A NEW SPECIES OF XESTOSPONGIA (PORIFERA: DEMOSPONGEA), FROM THE COLOMBIAN CARIBBEAN

By
SVEN ZEA¹ and KLAUS RÜTZLER²

SUMMARY

Xestospongia roseniisi is named from coral reef habitats of the Nuestra Señora del Rosario Archipelago in the Colombian Caribbean. This sponge is tube-shaped, brown in color, hard and brittle in consistency, and is provided with sinuous surface irregularities. The dense skeleton reticulation of thick spicule tracts is typical for the genus. Spicules are oxea having mean dimensions of 183.6 x 9.4 µm. X. roseniisi has several affinities with X. subtriangularis, particularly the small dimensions of spicules. Its distinctive growth form makes the new species unmistakable among the members of Xestospongia.

RESUMEN

De los habitat de arrecifes coralinos del Archipiélago de Nuestra Señora del Rosario en el Caribe Colombiano, se describe Xestospongia roseniisi. Esta esponja es tubiforme, de color café, de consistencia dura y quebradiza, y su superficie tiene algunas irregularidades sinuosas. Su densa reticulación esquelética de tractos espiculares gruesos es típica del género. Las espiculas son oxeas, con dimensiones promedio de 183.6 x 9.4 µm. X. roseniisi tiene algunas afinidades con X. subtriangularis, particularmente por el tamaño pequeño de las espiculas. La típica forma de crecimiento de esta nueva especie la hace inconfundible entre los miembros de Xestospongia.

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INTRODUCTION

During an inventory of marine sponges at the National Natural Park los Corales del Rosario (an area surrounding the Nuestra Señora del Rosario Archipelago) in the Colombian Caribbean (Zea in preparation) a common but unusual sponge was found forming clusters of tall brown tubes among reef coral. Apparently other collectors had previously noticed this conspicuous species because specimens are deposited at Museo del Mar, Bogota (examined by K. R, 1969, 1970; S. Z. 1980). That material also originated in the Rosario Islands. Examination of the literature and museum collections leaves no doubt that our specimens belong to an undescribed species of *Xestospongia*.

AREA STUDIED

The Nuestra Señora del Rosario Archipelago (Fig. 1) is a group of low coral islands of recent origin (5,000–10,000 years, cf. Pfaff, 1969: 20), surrounded by extensive live and well developed coral reefs. Around these islands and across to the mainland coast extends a submarine park, the Parque Nacional Los Corales del Rosario (PNNCR) which was created in 1977. The Park is located along the Caribbean coast of Colombia approximately 54 km Southwest of the city of Cartagena de Indias and covers an area nearly 178 km² between 10° 6’ - 10° 13’ N and 75° 30’ - 75° 50’ W. Park boundaries include the eastern part of Isla Baru (actually a continental peninsula) and the islands of Nuestra Señora del Rosario Archipelago (excluding Teseoro to the North), from the highest tidal line down to the 30 m isobath facing the open sea (Sistema de Parques Nacionales, 1980).

Favorable ecological and climatic conditions have fostered extensive coral reef development to a depth of 30 m. Less abundant coral growth occurs from 50-60 m (Colin, 1978: 29). Pfaff (1969: 27) and Garavito (1977: 6-7, Table 1) report that sea surface temperature ranges from 27°C to 31°C, and that salinity varies from 30 to 35°/m. An unusual phenomenon observed in this area during certain season is the presence of a 2-3 m thick surface layer of brackish and very turbid water originating from the outlet of the Canal del Dique, a branch of the Magdalena River, which flows into the Cartagena and Barbacoas Bays and was built by Spaniards several centuries ago. Apparently, this turbidity does not affect reef development, probably because it does not last long—not even throughout a single day—and because beneath this turbid layer the water is very clear. The morphology of the reefs in the Archipelago is determined to a great extent by the almost constant counter-current of the Caribbean (Perleth, 1971; and described for the area by Balletras, in preparation) which runs north to northeast and passes the islands through several channels, and by predominant (mainly summer) northwesterly
trade winds. The northern or windward reefs are very different from the southern or leeward reefs. Northern reefs are small and have steep slopes and their crowns reach the surface, whereas southern reefs extend to 1 km in size, are less inclined and are rarely shallower than 1 m. Both types slope to depths of 20-60 m. Typical features of the southern reefs are sand flats surrounding coral patches, high sedimentation rate, and absence, with a few exceptions, of the coral Acropora palmata. Sponge diversity, abundance and size are greater in the southern zones because the calm environment and availability of unoccupied substrate areas on dead coral parts offer more favorable growth conditions for these organisms than the more dynamic reefs of the north.

The studied area includes Isla Tesoro, 5 km north of the main group of Rosario Islands, the west cost of Isla Barú north to Bocachica (southern outlet of the Cartagena Bay), and the Salmedina bank, a platform reef submerged at 5 m, located 5 km west of Tierra Bomba Island.

METHODS

Sponges were collected by S. Zea, using skin and SCUBA equipment to a depth of 30 m. Some underwater photographs were taken with Nikonos III camera and Ektachrome 64 film without flash. Whole specimens were sun dried but pieces of each were fixed in 10% formalin neutralized with borax for one or two days and then transferred to 70% ethanol for final preservation. Spicule preparations were made by digesting pieces of sponge in hot sodium hypochlorite (commercial bleach). Spicule suspensions were washed and centrifuged repeatedly, and were subsequently placed on slides to be flame dried and embedded in Canada Balsam. Measurements were made of length and width of 50-100 spicules from each specimen. Skeleton structure was determined from hand sections by razor blade that were dehydrated in graded alcohols, cleared in Xylene and mounted on slides with Canada Balsam. Terminology is from Wiedenmayer (1977).


Order Haplosclerida Topsent, 1928
Family Petrosiidae van Soest, 1980
Genus *Xestospongia* de Laubenfels, 1932

*Xestospongia rosariensis* new species

Cylindrical tubes emerging from a basal mass; height 4-7.8 cm, diameter 1.4-13.0 cm, pseudocellular diameter 0.7-2.4 cm, wall thickness 0.1-2.0 cm. Color dark brown in live specimens, lighter in dry state; choanoosome yellowish. Consistency very firm, nonelastic; sticky when dry. Surface smooth with sinuous depressions. Ectosomal skeleton forming tangential reticulin (30-260 μm meshes) of single spicules or confused tracts (tract diameter 240 μm maximum). Choanoosomal skeleton dense and confused, subbiocoidal to radiate-accrescent towards periphery; meshes were distinguishable 40-100 μm, tracts reaching 240 μm diameter. Spicules: bastate oxea to strongyloxea slightly curved; less frequent fusiform oxeas, styloids and styelles; 100.0-183.6-212.6 μm length, 0.8-9.4-15.6 μm width (range and means for all specimens).

**SHAPE AND SIZE** (Figs. 2, 3): One or several cylindrical tubes emerge from a basal mass. The height of the tubes of all specimens studied is 4-7.8 cm, the diameter 1.4-13.0 cm, most commonly 4-9 cm. The apical opening or pseudocell of the tube has a diameter of 0.7-2.6 cm, or even more in large specimens. The rim tapers to a narrow edge. Thickness of the wall ranges from 0.1 cm at this edge to 2 cm at middle and lower sections. The inner cavity is of uniform diameter and generally extends to the base of the tube. Some tubes were noted to be closed and rounded at the upper end, with an opening sideways below the top. The basal mass generally does not spread beyond the diameter of the tube or tube cluster although a few broader increasing basal masses are found. Some specimens have decumbent or even repent stolons from which erect tubes like chimneys arise at regular intervals. Several tumbled specimens were seen that had reattached sideways to the substrate; the tubes had then changed the direction of their growth, taking the vertical position again. Most individuals of this species are fixed to hard substrata; however, in calm environments they are also found attached to pieces of dead coral among sand and coral rubble and at times are even partly buried in the substrate.

**COLOR**: Living specimens are dark brown, some with dark orange shades. Some specimens may appear lighter because of sediment adhering to the surface. The choanoosome is light yellow, abruptly darkening toward the surface. Dry specimens are light brown or cinnamon colored; the pseudocellular rim keeps its darker shade.
Figure 2. Underwater views of Xenopongia rotundis: (a) specimen ICN-MHN (P1) 007 attached to base of coral Montastrea annularis; (b) specimen ICN-MHN (Pa) 003 among coral Acropora cervicornis.
Figure 3. Variation in growth form of Xestospongia rossiicora: (a) holotype ICN-MHN (Pa) 001; (b) ICN-MHN (Pa) 005; (c) ICN-MHN (Pa) 004; (d) ICN-MHN (Pa) 006. (For sizes, see table 1).
CONSISTENCY: Very hard, nonelastic, brittle; stony when dried.

SURFACE: Smooth to the touch, in places rugose, with slight unevenness and irregularities, or with large protuberances in some areas. Some specimens are densely covered by the zoanthid Parazoanthus sp. The inner surface of the tube is rough to the touch and shows low concentric elevations, like growth rings; it is densely perforated by oscules that are arranged in more or less concentric rings, probably also a growth pattern. Oscules have diameters ranging from 0.6 mm to 3.4 mm.

FIGURE 4. Xestoporia roussinii, zooidal skeleton: (a) predominantly uniserial (isodictylic) reticulation; (b) subsidiotyl spicle arrangement (scale = 200 μm).

E-DERMIS: The ectosomal skeleton (Fig. 4) is differentiated as rather confused isodictylic to subsidiotyl tangential reticulum, with spicules placed in all directions, some studding the surface. The spicules are bound together by small amount of spongine. The meshes are irregular to polygonal, predominantly irregular; diameters range from 30 μm to 200 μm. Tract thickness ranges from the diameter of a single spicle (isodictylic reticulation) to 240 μm (subsidiotyl). In some zones the isodictylic reticulum prevails, in others the subsidiotyl arrangement; in most areas, however, the two types are interspersed. Some continuous thick multipunctal tracts surround isodictyal areas forming a double-compound reticulum.

CUITANOSE: The interior skeleton (Fig. 5) is very dense and lacks spongine. Its structure is predominantly subsidiotyl, but is confused because of the density of the spicules that form more or less triangular meshes. Spicule tracts range from the diameter of one spicle to 240 μm. Meshes measure 40 μm to 1.100 μm and enclose clusters of spicules without orientation. Toward the periphery of the tubes and particularly near the apex skeleton structure becomes more regular, turning anisotropic with pillar-like ascending multispir-
cular tracts connected by tangential tracts leaving rectangular meshes. The quite regular radiate reticulate skeleton structure of the peripheral growth regions is best observed at fairly low magnification (Fig. 6). The choanosome is rather cavernous, particularly in the older (lower) parts of the sponge tubes where sphericule channels with diameters of 80 μm to 8 mm or more run in all directions.

The inner tube surface has a predominantly suburoid cyst fiber arrangement without a tangential reticulum. More spicules and groups of spicules stud the inner surface than the ectosome.

Figure 5. Xestopongia zeylanica, choanosomal skeleton: (a) suburoid cyst to confused; (b) forming distinct tracts (scale = 200 μm).

Figure 6. Xestopongia zeylanica, longitudinal section through apex of a tube showing radiate-accorptive structure (scale = 1 mm).
Species (Fig. 7): *Hastasia obesa* to strongly curved, slightly curved. The points are conical, short and nearly always smooth, although some have slight annular constrictions and mammilliform tips. Shorter and thinner fusiform areas with integrating forms have growth stages of the more complete specimens. A few hastaria to fusiform styles or styloids occur.

Dimensions (range and means) are:

- Hastaria area to strongly curvate: 100.0-187.9-212.5 µm long by 4.7-10.0-15.6 µm wide.
- Fusiform area (developing stages): 103-167.3-200.0 µm by 0.8-3.8-6.3 µm.
- Combined dimensions: 100.0-183.6-212.4 µm by 0.8-9.4-15.6 µm.

Type locality: Aeropelágica de nuestra Señora del Rosario, Departamento de Bolivar, Colombia, South America, 10° 6' - 10° 15' N; 75° 36' - 75° 50' W.

Type material: Holotype and eleven paratypes (six schizotypy) (for dimensions, see Table 1). Holotype: ICN-MHF (Po) 201 (Fig. 1). One dry specimen and preserved parts, collected on 14 Aug 1980, south of Isla Barú, at a depth of 10 m, on coral rubble and sand in depression between coral patches, located immediately before the beginning of the reef slope. The specimen comprises a single erect tube, with its basal portion inclined and forming relatively narrow basal mass. Paratypes: ICN-MHF (Po) 02. One dry specimen and preserved parts, collected on 22 Nov 1979, northwest of Isla Barú, at a depth of 28-36 m, growing on the dead part of a coral-shaped colony of Montastraea annularis on the outside slope of the reef, the free-reef. The specimen comprises a single erect tube (broken at middle mass), arising from a relatively narrow basal mass. ICN-MHF (Po) 003, ICN-MHF (Po) 004, Dry and preserved parts (schizotypy) of two specimens collected on 1 May 1979, southwest of Isla Grande in a zone where very high Asteropora carinaria are prevalent, with many depressions surrounded by Montastraea annularis. The first specimen (Po) 003, (Fig. 25) was found at a depth of 1.5 m among A. carinaria. It consists of a broad increasing basal mass with four arising tubes of different sizes, slightly jointed. The second specimen (Po) 004, (Fig. 26) was found at a depth of 4 m, growing on the base of a kindred-shaped M. annularis colony. This specimen comprises one tube emerging from an increasing basal mass. ICN-MHF (Po) 099, ICN-MHF (Po) 086, MM-6010 1001. Three dry specimens and preserved parts of each, collected on 15 Feb 1980, south of Isla Grande,
Figure 7. *Xestospongia terebrans*, spicules: (a) variation in shape of ovicapsule to frustules, including stylate forms; (b) examples of ovicapsule (scale = 100 μm).
at a depth of 4-5 m, on coral debris and sand in depressions between patches of coral, mainly Montastrea annularis and Siderastrea siderea, located immediately before the beginning of the reef slope. (Po)005, (Fig. 3b) is an inclined tube, with approximately two thirds of its length appearing as a decumbent stolon, the pseudoscleroid end being slightly raised (the specimen probably fell on its side and was returning to the vertical). (Po)006, (Fig. 3d) comprises a group of five tubes emerging from a massive basal mass; the tubes are broader at their base. The specimen was found lying on its side and the pseudoscleres had already started turning upwards, POR:100 consists of a single tube arising from a rather narrow base. ICN-MñIN (Po)007. Preserved pieces of a specimen collected on 17 Feb 1980, on the northern reef of Isla Tascoro, at a depth of 29 m. The specimen was growing from under a laminar colony of M. annularis (Fig. 2a) on a 80-90° slope of the reef. It is a single tube curving upwards. USNM 30480. One dry specimen and alcohol preserved fragments, collected on 25 March 1980 in the Laguna de Pajarales in front of Isla Roata, at a depth of 7 m, on sand and coral debris on the inner slope at the southeast part of the lagoon. The specimen consists of a single erect tube with a small stolon protruding from the base; it is partially overgrown by another sponge, Neofibularia onusta Hartsman. USNM 30475, MM:1111 POR:16 (USNM 30481 fragment), USNM 30479. Dry fragment of specimens collected by J. Barreno, G. Bela and A. Pablin (Museo del Mar, Univ. Jorge Tadeo Lozano) in July 1970 at a depth of 3-10 m. Isla del Resarto are reported as location. USNM 30475 was a single tube; POR:16 was a cluster of five tubes, and USNM 30479 comprised eight flattened, flaring, laterally fused tubes.

Habitat: Xestospongia testudinaria is encountered only in reef environments. Although seen in high density coral reefs (Acanthastrea cervicornis, A. palmata plant M. annularis and Agaricia spp.), the species occurs most commonly in patch reef areas where large amounts of sand and rubble are found in the depressions between coral growth; it is also very abundant in large inner lagoons (e. g. Pajarales) and on the back reef and reef flat south of the islands. This sponge adheres to dead coral patches or to coral rubble; in places it is cemented to other sponges.

Etymology: Named after the type locality.

Discussion

The recent sponge monographs by Wiedenmayer (1977) and von Soest (1980) have elucidated the taxonomic status of Xestospongia. On the basis of these works and our own examination of species types we now confirm the existence of six members of Xestospongia in the tropical western Atlantic.
Xestopogonia muta (Schmiedl) occurs in Florida, the Bahamas, throughout the Caribbean and in Brazil; Xestopogonia portoricensis: van Soest and Xestopogonia rama (de Laubenfels) are known only from Puerto Rico; Xestopogonia rosariensis: new species, has not yet been found outside of the type locality, Islas del Rosario, Colombian Caribbean; Xestopogonia subtriangularis (Duchassaing) has a range from Florida and the Bahamas throughout the Caribbean; Xestopogonia viedennemayeri van Soest is known only from Curacao.

We agree with van Soest (1980: 79) that Strongylophora rampa de Laubenfels belongs to Xestopogonia but not that it is close to Tramos terebraci de Laubenfels. The latter species, mistakenly transferred to Xestopogonia by Wiedenmayer (1977), is a member of the order Hadromerida (Rützel and Vicente, in preparation).

Spicule dimensions indicate that Xestopogonia rosariensis (axial means 184 x 9 µm) is most closely related to Xestopogonia subtriangularis (195 x 6 µm). All other members of the genus have oxas or strongyles that are at least 550 µm long and 12 µm wide. The intermediate position of Xestopogonia rosariensis, where spicule size is concerned, weakens the argument (van Soest, 1980: 74) that Xestopogonia subtriangularis may not be a valid member of this genus.

ACKNOWLEDGMENTS

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Additional note: An additional specimen of X. rotasenensis, filed in the collection of the "Instituto de Investigaciones Marinas de Punta de Betín (INVEMAR)" in Santa Marta on the north coast of Colombia, is registered (reg. number INVEMAR-POR: 196). This specimen was collected by H. Sánchez in Aug 1981 at "El Morro" (a small granitic islet facing the Santa Marta Bay, 74° 13' N; 1° 15' W) at a depth of 30 m on broken dead corals and coral debris, just beyond the outer slope of the coral formation surrounding the islet (for description of the area see Erhardt, H. & B. Werring, 1975, Los corales (Anthozoa e Hydrozoa) de la Bahía de Santa Marta, Colombia. Boletín del Museo del Mar, Universidad Jorge Tadeo Lozano, Bogotá, 4: 1-350, 4 Figs., 28 figures). The specimen (Fig. 8) is a mass of approximately 15 cm long max., 10 cm wide, and 9 cm high. Although its shape differs from the usual in this species, its other characteristics coincide, and it is undoubtedly conspecific to the material from "Islas del Rosario". Its spicules measure (combined dimensions of hastate oxeas to strongly lorate and fusiform oxeas, developmental stages): 123.2-172.9-194.0 by 0.9-6.3-8.9 μm.

The interesting point about this additional registration is that during one of the many dives made by S. Z. in 1981 to depths of 35 m in the surroun-

Figure 8. Dry specimen of Xestospongia rotasenensis (INVEMAR-POR: 196) from Santa Marta region, north coast of Colombia (live size, see text of additional note).
<table>
<thead>
<tr>
<th>Specimen</th>
<th>Tube length x diam.</th>
<th>Bursal mass length x width</th>
<th>Pseudoscalidum length x height</th>
<th>Tube wall thickness</th>
<th>Spicules</th>
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<tr>
<td></td>
<td>(cm)</td>
<td>(cm)</td>
<td>(cm)</td>
<td>(cm)</td>
<td>length x width (μm)</td>
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<td>ICM-HN</td>
<td>44 x 44.5</td>
<td>~ 12 x 6 x 7</td>
<td>2.5-3</td>
<td>0.5</td>
<td>I 168.7-192.8-209.4 x 4.7-9.7-11.7</td>
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<tr>
<td>(Po) 001</td>
<td></td>
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<td>(calyx)</td>
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<tr>
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<td>78 x 45</td>
<td>~ 5 x 8 x 8</td>
<td>3 up to 1</td>
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<td>—</td>
<td>1.4</td>
<td>0.1-1.4</td>
<td>II 121.9-179.7-203.1 x 1.5-8.5-12.3</td>
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<td></td>
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</tr>
<tr>
<td>(col.)</td>
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<tr>
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<td>—</td>
<td>2.4</td>
<td>0.1-1.7</td>
<td>II 165.1-179.4-203.1 x 1.6-7.1-11.7</td>
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<tr>
<td>(Po) 004</td>
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<td>~ 10 x 4 x 4</td>
<td>1.4</td>
<td>0.1-1</td>
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<td>(discozy)</td>
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<td>~ 5 x 5 x 5</td>
<td>1.5</td>
<td>up to 1.5</td>
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<tr>
<td>ICM-HN</td>
<td>—</td>
<td>—</td>
<td>up to 1.2 or more</td>
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<td>32.67 x &lt;5.85</td>
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<td>—</td>
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<td>—</td>
<td>1.5-2</td>
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<td></td>
<td>II 188.0-206.6-220.0 x 10.0-11.7-12.5</td>
</tr>
</tbody>
</table>

1) (—) = no data.
2) J = hatchet ceras, styles and spongiosar; II = fusiform ceras (developmental stages); T = total I and II combined.
dings of Santa Marta was this species detected. This finding can be considered exceptional as it is certain that this species is not found in association with the coral formations of the site, as in the "Islas del Rosario". The specific ecological conditions (aquatic upwellings with temperatures falling to 23°C, as per data from INVMAR) could be the reason for the almost total absence of this species in Santa Marta. Future observations to the north and south of studied sites would clarify the problem.

LITERATURE CITED


