

The first record of *Cavernulina orientalis* (Thomson & Simpson, 1909) (Octocorallia: Pennatulacea: Veretillidae) from the Bay coast of Visakhapatnam, Andhra Pradesh

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Benthic fauna from in and around Visakhapatnam has been studied by: Radhakrishna (1964); Sudarsan (1983); Adishesasai (1992) and Vijayakumaran (2003). Previous records have mentioned the collection of specimens of the sea pen genus *Cavernularia* Valenciennes, 1850 from these waters (Radhakrishna 1964) but species of the closely related (or perhaps synonymous) genus *Cavernulina* Kuekenthal & Broch, 1911 have not been identified until now.

Pennatulaceans are quite common in benthic communities from a depth of a few metres to more than 6200 and thirty-four genera in fourteen families of living pennatulaceans are currently recognised (Williams 2011). They have been reported from in and around India by a number of authors (Parulekar 1981, Harkantra & Rodrigues 2003, and see Williams 1999: 47–48 for other references).

Following information published by Williams (1989, 1995), the genus *Cavernulina* is considered to comprise 4 species. However the validity of keeping *Cavernulina* and the closely related *Cavernularia* as separate genera has been discussed on several occasions. Kuekenthal & Broch (1911) investigated the previous work of Thomson & Simpson (1909) on the identification of two new *Cavernularia* species *C. orientalis* and *C. andamanensis* from the Indian Ocean. They stated that the very large variability of sclerite shape described for these species was actually not a characteristic of that genus and correspondingly they erected the new genus *Cavernulina* for these species and added a new species, *Cavernulina cylindrica*. Kuekenthal & Broch defined the genus *Cavernulina* as being radially built, club to cylinder-shaped, having an axis, polyps without calyces, rachis sclerites that are branched at the ends and peduncle sclerites that are broad and bone-shaped or rod-shaped. They also stated that the outer layer of the peduncle is free of sclerites. They defined *Cavernularia* as having sclerites oval to stick-shaped or spindle-shaped and unbranched, with or without an axis and without a sclerite-free outer layer to the peduncle. However, Hickson (1916) synonymised *Cavernulina* with *Cavernularia*, on the grounds that the sclerite differences do not justify a generic or even a specific distinction, and that the absence of a sclerite free layer in *Cavernularia* was due to abrasion. D'Hondt (1984) stated that separating *Cavernulina* and *Cavernularia* based solely on the former having branched sclerites in the rachis looks “delicate”. On the other hand, Imahara (1991) stated that he distinguished *Cavernulina* from *Cavernularia* on account of the bifurcate spicules and the presence of an axis in the former (even though both genera have species with an axis). Williams (1989) mentioned that *Cavernularia* and *Cavernulina* are closely related genera but differentiated them stating that: the rachis sclerites of *Cavernulina* are short (less than 0.4 mm in length) mostly branched or bifurcated at one or both ends, irregularly bone-shaped or rod-like; whereas *Cavernularia* possesses smooth sclerites that are ovals, elongate rods, spindles or needles (0.02–0.70 mm long) and are mostly unbranched or non-bifurcated at the ends. Later in 1995, Williams suggested both could probably be synonymised, considering *Cavernulina* to be of dubious validity taking into consideration the variable nature of branched and unbranched sclerites in several species of both *Cavernularia* and *Cavernulina*. Until a definitive revision of the genera is carried out, we record Thompson and Simpson's species as it appears in Williams (1995), namely *Cavernulina orientalis*.

Past records of *Cavernulina orientalis* from Indian waters are from the Orissa coast, Bay of Bengal (Thomson & Simpson 1909) and from Malvan, Maharashtra (Parulekar 1981, as *Cavernularia orientalis*).

The specimens studied here were collected by the first author in 2009, during regular sampling from the beach at Mangamaripeta, Visakhapatnam. The area under survey is a small fishing region where the operation of gillnets is very common. The specimens were dislodged from their habitat at a depth of 10–15 m, and brought ashore by fishermen along with the fish catch. The specimens were fixed in buffered formaldehyde (4% in seawater) and then transferred to 70%

ethanol. Sclerites were isolated from different parts of the colonies for microscopic examination following the procedure given by (Bayer 1961). Colony and sclerite terminology was mainly adapted from Bayer *et al.* (1983). The specimens have been deposited in the Visakhapatnam Regional centre of Central Marine Fisheries Research Institute Museum, India.

Order Pennatulacea Verrill, 1865

Family Veretillidae Herklots, 1858

Genus *Cavernulina* Kuekenthal & Broch, 1911

Cavernulina orientalis (Thomson & Simpson, 1909)

(Fig. 1)

Cavernularia orientalis Thomson and Simpson 1909: 305–306, pl. 9, figs. 1a, 1b; Hickson 1916: 52–55, fig. 9; 1937: 110–115, figs. 1, 2.

Cavernulina orientalis Kuekenthal & Broch 1911: 175; Kuekenthal 1915: 10; D'Hondt 1984: 629; Imahara 1991: 83–84, fig. 20, pl. IIk; Williams 1989: 307–308.

Material examined. VSCo2, Mangamaripeta, Visakhapatnam, 17°51'3.35"N and 83°24'50.45"E, beach, coll. S. Veena. 9 July 2009, 2 colonies.

Description. One of the two colonies has a total length of 48mm (Fig. 1A). It is clavate and elongate and has a peduncle 27 mm long and 3 mm wide that occupies about 56% of colony length. The rachis length is about 44% of colony length; 21 mm long and 7 mm maximum width. Both rachis and peduncle are thick and fleshy. Autozooids and siphonozooids are distributed on the rachis surface with no orderly pattern of arrangement. The autozooids are all completely retracted, some to level with the surface of the rachis and others forming dents, all appearing as dark brown to black pores, 0.30–1.00 mm diameter, and separated by distances varying from 0.50–1.00 mm. The siphonozooids are smaller than the autozooids and are distributed between them (Fig. 1A). A white, highly calcified internal axis is present, 19mm in length. It extends from the rachis down to about the upper 1/4 of the peduncle; 39% of colony length. The axis is rod shaped with a median whorl of projections and is 1 mm in maximum diameter (Fig. 1B). Sclerites are present in the surface of rachis and include crutches 0.60–0.90 mm long, bone-shaped rods 0.40–0.80 mm long and spindles 0.40–0.90 mm long (Fig. 1C). Sclerites from the interior of rachis are similar in shape and size to those of the surface. Peduncle surface sclerites are oval to spindle-shaped and many have a pre-median whorl. They are 0.30–0.98 mm long and the ends are rounded to bluntly pointed (Fig. 1D). Peduncle interior sclerites are sparse and similar in shape and size to those of the peduncle surface. Colouration is greyish white in the rachis, with dark brown to black autozooids. Sclerites are colourless. The second colony is 31mm long and its characters are much the same as those of the one described above.

This is the first record of *Cavernulina orientalis* from the Visakhapatnam coast and adds a new record to the benthic fauna of this region.

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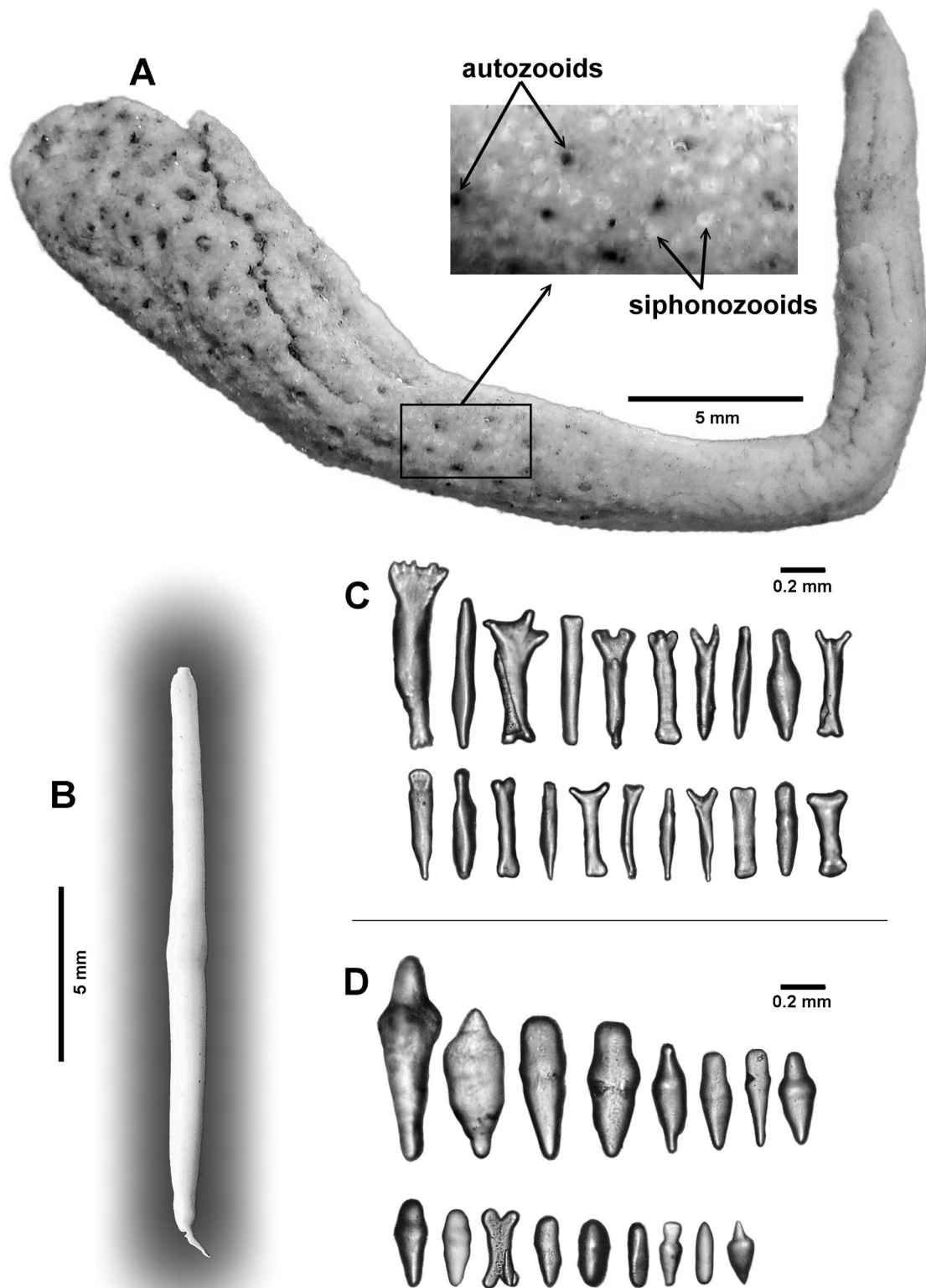


FIGURE 1. *Cavernulina orientalis*: A, whole colony with a portion enlarged to show the autozooids and siphonozoids; B, axis; C, rachis sclerites; D, peduncle sclerites.

References

- Adishesasai, K. (1992) *Littoral macrobenthos off Visakhapatnam, India*. PhD Thesis, Andhra University, India.
- Bayer, F.M. (1961) *The Shallow-water Octocorallia of the West Indian Region. A Manual for Marine Biologists. Studies on the fauna of Curaçao and other Caribbean Islands, No. 55*. Martinus Nijhoff, The Hague, Netherlands, 373 pp.
- Bayer, Frederick, M., Grasshoff, Manfred & Verseveldt, Jakob, (1983) *Illustrated Trilingual Glossary of Morphological and Anatomical Terms Applied to Octocorallia*. E.J. Brill Publishers, Leiden, The Netherlands, 75 pp.
- D'Hondt, Marie-José. (1984) Contribution a la connaissance de certains genres de la famille Veretillidae (Pennatulacea). Description de *Cavernulina grandiflora* n. sp. et de *Lituaria valenciennesi* nom. nov. *Bulletin du Museum National D'Histoire Naturelle, Section A, Zoologie Biologie et Ecologie Animales*, 6(3), 625–640.
- Harkantra, S.N. & Rodrigues, N.R. (2003) Pattern of species succession of soft-bottom macrofauna in the estuaries of Goa, west coast of India. *Current Science*, 85(10), 1458–1474.
- Hickson, S.J. (1916) *The Pennatulacea of the Siboga Expedition, with a general survey of the order*. E.J. Brill Publishers, Siboga Expeditie Monograph 14 (77), Leiden, The Netherlands, 265 pp.
- Hickson, S.J. (1937) The Pennatulacea. *Scientific Reports, John Murray Expedition, 1933–34*, 4(5), 109–130.
- Imahara, Y. (1991) Report on the Octocorallia from the Ryukyu Islands of Japan. *Bulletin of Institute of Oceanic Research and Development, Tokai University*, 11/12, 59–94.
- Kuekenenthal, W. (1915) *Pennatularia*. R. Friedländer und Sohn Publishers, Berlin, Germany, 132 pp.
- Kuekenenthal, W. & Broch, H. (1911) Pennatulacea. *Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Expedition "Valdivia" 1898-99*, 13(1), Lieferung 2, 113–576.
- Parulekar, A.H. (1981) Marine fauna of Malvan, Central west coast of India. *Mahasagar*, 14(1), 33–44.
- Radhakrishna, Y. (1964) *The systematics and ecology of bottom fauna*. PhD Thesis, Andhra University, India.
- Sudarsan, D. (1983) *Studies on Demersal and trawl fisheries of Visakhapatnam*. PhD Thesis, Andhra University, India.
- Thomson J.A. & Simpson J. (1909) *An Account of the Alcyonarians collected by the Royal Indian Marine Survey Ship Investigator in the Indian Ocean by J. Arthur Thomson & J.J. Simpson with a report on the species of Dendronephthya by W.D. Henderson. II. The Alcyonarians of the Littoral area*. Aberdeen, The University Press, Calcutta, 319 pp.
- Valenciennes, A. (1850) in Milne Edwards, H. & Haime, J., *A monograph of the British fossil corals, Part 1, Introduction, Corals from the Tertiary and Cretaceous formations*. Paleontological Society, Monographs, London, 71 pp.
- Vijayakumaran, K. (2003) Benthos in the near shore waters off Visakhapatnam. *Indian Journal of Fisheries*, 50(3), 297–311.
- Williams, G.C. (1989) The pennatulacean genus *Cavernularia* Valenciennes (Octocorallia: Veretillidae). *Zoological Journal of Linnean Society*, 95, 285–310.
- Williams, G.C. (1995) Living genera of sea pens (Coelenterata: Octocorallia: Pennatulacea) illustrated key and synopses. *Zoological Journal of Linnean Society*, 113, 93–140.
- Williams, G.C. (1999) Index Pennatulacea. Annotated bibliography and indexes of the Sea Pens (Coelenterata: Octocorallia) of the World 1469-1999. *Proceedings of the California Academy of Sciences*, 51(2), 19–103.
- Williams, G.C. (2011) Octocoral Research Center: Octocoral classification. California Academy of Sciences Research, California. Available from <http://research.calacademy.org/redirect?url=http://researcharchive.calacademy.org/research/izg/williams.htm> (accessed 29 March 2011).