REDESCRIPTION OF *GEODIA PAPYRACEA* (HECHTEL, 1965) WITH NEW RECORDS ALONG THE NORTHEASTERN AND SOUTHEASTERN BRAZILIAN COAST

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ABSTRACT

The species *Geodia papyracea* (Hechtel, 1965) is redescribed after complete study of their morphological and anatomical characters. The species is for the first time recorded for the coast of Fernando de Noronha Archipelago, Rio Grande do Norte, Alagoas, Rio de Janeiro and São Paulo States. This work present a comparative analysis of the studied specimens, collected at northeastern and southeastern brazilian coast, with the samples from Jamaica (type-material) and "Tropical Brazil" identified by Hechtel, both remeasured and reexamined at scanning electron microscope.

KEY WORDS

Astrophorida, Geodiidae, *Geodia papyracea*, new record, Northeastern/Southeastern Brazilian coast.

INTRODUCTION

Knowledge of sponges of the genus *Geodia* from the northeastern brazilian coast is limited to a few records made by SOLLAS (1886, 1888), LAUBENFELS (1956), BOURY-ESNAULT (1973), HECHTEL (1976), HAJDU *et al.* (1992) and MURICY & MORAES (1998).

The species *Geodia papyracea* was originally registered by HECHTEL (1965) from intertidal waters at Port Royal, Jamaica. BURTON (1940), HAJDU *et al.* (1992) and MURICY & MORAES (1998) are the only previous papers mentioning the presence of *G. papyracea* in the Brazilian coast, respectively the first two from Bahia, and the last for the coast of Tamandaré, Pernambuco (as *Geodia* cf. *papyracea*).

This study presents the first record of *G. papyracea* for the coast of Fernando de Noronha Archipelago, Rio Grande do Norte, Alagoas, Rio de Janeiro and São Paulo State coasts, amplifying their geographic and bathymetric distribution.

MATERIAL AND METHODS

The examined material was collected by Scuba or free diving and has been deposited in the Porifera Collection of Museu de Ciências Naturais (MCN), Fundação Zoobotânica do Rio

Grande do Sul, Porto Alegre, Brazil and Porifera Laboratory of Museu Nacional/Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil.

Collection sites are shown in Fig. 1. The map was obtained at the webpage Online Map Creation (www.aquarius.geomar.de/omc).

Skeletal slides and dissociated spicules mounts were made following HAJDU (1994). Scanning electron micrographs were taken following MOTHES & SILVA (2002). Triaenes measures are shaft length/shaft width/cladome length/clade legth/clade width. Microscleres measures are total diameter/center diameter/rays length/rays width. All measures in μm (Tab. I).

Abbreviations used in the text: MACN - Museo de Ciencias Naturales Bernardino Rivadavia, Buenos Aires, Argentina; MCN - Museu de Ciências Naturais, Fundação Zoobotânica do Rio Grande do Sul, Porto Alegre, Brazil; MNRJ - Museu Nacional do Rio de Janeiro, Rio de Janeiro, Brazil; PUCRS - Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, Brazil; UFRJPOR - Laboratório de Porifera, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil; USP - Universidade de São Paulo, São Paulo, Brazil; YPM - The Yale Peabody Museum, Connecticut, USA.

Fig. 1. Map of South American coast, showing the collection areas along the Northeastern and Southeastern Brazilian coast. Black marks = first record; gray marks = previous records.

RESULTS

Astrophorida
Geodiidae Gray, 1867
Geodia Lamarck, 1815

Diagnosis. Thickly encrusting, massive, or globulous sponges. Surface irregularly hispid. Cortex conspicuous, formed by a crust of sterrasters with a layer of euasters in the outer zone. Cladome of the triaenes located at the cortex. Megascleres (oxeas and triaenes) radially arranged at the peripheral zone of the sponge, oxeas more disorganized in arrangement in the interior. Inhalant and exhalant orifices arranged in clusters under a sieve of the cortex (cribiporal) (URIZ, 2002)

Geodia papyracea (Hechtel, 1965)
Figs 2-28

Geodia (*Cydonium*) *papyracea* HECHTEL, 1965: 71, 72, Text-fig. 13, plate VIII, Figs. 1, 2 (Type locality: Mangrove boat channel, Port Royal, Jamaica).
Geodia papyracea; HAJDU *et al*., 1992, SILVA & MOTHES, 2000.

Material Examined
Jamaica
Holotype YPM 5045 (Schizoholotype MCN 4043), Paratype YPM 5310 (Schizoparatype MCN 3152): Mangrove boat channel, Port Royal, coll. G. J. Hechtel, 13/VII/1961, 1 m.
Brazil. YPM 8977 (MCN 4046): "Tropical Brazil", J. Laborel coll., VI.1964; UFRJPOR 1432: Praia Suja, Natal, Rio Grande do Norte, E. P. Coelho & A. C. Nascimento colls, 22/VII/1979; MCN 1427: Fernando de Noronha Archipelago, Arno Lise coll., 26/XII/1978, intertidal; YPM 8961 (MCN 4045): Praia da Piedade, Recife, Pernambuco, 8°10' S - 34°54' W, J. Laborel coll., G. J. Hechtel det., 9/X/1961; UFRJPOR 1444 (MCN 4040): Praia da Piedade, Recife, Pernambuco, M. J. C. Belém coll., 22/I/1977; UFRJPOR 1397 (MCN 4038): Praia de Camaragibe, Alagoas, 15-19/X/1976; MNRJ 4720 (MC-N 5212): Ponta Verde, Maceió, Alagoas, E. Hajdu coll., 03/VII/2001, 0 - 1 m MACN 19116 (MCN 3646): Bahia, M. Doello-Jurado coll., IV/1922; MNRJ 8066: Ilha do Pelado, Tarituba, Paraty, Rio de Janeiro, E. Hajdu coll., 21/III/2004, 1 m; MCN 306: rocky shore in front of Biology Laboratory, Centro de Biologia Marinha USP, São Sebastião, São Paulo, Arno Lise coll., 16-23/XII/1974, 0 - 3 m.

Description. (Figs 2-4). Massive sponges of beige, white or light gray color. Hispid and rugose surface, firm to compressible consistency. Cortex detachable (Fig. 2), rather brittle. Macroscopic groupments of oscules (diameter 0.8 - 1.0 mm) present in some slight circular depressions of the surface, delimited as oscular cribriporal plates (diameter 0.5 - 1.0 cm), scattered particularly in upper and lateral faces of the sponge (Figs 2, 4), each of them containing about 8 to 20 oscula. These oscular plates are more evident in the specimens from Fernando de Noronha (MCN 1427) and Alagoas (MNRJ 4720). Pores usually scattered over all the surface of the

sponge. This species is usually associated with anthozoan (Fig. 3) or hydrozoan polyps (Fig. 4).

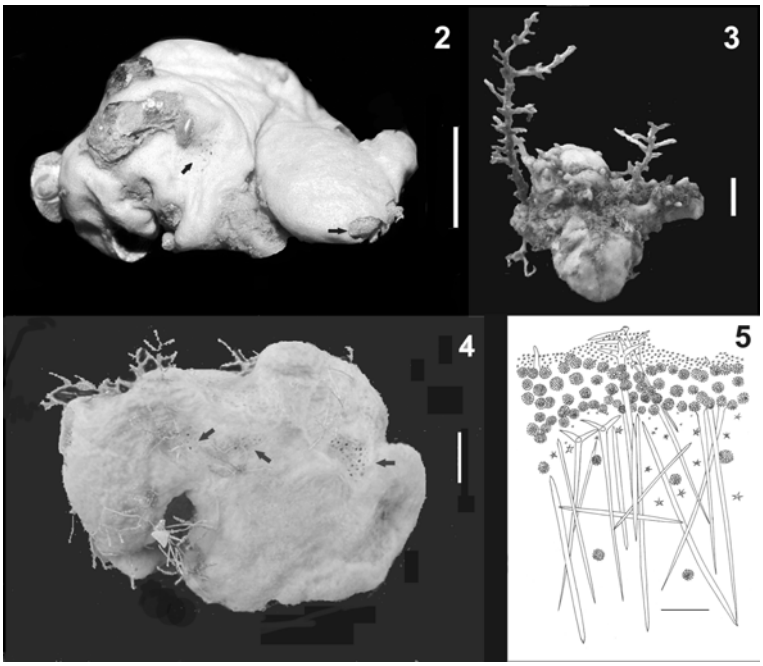

Fig. 2-5. *Geodia papyracea* Hechtel, 1965. **2-4,** Habit. **2,** MCN 1427, showing oscular cribriporal plates and detachable cortex. **3,** MNRJ 8066, associated with the anthozoan polyp *Carijoa* sp. **4,** MNRJ 4720, with oscular plates (arrows). Bars = 1 cm. **5,** Skeleton (Bar = 200 μm).

Skeleton. (Fig. 5). The cortex has 400 - 600 μm in thickness. A thin layer of strongylasters/spherostrongylasters is pierced by openings of 35 - 50 μm in diameter. A thin lacunar layer separates the ectocortex from the sterrastral crust. The cavities are crossed by megascleres and a few strongylospherasters. Numerous thick plagiotriaenes protrude the entire cortex. Their cladomes are inserted into the ectocortex. Large and stout oxeas, rare little thin oxeas and protriaenes and thin anatriaenes are also present. A few triaenes have an oblique or tangential position in the outer cortex. Two categories of oxyasters present at the subcortical region, the big ones scattered at the choanosome, where can be observed distinct developmental stages of the sterrasters.

Spicules. (Dimensions at Tab. I). Megascleres: Oxeas I (Figs 6, 8) - Stout, straight or slightly curved, with mucronate, gradual or abruptly pointed ends. Varying to strongyloxeas (Fig. 7) and styles.

Oxeas II (Fig. 13) - Slender, straight or curved, with gradual or abruptly pointed ends. Varying to strongyles (Fig. 12).

Tab. I. Comparative data on spicular micrometries of the holotype, paratype and additional material of *Geodia papyracea* Hechtel, 1965. Means are underlined. All measures are in μm (η = 50). n.r. = not referred; n.o. = not observed.

Spicules	Oxeas I	Oxeas II	Plagiotriaenes	Anatriaenes	Sterrasters	Oxyasters I	Oxyasters II	Strongylasters
Materials								
Holotype YPM 5045 (HECHTEL, 1965)	638-1058/9-20	n.r.	406-956/5-24/ n.r./33-123/4-24	297-470/2-3/n.r./ 7-36/1-2	50-72	29-46	21-30	5-7/
Schizoholotype (MCN 4043) (remeasured)	741-894.4-1035.5/ 11.5-16.2-25.3	82.8-152.7-223/ 3.5-4.9-6.9	450-728.5-1008.5/ 17.7-25.0-33.3/ 141-237.4-316.8/ 48.7-114.4-170.9/ 7.8-17.8-29.7	261-375.2-492.4 / 2-3.4-4.6/ 18-25.5-31.8/ 8.7-12.3-16/1-2.3	41.4-57-71.3	24.5-35.4-46.8/ 4.6-6.7-9.7/ 19.5-25.1-32.9/ 1-1.6-2.3	21.4-28.9-36.2/ 3.8-7.2-11.1/ 10.6-13.5-16.1/ 2-2.5-3.2	5-6.2-7.5/ 2.6-3.4-4.0/
Schizoparatype YPM 5310 (MCN 3152) (first measures)	779-993.1-1244.5/ 16.1-23.4-34.5	80.5-123.7-170.5	551-859.8-1026/ 19.2-27.4-35.8/ 142.5-238.9-318.3/ 50.2-115.9-172.5/ 9.2-19.1-31.1	(N=10) 300-612/ 4.6-6.9/25-52/ 11.5-25.7/2-3.4	41.8-64.2-87.4	13.8-28.9-41.4/ 3.5-6.1-9.2/ 10.3-22.8-32.2/ 1.2-1.8-2.5	13.6-26.1-36.8/ 3.5-7.7-11.5/ 8.2-10.3-12.7/ 2-2.6-3	5.2-6-6.9/ 2-2.5-3.2/
YPM 8961 (MCN 4045) (first measures)	615-900-1140/ 7.5-15.2-21.2	90.5-135.0-95.2/ 4.0-5.2-6.9	450-552.5-670/ 6.5-11.5-18.0/ 115-178-230/ 37.3-58.2-81.4/ 5.5-9.0-13.2	244.8-412-580/ 2.3-3.4-4.6/ 25.2-36.8-50/ 8.5-18.6-30.4/ 1.5-2.3-3.2	57-64.8-74	15.7-29.5-44.3/ 4.2-6.8-9.8 11.3-21.9-32.9/ 1.6-1.9-2.3	26-30.4-35.5/ 4-6.7-9.6/ 10-12.2-14.5/ 2-2.6-3.3	5-5.7-7.3 / 2.4-3.1-3.8
YPM 8977 (MCN 4046) (first measures)	764-978.2-1230.7/ 15.2-22.4-33.3	n.o.	n.o.	n.o.	39.1-59.4-71.5	(rare) 25-48.5/3.8-9/ 10.2-21/1.5-2.2	(rare) 23-32/5-11/ 9-15/2-3.5	5-6.2-7/ 1.8-2.6-3.5
MCN 1427	627-742-855/ 9.5-14.7-20.2	103.5-113-124/ 3.4-4.6-5.7	475-607.5-741/ 9.2-12.1-14.9	(N=10)430-520/ 2.5-4.0/22-49/ 10.2-23/1-3	27.6-34.5-41.4	16.1-20.2-25.3	12.2-15.1-18.9	3.4-4.6-5.7
UFRJPOR 1444 (MCN 4040)	660-963-911 70/20-26.1-35	14.4-130-220.8/4.8-6.8-12	280-847.5-1040/ 7.2-27.5-40.8/ 28.8-159-240/ 19.2-87-120/ 4.8-22.1-33.6	(N=7) 500-960/2.4-6.2/ 14.4-28.8/ 7.2-12/1.2-4.8	43.2-61.3-93.6	14-28.4-36/ 3.6-6.2-9.0/ 6-9.2-12/ 1.4-2.0-2.5	22-26.4-32/ 6.5-8.5-11	2.5-3.7-8.5
UFRJPOR 1397 (MCN 4038)	660-964.5-1200/10-26-45	69.6-101.5-160.8/3.6-4.7-7.2	710-936.4-930/ 16.8-33.4-43.2/ 132-219.1-312/ 57.6-99.3-144/ 14.4-28.1-36	(N=2) 920-1030/7.5-9.6/ 47-60/ 21-31.2/4.8-7.2	38.4-62.8-72	28-36-45/ 9.6-13.2-16	18.5-23.2-29/ 5.5-8.0-11.2	4.6-6.1-8.2
MNRJ 4720 (MCN 5212)	720-958-1180/ 10-20.2-30.0	75-102-130/ 2-3.6-	(N=25) 360-950/ 10-42.5/57.5-225/ 20-100/7.5-35	(N=8) 250-650/ 2.5-5.0/12.5-43.7/ 15-37.5/2.5-3.7	42.6-60.4-75	17.5-29.3-42.5/ 5.0-13.1-20/ n.r./<1	24-26.2-29	5.0-6.7-8.8
MNRJ 8066	600-954-1170/ 10-18.3-32	84-109.9-151.2/ 2.4-4.6-7.2	550-881.2-1050/ 14.4-26.7-38.4/ 88.8-178-240/ 43.2-84-115.2/12-24-36	(N=2) 540-660/3-6/ 24-50/ 11-25/2.4-4	43.2-56.1-67.2	25-36.5-49/ 8.2-11.5-15.4	21-27.5-34	3.7-5.2-6.8
MCN 306	580-981.6-1220/	60-136.2-170/ 2.5-7.2-12.5	740-919-970/ 12.5-21.5-27.5/ 100-143-190/ 11.3-19.4-27.5/ 52.5-60-65	(N=11) 410-760/2.3-4/ 17-43/ 9.6-18/1.5-3.4	40-53.9-65	25-32.1-37.5	16.5-23	2.5-6-10

Plagiotriaenes (Figs 9-11) - Slender; rhabdome straight or slightly curved, with gradually pointed or blunt extremity; cladi hardly curved upwards.

Anatriaenes (Figs 14, 15) - Slender, straight to slightly curved, with blunt or gradually pointed ends.

Protriaenes - Rare. Slender, straight or slightly curved, with abruptly pointed extremity; cladi hardly curved upwards (Dimensions: rhabdome length 640 - 790 μm, rhabdome width 4.2 - 5.0, cladome diameter 30 - 32.5, cladi length 25.0 - 27.5, cladi width 2.5 - 3.7).

Microscleres. Sterrasters (Figs 16-21) - Globose, spherical. numerous young reduced and depressed forms with conical rays (Fig. 16); developing intermediate globose forms with short rays provided of a distal minute star (Fig. 17); grown stages with rays provided of rosette (Figs 18, 19) or star like (Figs 20, 21) microspinature at the distal end.

Oxyasters I (Figs 22, 23) - 8 to 11 long and conical rays, microspined all along their length.

Oxyasters II (Figs 24, 25) - 18 to 24 long and conical rays, microspined at the distal portion.

Spherostrongylasters (Figs 26-28) - 10 - 14 stout, cylindrical and short rays, provided of conical or blunt microspines all along their length. Varying to spheroxyasters with conical tip rays (Figs 26 (arrow) and 27).

Geographic Distribution. Jamaica. Port Royal, Mangroove boat channel (HECHTEL, 1965; LEHNERT, 1998).

Colombia. Baía Nenguange (WINTERMANN-KILIAN & KILIAN, 1984).

Brazil (Fig. 1). Fernando de Noronha Archipelago (first record); Rio Grande do Norte, Praia Suja (first record); Alagoas, Ponta Verde and Praia do Camaragibe (first record); Pernambuco, Praia da Piedade, Recife, 8°10' S - 34°54' W (HECHTEL, 1976) and Tamandaré (MURICY & MORAES, 1998 as *Geodia* cf. *papyracea*); Bahia (BURTON, 1940 as *Geodia* sp.; HAJDU *et al.,* 1992); Rio de Janeiro, Paraty, Ilha do Pelado, Tarituba (first record); São Paulo, São Sebastião, Praia do Cabelo Gordo (first record).

Bathymetric distribution. From intertidal region (0 - 1 m) at Ponta Verde, Maceió, Alagoas, Brazil (present study) to 5 m at Baia Nenguange, Colombia (WINTERMANN-KILIAN & KILIAN, 1984).

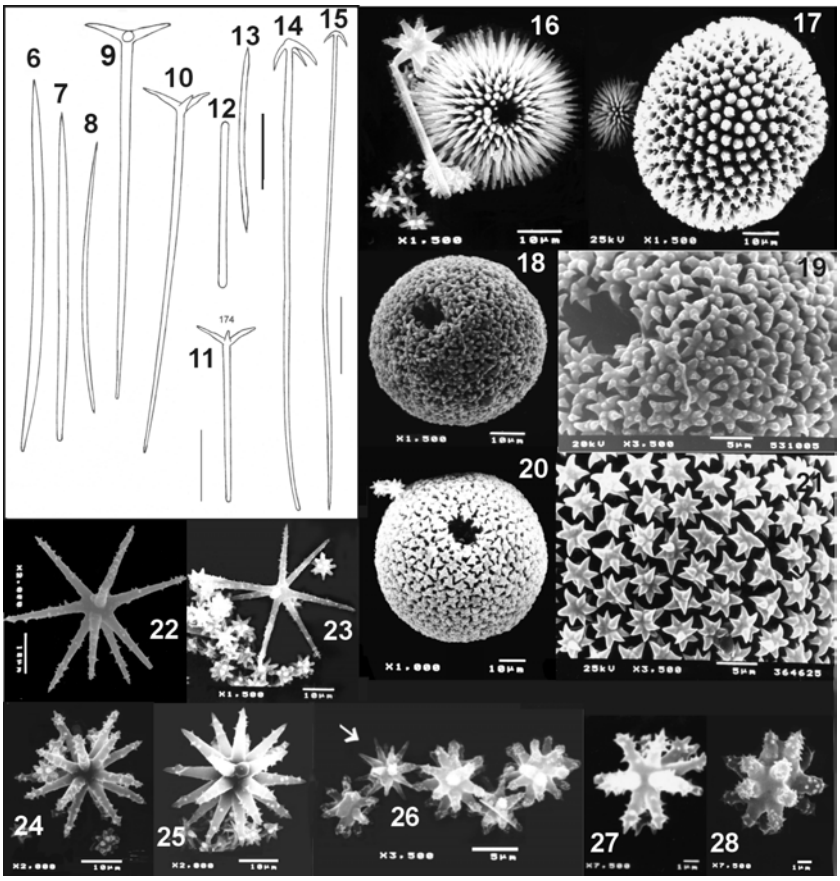

Fig. 6-28. Spicules of *Geodia papyracea* Hechtel, 1965. **6-15,** Megascleres: **6, 8,** oxea I. **7,** Strongyloxea. **9-11,** plagiotriaene. **12,** cortical strongyle. **13,** oxea II. **14, 15,** anatriaene. **16-28,** Microscleres: **16,** young sterraster. **17,** developmental stage of the sterraster. **18, 19,** grown sterraster with rosette like microspinature. **20, 21,** grown sterraster with star like microspinature. **22, 23,** oxyaster I. **24, 25,** oxyaster II. **26, 28,** spherostrongylaster. **27,** spheroxyaster. Bar Figs 6-11 = 200 μm, Figs 12-15 = 50 μm.

REMARKS

The studied material was compared with the holotype and paratype of *G. papyracea*, registered from Port Royal, Jamaica by HECHTEL (1965). The holotype and the specimens from Rio de Janeiro, Alagoas and São Paulo differs by the presence of sterrasters with star like microspinature (Figs 20, 21) instead of rosette like microspinature as in the samples from Port Royal, Jamaica (paratype YPM 5310) Praia da Piedade, Pernambuco and Fernando de Noronha Archipelago (Figs 18, 19). The last one has also shown smaller and rare spherostrongylasters. Other intraspecific variations of *G. papyracea* are rare cortical oxeas (samples UFRJPOR 1397-Pernambuco and

UFRJPOR 1432 - Rio Grande do Norte) and rare protriaenes (MNRJ 4720 - Alagoas, UFRJPOR 1397 - Pernambuco and paratype YPM 5310 - Jamaica).

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