

DISTRIBUTION OF GORGONIDS IN THE NORTHEAST COAST OF INDIA WITH PARTICULAR REFERENCE TO *HETEROGORGIA FLABELLUM* (PALLAS)

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ABSTRACT

During the 51st Cruise of FORV 'Sagar Sampada' extensive trawling at 6 stations between Lat. 16°00' and 20°00' N and in depths varying from 37 to 68 metres indicated the presence of gorgonids in 3 stations viz. No. 7, 11 and 23. The total quantity collected from the above stations was approximately 500 kg.

Analyses of samples collected indicate the presence of 12 species of gorgonids in this area and are referable to 9 genera under 4 families. The dominant species was *Heterogorgia flabellum* (Pallas) followed by *Ellisella maculata* (Studer) and *E. andamanensis* (Simpson). All these 3 species are now being exploited from the inshore areas also for export; the first one is commercially classified as 'black-type' while the others, under 'monkey-tail type'.

Heterogorgia flabellum is widely distributed in all the above 3 stations, but its concentration was considerably high in station 23. The maximum number of species (8) was recorded at this station.

An interesting point emerged from the study is that the specimens of *H. flabellum* were heavily infested with a variety of fouling organisms. Though barnacle was found to be the dominant group numerically, others such as sponges, bryozoans, corals (mainly solitary forms), ascidians and molluscs (mainly *Pteria* sp.) were also present in good numbers. The presence of foulers on specimens of *H. flabellum* indicated that this species synthesises no antifouling substance which will repel the settlement of foulers.

It may also be stressed here that the detailed information on the distribution of the above species provided here is not to be used for their indiscriminate exploitation and export, but to be used for exploiting them judiciously for experimental purposes.

Wherever necessary, some species have also been re-described with suitable illustrations.

INTRODUCTION

THE AREA covered during the 51st cruise of FORV *Sagar Sampada* was off the northeast coast of India between 16°00'N and 20°30'N. Due to the uneven nature of the bottom, trawling could not be done upto 18°02'N and 84°12.4'E. For the rest of the vessel's track trawling could

be done at 6 stations, i.e. No. 7 (65 m depth), 11 (68 m), 12 (46 m), 14 (50 m), 18 (37 m) and 23 (65 m). Of these, gorgonids were found only in 3 stations i.e. stations 7 (18°2.5'N and 84°11.5'E), 11 (19°15'N and 85°12.6'E) and 23 (18°07'N and 84°13.5'E). Though the overall depth range in the above 6 stations was between 37 and 68 m, the 3 stations, where gorgonids were present, were in the depth range 65 to 68 m.

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Analyses of sample collected indicated the presence of 12 species of gorgonids referable to 9 genera and 4 families. The numerically dominant species was *Heterogorgia flabellum* (Pallas), followed by the species *Ellisella maculata* Studer (in 2 stations) and *E. andamanensis* (Simpson) (in 3 stations). The maximum number (11) of species was collected from Station 23.

The total quantity of *H. flabellum* collected from the above 3 stations was approximately 500 kg, of which the maximum (300 kg) was obtained from Station 23.

Besides showing the wide geographic distribution of a few species in the Indian Ocean, the present study has also revealed an extended bathymetric distribution of 7 species of gorgonids, to 65 metres (Fig. 1).

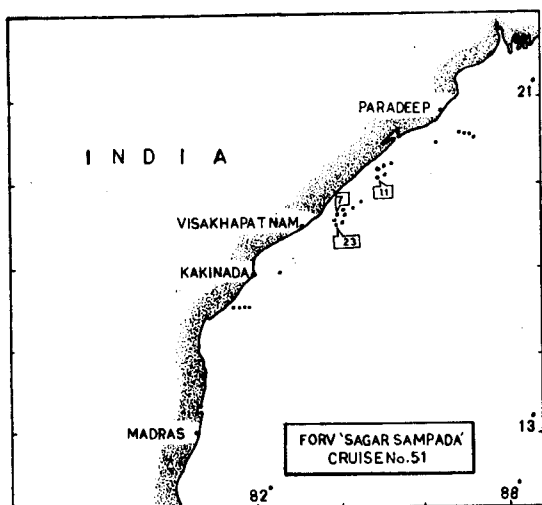


FIG. 1. Stations covered during the 51st Cruise of FORV Sagar Sampada. In stations 7, 11 and 23, gorgonids were present.

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LIST OF SPECIES

Order : GORGONACEA Lmx.

Suborder : SCLERAXONIA Studer

Family : *Subergorgiidae* Gray

1. *Subergorgia suberosa* (Pallas)

Suborder : HOLAXONIA Studer

Family : *Plexauridae* Gray

2. *Plexauroides praelonga* var. *cinerea* (Ridley)

Family : *Paramuriceidae* Bayer

3. *Discogorgia companulifera* (Nutting)

4. *Echinomuricea indica* Thomson and Simpson

5. *E. indomalaccensis* Ridley

6. *Echinogorgia macrospiculata* Thomson and Simpson

7. *Heterogorgia flabellum* (Pallas)

Family : *Ellisellidae* Gray

8. *Ellisella maculata* Studer

9. *E. andamanensis* (Simpson)

10. *Gorgonella unbraculum* (Ell. & Sol.)

11. *G. umbella* (Esper)

12. *Scirpearia filiformis* Toeplitz

SYSTEMATICS

Subergorgia suberosa (Pallas) (Fig. 2 a : 1, 2)

Subergorgia suberosa Kukenthal, 1924, p.43 (synonymy). Thomas and Rani Mary George, 1986, p. 98; figs. ib : 1, 2; pl. 1B (synonymy).

Material : One specimen; station not specified.

Description : Colony branched in one plane; branches and branchlets divide in one plane dichotomously and with a sunken groove running longitudinally on either side. Size of

specimen 35 × 28 cm (height × width); stalk incomplete, oval in cross-section with greater diameter along the plane of colony.

Cortex thin, may peel off easily at older parts, calyces distributed densely on lateral sides of branches and branchlets and devoid of at or near the sunken groove. In this character the present specimen comes close to *S. aspera* Nutting (1911). Calyces dome-shaped, orifice cut into 8 lobes; diameter upto 2 mm.

The skeletal arrangement tallies well with that of the type.

Spicules : (1) Belted spindles. Cortical, measuring upto 0.16 × 0.067 mm (Fig. 1 a : 1). (2) Medullary spicules. Sinuous, tuberculated and fused in advanced stages; younger forms may be free. In advanced stages these spicules may fuse together to form a dense axial skeleton (Fig. 1 a : 2).

Colour : Brown when dry; spicules may be slightly yellow or transparent.

Distribution : Indo-Pacific; it is here reported from a depth range of 60-70 m.

Plexauroides praelonga var. *cinerea* (Ridley)
(Fig. 2 b : 1-3)

Plexauroides praelonga cinerea Kukenthal, 1924, p. 126 (synonymy). Hickson, 1932, p. 497.

Material : One specimen from Station 23, depth 65 m.

Description : Specimen, a part of a large colony, measuring 19.5 × 4.5 cm (height × width); branching sparse and wide apart, branches arranged in the plane of colony except two branchlets which were arranged at right angles to the plane of colony; diameter of main branch 2 mm.

Coenenchyme denuded off at places, but wherever intact covered with epizoic animals. Spicules colourless, typical of variety.

Spicules : (1) Leaf-clubs. With one main leaf, with or without lateral leaves; both main and lateral leaves serrated at their margins. Basal part of spicule with 2 to 5 root-like tuberculated structures (Fig. 1 b : 1). (2) Spindled. Size upto 0.4 × 0.065 mm (Fig. 1 b : 2). (3) Multiradiates. (Fig. 1 b : 3).

Colour : Colony dirty gray when dry, axis black and spicules colourless.

Distribution : Indo-Australian; reported here from 65 m.

Discogorgia companulifera (Nutting)
(Fig. 2 c : 1-3)

Placogorgia companulifera Nutting, 1910, p.77, pl. 11, 3, 3a; 21; fig. 13.

Discogorgia companulifera Kukenthal, 1924, p. 213.

Material : One specimen from Station 23; depth 65 m.

Description : Colony subflabellata, branched in one plane, branches dividing dichotomously and without any sign of fusion. Attachment zone preserved well and colony measured 13 × 12.9 cm. Diameter of stalk 5 mm and branches 1.5 to 3.5 mm.

Calyces borne on all sides with a tendency to get arranged laterally in older parts and spirally in actively growing parts; globular in shape, size 0.7 × 1.3 mm (height × diameter). Polyps retractile completely.

The skeletal arrangement tallies well with that of the type.

Spicules : (1) Discs. Robust, rounded to sole-shaped or even top shaped. Tubercles on disc with minute spine like structures. Size upto 0.84 × 0.75 mm. Spicules cover general body surface and on calyces they may be smaller (Fig. 1 c : 1). (2) Spindles and crosses may also be noted (Fig. 1 c : 2, 3).

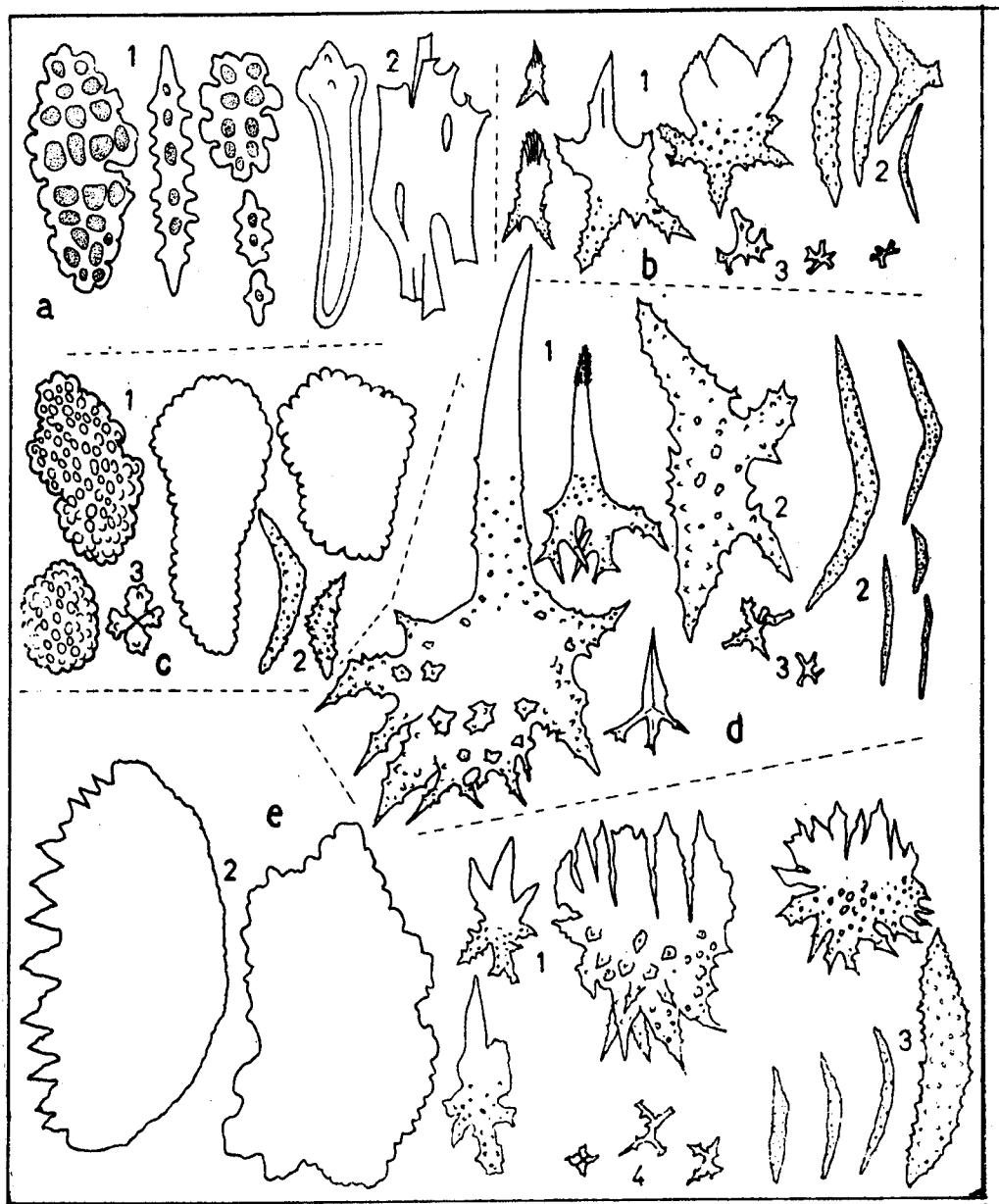


FIG. 2. a. *Subergorgia subserosa* : 1. Cortical spicules, different types. 2. Medullar spicules, two stages. b. *Plexauroides praelonga* var. *cinerea* : 1. leaf-clubs, different stages. 2. Spindle, different types. 3. Multiradiates. c. *Discogorgia companulifera* : 1. Discs, Only outline is given in some. 2. Spindles. 3. Cross. d. *Echinomuricea indomalaccensis* : 1. Thorn-scales, different growth stages. 2. Spindles, different types. 3. Multiradiates. e. *Echinogorgia macrospiculata* : 1. Leaf-clubs, different growth stages. 2. Tuberculated plates; two types, one with long spines on one border and the other without this modification. Only outline is shown. 3. Spindles. 4. Crosses and multiradiates.

Ecological notes : Epizoic animals, mainly hydrozoans, were present in good number indicating that this species synthesises no antifouling compounds.

Colour : Colony grayish brown when dry, axis dark brown and spicules colourless.

Distribution : Malaysian Archipelago. Here the distribution is extended upto Bay of Bengal and the bathymetric distribution to 65 m from its original depth of occurrence viz 55 m.

Echinomuricea indica Thomson and Simpson

Echinomuricea indica Thomas and Rani Mary George, 1986, p.104, fig. 1 i:1-5 (synonymy)

Material : One specimen.

Description : Morphology and spicular composition tally well with that described by Thomas and Rani Mary George (1986) from inshore areas of India except for the fact that the branches/branchlets are quite slender and less reticulate.

Present specimen measured 18.5 × 11.5 cm (height × width); stalk 3 mm and branches, on an average 1 mm in diameter.

Spicules : (1) Thorn-scales. Size 0.45 × 0.28 mm when well developed. Other spicules include spindles and tri, tetra or multiradiate forms common to species.

Colour : Cortex brown, axis dark brown and spicules colourless.

Distribution : This species was first recorded from the Indian seas by Thomas and Rani Mary Jacob (1987). It is fairly common along southeast and southwest coasts of India and is exploited commercially under 'black type' gorgonids. The present depth record of 65 m is quite a new one as far as this species is concerned.

Echinomuricea indomalaccensis Ridley
(Fig. 2 d : 1-3)

Echinomuricea indomalaccensis Thomas and Rani Mary George, 1986, p. 103, fig. 1 H : 1-5 (synonymy).

Material : One specimen from Station 23; depth 65 m.

Description : Stalk well developed, give rise to branches on either side in an irregular pattern. Size of colony 12 × 6.6 cm (height × width). Stalk and branches have same diameter, 5 mm while that of axial part along 1.5 mm on an average. Branches rebranch rarely and end in swollen tips. Surface has a rough appearance due to presence of spines originating from thorn-scales and projecting vertically at surface. Polyps, at places, get crowded and this arrangement gives a beaded appearance to branches. Branches and branchlets show no sign of fusion.

Calyces crowded, height 0.6 mm and width 1.4 mm on an average, margin ornamented with erect spines of thorn-scales.

Spicules : (1) Thorn-scales. Typical of species. Size when well developed, 1.11 mm; size of spine upto 0.75 mm (length), proximal part tuberculated and distal end microspined (Fig. 1 d : 1). Thomas and Rani Mary George (1986) noted two types of thorn-scales in the specimen collected from Madras. (2) Spindles. Ordinary type (Fig. 1 d : 2). (3) Crosses and multiradiates. Rare (Fig. 1 d : 3).

Colour : Colony brown when dry, axis dark brown and spicules colourless.

Distribution : Indo-Australian. This is here reported from a depth of 65 m, while the previously known range was only upto 37 m.

***Echinogorgia macrospiculata* Thomson and Simpson (Fig. 2 e : 1-4)**

Echinogorgia macrospiculata Thomson and Simpson, 1909, p. 219 Kukenthal, 1924, p. 202.

Material : One specimen from Station 23; depth 65 m.

Description : Stalk incomplete and denuded of coenenchyme at several places. Colony branched in one plane, branches curve out at their origin and grow up vertically without showing any sign of fusion. Tips of branch/branchlet blunt, diameter upto 2 mm average. Coenenchyme somewhat thick, about 4 times the diameter of axial part. Calyces dome-shaped, arranged very close to each other; height 0.4 mm and diameter 0.6 mm on an average; ornamented with leaf-clubs and plate-like spicules. Polyps fully retractile. Size of specimen 7.5 × 4 cm (height × width).

Spicules : (1) Leaf-clubs. With several petaloid structures on one side and with tuberculated, root-like structures on other. Spicule highly variable in size and shape and when well developed, measure 0.42 × 0.33 mm (Fig. 1 e : 1). (2) Tuberculated plates. Sometimes with longer spines on one border; size upto 1.13 × 0.75 mm (Fig. 1 e : 2). (3) Spindles. Ordinary type (Fig. 1 e : 3). (4) Crosses and multiradiates. Rare, diameter upto 0.067 mm (Fig. 1 e : 4).

Colour : Colony brown when dry, axis dark brown and spicules amber-coloured.

Distribution : The Type specimen was from Andamans (depth not specified). It is here recorded from the coastal areas of India from a depth of 65 m.

***Heterogorgia flabellum* (Pallas)**

Heterogorgia flabellum Thomas and Rani Mary George, 1986, p. 106, Fig. 1 m : 1-4 (synonymy).

Material : This species constituted the bulk in the collection and the specimens were available in all the three stations.

Since the identifying characters and the distribution of this species in the Indian seas have been published (Thomas and Rani Mary George, 1986; 1987; Thomas and Rani Mary Jacob, 1987) only some notes of ecological importance have been presented herein.

This species is widely distributed in the southwest and southeast coasts of India and forms the bulk of the 'black type' gorgonids now exported from India. Indiscriminate fishing of this species in all the main centres of exploitation indicates that there is a marked depletory trend in this case and this situation prompted Thomas and Rani Mary George (1987) even to propose a total ban on its export from India. The presence of this species in the northeast coast of India in deeper areas in appreciably good quantities is worth recording.

Another interesting aspect that emerged during the present study was that all specimens, irrespective of station and depth, were found infested with a wide variety of sedentary organisms. The most dominant group of foulers was barnacle (one species) and other composed of bryozoan, solitary coral, sponge (*Prostylyssa foetida*, *Microciona affinis* and *Microciona* sp.), mollusc (*Pteria* sp.), gorgonid (*Anthothelea* sp. since specific identification was not possible it is omitted from the present account) and calcareous alga.

It has been reported by several workers that gorgonids secrete certain chemicals to prevent the attachment of other organisms on their surface. The presence of a large number of foulers on the surface of *H. flabellum* indicates that this species synthesises no chemical to ward off the settlement of foulers.

Colour : Colony dull brown, pale white when dry; axis dark brown and spicules colourless.

Distribution : Indo-Australian; it is here recorded from 65 m depth.

Ellisella maculata Studer

Ellisella maculata Thomas and Rani Mary George, 1986, p. 108, Fig. 1 p : 1-3 (synonymy).

Material : Several specimens from stations 7 and 23; depth 65 m in both cases.

This species, which is commercially classified under 'monkey tail type', usually forms only a small fraction in our export at present. During the present survey this species could be collected from two stations indicating that it is common in this depth zone.

For further details on the systematics, distribution and abundance, Thomas and Rani Mary George (1986) may be consulted.

Colour : This species may exhibit dichromatism. Colony yellow, axis pale white, spindles light yellow and dumbbells colourless.

Distribution : Indo-Pacific; distributed upto 275 m depth.

Ellisella andamanensis (Simpson)

Ellisella andamanensis Thomas and Rani Mary George, 1986, p. 107, Fig. 1 o : 1-2 (synonymy).

Material : Several specimens from stations, 7, 11 and 23; depth range 65-68 m.

This species was known only from Japan and Andamans, and it was Thomas and Rani Mary George (1986) who recorded the same from the inshore areas of both southwest and southeast coasts of India. This species also, as in the above case, is classified under 'monkey tail type' and at present forms only a small fraction in the landings from places like Keelakarai (Gulf of Mannar) and Kadiapattanam (Arabian Sea).

The earlier collections referred to from the above places were from shallower areas (upto 7 m depth). The presence of this species

off the northeast coast of India in three stations indicates that this is widely distributed in higher depths.

Colour : Colony reddish brown to yellow when alive and this species may also be cited as an example of dichromatism. Axis pale white; larger spicules amber coloured while smaller ones often colourless.

Distribution : Japan, Bay of Bengal and southwest coast of India. This has a known bathymetric range of 7-75 m.

Gorgonella umbraculum (Ell. & Sol.)

Gorgonella umbraculum Thomas and Rani Mary George, 1986, p. 109, Fig. 1 s : 1-3 (synonymy).

Material : Several specimens from Station 23; depth 65 m.

Specimens of this species are usually common in the shallow water areas (depth 5 to 8 m) in southwest coast (mainly in the Gulf of Mannar) where they will attain a size of 100 × 80 cm (height × width) or even more. But specimens collected from the present station (No. 23) were all small (maximum height 14 cm) and frail with poorly developed lamellae, branches, branchlets and calyces, indicating that depth factor has something to do with the general morphology. A similar observation was made during the 22nd Cruise of FORV *Sagar Sampada* with regard to the specimens of the same species collected off Bombay (Thomas and Rani Mary George, 1989) at a depth of 86 m.

The maximum depth to which the present species is distributed is 100 m (Kukenthal, 1924). But in the Indian seas its active growth is noted at 5 to 8 m depth zone.

Colour : Colony orange when alive and may change into flesh colour on preservation (drying). Spicules are light yellow in colour.

Distribution : Indian Ocean and Red Sea.

Gorgonella umbella (Esper)

Gorgonella umbella Thomas and Rani Mary George, 1989.

Material : Three specimens from Station 23; depth 65 m.

This Indian Ocean species with wide bathymetric distribution could be collected from the above station in stray numbers. The colour of the specimen was white while those collected off Bombay (Thomas and Rani Mary George, 1989) were either white or yellow. Published records indicates that the colour of the specimens is subject to considerable variations.

Specimens of this species are rarely met with in the commercial landings from the southwest coast of India and the known bathymetric range is from 36 to 495 m.

For a general description of this species Thomas and Rani Mary George (1989) may be referred.

Scirpearia filiformis Toepl

Scirpearia filiformis Thomas and Rani Mary George, 1986, p. 111, fig. 1 h : 1-3 (synonymy).

Material : One specimen (incomplete) from Station 23; depth 65 m.

Colony inconspicuous with dichotomously dividing branches; branches and branchlets thread-like.

This species was first collected from the mainland of India (off Cape Comorin) by Thomas and Rani Mary George (1986) and is now recorded from the northeast coast of India.

For details on morphology, spicular composition, etc. refer Thomas and Rani Mary George (1986).

DISCUSSION

The most dominant quantitatively, was *Heterogorgia flabellum* followed by *Ellisella maculata* and *E. andamanensis*.

The various species represented here fall under (1) Those common in shallow areas and (2) those common in deeper areas.

Subergorgia suberosa, *Echinomuricea indica*, *E. indomalaccensis*, *Heterogorgia flabellum* and *Gorgonella umbraculum* are very common in the nearshore collections and in some parts, especially in the Gulf of Mannar. *Heterogorgia flabellum*, *Gorgonella umbraculum* and *Echinomuricea indica* formed extensive beds where the specimens attained a size 100 × 100 cm or even more. Though the above three species occurred in present collections, their numerical abundance was not at all impressive as their size; and their branches, branchlets, calyces, etc. were found poorly developed. The present study has also shown the extend bathymetric distribution of *Subergorgia suberosa*, *Plexauroides praelonga* var. *cinerea*, *Discogorgia companulifera*, *Echinomuricea indica*, *E. indomalaccensis*, *Echinogorgia macrospiculata* and *Heterogorgia flabellum*, to 65 m.

Of those common in deeper waters, there are only three species in the present collection : *Ellisella maculata*, *Gorgonella umbella* and *Scirpearia filiformis*. Even though the above species occur in the inshore areas they never attain the size noted in the deeper areas presently surveyed and have never been found forming extensive beds in the inshore realms. Of these three, *Gorgonella umbella* occurred over extensive areas off Bombay (Thomas and Rani Mary George, 1989) in depth zone 68 - 86 m, while for the other two species no bed has been located yet in deeper areas.

Heterogorgia flabellum, a shallow-water species, was found distributed in three stations (Stns. 7, 11 and 23) in considerably good quantities indicating that this species has wide distribution in 65 to 68 m depth zone, off northeast coast of India. But the specimens collected were small, the reticulation poorly developed and were completely covered with fouling organisms unlike those collected from the inshore areas. It has been shown in the past that some species of gorgonids synthesise chemicals which can fight the colonisation of intruders. But in this case, the presence of foulers is an indirect evidence to show that no such chemical is synthesised by this species, atleast in this deep-water environs.

The other two species, though not so

abundant as the above mentioned one and occur side by side with this (*viz. Heterogorgia flabellum*) are *Ellisella maculate* and *E. andamanensis*. Both these species are now being exploited from the nearshore areas for export in small quantities under the trade name 'monkey tail type' *E. maculata* has a bathymetric range upto 275 m while the same for *E. andamanensis* is only upto 75 m. Hence, it is interesting to note that both these species flourish well within their known bathymetric limits in considerably deeper areas off northeast coast of India.

It is also stressed here that the information now gathered should not be used in exploiting them commercially but, initially, for experimental studies to determine the extent of resources and the possibility of the extraction of the various 'wonder drugs'.

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