

New records of soft corals (Cnidaria: Octocorallia) at Digha and adjacent areas, West Bengal, India

J S Yogesh Kumar*

Zoological Survey of India, Sunderban Regional Centre, Canning, West Bengal – 743 329, India

*[E-mail: yogeshkumar.js@zsi.gov.in]

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A comprehensive and thorough research study was undertaken in Digha and the neighbouring coastline of West Bengal to investigate the benthic communities in the area. The survey identified a total of 16 species, including 12 previously unrecorded soft coral species at the study sites. As a result of this investigation and considering the existing data, the total number of octocoral species in the region has been revised to 20 species. This research contribution, specifically documented the new record of 12 soft coral species, *i.e.*, *Dendronephthya ganjamensis* Henderson, 1909; *Carijoa riisei* (Duchassaing & Michelotti, 1860); *Muricella ramosa* Thomson & Henderson, 1905; *Acanthogorgia muricata* Verrill, 1883; *Menella* sp.; *Subergorgia suberosa* (Pallas, 1766); *Acanella robusta* Thomson & Henderson, 1906; *Junceella juncea* (Pallas, 1766); *Verrucella umbracula* (Ellis & Solander, 1786); *Lituaria hicksoni* Thomson & Simpson, 1909; *Pteroeides punctatum* Thomson & Simpson, 1909; and *Pennatula indica* Thomson & Henderson, 1906 within the study area.

[**Keywords:** Digha, New record, Octocorals, Sea fan, Sea pen, Soft corals, West Bengal]

Introduction

Octocorals are recognised under the phylum Cnidaria, class Anthozoa, subclass Octocorallia consisting of two orders, namely Malacalcyonacea and Scleralcyonacea (soft corals, sea pens and sea fans). The species belonging to this phylum are exclusively adapted to marine environments and can be encountered in a wide range of ocean depths, spanning from shallow coastal waters to the deepest parts of the ocean, in both tropical and polar seas, while some species also prefer freshwater habitats¹. Octocorals, which are recognised as habitat-forming species and ecosystem engineers, play a crucial role in marine ecosystems due to their widespread and diverse presence within the sessile benthic fauna of coral reef communities¹.

The distribution and abundance of octocorals are based on environmental and climatic factors such as substrate, water quality, light penetration, water current and sedimentation load². The octocorals are characterised by calcareous materials namely calcareous sclerites located within the coenenchyme and polyps. Polyps contain eight tentacles and are always pinnate shaped with eight mesenteries. The octocorals are the second major faunal community, just after the hard corals in the reef ecosystem and

provide shelter for fishes, molluscs, echinoderms, crabs and other reef-associated fauna¹.

The taxonomy of octocorals in India has a historical foundation, dating back to early studies like Duncan's examination of a fossil octocoral sample known as *Palaeontologia indica*³. Subsequent systematic investigations into this group were initiated by researchers like Hickson⁴ and Pratt⁵, who focused on octocorals of Maldives and Lakshadweep Islands. These preliminary works were followed by various publications detailing octocorals found in the Gulf of Mannar reef ecosystem⁶⁻²¹, Gujarat²²⁻²⁵, Lakshadweep Islands^{4,5,26-28}, Andaman and Nicobar Islands²⁹⁻⁴², Visakhapatnam coast^{43,44}, Pondicherry¹⁸, Kerala⁴⁵⁻⁴⁸, and the West Bengal coast⁴⁹⁻⁵¹.

While a limited number of studies have explored octocorals in other reef locations and deep-sea ecosystems along the Indian coasts, the present study, conducted along the Digha and adjacent coasts, has documented the octocoral community in the study sites.

Materials and Methods

Study area

Digha is a coastal resort town in West Bengal, situated at 21°36'30" N and 87°32' E and has a long

sandy coastal line covering 12 km from Digha Mohona to Udaipore (border of Orissa). The studies were conducted from April 2017 to March 2020 along the Digha coast and adjacent coastal areas from Junput beach, West Bengal to Chandipur beach, Orissa. During the study period, 11 study sites (Fig. 1) were covered, of which six sites were in West Bengal (Digha, Digha Mohana, Shankarpure, Mandermani, Petuaghat, Janput) and five sites in Orissa (Chandipur, Kasfal, Kirthanania, Taalsari, Udipure). A total of 10 sub-tidal sites were surveyed, and samples were collected using a trawl fishing net. Details of the study sites with GPS co-ordinates are presented in Table S1.

Methodology

The survey was carried out at the above-said study sites from April 2017 to March 2020 (not seasonal) to assess the benthic communities along the Digha coast and adjoining areas. This study focuses on the distribution and richness of soft corals because no such studies are reported from this region. The sub-tidal sample collection was undertaken by onboard offshore programmers (fishers) using gillnet, trawl nets and shore sine collection. In contrast, inter-tidal studies were made by walking along the coastline and frequently visiting the fish landing centres (Digha Mohana, Shankarpur, Petuaghat, Kasfal). The collected octocoral specimens were identified by morphological characteristics of the colonies and sclerites structure. Sclerites were extracted using 5 % Sodium hypochlorite and preserved 95 % ethyl alcohol^{1,52}.

Results

A total of 104 examples of octocoral specimens (16 species) were collected, identified and deposited

in Zoological Survey of India, Marine Aquarium Regional Centre (ZSI-MARC), Digha. Detailed systematics of collected specimens belonging to the subclass Octocorallia are given below, and updated list of species from the West Bengal coast, is presented in Table 1.

Phylum: Cnidaria Hatschek, 1888

Class: Octocorallia Haeckel, 1866

Order: Malacalcyonacea

Family: Nephtheidae Gray, 1862

Genus: *Dendronephthya* Kükenthal, 1905

Dendronephthya ganjamensis Henderson, 1909

Materials examined: 01 specimen, Digha Shankarpur fishing harbour, 21°38'21.54" N, 87°34'14.28" E, 20.VI.2017, Trawl net, ZSI/MARC C4904.

Identification: The specimens are yellowish with white stalk and branches, pink or red colour polyps. Stalks short in all the samples. Sclerites spindle-shaped, white colour spindles present in the stalks and pink colour spindles in polyps. Sclerites 0.2 to 2 mm in size. Size: 5 cm width and 3.5 cm in height. Habitat: Reef and Sandy bottom (Fig. 2).

Distribution: India – Ganjam coast, Orissa, East coast of India⁵¹, West Bengal coast (New distribution record).

Remarks: The species was identified with huge sclerites (2 mm) (both straight and curved) densely covered in rough and branched spines with regular arrangement. The arrangement of sclerites in the main stem and branches is irregularly transverse, and in small twigs, the arrangement is longitudinal, following the original description in 1909 by Henderson.

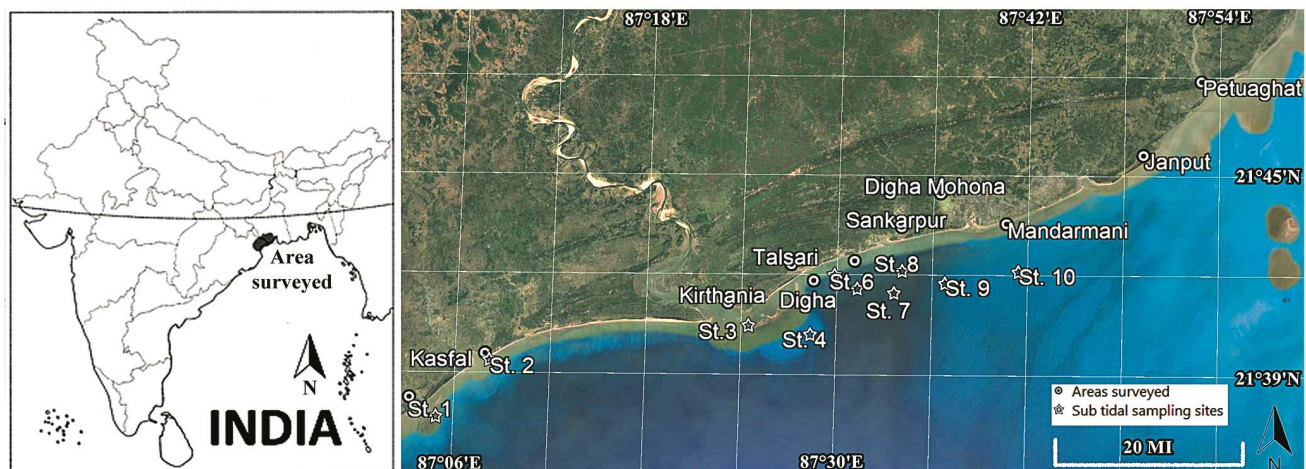


Fig. 1 — Study sites along Digha and adjoining coastal areas. Stations 1 to 10 – sub-tidal sampling sites (Map – Google Earth Pro)

Table 1 — List of Octocorals from the study sites along Digha and adjacent coast

| Sr. No. | Name of the species | 1 | 2 | 3 | 4 | 5 | 6 | 7 | Remarks |
|---------|--|---|----|----|----|---|---|---|--|
| 1 | <i>Dendronephthya ganjamensis</i> Henderson, 1909 | - | - | + | - | - | - | - | NR |
| 2 | <i>Carijoa riisei</i> (Duchassaing & Michelotti, 1860) | - | + | + | - | - | - | - | NR |
| 3 | <i>Muricella ramosa</i> (Thomson & Henderson, 1905) | - | - | - | - | - | - | + | NR |
| 4 | <i>Acanthogorgia muricata</i> Verill, 1883 | - | - | - | - | - | - | + | NR |
| 5 | <i>Menella</i> sp. | - | + | - | - | - | - | - | NR |
| 6 | <i>Subergorgia suberosa</i> (Pallas, 1766) | - | + | - | - | - | - | - | NR |
| 7 | <i>Acanella robusta</i> Thomson and Henderson, 1906 | - | + | - | - | - | - | - | NR |
| 8 | <i>Junceella juncea</i> (Pallas, 1766) | - | + | + | - | - | - | - | NR |
| 9 | <i>Verrucella umbracula</i> (Ellis & Solander, 1786) | - | - | + | - | - | - | - | NR |
| 10 | <i>Cavernularia elegans</i> Herklots, 1858 | - | - | - | - | - | - | - | Ramakrishna <i>et al.</i> ^{49,51} |
| 11 | <i>Cavernularia luetkenii</i> Kolliker, 1872 | - | + | - | - | - | - | - | Ramakrishna <i>et al.</i> ^{49,51} |
| 12 | <i>Cavernularia malabarica</i> Flower, 1894 | - | + | + | + | + | + | - | Ramakrishna <i>et al.</i> ^{50,51} |
| 13 | <i>Cavernularia obesa</i> Valenciennes Milne Edwards & Haime, 1850 | - | + | - | - | - | - | - | Ramakrishna <i>et al.</i> ^{49,51} |
| 14 | <i>Cavernularia orientalis</i> Thomson & Simpson, 1909 | - | - | - | - | - | - | - | Ramakrishna <i>et al.</i> ^{49,51} |
| 15 | <i>Lituaria hicksoni</i> Thomson & Simpson, 1909 | - | + | + | - | - | - | - | NR |
| 16 | <i>Pteroeides esperi</i> Herklots, 1858 | - | - | - | - | - | - | - | Ramakrishna <i>et al.</i> ⁵¹ |
| 17 | <i>Pteroeides punctatum</i> Thomson & Simpson, 1909 | + | + | - | - | - | - | - | NR |
| 18 | <i>Pennatula indica</i> Thomson & Henderson, 1906 | - | + | - | - | - | - | - | NR |
| 19 | <i>Virgularia juncea</i> (Pallas, 1766) | - | + | + | - | - | - | - | Ramakrishna <i>et al.</i> ⁵¹ |
| 20 | <i>Virgularia elegans</i> Gray, 1870 | - | + | - | - | - | - | - | Ramakrishna <i>et al.</i> ^{49,51} |
| | Total number of species | 1 | 13 | 7 | 1 | 1 | 1 | 2 | |
| | Total number of specimens | 1 | 39 | 21 | 35 | 5 | 1 | 2 | |

+ Present; – Absent; 1-Petuaghat; 2-Digha Mohana; 3-Shankarpur; 4-Digha Beach; 5-Udaypur; 6-Taalsari; 7-Kasfal, NR-New record

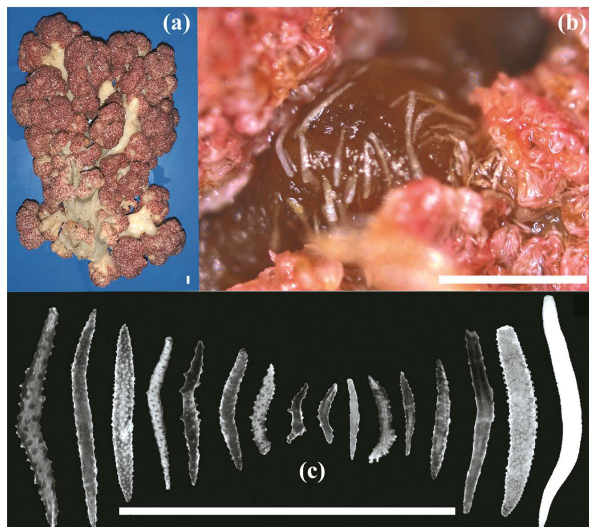


Fig. 2 — *Dendronephthya ganjamensis* Henderson, 1909: a) Specimen collected from the Digha coast with short stalk; and b, c) Sclerites. Scale: 1 mm

Family: Carijoidae McFadden, van Ofwegen & Quattrini, 2024

Genus: *Carijoa* Müller, 1867

***Carijoa riisei* (Duchassaing & Michelotti, 1860)**

1860. *Telesto riisei* Duchassaing & Michelotti

Materials examined: 01 specimen, Digha Shankarpur fishing harbour, 21°38'21.54" N, 87°34'14.28" E, 28.II.2018, Trawl net, ZSI/MARC C5370; 01 specimen, Digha Mohana fish landing

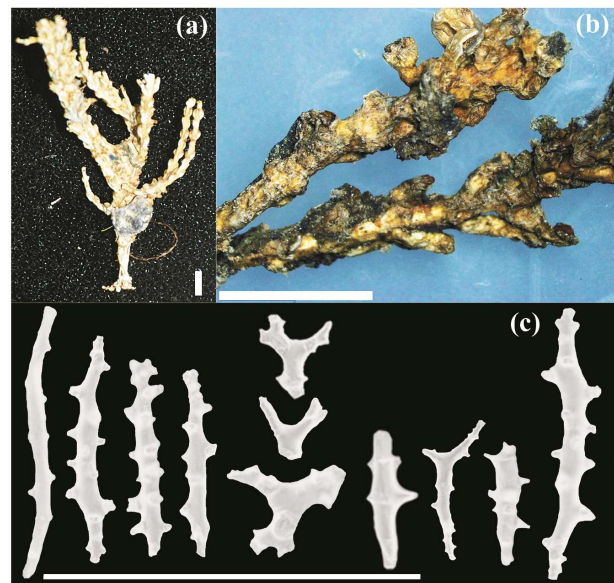


Fig. 3 — *Carijoa riisei* (Duchassaing & Michelotti, 1860): a, b) Specimens collected from the Digha Mohana and Shankarpur, and c) Sclerites. Scale: 1 mm

center, 21°38'21.54" N, 87°34'14.28" E, 21.XI.2018, Trawl net, ZSI/MARC C6440.

Identification: Colonies branched, and calyces alike buds, facing upward. Polyps monomorphic with tall axial polyps. Sclerites colourless, up to 0.5 mm in size, slender, and rod-shaped. Size: 5 to 8.5 cm. Habitat: Artificial reef, reef and ship bottom fouling (Fig. 3).

Distribution: India – Keelakarai, Gulf of Mannar, Southeast Coast of India, Pirotan Island and Laku point, Gulf of Kachchh, West coast of India, West Bengal coast³⁵ (New distribution record); Elsewhere – Wandoor, North Andaman Islands, North Pacific Ocean, Caribbean Sea, Gulf of Guinea, Indonesia, Gulf of Mexico⁵⁶.

Family: Acanthogorgiidae Gray, 1859

Genus: *Muricella* Verrill, 1869

***Muricella ramosa* (Thomson & Henderson, 1905)**

1905b. *Muricella ceylonensis* Thomson & Henderson

1909. *Muricella ramosa* Thomson and Simpson

Materials examined: 01 specimen, Kasfal, 21°31'13.08" N, 87° 7'52.92" E, 04.XII.2018, Trawl net, ZSI/MARC C7500.

Identification: Specimen sparsely branched with holdfast. Branches with loose reticulation. Sclerites like warty spindles up to 3 mm in size. Size: 16 cm. Habitat: Reef ecosystem (Fig. 4).

Distribution: India – Thoothukudi, Cuddalore, Southeast coast of India, Andaman and Nicobar

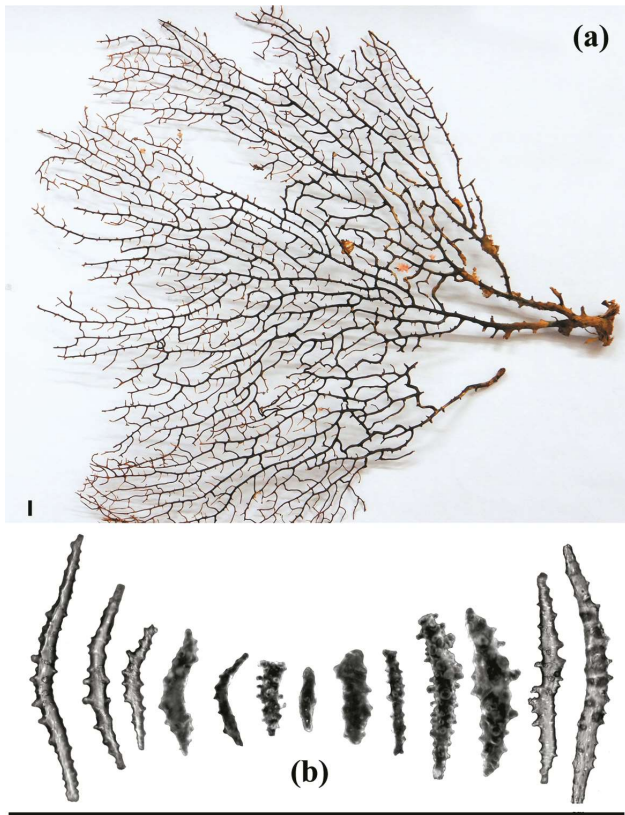


Fig. 4 — *Muricella ramosa* (Thomson & Henderson, 1905): a) Specimen collected from the Digha Shankarpur, and b) Sclerites. Scale: 1 mm

Islands, West Bengal coast (Newly recorded)³⁵; Elsewhere – Australia, Thailand, South Africa, Srilanka, Indonesia⁵⁶.

Remarks: The branching is in one plane with abundant anastomosis. The major axis is black, with a harder texture in older parts. While the younger parts are cylindrical, older parts are flattened in the plane perpendicular to the ramification. All of the colony characters are in alignment with the original description⁹.

Genus: *Acanthogorgia* Gray, 1857

***Acanthogorgia muricata* Verill, 1883**

1905b. *Acanthogorgia muricata* var. *indica* Thomson and Henderson, p. 290

1909. *Acanthogorgia muricata* Thomson and Simpson, p. 192

Materials examined: 01 specimen, Kasfal, 21°31'13.08" N, 87°7'52.92" E, 04.XII.2018, Trawl net, ZSI/MARC C7496.

Identification: Specimen colourless, sparsely branched with holdfast. Sclerites colourless, up to 1 mm in size. Size: 14 cm. Habitat: Reef ecosystem (Fig. 5).

Distribution: India – Nagapatinam, off Cuddalore, Bay of Bengal, Southeast coast of India¹⁴, West Bengal coast (Newly recorded); Elsewhere – Myanmar, Srilanka, Indonesia⁵⁶.

Remarks: The samples were identified based on the description of Thomson & Simpson³⁰.

Family: Acanthogorgiidae Gray, 1859

Genus: *Menella* Gray, 1870

***Menella* sp.**

Materials examined: 01 specimen, Digha Mohana fishing harbour, 21°38'14.94" N, 87°34'54.90" E, 04.I.2018, Trawl net, ZSI/MARC C7497.

Identification: Colony pale red in colour and loosely branched. Polyps irregular, scattered around the branches. Sclerites bright red in colour, and 0.1 to 0.3 mm in size. Size: 42 cm. Habitat: Reef ecosystem (Fig. 6).

Distribution: India – Havelock, South Andaman Island, Munak, Gate, Nancowry, Nicobar Island; West Bengal coast (Newly recorded); Elsewhere – Red Sea³⁵, Egypt⁵⁶.

Remarks: The presently collected specimen colony structure, colour and rooted leaves sclerites are similar to *M. kanisa* Grasshoff, 2000.

Family: Subergorgiidae Gray, 1859

Genus: *Subergorgia* Gray, 1857

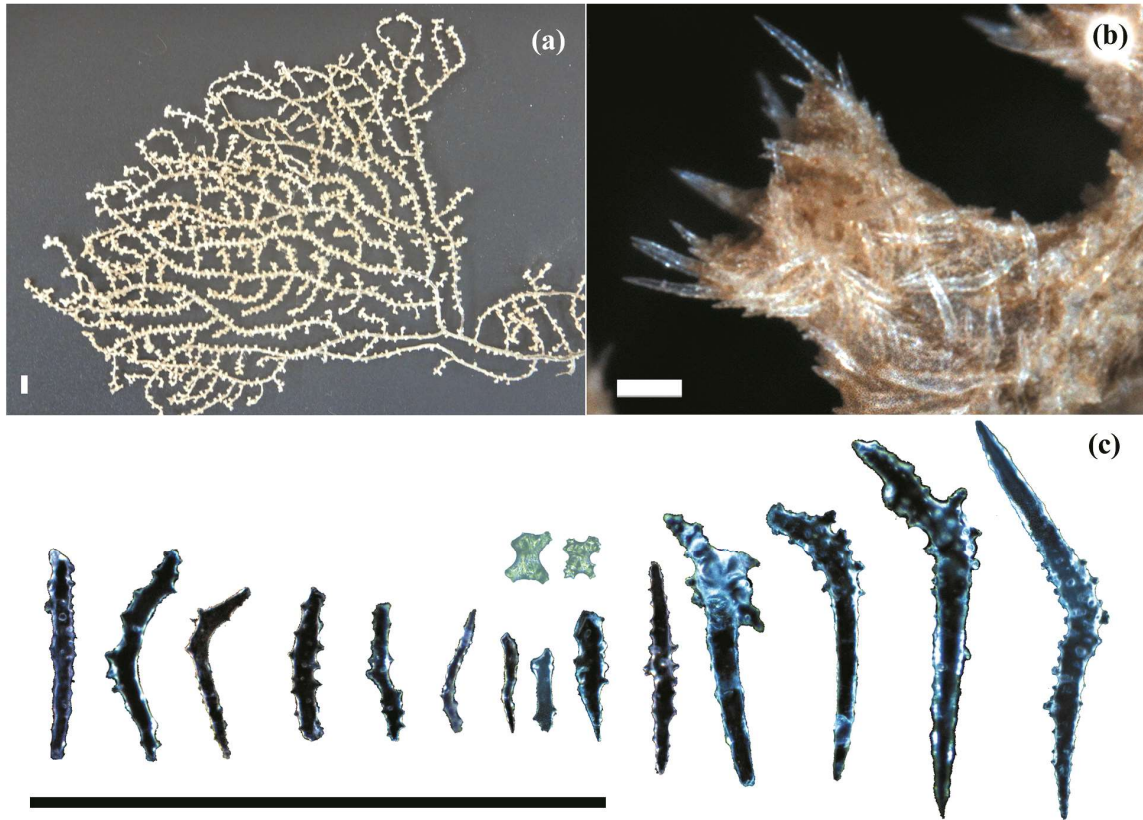


Fig. 5 — *Acanthogorgia muricata* Verill, 1883: a, b) Specimens collected from Kasfal Beach, and c) Sclerites. Scale: 1 mm

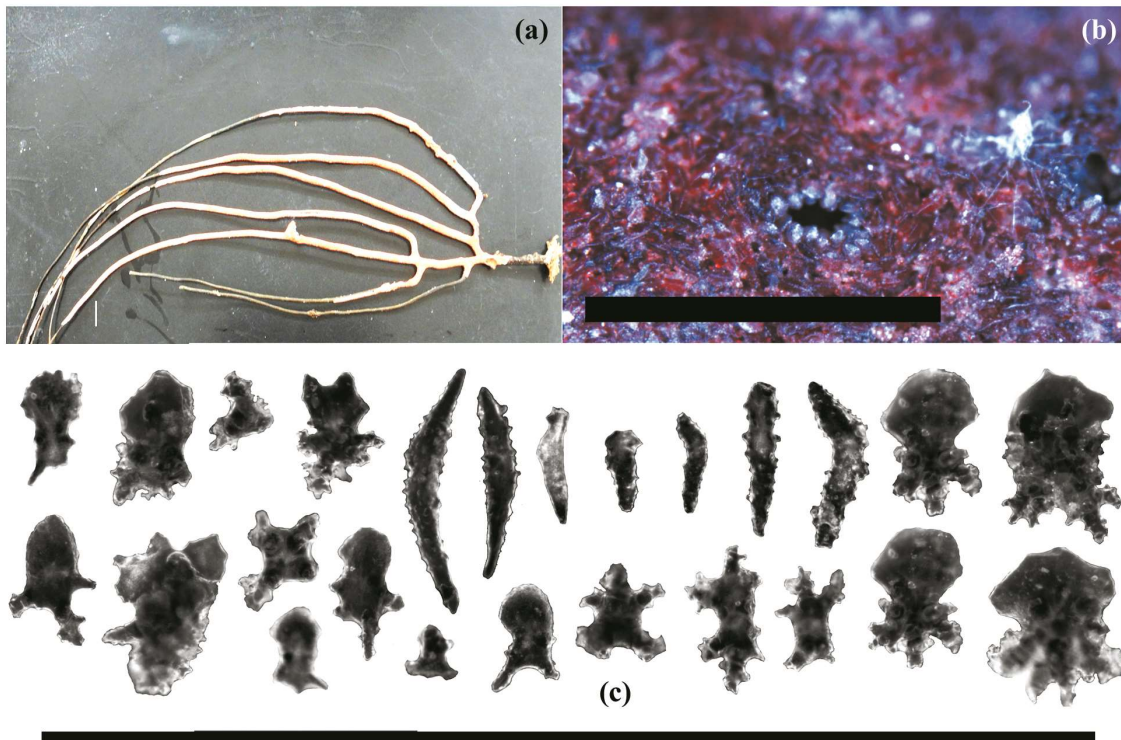


Fig. 6 — *Menella* sp.: a, b) Specimens collected from Digha Mohana, and c) Sclerites. Scale: 1 mm

***Subergorgia suberosa* (Pallas, 1766)**1911. *Subergorgia appressa* Nutting1911. *Subergorgia pulchra* Nutting

Materials examined: 01 specimen, Digha Mohana fishing harbour, 21°38'14.94" N, 87°34'54.90" E, 04.I.2018, Trawl net, ZSI/MARC C7196.

Identification: Specimen rusty red in colour, bushy colony, with ascending branches. Sclerites yellow-coloured, up to 0.2 mm in size. Size: 10 cm. Habitat: Rocky, reef and sandy bottom (Fig. 7).

Distribution: India – Tuticorin, Keelakarai, Rameshwaram, Kanyakumari, Chinnamuttom, Uveri, Thiuchendur, Vellapatti, Yerwadi, Keelakarai, Pamban, Vedalai, Sundaramudaiyan, Cuddalore, Pondicherry, between Off Kaniyakumari and Vizhinjam, between Paradeep and Visakhapatnam, along off Veravel coast and Laku Point Gujarat coast, Laccadive, Havelock, John Lawrence, Guitor, Munak Gate, Nancowry in Andaman and Nicobar Islands, West Bengal coast (Newly recorded)³⁵; Elsewhere – South China Sea, Australia⁵⁶.

Order: Scleralcyonacea

Family: Keratoisididae

Genus: *Acanella* Gray, 1870***Acanella robusta* Thomson and Henderson, 1906**

Materials examined: 03 specimens, Digha Mohana fish landing center, 21°38'14.94" N, 87°34'54.90" E, 20.IX.2018, Trawl net, ZSI/MARC C7318.

Identification: Specimen bushy with branches growing from all sides of the stem. Main axis with calcareous joints and irregular polyps on the stem. Sclerites spindle-shaped in polyps and 0.5 to 2 mm in size. Size: 14 cm height, 7 cm width. Habitat: Deep water environment (Fig. 8).

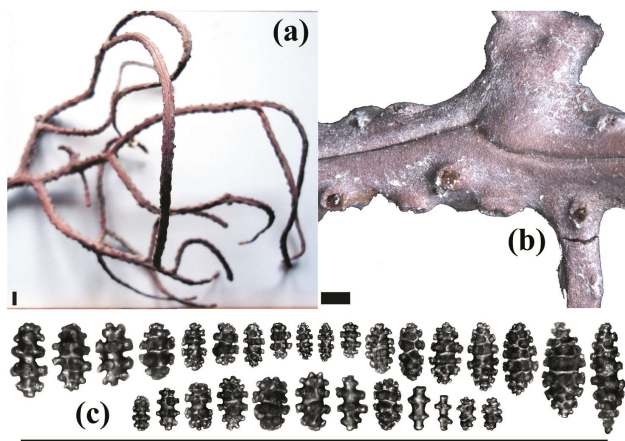


Fig. 7 — *Subergorgia suberosa* (Pallas, 1766): a, b) Specimens collected from Digha Mohana, and c) Sclerites. Scale: 1 mm

Distribution: India – 18°18' N; 93°25' E at 843 Fathoms in Bay of Bengal³⁵, West Bengal coast (Newly recorded); Elsewhere – Myanmar⁵⁶.

Remarks: Collected specimen description allies with the original description, and the species can be distinguished from other allied species by the presence of tuberculated obliquely arranged sclerites, small rods in the coenenchyma, and large squat base⁵⁷.

Family: Ellisellidae Gray, 1859

Genus: *Junceella* Valenciennes, 1855***Junceella juncea* (Pallas, 1766)**1766 *Gorgonia juncea*, Pallas, p. 180

1905 *Junceella trilineata* Thomson & Henderson, p. 313, pl. 4. Figs. 4 & 5

1855 *Junceella vimen* Valenciennes

Materials examined: 01 specimen, Digha Shankarpur fishing harbour, 21°38'21.54" N, 87°34'14.28" E, 28.II.2018, Trawl net, ZSI/MARC C5437; 01 specimen, Digha Mohana fishing harbour, 21°38'14.94" N, 87°34'54.90" E, 07.XI.2018, Trawl net, ZSI/MARC C7312.

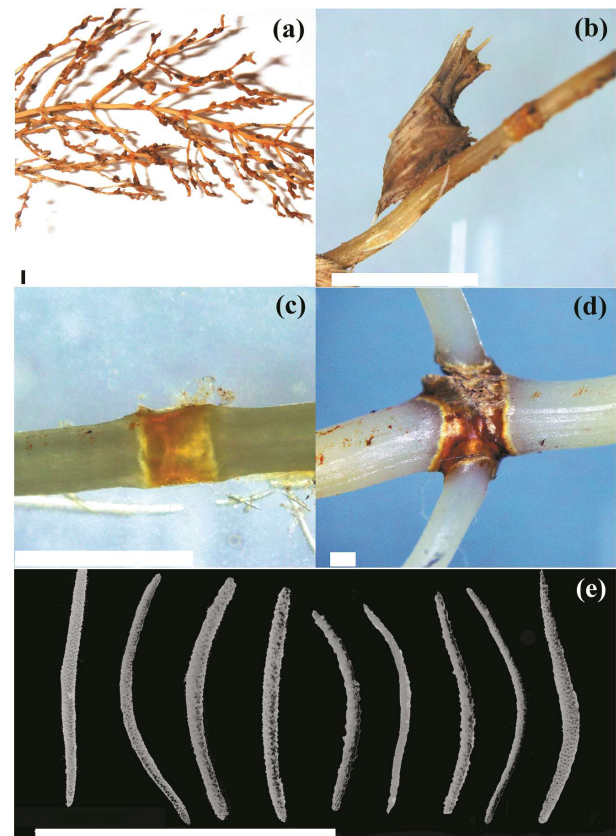


Fig. 8 — *Acanella robusta* Thomson & Henderson, 1906: a – d) Specimens collected from the Digha Mohana, and e) Sclerites. Scale: 1 mm

Identification: Colony whip-like, grow up to 2 m, unbranched, mostly red in colour, sometimes in white. Sclerites club-shaped and orange-red in colour. Size: 28 cm. Habitat: Reef ecosystem (Fig. 9).

Distribution: India – Andaman and Nicobar Islands, Lakshadweep Islands, Rameswaram, Pamban, Yerwadi, Keelakarai, Kanyakumari, Cape Comorin, Muttom, Kadiapattinam, Tengapattinam, Vizhinjam, Perumanal, Uvari, Vellapatti, Thoothukudi, Nagapattinam, Cuddalore, Madras, Visakhapatnam, Pondicherry, Southeast coast of India, Off Bombay, between Off Paradeep and Okhamandal, Salaya, Gulf of Kachchh³⁵, West Bengal coast (Newly recorded), West coast of India; Elsewhere – Red Sea, Indo-West Pacific⁵⁶.

Remarks: The present specimen's sclerite characteristics align well with the description by Grasshoff⁵⁹.

Genus: *Verrucella* Milne Edwards & Haime, 1857

***Verrucella umbracula* (Ellis & Solander, 1786)**

1996 *Gorgonella umbraculum* Thomas

1786 *Ctenocella umbraculum* Ellis & Solander

Materials examined: 01 specimen, Digha Shankarpur fishing harbour, 21°38'21.54" N, 87°34'14.28" E, 28.II.2018, Trawl net, ZSI/MARC C7498.

Identification: Colony fan-shaped, orange-red in colour, and branches thick and strong. Sclerites double-headed spindles and 0.05 to 0.08 mm in size. Size: 13 cm. Habitat: Deep water reef ecosystem (Fig. 10).

Distribution: India – Idinthakarai, Koothankuli, Cuddalore, Vedala, Pamban, Chinna Muttam,

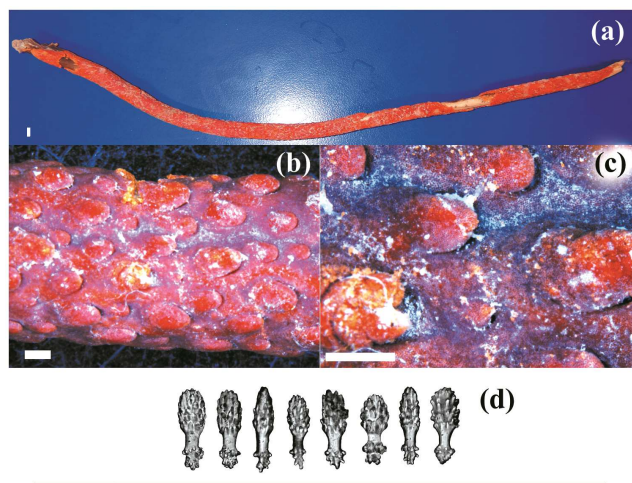


Fig. 9 — *Junceella juncea* (Pallas, 1766): a) Specimen collected from the Digha Mohana; and b – e) Sclerites. Scale: 1 mm

Kanyakumari, Mandapam, Cuddalore, Erwadi, Visakhapatnam, Southeast coast of India³⁵, West Bengal coast (Newly recorded); Elsewhere – South Africa, Indian Ocean, South China Sea⁵⁶.

Remarks: Very common from both the east and west coast of India and the identification was carried out following Thomas & George¹².

Superfamily: Pennatulioidea

Family: Veretillidae Herklots, 1858

Genus: *Cavernularia* Valenciennes in Milne Edwards & Haime, 1850

***Cavernularia luetkenii* Kolliker, 1872**

Materials examined: 04 specimens, Digha Mohana fishing harbour, 21°38'21.54" N, 87°34'14.28" E, 26.II.2018, Trawl net, ZSI/MARC C7320.

Identification: The colony is light salmon coloured; the stalk is 9 mm, and the trunk is 24 mm. Size: 3.5 cm. Habitat: soft bottom, sandy and muddy bottom (Fig. 11).

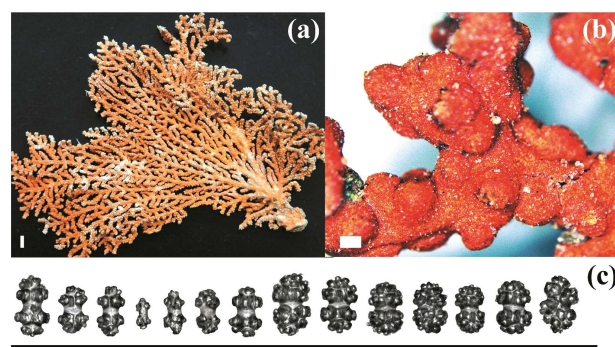


Fig. 10 — *Verrucella umbracula* (Ellis & Solander, 1786): a) Specimen collected from the Digha Shankarpur, and b – c) Sclerites. Scale: 1 mm

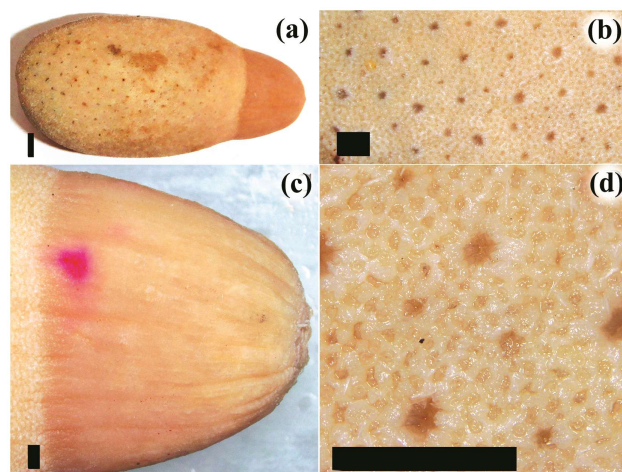


Fig. 11 — *Cavernularia luetkenii* Kolliker, 1872: a) Specimens collected from Digha Mohana; b, d) Enlarged surface, and c) Enlarged stalk. Scale: 1 mm

Distribution: India – Odisha coast, River Hugli, Sansheads, Digha, East coast of India and Calicut, West coast of India. The species is very common in bycatch, Digha coast³⁵; Elsewhere – Eastern Atlantic and Western Pacific Oceans⁵⁶.

Remarks: The species can be identified based on the following characteristics: colony clavate shaped, the axis is short and present at the base of the rachis, autozoid sclerites are absent, rachis surface sclerites are club-shaped rods measuring less than 0.3 mm⁶⁰.

Genus: *Cavernularia* Valenciennes in Milne Edwards & Haime, 1850

***Cavernularia malabarica* Flower, 1894**

Materials examined: 12 specimens, Shankarpur, 21°38'21.54" N, 87°34'14.28" E, 20.VI.2018, Trawl net, ZSI/MARC C4905; 01 specimen Digha Mohana Fishing harbour, 21°38'14.96" N, 87°34'54.75" E, 26.II.2018, Trawl net, ZSI/MARC C4983; 01 specimen Off Taalsari, 21°34'45.97" N, 87°29'24.50" E, 26.II.2018, Trawl net, ZSI/MARC C5367; 01 specimen, Digha Beach, 21°36'28.54" N, 87°29'25.26" E, 17.IV.2018, Trawl net, ZSI/MARC C5390; 16 specimens, Shankarpur fish landing Center, 21°38'21.54" N, 87°34'14.28" E, 17.VII.2019, ZSI/MARC C6478; 01 specimen, Off Shankarpur, 21°34'54.95" N, 87°36'38.48" E, 28.II.2018, ZSI/MARC C5514; 01 specimen Off Digha, 21°36'39.69" N, 87°33'24.65" E, 26.II.2018, ZSI/MARC C5428; 06 specimens, Digha Mohana fish landing center, 21°38'14.92" N, 87°34'54.88" E, 03.IX.2018, Trawl net, ZSI/MARC C5696; 01 specimen, Udaypur, 21°36'58.59" N, 87°30'1.74" E, 13.X.2018, Trawl net, ZSI/MARC C5842; 05 specimens, Old Digha, 21°36'58.59" N, 87°30'1.74" E, 28.IV.2019, Trawl net, ZSI/MARC C6324.

Identification: Specimen trunk 20 mm, and stalk 10 mm in size. Polyps yellow-coloured and visible. Size: 3 cm. Habitat: soft bottom, sandy and muddy bottom (Fig. 12).

Distribution: India – Malabar coast, Kerala, West coast of India, Madras museum specimen, Vishakhapatnam, Andhra Pradesh, Digha (West Bengal), East coast of India³⁵. The species is widespread on the Digha coast; Elsewhere – Pakistan⁵⁶.

Genus: *Cavernularia* Valenciennes in Milne Edwards & Haime, 1850

***Cavernularia obesa* Valenciennes Milne Edwards & Haime, 1850**

Materials examined: 08 specimens, Digha Mohana

fishing harbour, 21°38'14.93" N, 87°34'54.85" E, 26.II.2018, Trawl net, ZSI/MARC C7319.

Identification: Specimen cylindrical; rachis up to 72 %, and peduncle is only 28 % of the colony. Autozooids and siphonozooids are located on rachis. Size: 4.5 cm. Habitat: soft bottom, sandy and muddy bottom (Fig. 13).

Distribution: India – Odisha coast, Digha, Vishakhapatnam coast, East coast of India³⁵. This species is very common on the Digha coast; Elsewhere – Islands along the East Pacific Ocean⁵⁶.

Remarks: The species can be identified based on the following characteristics: colony clavate to cylindrical shaped, and the axis is absent, autozoid sclerites are absent, rachis surface sclerites are club-shaped rods measuring less than 0.5 mm⁶⁰.

Genus: *Lituarina* Valenciennes in Milne Edwards & Haime, 1850

***Lituarina hicksoni* Thomson & Simpson, 1909**

Materials examined: 1 specimen, Shankarpur fish landing Center, 21°38'21.53" N, 87°34'14.35" E,

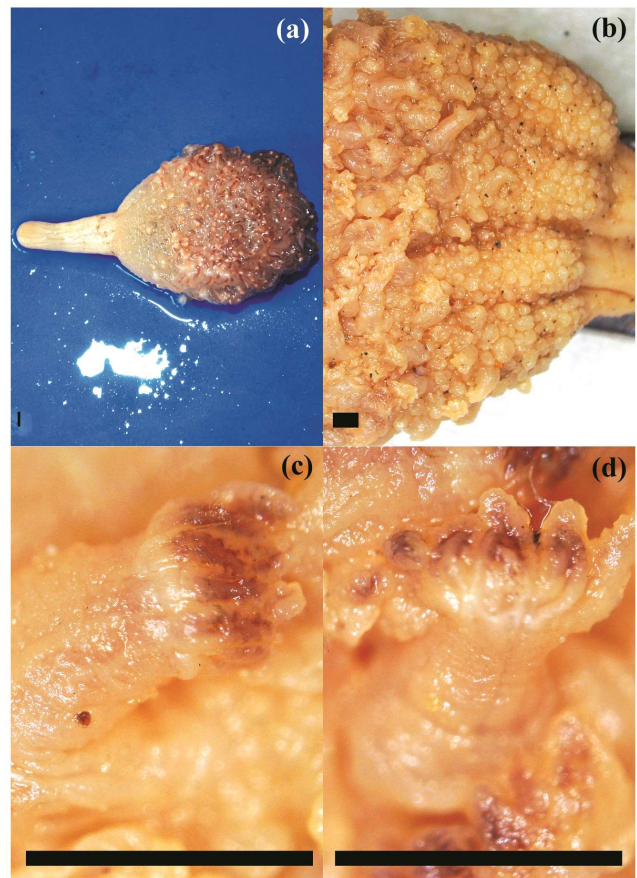


Fig. 12 — *Cavernularia malabarica* Flower, 1894: a) Specimen collected from Digha Mohana, and b – d) Enlarged polyps. Scale: 1 mm

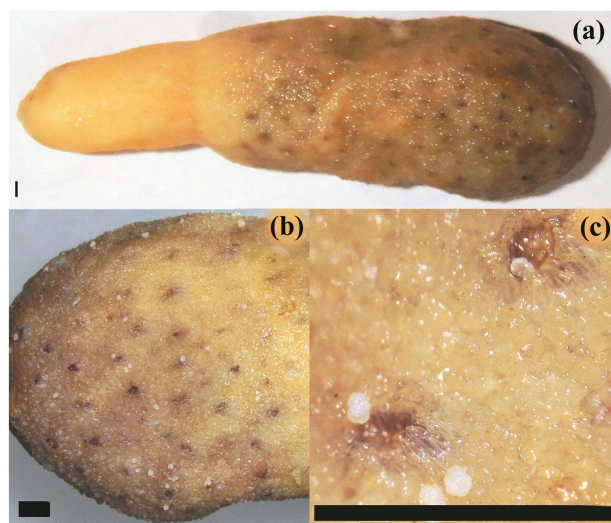


Fig. 13 — *Cavernularia obesa* Valenciennes Milne Edwards & Haime, 1850: a) Specimen collected from Digha Mohana; and b, c) Enlarged surface. Scale: 1 mm

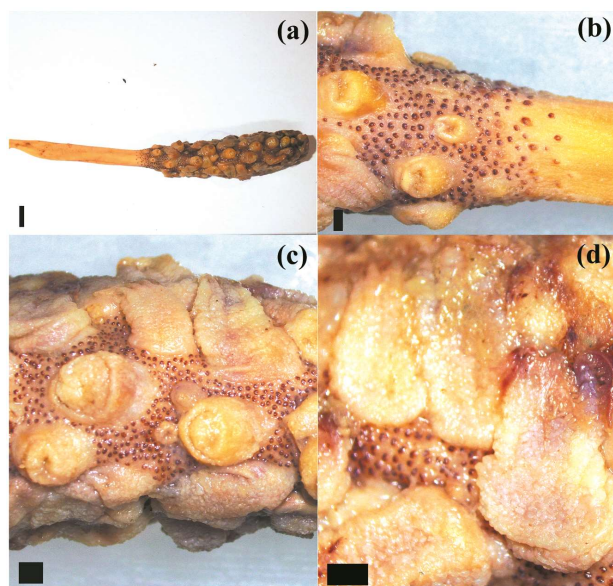


Fig. 14 — *Lituaria hicksoni* Thomson & Simpson, 1909: a) Specimen collected from Digha Mohana; and b – d) Enlarged polyps. Scale: 1 mm

20.VI.2017, Trawl net, ZSI/MARC C4906; 1 specimen, 28.II.2018, ZSI/MARC C7323; 5 specimens, Digha Mohana fish landing Center, 21°38'14.97" N, 87°34'54.70" E, 26.II.2018, Trawl net, ZSI/MARC C7321, 1 specimen, 28.II.2018, Trawl net, ZSI/MARC C7324.

Identification: Specimen's stalk and polyps yellow-coloured. Siphonozooids brown in colour. Peduncle 40 % and rachis is 60 % of the colony. Size: 8 cm. Habitat: soft bottom, sandy and muddy bottom (Fig. 14).

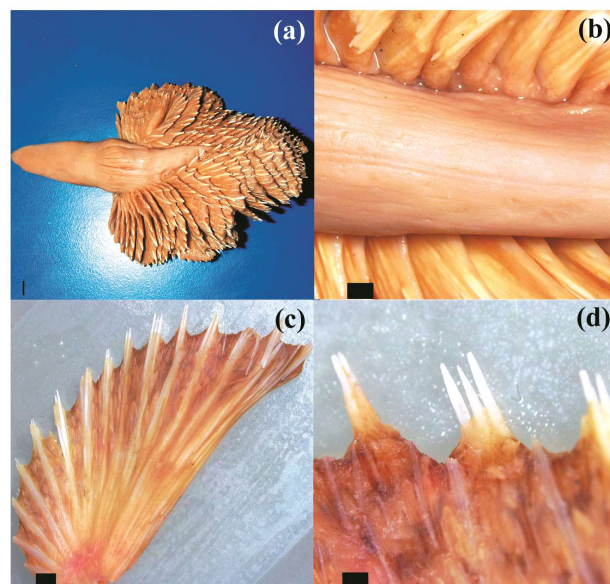


Fig. 15 — *Pteroeides punctatum* Thomson & Simpson, 1909: a) Specimen collected from Digha Mohana; and b – d) Pinnules arrangement and shape. Scale: 1 mm

Distribution: India – Off Odisha coast, East coast of India, West Bengal coast (Newly recorded)³⁵; Elsewhere – South Africa, Indonesia, Pakistan⁵⁶.

Remarks: The specimens were identified following the characteristics given in the original description, such as a tapering axis at the top of the rachis; large and colourless polyps with a distance of maximum up to 2 mm from each other.

Family: Pennatulidae Ehrenberg, 1834

Genus: *Pteroeides* Herklots, 1858

***Pteroeides punctatum* Thomson & Simpson, 1909**

Materials examined: 1 specimen, Petuaghat fish landing Center, 21°47'45.00" N, 87°52'51.36" E, 26.XI.2019, Trawl net, ZSI/MARC C6756; 7 specimens, Digha Mohana, 21°38'14.99" N, 87°34'55.00" E, 26.II.2018, Trawl net, ZSI/MARC C7322.

Identification: Specimen yellow in colour; stalk thick and conical. A total of 25 pinnules with sclerites and 14 rays. Size: 10.5 cm. Habitat: soft bottom, sandy and muddy bottom (Fig. 15).

Distribution: India – Palk Strait, Southeast coast of India, Andaman and Nicobar Islands, West Bengal coast (Newly recorded)³⁵.

Remarks: The specimens were identified following the characteristics given in the original description, such as zooid plate broader in pro-rachidial margin, sickle-shaped spicules, needles present in polyp-zone,

projected spines absent, visible rays present near zooid plate area.

Genus: *Pennatula* Linnaeus, 1758

***Pennatula indica* Thomson & Henderson, 1906**

Materials examined: 01 specimen, Digha Mohana fishing harbour, 21°38'14.94" N, 87°34'54.90" E, 26.XI.2019, Trawl net, ZSI/MARC C7501.

Identification: Specimen yellow-coloured, total 25 pinnules on one side. In each pinnules consists of bands of sclerites with 13 rays. Size: 9.5 cm. Habitat: soft bottom, sandy and muddy bottom (Fig. 16).

Distribution: India – Off Kerala coast, Arabian Sea, West coast of India, West Bengal coast (Newly recorded)³⁵; Elsewhere – Australia, Indonesia, Oman⁵⁶.

Remarks: The specimens were identified following the characteristics given in the original description, such as the axis tapers just above the base up to the branching of rachis and quadrangular shaped with slightly convex sides.

Family: Virgulariidae Verrill, 1868

Genus: *Virgularia* Lamarck, 1816

***Virgularia juncea* (Pallas, 1766)**

Materials examined: 1 specimen, Shankarpur fish landing Center, 21°38'21.52" N, 87°34'14.40" E, 20.VI.2017, Trawl net, ZSI/MARC C4907; 1 specimen, 28.II.2018, Trawl net, ZSI/MARC C5437.

Identification: Colony separated into two parts.

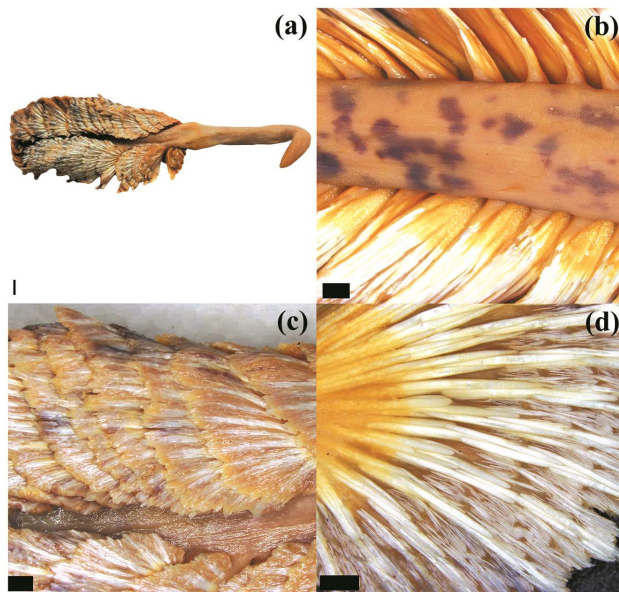


Fig. 16 — *Pennatula indica* Thomson & Henderson, 1906: a) Specimen collected from Digha Mohana, and b – d) Pinnules arrangement and shape. Scale: 1 mm

Surface very smooth on the first part and the second part (lower one) have pinnules. Central axis cylindrical from top to bottom. Size: 45 cm. Habitat: soft bottom, sandy and muddy bottom (Fig. 17).

Distribution: India – Andaman and Nicobar Islands & West Bengal coast³⁶; Elsewhere – Korea, Australia, Madagascar, Indonesia, New Caledonia⁵⁶.

Remarks: Specimens were identified following the characteristics mentioned in the original description, such as the pinnules are distinct in the first 30 % of the body length with an innerspace of maximum of 1.5 mm, while the next 35 % of body length is covered with smaller apposed pinnules and last 10 % of the body length is covered with pinnules appearing as minute dots; elongated expansion at the base; and cylindrical axis disappearing over the bladder.

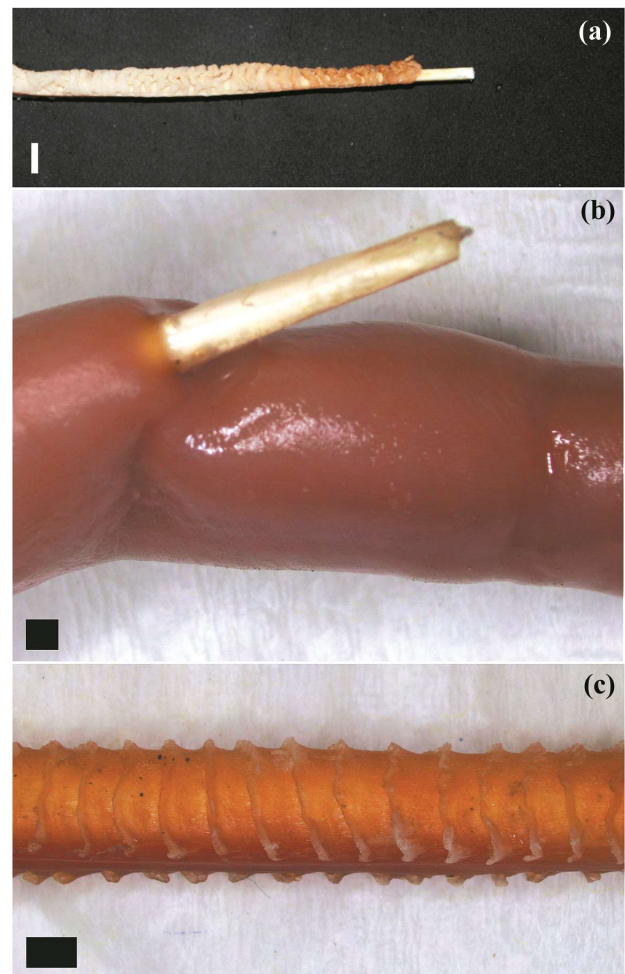


Fig. 17 — *Virgularia juncea* (Pallas, 1766): a) Specimen collected from Digha Mohana; and b – c) Colony enlarged with rudimentary pinnules. Scale: 1 mm

Discussion

The present study reported a total of 16 species of soft corals and sea fans from the study sites belonging to the order Malacalcyonacea (6 species) and Scleralcyonacea (10 species). Among them, 12 species were recorded for the first time at the Digha coast, West Bengal. This study updated the checklist of octocorals at West Bengal to 20 octocoral species. West Bengal, as a coastal state, boasts a shoreline that extends for 157.5 km. This figure is relatively modest when compared to other states, primarily because of the extensive estuarine network in the southern part of Bengal. Despite the relatively shorter coastline, West Bengal's coastal region is home to a diverse array of marine life, including over 350 species of marine fishes and marine mollusks. Furthermore, the region is notable for its rich marine invertebrate diversity, with 331 species spanning nine different phyla⁵³⁻⁵⁵. This ecotone encompasses a range of habitats with distinct geomorphology and diverse and productive biodiversity. It is characterised by vulnerable and unstable ecological conditions and is subject to numerous environmental hazards such as cyclones and tidal waves, as well as environmental disturbances like global warming, sea level rise, and eutrophication. Additionally, it serves as a receptacle for sewage, oil, pesticides, and heavy metals. The present study site is situated on the eastern coast of India, where the Hooghly and Subarnarekha estuaries meet the Bay of Bengal. This coastal area is home to a wide variety of marine animals and plants, including pelagic and benthic fauna, as well as specialised halophytic flora, which thrive in different habitats. The presence of sand dunes, littoral drifts, longshore currents, increased turbidity, and salinity sets this coast apart from the northeastern coastal belts of South 24 Parganas district in West Bengal, making it unique^{49,50}.

Octocorals are a major component of the coral reef ecosystems and are distributed globally¹. In India, octocorals are recognised to have a very rich diversity as 465 species are reported from the Indian coast⁴⁰⁻⁴¹. Among them, the maximum number of species were reported from the Andaman and Nicobar Islands (277 sp.) and the minimum number of species are reported from the Karnataka coast (4 sp.). Only eight species were reported from the Digha coast, West Bengal (*Cavernularia elegans*, *C. obesa*, *C. lutkenii*, *C. orientalis*, *C. malabarica*, *Virgularia elegans*, *Pteroeides esperi*, *Vergularia* sp.^{49,50}). Octocorals are primarily found in deep waters. Among these, the

three species belonging to the superfamily Pennatulioidea, commonly known as sea pens, have a preference for soft bottoms, such as muddy and sandy substrates, as their polyp is modified into a bulb, which can extend a significant distance in soft substrate for better attachment. Meanwhile, other soft corals and sea fans are typically located in rocky bottoms and within coral reef ecosystems. While the abundant marine invertebrate fauna in coastal parts of West Bengal (*i.e.* Digha coast) has been discussed earlier^{49,50}, it's worth noting that there's a significant dearth of studies regarding the population and distribution of octocorals in this region. This scarcity of research can be attributed to various factors, such as the influence of river runoff and the substantial sediment load carried by multiple rivers, including the Hoogly, Matla, Jamira, Gosaba, Saptamukhi, and Haribhanga rivers along the West Bengal coast. These factors are believed to have a detrimental impact on the presence of octocorals in this area due to the habitat preference of these species, as mentioned earlier. Hence, the current research was conducted to provide an up-to-date understanding of the distribution of octocorals in this region of India.

Corals and octocorals are significant contributors to the marine ecosystem and integral components of the coastal environment. In 1998 and 2010, instances of coral bleaching were documented, affecting approximately 70 % of the coral coverage of Indian coastline^{34,35}. Therefore, it is strongly recommended that more comprehensive research be conducted in the future to facilitate in-depth ecological analysis and assess the distribution of octocorals from shallow water areas of West Bengal for better conservational efforts.

Supplementary Data

Supplementary data associated with this article is available in the electronic form at [https://nopr.niscpr.res.in/jinfo/ijms/IJMS_53\(01\)24-36_SupplData.pdf](https://nopr.niscpr.res.in/jinfo/ijms/IJMS_53(01)24-36_SupplData.pdf)

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Conflict of Interest

The author declare no conflict of interest directly or indirectly with respect to the study reported in this communication.

Ethical Statement

Consent was obtained from the Director, Zoological Survey of India, India for conducting a survey to collect, preserve & identify faunal specimens for better knowledge of the diversity, as well as preparation of the faunal catalogue of the Digha and adjacent coasts.

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