *E. formosus* is thus here synonymized with the new species. *Erylus latens* sp. nov. differs from all other Brazilian species of the genus by its short-shafted plagiotriaenes together with three categories of asters (two of oxyasters and one of strongylasters).

Nine species of *Erylus* were recorded from the Caribbean (Pulitzer-Finali 1986), of which only four have short-shafted plagiotriaenes: *Erylus transiens*, *E. ministrongilus* Hechtel, 1965, *E. clavatus* Pulitzer-Finali, 1986 (probably a junior synonym of *E. formosus*; cf. van Soest *et al.* 2005), and *E. trisphaera* (de Laubenfels, 1953, as *Unimia*). *Erylus ministrongilus* differs from the new species by the smaller and thinner aspidasters and by the absence of strongylasters. *Erylus clavatus* has larger oxeas (930-1230/14-28 μm), tylasters, and its calthrops are orthotriaenes instead of plagiotriaenes (Pulitzer-Finali 1986). *Erylus trisphaera* has exclusive trilobate aspidasters. Other three species of *Erylus* are known from the Atlantic: *E. granularis* Topsent, 1904, *E. expletus* Topsent, 1927, and *E. papillatus* Topsent, 1928 (see also Adams and Hooper 2001); all of them differ from *Erylus latens* sp. nov. by their oval or rounded aspidasters.

Brazilian species of *Erylus* were collected mostly by dredging along the continental shelf (*E. formosus*, *E. corneus*, *E. transiens*, *E. diminutus*, and *E. toxiformis* – Boury-Esnault 1973, Mothes and Lerner 1999, Mothes *et al.* 1999, 2003, 2004) and slope (*E. soesti* – Mothes and Lerner 2001), with only *E. formosus* also occurring in littoral areas (Solé-Cava *et al.* 1981) and in oceanic islands such as Fernando de Noronha (Mothes and Bastian 1993, Muricy and Moraes 1998) and Atol das Rocas (Moraes *et al.* 2003). The new species is only the second species of *Erylus* described from Brazilian oceanic islands, and the first description of a sponge from Trindade Island. Beyond the seven species of *Erylus* described so far from Brazil, at least six other records, as yet unidentified and undescribed, are also known (*Erylus* spp. 1-5 in Muricy *et al.* 2006, *Erylus* sp. 1 in Moraes *et al.* 2006). The diversity of the genus *Erylus* in Brazil is therefore probably greater than the current estimations.

Key to Brazilian species of *Erylus* (modified from Mothes and Lerner 2001)

- 1A. Tetractinal megascleres include dichotriaenes2
- 1B. Tetractinal megascleres include only orthotriaenes or plagiotriaenes, dichotriaenes absent4
- 2A. Tetractinal megascleres dichotriaenes only; ortho- and plagiotriaenes absent3
- 2B. Dichotriaenes, when present, occur together with plagiotriaenes; aspidasters disk-shaped, oxyasters in one or two recognizable size categories *E. transiens*
- 3A. Dichotriaenes with short rhabdome (256-304 μm long); strongyles varying to strongyloxeas (460-920 μm long); aspidasters flattened, with slightly irregular outline (159-229 μm long)..... *E. diminutus*

- 3B. Dichotriaenes with long rhabdome (805-1380 µm long); oxeas long (2093-3220 µm long); aspidasters not flattened, with strongly irregular outline (46-129 µm long).....*E. soesti*
- 4A. Aspidasters atypical, sterraster-like, disk-shaped, not flattened (207-506 µm long); reduced toxa-like oxyasters present (74-104 µm long).....*E. toxiformis*
- 4B. Aspidasters typical, flattened; toxa-like oxyasters absent.....5
- 5A. Aspidasters elliptical or disk-shaped.....6
- 5B. Aspidasters finger-shaped or elongate (95-305 µm long).....7
- 6A. Oxyasters in a single category (9-23 µm).....*E. corneus*
- 6B. Oxyasters in two size categories (23-57 and 8-27 µm).....*E. transiens*
- 7A. Long-shafted orthotriaenes; oxyasters and strongylasters in one size category.....*E. formosus*
- 7B. Short-shafted plagiotriaenes; oxyasters in two shape categories and strongylasters in one size category.....*E. latens* sp. nov.

Acknowledgements

We thank Diogo Pagnoncelli, Bárbara Rustum Andréa, Bertran Feitoza, Zaira Matheus and Claudio Moraes for laboratory and/or field help. We also thank Shirley Stone (The Natural History Museum, London) and Dr. Claude Lévi (Muséum National d'Histoire Naturelle, Paris) for the kind loan of specimens for comparison. We are grateful to Dr. Marcia Attias and Noêmia Rodrigues (Laboratório de Ultraestrutura Celular Hertha Meyer, Instituto de Física Carlos Chagas Filho, UFRJ) for their help in the use of SEM. The comments of two anonymous reviewers greatly improved the manuscript. Special thanks to Rob van Soest and Beatriz Mothes for the kind help to obtain relevant literature. Fundação O Boticário de Proteção à Natureza, Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), Fundação Carlos Chagas Filho de Apoio à Pesquisa do Estado do Rio de Janeiro (FAPERJ), Secretaria da Comissão Interministerial para os Recursos do Mar (SECIRM), and Marinha do Brasil provided financial and logistic support.

References

- Adams CL, Hooper JNA (2001) A revision of Australian *Erylus* (Porifera: Demospongiae: Astrophorida: Geodiidae) with a tabular review of worldwide species. *Invert Taxon* 15: 319-340
- Boury-Esnault N (1973) Campagne de la Calypso au large des côtes atlantiques de l'Amérique du Sud (1961-1962). Spongiaires. *Rés Sci Camp "Calypso", Paris* 10: 263-295
- Briggs J (1966) Oceanic islands, endemism, and marine paleotemperatures. *Syst Zool* 15: 153-163
- Carmely S, Roll M, Loya Y, Kashman Y (1989) The structure of eryloside-A, a new antitumor and antifungal 4-methylated steroidal glycoside. *J Nat Prod* 52(1): 161-170
- Carter HJ (1890) Porifera – Notes on the zoology of Fernando de Noronha. *J Linn Soc* 20: 564-569
- Case TJ, Cody ML (1987) Testing theories of island biogeography. *Am Sci* 75(4): 402-411
- Castro JWA, Antonello LL (2006) Geologia das ilhas oceânicas brasileiras. In: Alves RJV, Castro JWA (eds). *Ilhas oceânicas brasileiras: da pesquisa ao manejo*. Ministério do Meio Ambiente, Brasília. pp. 27-57
- de Laubenfels MW (1934) New sponges from Puerto Rican Deep. *Smithson Misc Coll* 91(17): 1-28
- de Laubenfels MW (1953) Sponges from the gulf of Mexico. *Bull Mar Sci Gulf Carib* 2(3): 511-557
- Edwards A, Lubbock R (1983) Marine zoogeography of St. Paul's Rocks. *J Biogeogr* 10: 65-72
- Esteves E, Moraes F, Muricy G, Amaral F (2002) Duas novas ocorrências da ordem Hadromerida (Porifera, Demospongiae) para o Arquipélago de São Pedro e São Paulo, Brasil. *Bol Mus Nac, Zool* 488: 1-12
- Gray JE (1867) Notes on the arrangement of sponges, with descriptions of some new genera. *Proc Zool Soc London* 2: 492-558.
- Gulavita NK, Wright AE, Kelly-Borges M, Longley RE, Yarwood D, Sills MA (1994) Eryloside E from an Atlantic sponge *Erylus goffrilleri*. *Tetrahedr Lett* 35(25): 4299-4302
- Hechtel GJ (1965) A systematic study of the Demospongiae of Port Royal, Jamaica. *Bull Peabody Mus Nat Hist* 20: 1-103
- Hyatt A (1877) Revision of the North American Porifera, with remarks upon foreign species. Part II. *Mem Boston Soc Nat Hist* 2(5): 481-554
- Kubaneck J, Pawlik JR, EveI TM, Fenical W (2000) Triterpene glycosides defend the Caribbean reef sponge *Erylus formosus* from predatory fishes. *Mar Ecol Progr Ser* 207: 69-77
- Kubaneck J, Whalen KE, Engel S, Kelly SR, Henkel TP, Fenical W, Pawlik JR (2002) Multiple defensive roles for triterpene glycosides from two Caribbean sponges. *Oecologia (Berlin)* 131(1): 125-136
- Lehnert H, Stone R, Heimler W (2006) *Erylus aleuticus* sp. nov. (Porifera: Demospongiae: Astrophorida: Geodiidae) from the Aleutian Islands, Alaska, USA. *J Mar Biol Assoc UK* 86: 971-975
- MacArthur RH, Wilson EO (1967) The theory of island biogeography. Princeton University Press, Princeton.
- Melson WG, Hart SR, Thompson G (1972) St. Paul's Rocks, Equatorial Atlantic: petrogenesis, radiometric ages, and implications on sea-floor spreading. *Mem Geol Soc Am* 132: 241-272
- Moraes FC, Muricy G (2003) Taxonomy of *Plakortis* and *Plakinastrella* from oceanic islands off north-eastern Brazil, with description of three new species. *J Mar Biol Assoc UK* 83: 385-397
- Moraes FC, Ventura M, Klautau M, Hajdu E, Muricy G (2006) Biodiversidade de esponjas das ilhas oceânicas brasileiras. In: Alves RJV, Castro, JWA (eds). *Ilhas oceânicas brasileiras – da pesquisa ao manejo*. Ministério do Meio Ambiente, Brasília. pp. 147-178
- Moraes FC, Vilanova EP, Muricy G (2003) Distribuição das esponjas (Porifera) na Reserva Biológica do Atol das Rocas, Nordeste do Brasil. *Arq Mus Nac, Rio de Janeiro* 61(1): 13-22
- Mothes B, Bastian MCKA (1993) Esponjas do Arquipélago de Fernando de Noronha, Brasil (Porifera, Demospongiae). *Iheringia, Zool* 75: 15-31
- Mothes B, Capitoli RR, Lerner C, Campos MA (2004) Filo Porifera – Região Sul. In: Amaral CZA, Rossi-Wongtschowski CLB (eds). *Biodiversidade bentônica da região sudeste-sul do Brasil – plataforma externa e talude superior*. Instituto Oceanográfico USP (série Documentos REVIZEE score sul), São Paulo. Pp. 57-63

- Mothes B, Lerner C (1999) *Erylus toxiformis* (Porifera, Geodiidae), a new species from the Southwestern Atlantic. *Beaufortia* 49(4): 29-33
- Mothes B, Lerner C (2001) A new species of *Erylus* Gray, 1867 (Porifera, Geodiidae) from the Southeastern coast of Brazil. *Beaufortia* 51(4): 83-89
- Mothes B, Lerner C, Silva CM (2003) *Guia ilustrado das esponjas marinhas da costa sul brasileira*. USEB, Porto Alegre
- Mothes B, Lerner CB, Silva CMM (1999). Revision of Brazilian *Erylus* (Porifera: Astrophorida: Demospongiae) with description of a new species. *Memoir Queensl Mus* 44: 369-380
- Mothes-de-Moraes B (1978) Esponjas tetraxonidas do litoral sul-brasileiro: II- Material coletado pelo N/Oc. "Prof. W. Besnard" durante o Programa Rio Grande do Sul. *Bolm Inst Oceanogr São Paulo* 27(2): 57-78
- Mothes-de-Moraes B (1981) Ocorrência de *Erylus topsenti* Lendenfeld, 1903 na costa do Rio de Janeiro (Porifera, Demospongiae). *Iheringia, Zool* 57: 105-111
- Muricy G, Moraes FC (1998) Marine sponges of Pernambuco State, NE Brazil. *Rev Bras Oceanogr* 46(2): 213-217
- Muricy G, Santos CP, Batista D, Lopes DA, Pagnoncelli D, Monteiro LC, Oliveira MV, Moreira MCF, Carvalho MS, Melão M, Klautau M, Rodriguez PRD, Costa RN, Silvano RG, Schwientek S, Ribeiro SM, Pinheiro US, Hajdu E (2006) Capítulo 3. Porifera. In: Lavrado HP, Ignacio BL (eds). *Biodiversidade bentônica da região central da Zona Econômica Exclusiva brasileira*. Série Livros 18, Museu Nacional, Rio de Janeiro. Pp. 109-145
- Okada Y, Matsunaga S, van Soest RWM, Fusetani N (2006) Sokodosides, steroid glycosides with an isopropyl side chain, from the marine sponge *Erylus placenta*. *J Org Chem* 71(13): 4884-4888
- Paulay G (1994) Biodiversity on oceanic islands: its origin and extinction. *Am Zool* 34: 134-144
- 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 Genova* 86: 1-216
- Sandler JS, Forsburg SL, Faulkner J (2005) Bioactive steroidal glycosides from the marine sponge *Erylus lendenfeldi*. *Tetrahedron* 61(5): 1199-1206
- Solé-Cava AM, Kelecom A, Kannengiesser GJ (1981) Study of some sponges (Porifera, Demospongiae) from the infralitoral of Guarapari, Espírito Santo, Brazil. *Iheringia, Zool* 60: 125-150
- Sollas WJ (1885) A classification of the sponges. *Ann Mag Nat Hist* 5(16): 395
- Sollas WJ (1886) Preliminary account of the Tetractinellid sponges dredged by the H.M.S. 'Challenger' during the years 1873-1876. Part I. The Choristida. *Sci Proc Roy Dublin Soc* 5: 177-199
- Sollas WJ (1888) Report on the Tetractinellida collected by H.M.S. 'Challenger' during the years 1873-1876. *Rep Sci Res Voy H.M.S 'Challenger'*, *Zool* 25(63): 1-458
- Stead P, Hiscox S, Robinson PS, Pike NB, Sidebottom PJ, Roberts AD, Taylor NL, Wright AE, Pomponi SA, Langley D (2000) Eryloside F, a novel pentasterol disaccharide possessing potent thrombin receptor antagonist activity. *Bioorg Med Chem Lett* 10(7): 661-664
- Takada K, Nakao Y, Matsunaga S, van Soest RWM, Fusetani N (2002) Nobiloside, a new neuraminidase inhibitory triterpenoidal saponin from the marine sponge *Erylus nobilis*. *J Nat Prod* 65(3): 411-413
- Tilley CE (1947) The Dunitite-Milonytes of St. Paul's Rocks (Atlantic). *Am J Sci* 245(8): 483-491
- Topsent E (1892) Contribution à l'étude des spongiaires de l'Atlantique Nord. *Rés Camp Sci Accomp Prince Albert 1^{er} de Monaco* 2: 1-165
- Topsent E (1904) Spongiaires des Açores. *Rés Camp Sci Accomp Prince Albert 1^{er} de Monaco* 25: 1-218
- Topsent E (1927) Diagnoses d'éponges nouvelles recueillies par le Prince Albert 1^{er} de Monaco. *Bull Inst Océanogr Monaco* 502: 1-19
- Topsent E (1928) Spongiaires de l'Atlantique e de la Mediterranée. *Rés Camp Sci Accomp Prince Albert 1^{er} de Monaco* 74: 1-376
- Uriz MJ (2002) Family Geodiidae Gray, 1867. In: Hooper JNA, van Soest RWM (eds). *Systema Porifera: a guide to the classification of sponges*. Kluwer Academic/Plenum Publishers, New York. pp. 134-140
- van Altna I, van Soest RWM, Roberge M, Andersen RJ (2003) Trisphaerolide A, a novel polyketide from the Dominican sponge *Erylus trisphaerus*. *J Nat Prod* 66(4): 561-563
- van Soest RWM, Boury-Esnault N, Janussen D, Hooper J (2005) World Porifera Database. <http://www.marinespecies.org/porifera/>. Accessed on 2007-06-19
- van Soest RWM, Stentoft N (1988) Barbabos deep-water sponges. *Stud Fauna Curaçao Caribb Isl* 70: 1-175
- Villaça RC, Pedrini AG, Pereira SMG, Figueiredo MAO (2006) Flora marinha bentônica das ilhas oceânicas brasileiras. In: Alves RJV, Castro JWA (eds). *Ilhas oceânicas brasileiras – da pesquisa ao manejo*. Ministério do Meio Ambiente, Brasília. pp. 105-146
- von Lendenfeld R (1903) Porifera. Tetraxonia. *Das Tierreich* 19: 1-168
- von Lendenfeld R (1910) The sponges. 2. The Erylidae. Report on the scientific results of the expedition to the Eastern Tropical Pacific carried out by Alexander Agassiz on the US Fisheries Comission Steamer "Albatross" in 1904-1905. *Mem Mus Comp Zool Harvard Coll* 41(2): 261-324
- Weltner W (1882) *Beiträge zur Kenntniss der Spongien*. Inaugural Dissertation, Freiburg