



Semperella megaloxea sp. nov. (Family: Pheronematidae): A new hexactinellid sponge from Andaman waters, India

K. VINOD¹, RANI MARY GEORGE², P. A. THOMAS³ AND MARY K. MANISSERI⁴

¹Mandapam Regional Centre of Central Marine Fisheries Research Institute, Mandapam Camp- 623 520, Tamil Nadu, India

²Vizhinjam Research Centre of Central Marine Fisheries Research Institute, Thiruvananthapuram - 695 521 Kerala, India

³Panachamoottil, Gandhipuram, Sreekariyam P. O., Thiruvananthapuram, Kerala, India

⁴Central Marine Fisheries Research Institute, Kochi - 682 018, Kerala, India

e-mail: vinod_kavungal@yahoo.co.in

ABSTRACT

The hexactinellid sponge described in this paper, *Semperella megaloxea* sp. nov. was collected from the eastern side of North Andaman waters off Diglipur at 13° 06' N lat. and 93° 11' E long. during one of the FORV *Sagar Sampada* expeditions. Critical examination of the specimen indicated that it belonged to the Class Hexactinellida, Sub-class Amphidiscophora and Order Amphidiscosida. Although diactin spicules are present, the presence of large number of pentactin spicules indicates that it belongs to the Family Pheronematidae. The columnar body with atrial surface divided into several areas separated by dermal areas indicates that the specimen belongs to the genus *Semperella*. The morphology of the whole sponge specimen, the presence of very long diactin spicules of oscular tuft and the pentactins with very long rays do not match well with any of the already described species of the genus *Semperella* Gray.

Keywords: Andaman waters, Deep-sea sponges, Hexactinellida, New species, Porifera

Introduction

Sponges occur in marine as well as in freshwater ecosystems; though higher diversity prevails in marine habitats. The marine forms are found in inshore as well as deeper waters. The 'World Porifera Database' enlists 8349 valid species of sponges (Van Soest *et al.*, 2012). The hexactinellids constitute one of the important members of the deep-sea sponge communities, many of which remain poorly documented and intensive deep-sea surveys therefore, might unravel many new hexactinellid species. This paper describes a new hexactinellid sponge species collected from the eastern side of North Andaman waters.

Materials and methods

One specimen of hexactinellid sponge was obtained along with few specimens of *Hyalonema* (*Cyliconema*) *apertum apertum* from the eastern side of North Andaman waters, during a cruise aboard FORV *Sagar Sampada* (Cruise No. 252) in January-February 2007. The specimen was obtained in bottom trawl "Expo" from North Andaman waters off Diglipur at 13° 06' N lat. and 93° 11' E long., from a depth of 402 m (Fig. 1).

The collected specimen was brought to the laboratory, air-dried and preserved in air-tight polythene bags for further examination. The morphological characters were

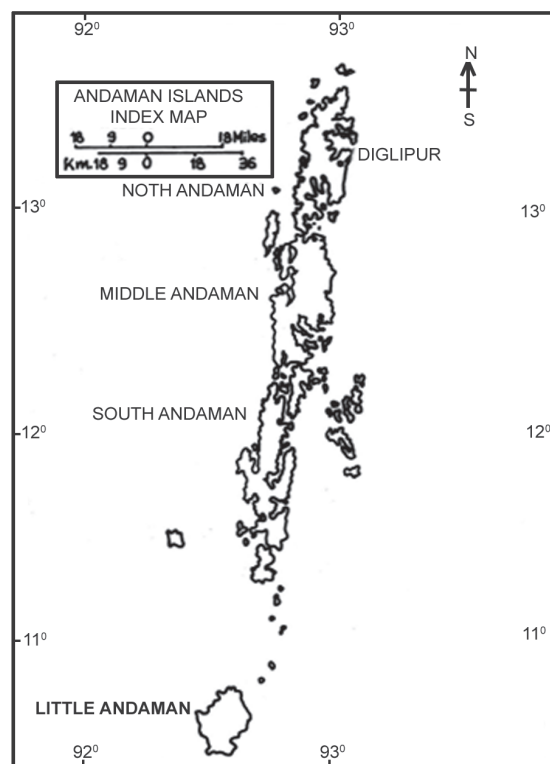


Fig. 1. Map showing the sampling site from where *Semperella megaloxea* sp. nov. was collected

examined and sub-samples were taken for spicule preparations from defined body areas – dermal, atrial, choanosomal and peduncle. Sections from specified areas were heated in concentrated nitric acid for digestion of organic matter and separation of spicules. The siliceous spicules were used for microscopic analyses and were measured using the software ‘Image Manager Leica IM 50’ and expressed in micrometer.

Results and discussion

The morphological studies and spicule characteristics of the specimen revealed that it belongs to the Class Hexactinellida and Family Pheronematidae.

Systematic position

- Phylum : Porifera Grant
 Class : Hexactinellida Schmidt
 Sub-class : Amphidiscophora Schulze
 Order : Amphidiscosida Schrammen
 Family : Pheronematidae Gray
 Genus : *Semperella* Gray
 Species : *Semperella megaloxea* sp. nov.

Material examined

One entire specimen collected from the eastern side of North Andaman waters at 13° 06' N lat. and 93° 11' E long., from a depth of 402 m.

Repository: The specimen is deposited in the ‘Designated National Repository’, Central Marine Fisheries Research Institute, Kochi, Kerala, India with Accession No. BB.1.1.2.1.

Description

Body

The body is club-shaped, widening slightly towards the upper end and bilaterally symmetrical. The basal part is in the form of broad, loose, partly broken untwisted tuft, (Fig. 2). The total length of the specimen is 520 mm; wherein the body proper is 130 mm, basal tuft (incomplete) 40 mm and oscular fringe, 350 mm. The width of the body ranged from 60-75 mm and characterized by the presence



Fig. 2. Entire specimen showing oscular fringe, body and basal tuft

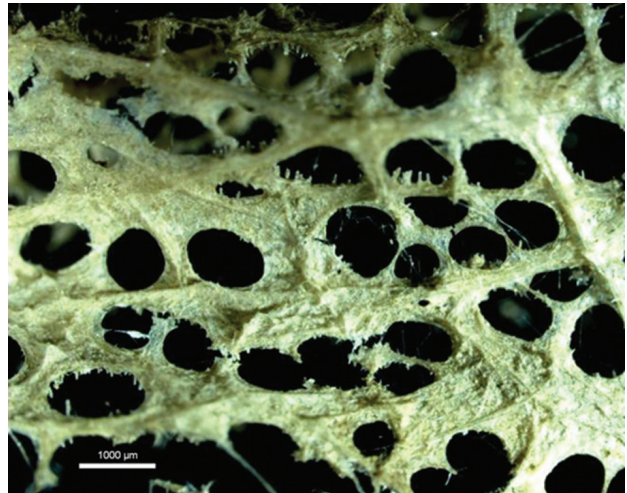


Fig. 3. Magnified view of the sieve plate of *Semperella megaloxea* sp. nov.

of an apical sieve plate (Fig. 3). Body faintly ridged, ridges run length-wise, with vague inter-connections.

Spicules

The anchorate basalialia are 2, 3 or even 4 toothed, of which some may even be degenerate or malformed (Fig. 4, A).

A few spicules of this category could be isolated from the remnants of the damaged basal attachment zone. The smallest available spicule has a total length of 4 mm and provided with two clads (teeth) arranged at opposite direction. The shaft is entirely spinous except at the neck portion, spines may be opposite, alternate or irregular in position. The shaft is quite narrow at the neck part and enlarges slightly at the middle of shaft. The terminal part of the shaft is smooth and sharply pointed (Fig. 4, A5). Sometimes, the spination on shaft becomes more complicated ‘with interrupted spiral denticulate ridges’ as seen in the spicules of *Chalaronema sibogae* Ijima (Tabachnick and Menshenina, 2002, p.1257, Fig. 15, J). The clads (teeth), at this stage, may have a chord length of 0.132 mm, width of shaft (at neck part) 0.026 mm and at middle part 0.06 mm average (excluding spines) (Fig. 4, A3). In some cases, the neck portion may have 3-5 annulations (Fig. 4, A1) encircling the shaft partly or completely. Tips of these spicules are beset with small pinules directed towards the terminal part of the shaft, sometimes fused to the latter fully (Fig. 4, A4). The total length of the largest spicule examined is 200 mm.

Choanosomal spicules consist of pentactins, diactins and sometimes stauractins. The pentactin spicules are very large; their rays very long, reaching upto 12 mm. Sometimes, four of the rays get atrophied and the fifth one becomes stouter reaching a width of 0.27 mm or more

(Fig. 4, B4-B7). Such pentactin spicules are seen in *Semperella schulzei* (Semper) also (Tabachnick and Menshenina, 2002, p.1276, Fig. 5, P, Q). A new type of pentactin with 3 capitate and 2 normal rays was also rarely observed (Fig. 4, B8), the normal ray may measure (*i.e.*, one ray) 0.728 x 0.018 mm.

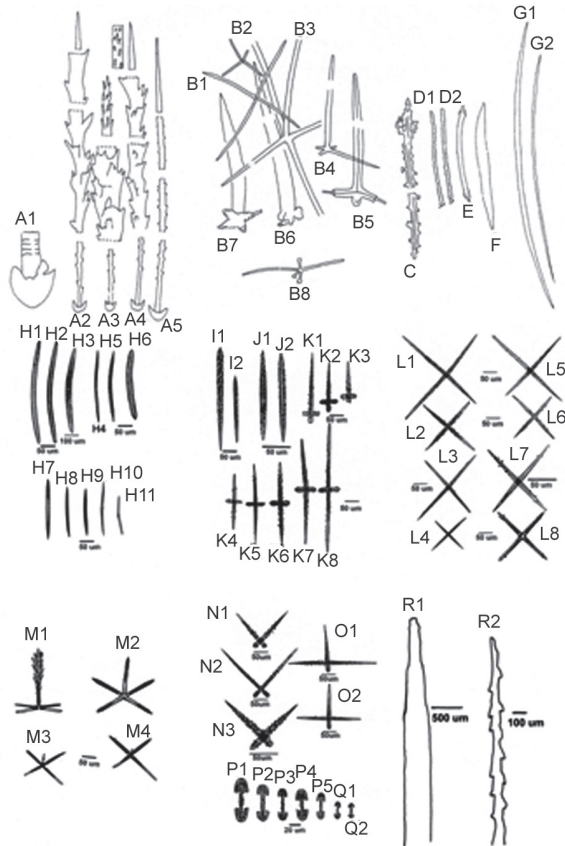


Fig. 4. Spicules of *Semperella megaloxea* sp. nov.

A1 Enlarged head of anchorate basalia; A2-A5 Different growth forms of anchorate basalia (A2, A4, A5 – 2 hooks; A3 – 4 hooks); B1-B3 Normal pentactins; B4-B7 Pentactins with atrophied rays; B8 Pentactin with capitate and normal rays; C Diactin ornamented with spines; D1-D2 Sceptres (incomplete); E Diactin with lancet-shaped tips which are microspined; F Diactin common on sieve plate; G1-G2 Long diactins of oscular tuft; H1-H11 Diactins of different sizes; I1-I2 Uncinates; J1-J2 Spiny diactins; K1-K8 Pentactins with 2 long rays and short tangential rays; L1-L8 Stauractins; M1-M4 Dermal pentactins (pinular); N1-N3 Pentactins with 2 long rays; O1-O2 Pentactins with 3 long rays and short rays; P1-P5 Mesamphidisc; Q1-Q2 Micramphidisc.

Stauractins with short and long rays are present with spines throughout the length of the rays (72.95-261.44/4.72-13.77 μm) (Fig. 4, L1, L2, L5, L6). In some stauractins, only few spines are present along the length of the rays (50.54-158.14/4.42-14.40 μm) (Fig. 4, L3, L7). In addition,

stauractins with smooth rays (43.69-126.58/5.86-7.27 μm) (Fig. 4, L4) and with spines only at the tip of the rays (103.03-139.28/9.32-12.77 μm) (Fig. 4, L8) are also present.

The long diactins of oscular tuft measuring 50 cm x mm is the characteristic feature of this species (Fig. 4, G1 & G2). They are smooth and sharply pointed at both ends.

Diactins are of different types (Fig. 4, H1-H11); smooth with both ends tapering (81.10-718.70/2.80-36.46 μm) (Fig. 4, H1-H9). Small diactins with a swelling in the middle and both ends tapering (79.86-188.79/3.24-6.51 μm) were present (Fig. 4, H10-H11). Spiny diactins (88.87-215.99/7.23-12.75 μm) are also common (Fig. 4, J1, J2). Diactins ornamented with spines all over (0.63 x 0.022 mm) are rarely observed (Fig. 4, C). Sceptres were also rarely observed (Fig. 4, D1, D2). Diactins with lancet-shaped tips which are microspined (Fig. 4, E) measured 0.3 x 0.008 mm. Uncinates measuring 202.14-361.69/10.19-19.92 μm are present (Fig. 4, I1, I2).

Hypodermal and hypotriaia differ from choanosomal spicules usually being pentactins with the longest ray directed outside the body and tangential rays short and equal in length (long ray 116.30-209.56/7.60-12.83 μm; tangential rays 13.77-26.36/8.09-13.34 μm) (Fig. 4, K1-K3). Also, spicules with two long rays (116.02-133.36/8.22-9.11 μm) and short tangential rays (26.53-27.19/10.02-10.95 μm) with few spines are present (Fig. 4, K4, K5). Pentactin spicules which are completely spiny are also encountered (long rays 90.39-284.27/5.272-13.57 μm; tangential rays 16.91-32.56/7.81-15.56 μm) (Fig. 4, K6-K8).

Spiny pentactins with 2 long rays (76.06-250.30/8.46-13.37 μm) and short rays (16.28-39.73/12.83-14.91 μm) are present (Fig. 4, N1-N3). Pentactin spicules with 3 long rays (118.85-222.57/7.11-12.71 μm) and short rays (19.71-32.0/8.57-15.72 μm) are also common, which are completely spiny (Fig. 4, O1). Similar pentactins with few spines (long rays 74.87-164.50/7.75-9.61; short rays 28.99-37.77/8.03-12.07 μm) are also present (Fig. 4, O2).

The pinular pentactins (Fig. 4, M1) have pinular ray which is long and spiny (180.85 – 370.76/8.44 – 22.93 μm). The tangential rays are smooth and pointed (74.79 – 110.40/4.22 – 14.44 μm). In some pentactins (Fig. 4, M2), the median ray as well as the tangential rays are spiny (median ray: 50.06 – 71.26/7.26 – 12.75 μm; tangential rays: 110.96 – 148.50/11.90 – 12.65 μm). In some pentactins, the tips of median as well as tangential rays are spiny (median rays: 129.31 – 192.75/12.13 – 13.96 μm; tangential rays: 102.52 – 122.12/12.28 – 14.33 μm). In some pentactins, the rays are smooth

(Fig. 4, M3-M4), the median ray measuring 34.01 – 120.33/4.72 – 5.99 μm and the tangential rays measuring 64.51 – 118.21/5.04 – 11.44 μm .

The amphidiscs are of two types *viz.*, mesamphidiscs and micramphidiscs; both are characterized by the presence of tubercles on their shafts. The mesamphidiscs (Fig. 4, P1-P5) have a total length of 42.42-98.67 μm , umbel length of 9.51-24.04 μm and umbel diameter of 10.49-22.47 μm . The micramphidiscs (Fig. 4, Q1-Q2) have a total length of 24.34-39.06 μm , umbel length of 5.13-11.15 μm and umbel diameter of 7.32 – 11.91 μm .

Etymology

The specific name ‘megaloxea’ refers to the relatively large oxeote oscularia found in the species.

Remarks

The hexactinellid sponge studied here belongs to the sub-class Amphidiscophora and order Amphidiscosida. The main choanosomal megascleres consist of pentactins which are characteristic of the family Pheronematidae. Genera of Pheronematidae are defined mainly by their characteristic body forms. The cup-like, hemispherical or spherical body forms are common for *Pheronema*; a row of bilaterally symmetrical forms, spoon or fan-like, are known for *Platylistrum*, *Sericolophus* and *Poliopogon*; a form with osculum overgrown by lateral walls is typical for *Schulzeviella*; and a columnar body with atrial surface divided into several areas separated by dermal areas is special for *Semperella*.

Among the members of the family Pheronematidae, choanosomal spicules mostly have the form of pentactins which can be accompanied by rare hexactins, tetractins and tauactins, but probably never diactins (Tabachnick and Menshenina, 2002). However, the present specimen is characterized by the presence of very long diactins in addition to pentactines. The morphology of the whole

specimen, the presence of very long diactins of oscular tuft and the pentactins with very long rays are unique to the species described, unlike in any existing species of the Family Pheronematidae. Although many of the characters match well with the genus *Semperella*, the characters do not have any similarity with any of the already described species under the genus.

Acknowledgements

The authors express their sincere gratitude to the Director, Central Marine Fisheries Research Institute, Kochi, India for the support and facilities provided. The authors also thank Dr. A. A. Jayaprakash, Former Principal Scientist, Pelagic Fisheries Division, CMFRI for providing the sample which was collected during the cruise aboard FORV *Sagar Sampada*.

References

- Hooper, J. N. A. and Van Soest, R. W. M. 2002. *Systema Porifera: A guide to the classification of sponges*. In: Hooper, J. N. A. and Van Soest, R. W. M. (Eds.), Kluwer Academic/Plenum Publishers, New York, NY (USA), p. 1-1099.
- Reiswig, H. M. 2002. Order Amphidiscosida Schrammen, 1924. In: Hooper, J. N. A. and Van Soest, R. W. M. (Eds.), *Systema Porifera: A guide to the classification of sponges*. Kluwer Academic/Plenum Publishers: New York, NY (USA), II, p. 1231-1266.
- Tabachnick, K. R. and Menshenina, L. L. 2002. Family Pheronematidae Gray, 1870. In: Hooper, J. N. A. and Van Soest, R. W. M. (Eds.), *Systema Porifera: A guide to the classification of sponges*. Kluwer Academic/Plenum Publishers: New York, NY (USA), II, p. 1267-1280.
- Van Soest, R. W. M., Boury-Esnault, N., Hooper, J. N. A., Rützler, K., de Voogd, N. J., Alvarez de Glasby, B., Hajdu, E., Pisera, A. B., Manconi, R., Schoenberg, C., Janussen, D., Tabachnick, K. R., Klautau, M., Picton, B., Kelly, M. and Vacelet, J. 2012. *World Porifera Database*. <http://www.marinespecies.org/porifera/> (accessed 9th February 2012).