



Occurrence of *Pteroeides esperi* (Octocorallia: Pennatulacea: Pennatulidae) along the coast of Andhra Pradesh, India

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Short communication

Abstract

Pteroeides esperi belonging to the family Pennatulidae is distributed in the Indo-West Pacific Ocean. In the present study, five specimens were collected from the landings of commercial multiday trawler operated at the depth of 30-40 m along the coast of Andhra Pradesh, Bay of Bengal. These specimens were characterized by the presence of cone-shaped colony, needle-like sclerites of the polyp leave forming rays, rod-shaped sclerites in rachis and length of peduncle less than half of the length of the colony. Therefore, based on the morphological description and sclerite details, these specimens were identified as *P. esperi*. This report represents the first formal record of the species in the coastal waters of Andhra Pradesh.

Keywords: *Sea pen, pennatulidae, sclerites, western Bay of Bengal*

Introduction

Pennatulaceans are distinct groups of Octocorals under the Phylum Cnidaria and are commonly called sea pens or sea feathers because they resemble quill pens (Williams, 2018). They are distributed throughout the world's oceans from intertidal to over 6200 m in depth (Williams, 2018). They are colonial soft corals with widespread distribution, that primarily live on soft sediments, where most species use their muscular peduncle to anchor themselves in the sediment (Williams, 2011). They have ecological significance as they can act either as nurseries for larval fish or can provide important habitat for many species of benthic fishes and macro-invertebrates and are also a source of food (Garcia-Matucheski and Muniain, 2011; Baillon *et al.*, 2012). They play a fundamental ecological role in sedimentary habitats by adding structural complexity to a homogeneous habitat, potentially representing biodiversity

hotspots (Bastari *et al.*, 2018). These are a rich source of bioactive compounds for pharmaceutical use (Putra *et al.*, 2017).

Sea pens exhibit a great variety of growth forms such as plumose, umbellate, clavate, foliate, capitates, digitiform, whip-like, or vermiform. Exclusively, mature colonies develop from a single large primary polyp that produces secondary polyps by lateral budding of its body wall (Williams, 2011). Also exclusive to the pennatulaceans, is the character of a muscular peduncle, which anchors the colony by peristaltic contractions into soft substrata such as sand, mud, or abyssal ooze (Williams, 2011). Some species have a peduncle that is expanded to form a sucker-like structure and can attach to rocky substrata (Williams and Alderslade, 2011).

There are 53 species of sea pens reported from Indian waters (Tudu *et al.*, 2018). Previously, three species of sea pens belonging to the genus, *Cavernularia* (*Cavernularia malabarica*, *Cavernularia obesa* and *Cavernularia orientalis*) were reported from Visakhapatnam coast, Andhra Pradesh (Veena and Kaladharan, 2010, 2012, 2013). The present species has been reported earlier from the coast of Odisha, Digha (West Bengal), Gulf of Mannar (Tamil Nadu) and Andaman Island (Ummerkuty, 1961; Datta *et al.*, 1990; Tudu *et al.*, 2018). This is the first report of *Pteroeides esperi* from the Visakhapatnam coast and adds a new record to the benthic fauna of the region.

Material and methods

Specimens were collected from the landings of commercial multiday trawlers operating at Visakhapatnam (Lat. 17.813943 N Long. 83.592212 E) and Kakinada (Lat. 17.183011 N Long. 82.571500 E) along the coast of Andhra Pradesh during February

2015 and March 2016 respectively. The specimens were fixed in buffered formaldehyde (4% in seawater) and then transferred to 70% ethanol. Tissue samples were taken from different body parts and dissolved in a 4% sodium hypochlorite (NaClO) solution for digestion of organic matter and separation of sclerites (Williams and Mattison, 2018). Sclerites were observed and photographed using an Olympus compound microscope and Canon SX710 HS 20.3MP Point and Shoot Digital Camera. The specimens were identified based on the morphological features of the colony and sclerites structure (Kukenthal, 1915; Williams, 1995).

Results and discussion

Systematics

Class : Anthozoa; Ehrenberg, 1834
 Order : Pennatulacea; Verrill, 1865
 Family : Pennatulidae Ehrenberg, 1834
 Genus : *Pteroeides* Herklots, 1858
Pteroeides esperi Herklots, 1858
Holotype (Figs: 1-3)

P. esperi: MNHN-IK-2019-353, Museum national d'Histoire naturelle, Paris (France), Herklots, J.A., 1858, Island of Sumatra, Indian Ocean, Colony length: 110 mm, Pl. II., f. 2, p. 20-20.

Synonyms

Pennatula hydroptica: Cuvier MS in Kolliker, 1869

Pteroeides hydropticum: MNHN-IK-2000-314; Museum national d'Histoire naturelle, Paris (France), Cuvier, 1869; Java Island, Indian Ocean; p. 97-98

Pteroeides tenerum: Kolliker, 1869, Colony length: 100 mm, f. 37; p. 192-193.

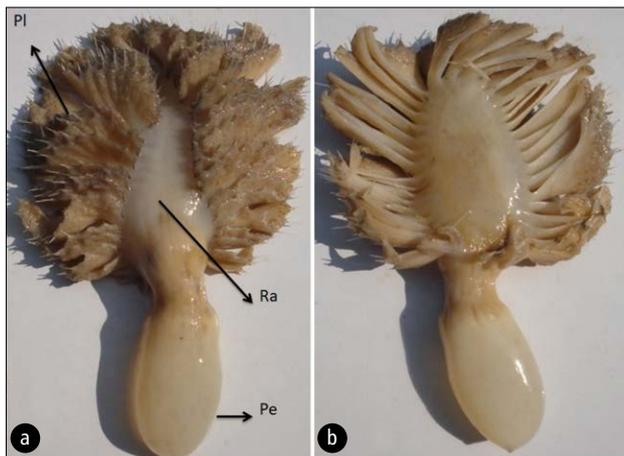


Fig. 1. *P. esperi* (a) The ventral view showing peduncle (Pe), rachis (Ra) and polyp leaves (Pl) (b) the dorsal view

Materials examined

Three specimens (Polyp length: 100 mm, 100 mm, 123 mm), March 2016, Visakhapatnam (Lat. 17.813943N Long. 83.592212E) coll. P. R. Behera, depth 35-40 m, gear: multiday bottom trawl; two specimens (Polyp length: 85 mm, 100 mm), February 2015, Kakinada (Lat. 17.183011 N Long. 82.571500 E), Andhra Pradesh coll. Jishnudev, depth: 30-40 m; gear: multiday bottom trawl.

Description

Colony 85-123 mm in length and 40-45 mm in width. They appear to be stout and feather-like consisting of a naked spongy peduncle and a single central axis (rachis) (Fig. 1). Peduncle length varies from 40-50 mm and 18-20 mm in diameter. Peduncle less than half of the length of the colony. Rachis are present throughout the length of the colony having bilateral symmetry. It has 21-26 pairs of polyp leaves. Polyp arises from polyp leaves that originate laterally from the rachis. The polyp is well-developed and rigid due to the presence of one to many supporting rays composed of long needle-like sclerites (Fig. 2a). Larger leaves with 35-40 mm in length and 18-20 mm in width. There are 18-20 rays per leaf in leaves from the middle region of the rachis. Rays extend through the entire length of a particular leaf and may extend 1 to 2 mm beyond the margin. Rays are visible in the basal plate of siphonozooids (Fig. 2b). Autozooids are restricted to the outer margin of each leaf to 5 mm below the margin on both the upper and lower surface of each leaf and retractile directly into pockets of the fleshy leaf margin (Fig. 2 a, b). Autozooids are not arranged in distinct rows however 5 to 8 autozooids are scattered between two adjacent rays. Siphonozooids are minute, numerous and crowded in a conspicuous proximal zone of each polyp leaf, which is at the leaf's lower surface (Fig. 2b).

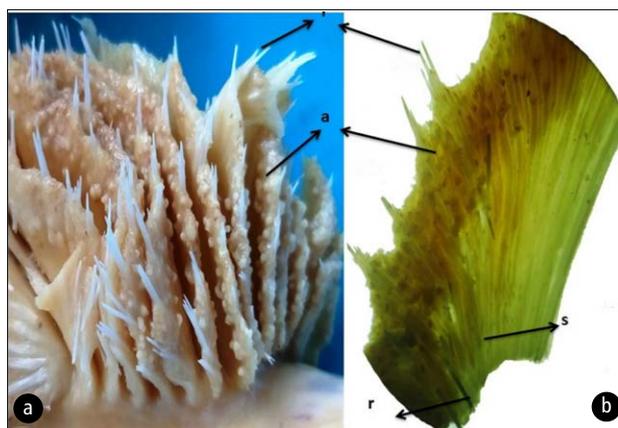


Fig. 2. (a) Polyp leaves (b) a portion of a single polyp leaf (10x) showing rays (r) of needle-like sclerites, autozooids (a), and proximal zone of siphonozooids (s)

Sclerites

Sclerites are smooth, not three-flanged. The surface of the peduncle has both spindle and rod shapes and the rachis have only rod shape sclerites. The peduncular interior does not have any sclerites. They are needle-shaped in the polyp leaves (Fig. 3). The length of the needles in the leaves varies from 8 to 11 mm. The ends of some needles may contain fine tuberculation. The maximum length of the sclerites on the surface of the peduncle is 0.17 mm and in the rachis, they reach up to 0.12 mm. The polyp leaves are cream with white rays and the peduncle is grey. Sclerites are white to golden in colour.

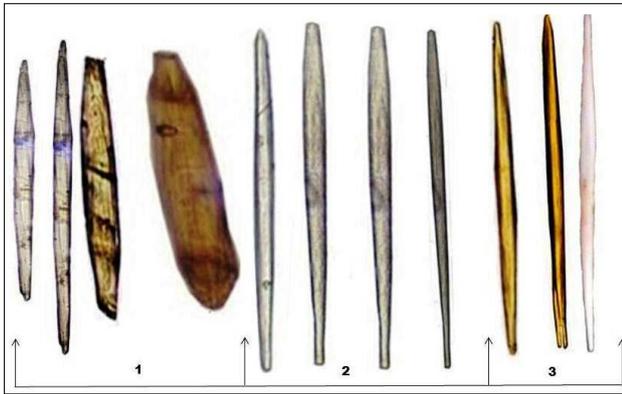


Fig. 3. (1) Sclerites of surface peduncle, (2) Sclerites of rachis and (3) Needles of polyp leaf

Distribution and habitat

The species is distributed throughout the Indo-West Pacific Ocean (Europe, Mediterranean, west coast of Africa, east coast of Africa, Madagascar, Indian Ocean, Australia, Malay Archipelago, Philippines, New Guinea, China, Taiwan, Okinawa, Japan, New Zealand and New Caledonia) (Williams, 1995).

Remarks

The genus, *Pteroeides* contains 28 valid species (Cordeiro *et al.*, 2022). They can be distinguished with needle-like sclerites of the polyp leaves forming rays and rod-shaped sclerites in rachis (Williams, 1995). Although 13 species within the genus have been reported from Indian waters (Tudu *et al.*, 2018), at present only one species, *P. esperi* is valid (Cordeiro *et al.*, 2022). The status of the species, *Pteroeides hymenocaulon* is nomen dubium and other species are uncertain (Cordeiro *et al.*, 2022). Earlier three species of pennatulaceans, *C. malabarica* (Veena and Kaladharan,

2010), *C. orientalis* (Veena and Kaladharan, 2012) and *C. obesa* (Veena and Kaladharan, 2013) were reported from the coastal waters of Visakhapatnam, Andhra Pradesh. Therefore, this report represents the first formal record of the species in the coastal waters of Andhra Pradesh, Western Bay of Bengal.

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References

- Baillon, S., J. Hamel, V. Wareham and A. Mercier. 2012. Deep cold water corals as nurseries for fish larvae. *Front. Ecol. Environ.*, 10: 351-356.
- Bastari, A., D. Pica, F. Ferretti, F. Micheli and C. Cerrano. 2018. Sea pens in the Mediterranean Sea: habitat suitability and opportunities for ecosystem recovery. *ICES J. Mar. Sci.*, 75(5): 1722-1732.
- Cordeiro, R., C. McFadden, L. van Ofwegen and G. Williams. 2022. World List of Octocorallia. *Pteroeides* Herklots, 1858. Accessed through: World Register of Marine Species at: <https://www.marinespecies.org/aphia.php?p=taxdetails&id=128496> on 2022-05-04
- Datta, P. K., A. K. Ray, A. K. Barua, S. K. Chowdhuri and A. Patra. 1990. Isolation of a bioactive sterol from *Pteroeides esperi*. *J. Nat. Prod.*, 53(5): 1347-1348.
- García-Matucheski, S. and C. Muniain. 2011. Predation by the nudibranch *Tritonia odhneri* (Opisthobranchia: Tritoniidae) on octocorals from the South Atlantic Ocean. *Mar. Biodiver.*, 41(2): 287-297.
- Herklots, J. A. 1858. Notices pour servir à l'étude des polypiers nageurs ou pennatulidés. *Bijdragen tot de Dierkunde*, p. 71-31.
- Kolliker, R. A. 1869. Anatomisch-Systematische Beschreibung der Alcyonarien. I. Die Pennatuliden. *Abhandlungen von der Senckenbergischen naturforschenden Gesellschaft*, 7: 111-255.
- Kukenthal, W. 1915. Pennatularia. Berlin, Verlag von R. Friedlander und Sohn. Das Tierreich. 43: 1-132.
- Putra, M. Y., T. W. Joko and M. Tutik. 2017. A review of chemistry and biological activities of the Indonesian Octocorallia. *J. Appl. Pharmaceut. Sci.*, 7(05): 219-227.
- Tudu, P. C., D. Rayand and A. Mohapatra, 2018. A Checklist of Indian Sea pen (Cnidaria: Anthozoa: Pennatulacea, Indian *J. Geo-Mar. Sci.*, 47 (05): 1014-1017.
- Ummerkuty, A. N. P. 1961. Studies on Indian copepods on eleven new species of marine cyclopoid copepods from the South-East coast of India. *J. Mar. Biol. Ass. India*, 3 (1 & 2): 19-69.
- Veena, S. and P. Kaladharan. 2010. *Cavemularia malabarica* Fowler, 1894 from the Bay coast of Visakhapatnam, Andhra Pradesh. *Nature Proceedings*. p. 1-11.
- Veena, S. and P. Kaladharan. 2012. First record of *Cavemulina orientalis* (Thomson & Simpson, 1909) (Octocorallia: Pennatulacea: Veretillidae) from the Bay coast of Visakhapatnam, Andhra Pradesh. *Zootaxa*, 3204: 61-64.
- Veena, S. and P. Kaladharan, 2013. *Cavemularia obesa* from the bay coast of Visakhapatnam, Andhra Pradesh, India. *Mar. Biod. Rec.*, 6: 1-6.
- Williams, G. C. 1995. Living genera of sea pens (Coelenterata: Octocorallia: Pennatulacea): illustrated key and synopses. *Zool. J. Linn. Soc.*, 113: 93-140.
- Williams, G. C. 2011. The global diversity of sea pens (Cnidaria: Octocorallia: Pennatulacea). *PLoS ONE* 6(7): e22747.
- Williams, G. C. and P. Alderslade. 2011. Three new species of pennatulacean octocorals with the ability to attach to rocky substrata (Cnidaria: Anthozoa: Pennatulacea). *Zootaxa*, 3001(1): 33-48.
- Williams, G. C. 2018. Illustrated key and synopses of shallow-water gorgonians and pennatulaceans of the Central Philippines, Part 2 (Cnidaria: Anthozoa: Octocorallia). *Proc. California Acad. Sci.*, 64(13): 361-398.
- Williams, G. and C. Mattison. 2018. Microscope slide or SEM stub preparation for octocoral sclerites or other invertebrate spicules. <http://researchrhive.calacademy.org/research/izz/> OctoResearchTech.htm.