# Sanidaster in freshwater sponges: an unexpected spicule for the birotuled Genus *Corvoheteromeyenia* Ezcurra de Drago, 1979

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*Published on 25 September 2015*

urn:lsid:zoobank.org:pub:0555CC81-D4B2-48D1-B10B-C382C64195E0

Pinheiro U., Silva C. & Calheira L. 2015. — Sanidaster in freshwater sponges: an unexpected spicule for the birotuled Genus *Corvoheteromeyenia* Ezcurra de Drago, 1979. *Zoosystema* 37 (3): 449-456. http://dx.doi.org/10.5252/z2015n3a2

## ABSTRACT

*Corvoheteromeyenia* Ezcurra de Drago, 1979 is exclusively known from Neotropical Region with two species recorded: *C. australis* (Bonetto & Ezcurra de Drago, 1966) and *C. heterosclera* (Ezcurra de Drago, 1974). The genus is characterized by the presence of birotuled gemmuloscleres inserted radially embedded in the gemmule, by megascleres which are exclusively oxeas, occasionally sparsely microspined and pseudobirotuled microscleres present in two distinct series. A total of twelve specimens were collected in São Francisco Basin (Bahia State, Brazil) and identified as belonging to *Corvoheteromeyenia.* Based on this material, we record *C. heterosclera* for São Francisco Basin. Additionally, we describe a new species of *Corvoheteromeyenia* that differs from other species of genus by having gemmulosclere sanidaster. Sanidaster display an intermediate morphology between the birotule and rodlike (acanthostrongyle) spicular type. The gemmulosclere sanidaster found here could be interpreted as malformations due to environmental conditions, since malformations in gemmuloscleres had previously been observed in experimental conditions in some freshwater sponges exposed to heavy metal. However, in these conditions only 50% of gemmoscleres were malformed, and in *C. sanidastosclera* n. sp., 100% of gemmoscleres were sanidasters. Thus we do not believe that this morphology of spicules was the result of exposure to chemical compounds in the environment. This result reinforces the idea of Penney & Racek (1968) that the segregation of Spongillidae Gray, 1867 into two groups based on the form of gemmoscleres as proposed by Vejdovsky (1887) is no longer justified.

**KEY WORDS**
Freshwater sponges,
gemmuloscleres,
taxonomy,
Bahia,
Neotropical Region,
new species.

**RÉSUMÉ**

*Des sanidasters chez les éponges d'eau douce : une spicule inattendue chez le genre birotulé* Corvoheteromeyenia *Ezcurra de Drago, 1979.*

*Corvoheteromeyenia* Ezcurra de Drago, 1979 est trouvé exclusivement dans la région néotropicale, où il est connu par deux espèces: *C. australis* (Bonetto & Ezcurra de Drago, 1966) et *C. heterosclera* (Ezcurra de Drago, 1974). Le genre est caractérisé par la présence de gemmulosclères birotulées insérées radialement dans la gemmule ; de mégasclères uniquement composées d'oxes, occasionnellement couvertes par des microépines ; et des microsclères pseudobirotulées présentes en deux séries distinctes. Douze spécimens ont été collectés dans le bassin du São Francisco (Bahia, Brésil) et identifiés comme appartenant au genre *Corvoheteromeyenia.* Ce matériel nous permet de signaler la présence de *C. heterosclera* dans le bassin du São Francisco. De plus, nous décrivons une nouvelle espèce de *Corvoheteromeyenia* qui diffère des autres espèces du genre par la présence de gemmulosclères sanidasters. Les sanidasters ont une morphologie intermédiaire entre les formes birotulées et les formes de bâtonnet (acanthostrongyles). La présence de gemmulosclères sanidasters pourrait être interprêtée comme une malformation due aux conditions environnementales, puisque des malformations des gemmulosclères ont déjà été observées en conditions expérimentales, quand certaines éponges d'eau douce étaient exposées à des métaux lourds. Cependant, seulement 50 % des gemmulosclères étaient alors malformées, alors que chez *C. sanidastosclera* n. sp. 100 % des gemmulosclères sont sanidasters. Ainsi nous ne croyons pas que la morphologie de ces spicules soit un résultat d'une exposition aux composés chimiques dans l'environnement. Nos résultats renforcent l'hypothèse de Penney & Racek (1968) selon laquelle la séparation des Spongillidae Gray, 1867 en deux groupes d'après la forme de leurs gemmulosclères comme proposée par Vejdovsky (1887) n'est plus justifiée.

**MOTS CLÉS**
Éponge dulcicole, gemmulosclère, taxonomie, Bahia, Région néotropicale, espèce nouvelle.

## INTRODUCTION

The first classification of freshwater sponges was proposed by Gray (1867), creating the order Potamospongida and the family Spongilladae (misspelling of Spongillidae) to include all genera studied by Bowerbank (1863). Carter (1881) downgraded the taxon Potamospongida to family and proposed the group Spongillina. Vejdovsky (1887) formalized Spongillina as subfamily Spongillinae, and created subfamily Meyeninae, to group the species with birotuled gemmuloscleres. However, when Penney & Racek (1968) proposed the genus *Radiospongilla*, they noticed that some species present birotuled gemmuloscleres and others gemmuloscleres with rodlike shape (acanthostrongyle). Thus, did not make sense the segregation between both subfamilies. Only recently, the suborder Spongillina (order Haplosclerida) was proposed by Manconi & Pronzato (2002) to include all freshwater sponges, taxon upgraded as order Spongillida by Morrow & Cardenas (2015) base on molecular data.

*Corvoheteromeyenia* Ezcurra de Drago, 1979 is exclusively known from Neotropical Region with two species recorded: *C. australis* (Bonetto & Ezcurra de Drago, 1966) and *C. heterosclera* (Ezcurra de Drago, 1974), the former reported from Argentina and South Brazil, and the latter from Costa Rica, Venezuela, Curaçao, Argentina (Parana Basin) and Northeast Brazil (Maranhão, Rio Grande do Norte and Pernambuco States). The genus is characterized by birotuled gemmuloscleres inserted radially in the gemmules; megascleres which are exclusively oxeas, occasionally sparsely microspined; and pseudobirotuled microscleres present in two distinct series.

Ezcurra de Drago (1979) differentiated the *Corvoheteromeyenia* species by gemmuloscleres, whereas in *C. heterosclera* all gemmuloscleres have similar rotules regularly dentated, in *C. australis*, the size and morphology of rotules are variables. Thus, in *Corvoheteromeyenia* the gemmuloscleres are important diagnostic characters. Based on material collected in São Francisco Basin, we describe a new species of *Corvoheteromeyenia* characterized by the additional presence of sanidaster gemmuloscleres.

## MATERIAL AND METHODS

Material studied was collected from tanks of a fish farm in Paulo Afonso municipality, Bahia State, on the shores of São Francisco River (09°22'38"S, 38°13'58"W) (Fig. 1). The specimens were removed with a spatula and preserved in ethanol (70%). The identification to species was carried out through analysis of spicules and gemmules using Light Microscopy (LM) and Scanning Electron Microscopy (SEM) according to the methods described by Hajdu *et al.* (2011). Measurements of spicules (n=30) were made for megascleres, microscleres, gemmuloscleres and gemmules of all specimens (minimum-mean-maximum for spicule lengths, width of shaft and width of pseudo-rotules, when possible; length of the spines of gemmuloscleres), for comparison with other *Corvoheteromeyenia* species. The size category of gemmuloscleres were determined with Sturges' algorithm (Sturges 1926) to define spicule categories. A total of 100 spicules were measured of the specimen (UFPEPOR 1771). The specimens were deposited in the Porifera Collection of the Universidade Federal de Pernambuco, Recife, Brazil (UFPEPOR), and Muséum national d'Histoire naturelle, Paris, France (MNHN).

TABLE 1. — Records and comparative micrometric data of the species of *Corvoheteromeyenia* Ezcurra de Drago, 1979; values are in micrometers (µm), expressed as follows: minimum–maximum or minimum-mean-maximum length/width of shaft // length of the rotule, when possible; length of the spines of gemmuloscleres; and diameter of gemmules; *****, two categories; **1**, Bonetto & Ezcurra de Drago (1966); **2**, Tavares *et al.* (2003); **3**, Volkmer-Ribeiro & Pauls (2000); **4**, Debrot & van Soest (2001); **5**, Volkmer-Ribeiro & Machado (2009); **6**, Ezcurra de Drago (1974).

| **Species** | **Locality** | **Megasclere** | **Microscleres pseudobirotule** | | **Gemmuloscleres** | **Gemmules** |
|---|---|---|---|---|---|---|
| Specimens | | Acanthoxea | Type 1 (short shaft) | Type 2 (long shaft) | Sanidaster or Birotule | |
| *C. sanidastosclera* n. sp. (Holotype UFPEPOR 1105) | Bahia State, Brazil | 234.2-269.1-310.7 / 9.6-12.7-19.1 | 11.9-18.4-26.3 / 2.4 // 3.6-4.9-7.2 | 31.1-48.6-71.7 / 2.4-3.9-4.8 | 71.7-82.8-95.6 / 4.8-7.3-19.1 // 3.2-6.3-9.7 | 406.3-466.4-501.9 |
| *C. sanidastosclera* n. sp. (Paratypes) | Bahia State, Brazil | 225.4-317.4-373.5 / 6.4-12.9-19.3 | 12.9-19.1-35.4 / 3.2 // 6.4-6.6-9.7 | 41.9-58.7-80.5 / 3.2-5.8-9.6 | 51.5-80.4-96.6 / 6.4-7.4-12.9 // 3.2-6.1-9.7 | 483-574.2-627.9 |
| *C. heterosclera* (Ezcurra de Drago, 1974) | Bahia State, Brazil | 199.7-297.8-373.5 / 9.7-12.6-16.1 | 12.9-19.6-35.4 / 1.6-3.1-4.8 // 3.2-6.1-12.9 | 32.2-64.4-96.6 / 4.8-6.5-9.7 | 54.7-69.4-80.5 / 4.8-7.5-12.9 // 1.6-2.2- 3.2 | 515.2-552-611.8 |
| *C. australis* (Bonetto & Ezcurra de Drago, 1966) | Argentina[1] | 300-350 / 13-20 | 20-35 / 8 | 45-70 / 5 | 50-80 / 19-23 // 2-5 | 400-500 |
| *C. australis* | Rio Grande do Sul State, Brazil[2] | 47-68-87 / 2.5-3.5-5 | 20-19.6-25 / 1.2-1.9-2.5 | 20-40-55 / 2.3-3.2-3.7 | 47.5-54.3-77.5/ 3.7-4.9-5 | – |
| *C. heterosclera* | Venezuela[3] | 314-339 / 14 | 17-26 / 3 // 10 | 32-70 / 2.5 | 62.5-7.3-90*/ 3.7-5-6.2* 61-69 / 18 // 6 | – |
| *C. heterosclera* | Curaçao[4] | 239-411 / 5-12 | 32-36 / 1 | 55-59 / 2 | 58-76 / 19-23 // 4-5 | 400-550 |
| *C. heterosclera* | Costa Rica[5] | 279.4-366.9-442.2 / 10.4-17.2-22.9 | 10.6-17.1-24.9 / 1.9-2.1-2.7 | 62.1-99.3-137.6 / 3.5-5.1-6.9 | 83.0-93.7-102.4 / 4.9-6.2-7.6 | |
| *C. heterosclera* | Northeast, Brazil[6] | 300-340 / 10-12* 150-300 / 5-8 | 8-20 | 22-70 | 60-75 / 18-20 // 3-5 | – |

## SYSTEMATICS

A total of twelve specimens were collected and identified as belonging to *Corvoheteromeyenia*. The description of the new species, measurements of the spicules and gemmules, and the distribution of *Corvoheteromeyenia* are presented in Table 1.

Class DEMOSPONGIAE Sollas, 1885
Order SPONGILLIDA Manconi & Pronzato, 2002
Family SPONGILLIDAE Gray, 1867

### Genus *Corvoheteromeyenia* Ezcurra de Drago, 1979

*Corvoheteromeyenia* Ezcurra de Drago, 1979: 110.

*Corvomeyenia* (in part) Bonetto & Ezcurra de Drago, 1966: 139. — Ezcurra de Drago 1974: 233.

TYPE SPECIES. — *Corvomeyenia australis* Bonetto & Ezcurra de Drago, 1966, by original designation.

DIAGNOSIS (EMENDED). — Spongillidae with body shape encrusting. Choanosomal skeleton irregularly alveolate. Megascleres slightly curved oxeas, generally smooth, sometimes irregularly microspined. Microscleres pseudobirotule ranging in shape and shaft size. Gemmules adhered to the substrate or free in the sponge body. Foramen single and circular. Gemmular theca tri-layered with gemmuloscleres radially embedded. Gemmuloscleres birotule or sanidaster (modified from Manconi & Pronzato 2002).

REMARKS

The emended definition of *Corvoheteromeyenia* was made necessary by the description of the new species, which in addition to birotuled gemmuloscleres also had sanidaster gemmuloscleres.

### *Corvoheteromeyenia heterosclera* (Ezcurra de Drago, 1974) (Figs 2A-C; 3)

*Corvomeyenia heterosclera* Ezcurra de Drago, 1974: 233.

For synonymy see Muricy *et al.* (2011).

MATERIAL STUDIED. — UFPEPOR1764, UFPEPOR1768, UFPEPOR1771, UFPEPOR1772, UFPEPOR1773, UFPEPOR1774 and UFPEPOR1775, São Francisco Basin, Paulo Afonso Municipality, Bahia State, Brazil, in fish farm tanks, (09°22'30"S, 38°13'58"W), U. Pinheiro coll., 06.IV.2010.

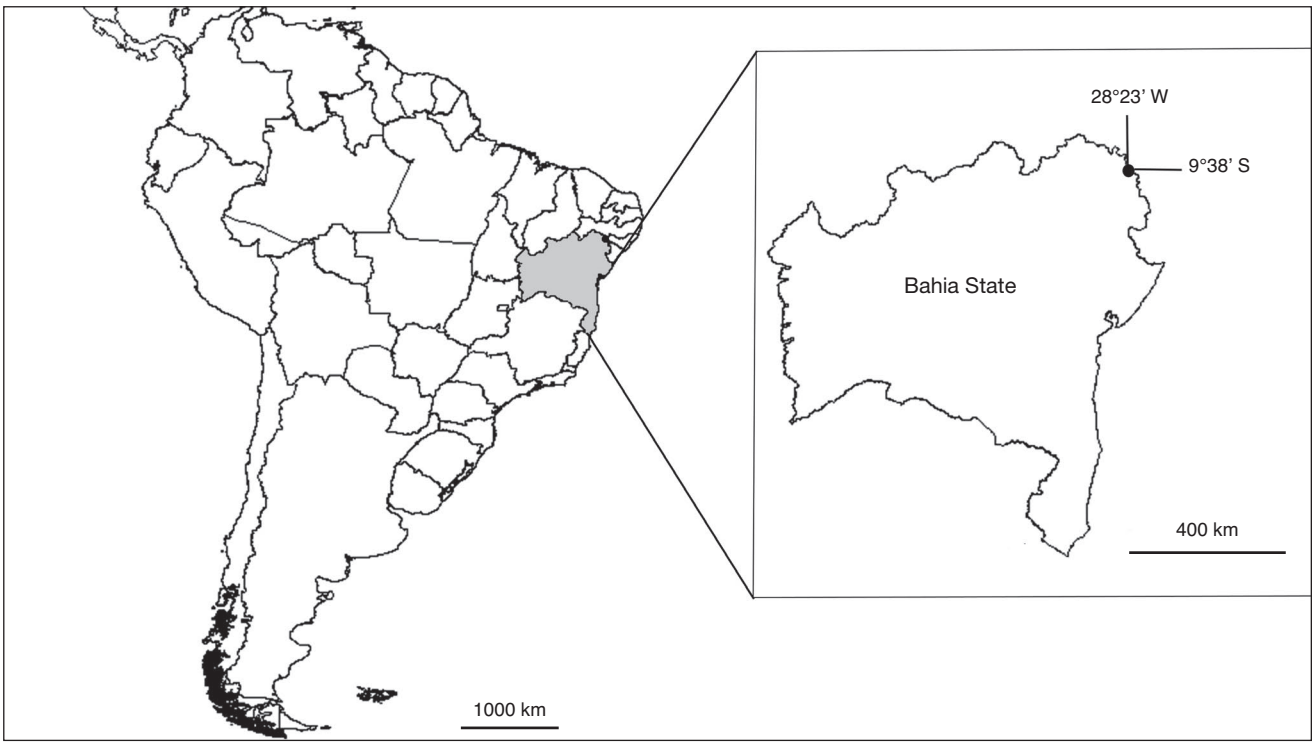


Fig. 1. — Record of the *Corvoheteromeyenia heterosclera* (Ezcurra de Drago, 1974) and *C. sanidastosclera* n. sp. from Paulo Afonso municipality, Bahia State, in the shores of São Francisco River, Brazil (09°22'38"S, 38°13'58"W).

Diagnosis. — Encrusting sponge, with oxeas megascleres smooth or microspined; pseudobirotule microscleres present in two types; birotuled gemmuloscleres inserted radially in the gemmules.

Ecology. — The specimens were collected in clear waters of artificial environment, in fish farm tanks walls measuring 1.5 $m^3$ and 800 $m^3$, that are supplied with water from São Francisco River, with depth ranging from 10 cm to 1 m.

## Description

The shape of this sponge is encrustant, less than 5 mm thick, it can achieve more than one metre in length. Surface is hispid and reticulated with anastomosing ridges projections, and circular oscules. Colour in life is light green (Fig. 2A-C), turning grayish green after preservation in ethanol 70%. Consistency soft and compressible. Oxeas megascleres are smooth (rare) or microspined (predominant) (199.7-297.8-373.5 / 9.7-12.6-16.1 µm), with few conical spines sparsely arranged on the shaft (Fig. 3A, B). Pseudobirotule microscleres of two types (Fig. 3C, D): type 1 (12.9-19.6-35.4 / 1.6-3.1-4.8 // 3.2-6.1-12.9 µm), short shaft, smooth, thin, tip terminated with three to five hooks for each pseudo-rotule. Pseudo-rotules are concave, with hooks curved towards the shaft of the spicule (Fig. 3C); and the type 2 (32.2-64.4-96.6 / 4.8-6.5-9.7 µm), long shaft, with a variable number of spines, microspined in the central portion, with discreet hooks forming pseudo-rotules (Fig. 3D). Birotuled gemmuloscleres (Fig. 3E) (54.7-69.4-80.5 / 4.8-7.5-12.9 // 1.6-2.2-3.2 µm), inserted radially in the theca of gemmules (Fig. 3H). Present two circular and identical rotules which can vary between concave to slightly flat, with marginal minutes spines. The shaft can has smooth or compound spines (with secondary minutes spines). Gemmules (512.2-552-611.8 µm) abundant, spread throughout the sponge body, from the surface to the base, spherical (Fig. 3F). Foramen single and circular (Fig. 3G). Gemmular theca trilayered well developed (Fig. 3H), inner layer present compact spongin, where gemmuloscleres are embedded radially.

## Remarks

The genus *Corvoheteromeyenia* was proposed by Ezcurra de Drago (1979) to allocate two species of *Corvomeyenia*: *C. australis* (Bonetto & Ezcurra de Drago, 1966) and *C. heterosclera* (Ezcurra de Drago, 1974). Ezcurra de Drago (1979) noticed differences between the South American species and those of the other genus, based on gemmuloscleres and microscleres, and designated *C. australis* as the type species.

The differences between *Corvoheteromeyenia* species are very controvert. Just one year after have been described *C. heterosclera*, Bonetto *et al.* (1975) proposed this species as junior synonym of *C. australis*. However, Ezcurra de Drago (1979) recognized some differences: *C. australis* had variations in the size and shape (rotules) of gemmuloscleres, while *C. heterosclera* presents lower size variation and one type of rotules. On the other hand, Tavares *et al.* (2003) and Machado *et al.* (2012) reported two categories of gemmoscleres as diagnostic character of *C. australis.*

In the present material, the Sturges algorithm (Fig. 4) showed only one size category of gemmuloscleres, with gradient of variation in the size and shape of rotules. These results agree parcially to Ezcurra de Drago definition, although we do not see rotules with curved hooks. Unfortunately, as the type ma-

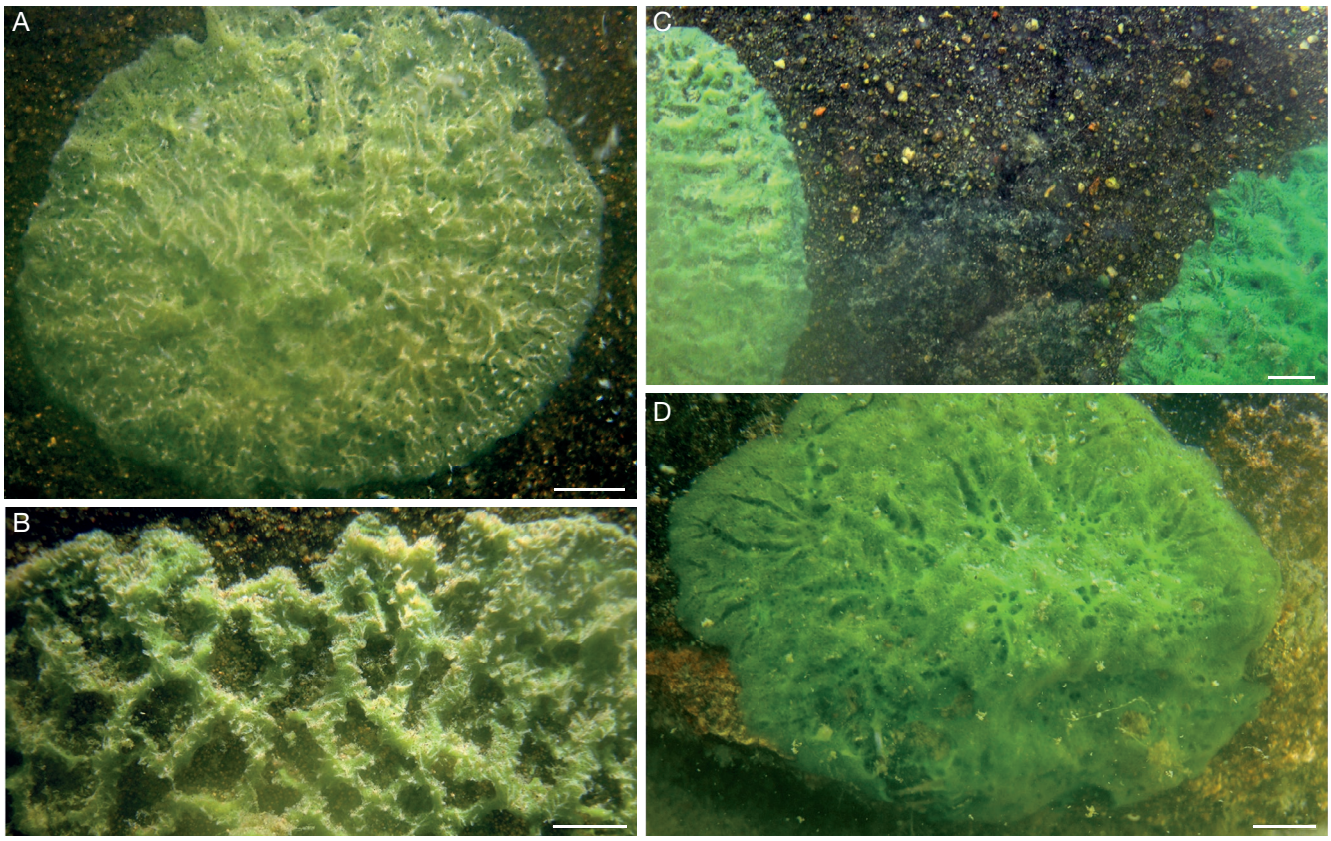


Fig. 2. — *Corvoheteromeyenia* Ezcurra de Drago, 1979, Paulo Afonso municipality, Bahia State, in the shores of São Francisco River, Brazil: **A**, **B**, *Corvoheteromeyenia heterosclera* (Ezcurra de Drago, 1974), *in situ*; **C**, *Corvoheteromeyenia heterosclera, in situ*, on the left side and *Corvoheteromeyenia sanidastosclera* n. sp., *in situ*, on the right side; **D**, *Corvoheteromeyenia sanidastosclera* n. sp., *in situ*. Scale bars: 1 cm.

terial of both species are unavailable (Muricy *et al.* 2011) we prefer to identify the present material as *C. heterosclera* until the review of these species be done.

## *Corvoheteromeyenia sanidastosclera* n. sp. (Figs 2C, D; 5)

Type locality. — São Francisco Basin, Paulo Afonso Municipality, Bahia State, Brazil, in tanks fish farm.

Type specimens. — **Holotype**. UFPEPOR1105, São Francisco Basin, Paulo Afonso Municipality, Bahia State, Brazil, in tanks fish farm tanks, (09°22'30"S, 38°13'58"W), C. Silva coll., 06.IV.2010. **Paratypes**. UFPEPOR1113, UFPEPOR1116, UFPEPOR1132 and MNHN.DCL4110, São Francisco Basin, Paulo Afonso Municipality, Bahia State, Brazil, in fish farm tanks, (09°22'30"S, 38°13'58"W), C. Silva coll., 06.IV.2010.

Diagnosis. — Sponge encrusting to slightly massive, with megascleres that are exclusively microspined oxeas; pseudobirotuled microscleres present in two distinct types; gemmuloscleres present as sanidasters inserted radially in the gemmules.

Ecology. — The specimens were collected in clear waters of artificial environment, in fish farm tanks walls measuring 1.5 $m^3$ and 800 $m^3$, that are supplied with water from São Francisco River, with depth ranging from 10 cm to 1 m.

Etymology. — The specific epithet refers to of morphology of the sponges' gemmuloscleres: sanidaster.

Description of holotype

UFPEPOR1105 is encrusting, forming a thin layer on the substrate. Colour is dark green *in vivo* and beige in ethanol. Megascleres acanthoxea (234.2-269.1-310.7 / 9.7-12.7-19.1 µm), microscleres with two types of pseudobirotules: type 1 (short shaft), (11.9-18.4-26.3 / 2.4 // 3.6-4.9-7.2 µm) more abundant than type 2 (long shaft), (31.1-48.6-71.7 / 2.4-3.9-4.8 µm), sanidaster gemmuloscleres (71.7-82.8-95.6 / 4.8-7.3-19.1 // 3.2-6.3-9.7 µm), gemmules (406.3-466.4-501.9 µm).

Description

*Corvoheteromeyenia sanidastosclera* n. sp. is characterized by presence of sanidaster gemmuloscleres (acanthostrongyles with tuberculate spines, Fig. 5E). The shape of this sponge ranges from encrustant to slightly massive, not exceeding 1 cm of thickness. Colour dark green *in vivo* and becoming light green (Fig. 2C, D) or beige in ethanol. Consistency soft, easily torn. Gemmules distributed throughout the sponge but concentrated near the substrate. Megascleres fusiform, slightly curved oxeas (225.4-307.7-373.5 / 6.4-12.8-19.3 µm), smooth or with recurved sparse microspinations, ranging from simple to compound (Fig. 5A, B). Pseudobirotuled microscleres of two types (Fig. 5C, D): type 1, (11.9-18.9-35.4 / 2.4-3.0-3.2 // 3.6-6.2-9.7 µm) most common, with three or four large hooks forming rotules and a short shaft that can be smooth

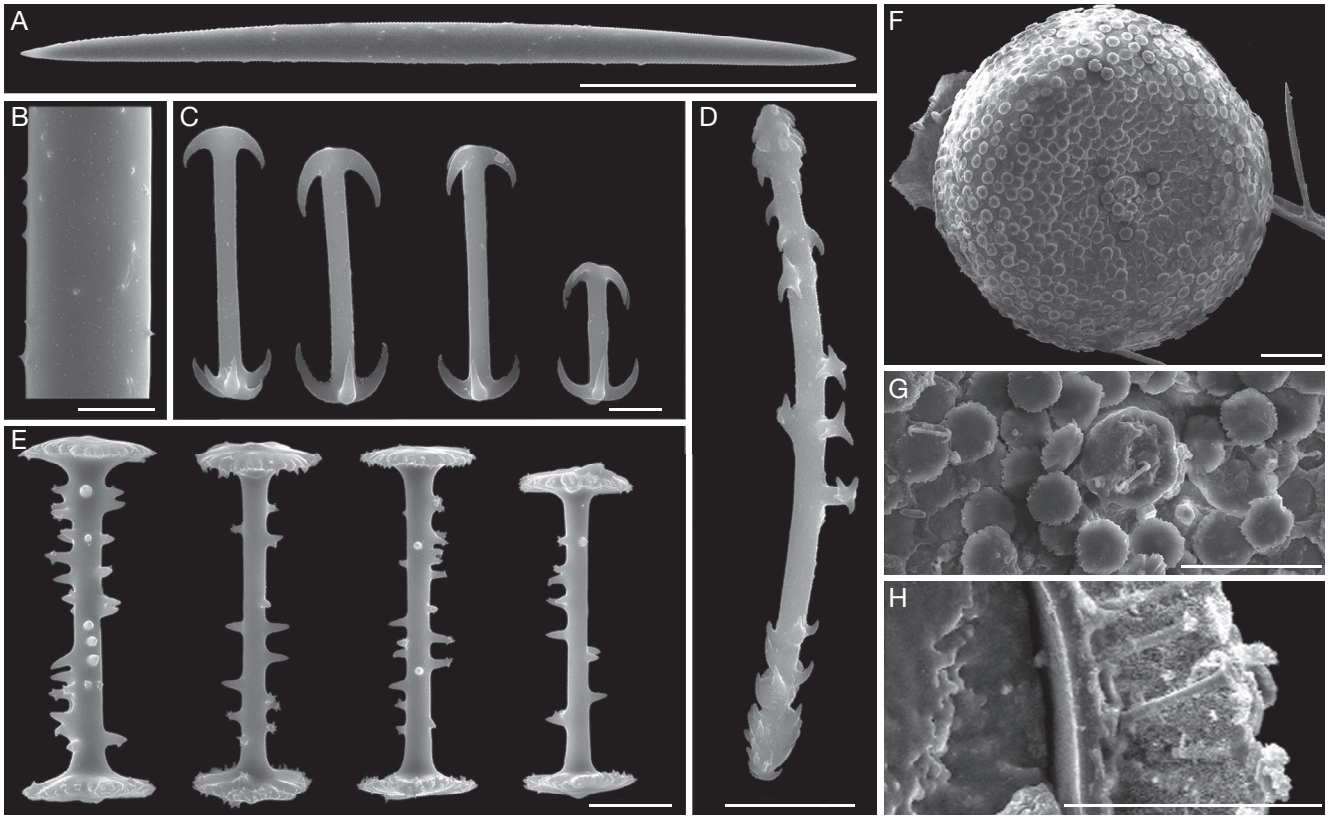


Fig. 3. — Spicules of *Corvoheteromeyenia heterosclera* (Ezcurra de Drago, 1974) (UFPEPOR1771), spicular components: **A**, **B**, megasclere acanthoxea; **C**, **D**, microscleres pseudobirotules; **E**, gemmuloscleres birotule; **F**, gemmule; **G**, foramen of gemmule; **H**, gemmules with gemmuloscleres inserted radially. Scale bars: A, F, 100 µm; B, C, 5 µm; D, 10 µm; E, 20 µm; G, 50 µm; H, 300 µm.

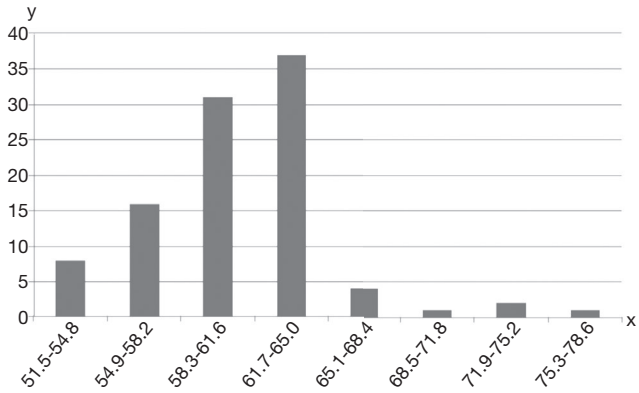


Fig. 4. — Distribution frequency of the size-classes of the birotule gemmuloscleres of *Corvoheteromeyenia heterosclera* (UFPEPOR1771); (n=100). Abbreviations: **x**, shaft size in microns; **y**, shaft frequency in number of spicules per size class.

or spined (Fig. 5C); and type 2, (31.1-56.6-90.2 / 2.4-5.9-9.7 µm), less common with more discreet hooks forming rotules and a longer shaft than type 1, with simple to compound microspines distributed equitably along the shaft (Fig. 5D).

Gemmuloscleres sanidasters (51.5-80.9-96.6 / 4.8-7.4-19.1 // 3.2-6.1-9.7 µm), inserted radially on the theca of gemmules (Fig. 5H) with tuberculated spines distributed along the shaft which often have secondary small spines near the tips. Spines along the gemmulosclere are perpendicular to the shaft and might be spirally arranged; spines near the tips are often oblique to the shaft. Occasionally, sanidasters have spines near the tips clustered end resembling a birotule but with the shaft exceeding the rotule (Fig. 5E). Gemmules (406.3-552.7-627.9 µm) abundant, greenish, spherical, free or normally located in the basal part of sponge (Fig. 5F). Foramen single and circular (Fig. 5G). Gemmular theca tri-layered (Fig. 5H); outer layer with emerging tips of sanidaster; pneumatic layer well developed, with network of regular spongin fibers; gemmuloscleres radially embedded; inner layer well developed with compact spongin.

### Remarks

The sanidaster gemmuloscleres found here could be interpreted as malformations due to environment conditions. Mysing-Gubala & Poirrier (1981) observed malformations in gemmuloscleres of *Ephydatia fluviatilis* (Linnaeus, 1759) when submitted to cadmium (Cd) and mercury (Hg) in experimental conditions. In this case, 33% and 50% of gemmuloscleres were malformed when the sponges were exposed at Cd and Hg respectively. Although, in *Corvoheteromeyenia sanidastosclera* n. sp. 100% of gemmuloscleres are sanidasters, and we do not believe that this morphology of spicules could be a result of a possible chemical compounds exposure in the environment. Although, we did not measured the chemical composition of the water, we believe that this water has not been contaminated by heavy metal, since these fish farm

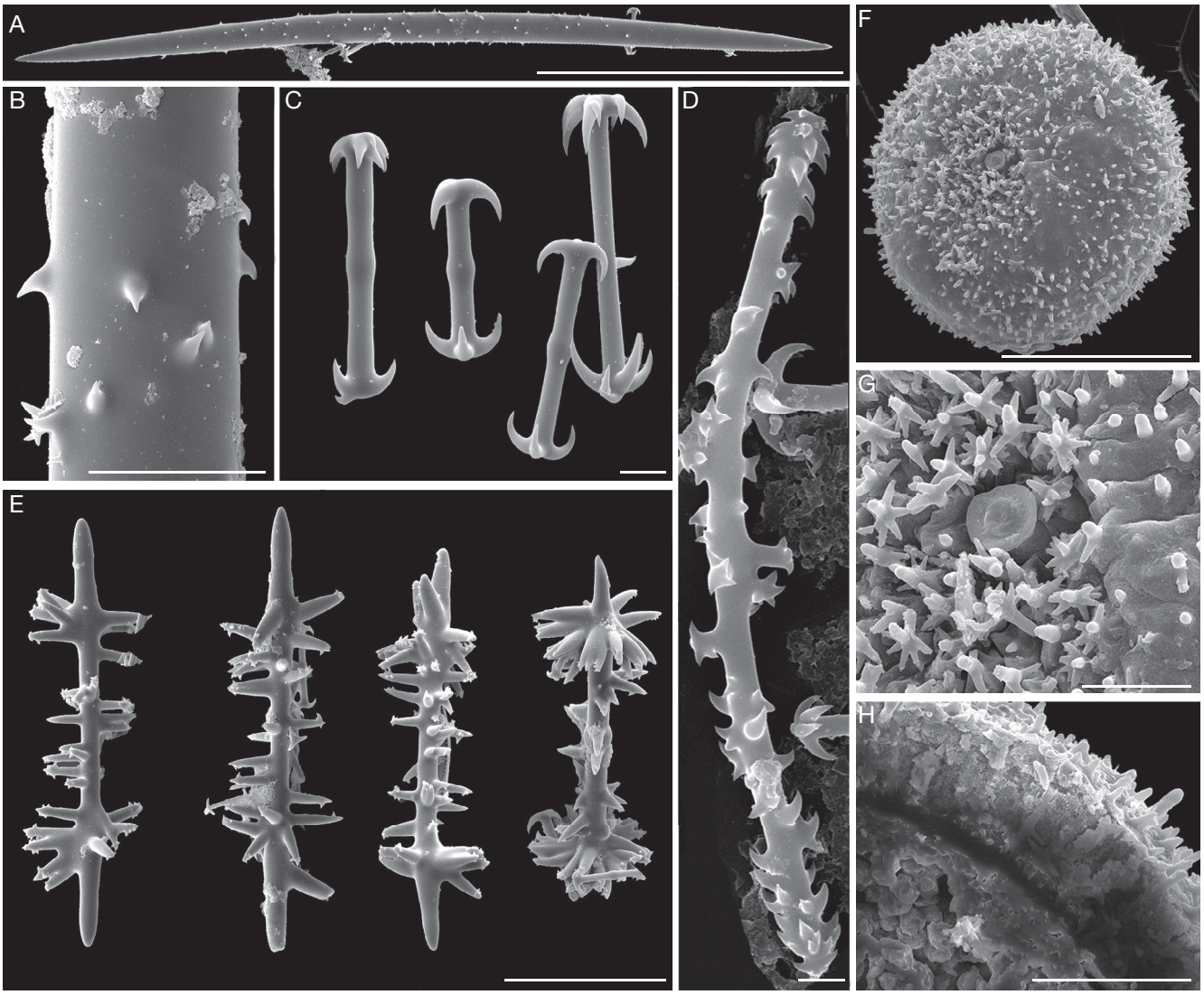


Fig. 5. — Spicules of *Corvoheteromeyenia sanidastosclera* n. sp. (UFPEPOR1105), spicular components: **A**, **B**, megasclere acanthoxea; **C**, **D**, microscleres pseudobirotules; **E**, gemmuloscleres sanidaster; **F**, gemmule; **G**, foramen of gemmule; **H**, gemmules with gemmuloscleres inserted radially. Scale bars: A, H, 100 µm; B-D, 10 µm; E, 30 µm; F, 300 µm; G, 50 µm.

tanks are used for human feeding. Besides, we collected *Corvoheteromeyenia heterosclera* in the same locality (specimens above), which have 100% birotule gemmuloscleres (Fig. 2C).

*Corvoheteromeyenia sanidastosclera* n. sp. is characterized by the presence of sanidaster gemmoscleres which differentiates it from *C. australis* and *C. heterosclera* that have birotuled gemmuloscleres.

Except for experimental conditions in *Ephydatia fluviatilis* explained above, sanidaster had been reported just once in freshwater sponges by Volkmer-Ribeiro & Watanabe (1983) in the description of *Sanidastra yokotonensis* Volkmer-Ribeiro & Watanabe, 1983. In the occasion, the authors interpreted this find as a possible phylogenetic relationship with the family Latrunculiidae Topsent, 1922 (order Poecilosclerida) and reinforced the hypothesis of polyphyletic origin of freshwater sponges from different marine sponges stocks. In subsequent works, Manconi & Pronzato (1996, 2002) reported *Sanidastra yokotonensis* from Mediterranean. They disagree with polyphyletic's hypothesis of Volkmer-Ribeiro & Watanabe (1983). Additionally, they didn't use the term "sanidaster" for the gemmuloscleres, because they believe that these spicules are a freak oxea.

On the other hand, Samaai & Kelly (2002) provided an excellent illustration, which shows that the sanidaster spicules are found in different phylogenetic taxa. In this sense, we believe that the spicule sanidaster has had a homoplastic origin and do not represent a character with a phylogenetic signal. Like other spicules, as "birotule" which is used to unrelated taxa (for example, family Iotrochotidae Dendy, 1922 marine sponges, and Spongillidae Freshwater sponges). Thus, there is no sense in using sanidasters only to marine sponges. Here we prefer to use the term "sanidaster" to describe the morphology of the spicule.

The new species shares with other species of *Corvoheteromeyenia* megascleres oxeas, and two categories of pseudobirotuled microscleres, which allowed this species to be allocated in

this genus. Ezcurra de Drago (1979) reinforces that gemmulosclere is the most important diagnostic character in *Corvoheteromeyenia*, when differentiated *C. australis* and *C. heterosclera* by the former present variation in the shape and size of rotules against stable shape and size of rotules in the latter. In this way, *C. sanidastosclera* n. sp. do not have rotules in its gemmuloscleres. Beside, the gemmuloscleres of the new species have spines longer than others species (Table 1) and with different morphology, with tuberculate spines in the new species against conical spines in others species.

The sanidaster gemmuloscleres found in *C. sanidastosclera* n. sp. also implies an intermediate stage between those freshwater sponges with acanthostrongyle and birotule gemmuloscleres. In the sanidasters the spines are reaching the tips of the spicules and forming a birotule-like sanidaster. This finding again reinforces the idea of Penney & Racek (1968) that the segregation of Spongillidae into two groups based on the morphology of gemmuloscleres as proposed by Vejdovsky (1887) is not longer justified. In *Radiospongilla* acanthostrongyles and birotules are present in different species, whereas in *Corvoheteromeyenia sanidastosclera* n. sp. the pattern is present within a single species.

**Acknowledgements**

Thanks to the Fundação de Amparo a Ciência e Tecnologia do Estado de Pernambuco (FACEPE) and the Coordenação e Aperfeiçoamento de Pessoal de Nível Superior (CAPES) for financial support. Companhia Hidroelétrica do SãoFrancisco (CHESF) are also thanked for providing study materials. To Dr José Patrocínio Lopes by information of the material collected. Authors are also thankful to Dr Janaina Melo and Dyego Maia for SEM facilities at Centro de Tecnologias Estratégicas do Nordeste (CETENE), MSc Juliana Lira, Dr Paulo Bonifácio for technical support. We thank two anonymous reviewers for the manuscript review.

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*Submitted on 27 November 2014;*
*accepted on 21 April 2015;*
*published on 25 September 2015.*