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A Study on the Gorgonid Bed Off Chennai and its Qualitative Appraisal

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Gorgonian corals or horny corals are common tropical and subtropical octocorallian cnidarians having biomedical importance. This group includes the sea fans, sea feathers and sea whips. The discovery of prostaglandins and other natural products from gorgonids triggered off a worldwide hunt for this chemically rich animals. The present paper describes the status of taxonomy of seven species collected from the Kovalam shore, Chennai. They are referable to three families and five genera. Species such as *Echinomuricea indica* Thomson and Simpson, *Gorgonella umbraculum* (Ellis and Solander) and *Pseudothesea pallida* (Nutting) forms the mainstay of Kovalam waters, off Chennai.

Detailed descriptions of all species, their classification, distribution, size attained, etc. are presented in this paper with sketches of spicular complements of species of biomedical applications to facilitate easy identification.

Keywords: Octocorals, gorgonarians, taxonomy.

Introduction

Gorgonids are colonial animals akin to corals, are included under Phylum Coelenterata of the Class Anthozoa. Two major subdivisions or subclasses of anthozoans have been defined; these are the subclass Octocorallia or Alcyonaria and the subclasss Hexacorallia or Zoantheria. Species falling under gorgonids are popularly called sea fans, sea whips and sea feathers. They are sedentary and most of them are phototropic. Their growth-form may be reticulate or bushy and some in one plane, hence the name 'sea fans'. The body of gorgonid (sea fan) is divided into an axial part comprising of horny material (hence the name horny-coral) and an outer rind (or skin) containing loosely arranged calcareous spicules or sclerites.

Most of the gorgonids are beautifully coloured and hence called 'flowers of the sea bottom'. The gorgonid fauna play significant role in the global coral reef ecology. There is growing interest in the biomedical applications of gorgonids. The discovery of prostaglandins from a Caribbean gorgonid *Plexaura homomalla* in 1969 triggered off a world wide 'hunt' for gorgonids. In this context, India stepped up commercial exploitation and export of gorgonids in 1975 to countries like France, Germany, Belgium, U.S.A., etc. The demand of Indian gorgonids in the foreign market may be said to be a part of the worldwide hunt for genetic material from technologically poor

but genetically rich Developing countries (DCs) like India (Thomas and Rani Mary George, 1990).

India exported about 109 tonnes of gorgonids during 1975-92 period valued Rs.35.6 lakhs rupees as per MPEDA records. Studies by Thomas and Rani Mary George (1986, 1987, 1995 & 1998) on the gorgonid resources, including its export of 31 species referable to 19 genera and 9 families form the mainstay of Indian gorgonid fishery. A report depicting the gravity of the situation, depletion of the gorgonid population and the measures to be adopted to revamp the lost glory of Indian gorgonid beds etc. was submitted in 1986 by Thomas and Rani Mary George.

Gorgonids are known to be a rich source of bioactive compounds and many of these compounds or derivatives thereof are now classified under 'Wonder Drugs'. Many species known from Indian seas are rich in asperdiol, crassin acetate, eunicin, briarein, copaene, Allaromadendrene etc. Almost all species are rich in prostaglandins (PGE, PGF, PGE_2, PGF_2 alpha, PGF_2 beta and the like). Briarane diterpenes compounds such as, junceellin and praelolide are extracted from an Indian gorgonid *Gorgonella umbraculum* (Chitti Subrahmanyam *et al.*, 1998 and 2000). Isomeres of prostaglandins have many clinical possibilities and are used in the treatment of heart attack, birth control, arthritis, psoriasis, asthma etc.

Analysis of the samples collected revealed the presence of 7 species referable to 3 families and 5 genera belonging to the suborder Holaxonia of the order Gorgonacea Lmx.

The general classification followed here is that of Bayer (1963) and morphology of the species is after Bayer *et al.* (1983). In the case of poorly known species detailed descriptions are provided while in others only some points worth mentioning are given. Suitable illustrations are provided for three species to facilitate their easy identification and comparison with earlier records from the Indian Ocean or elsewhere.

List of species

Order : GORGONACA Lmx.

Suborder : Holaxonia Studer

Family : Plexauridae Gray

Genus : *Plexauroides* Wright and Studer

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

Family : Paramuriceidae Bayer

Genus : *Echinomuricea* Verrill

3. *Echinomuricea indomalaccensis* Ridley

4. *Echinomuricea indica* Thomson and Simpson

Genus : *Pseudothesea* (Nutting)

5. *Pseudothesea pallida* (Nutting)

Family : Ellisellidae Gray

Genus : *Gorgonella* Valenciennes

6. *Gorgonella unmbraculum* (Ellis and Solander)

Genus : *Junceella* (Pallas)

7. *Junceella juncea* (Pallas)

Systematics

Order : GORGONACA Lmx.

Suborder :Holaxonia Studer

Family : Plexauridae Gray

Polyps completely retractile. Colony fruitcose or not; branches divide dichotomously or pinnately. Axis with central chord, base of the colony heavily calcified; cortex thick.

Genus : *Plexauroides* Wright and Studer

Stem and branches cylindrical, divide dichotomously. Cortex with two distinct layers of spicules, an inner row of stellate forms covered externally with characteristic 'leaf-clubs' (Blattkeulen). Axis with a distinct central chord, base of the colony heavily calcified.

The central axis, in this case, is made of horny material only and may be reinforced with calcareous material in varying degrees.

1. *Plexauroides praelonga* var *typica* (Ridley)

1. *Plexaura praelonga var.typica and var. elongata*

Thomson and Henderson, 1905, p.304.

Thomas and Rani Mary George, 1986, p.99, f.1d.

Material: Few specimens from Kovalam (Chennai).

Description

Colonies bushy with branches in one or more planes; diameter of branch, 2-5 mm; divide sparingly but if dividing, often in a dichotomous pattern at long intervals.

Calyces inserted without any orifice, evenly distributed on branches and 1 mm apart, with a greater diameter of 1 mm.

Spicules : Spicules are represented by (1) Leaf clubs (2) Spindles may be spiny or warty. (3) Stars and multiradiates.

Colour : Colony bright crimson when alive; axis black to greenish brown, spicules bright red in colour.

General distribution : Indo-Australian. Littoral.

Local distribution : Kovalam off Chennai, and Gulf of Mannar, common at 4 to 8 m depth.

Size attained : Up to 15 cm.

Commercial name : 'Red' type; smaller specimens are often included under 'Flower' type.

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

Plexaura praelonga var.*cinerea* Ridley, 1884, p.340,
Thomas and Rani Mary George, 1995, p.136, f.2b.

Material: Few specimens from Kovalam (Chennai).

Description

Colony large apart, measuring 16.5 x 3.2 cm (height x width); branching sparse and wide apart, branches arranged in one plane, diameter of the main branch is 2 mm. Coenenchyma denuded off at some places.

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 structure. (2) Spindles and (3) Multiradiates.

Colour : Colony gray in colour when dry; axis black and spicules colourless.

General distribution : Indo-Australian.

Local distribution : Kovalam off Chennai, 65 m depth.

Size attained : Up to 25 cm in height.

Commercial name : 'Red' type; smaller specimens are often included under 'Flower' type.

Family

***Paramuriceidae* Bayer**

Central chord, in this family, is wide and chambered; polyps retractile, calyces protruding and with an armature of strong points *en chevron*. Cortical spicules usually spindles, but modified thorn scales or other types may also be met with.

This family is well represented in the commercial landings of Inida with a total of 9 widely distributed species under 5 genera.

Genus :*Echinomuricea* Verrill

Characteristic spicule in this genus, is 'tjhorn scale' (or *Echinomuricea* type as it is called), with a single strong spine supported at the base by several root-like structures. These spicules ornament the surface. Spindles with or without strong outer processes may be noted. Colonies may be branches in one plane and may be reticulate.

3 .Echinomuricea indomalaccensis Ridley

Echinomuricea indomalaccensis Ridley, 1884,p.386:
Thomas and Rani Mary George, 1986,103, f.1h.

Material: One specimen from Kovalam (Chennai).

Description:

Colonies flabellate and loosely reticulate; main branches originating from the stalk are traceable up to the edge of the colony; tips of branches swollen and without terminal polyp. Branches and branchlets flattened in the general plane of the colony; flattened side may measure up to 5 mm and other side about 3 mm on an average. Calyces densely distributed all over, 0.5 – 1 mm apart, their margin often with radiating thorns (of thorn-scale).

Spicules : (1) Thorn-scales (*Echinomuricea* type).
(2) Spindles. These may be with long spines on one side (as in *Thesea* type) or not.
(3) Crosses and
(4) Multiradiates.

Colour : Colony red, axis brown and spicules red in colour.
General distribution : Indo-Australian. Up to 37 metres.
Local distribution : Kovalam off Chennai, 65 m depth.
Size attained : Up to 15 cm.
Commercial name : 'Red' type.

4. Echinomuricea indica Thomson and Simpson (Fig.1c; Pl.1C)

Echinomuricea indica Thomson and Simpson, 1909, v.2, p.204, pl.3, f.2,3; pl.8, f.4;
Kukenthal, 1924, p.188;
Thomas and Rani Mary George, 1986, p.104, f.1.

Material: Several specimens from Kovalam (Chennai).

Description

Maximum size is 11.5 cm in height with a spread of 13.7 cm or more. Colony divides in one plane and may assume ovate, obovate or even circular shape in

advanced stage of growth. Branching arising directly from the stalk lose their identity after a short distance and the branchlets formed often transverse in a radial pattern. These branchlets often anastomose freely in an irregular pattern, resulting in an irregular reticulation with mesh size varying between 1 x 1.5 and 1.5 x 6 cm; meshes often elongated in the axis of growth, and the branchlets forming the sides of mesh may have an average diameter of 2 mm; branchlets often end in blunt tips.
Calyces distributed throughout, hemispherical; height 0.5 mm and diameter 1.5 mm on an average. Anthocodia retractile, calyx margin ornamented with thorn spicules, collaret well defined and robust.

Spicules : (1) Thorn spicules. Echinomuricea type, with sharp conical spine bearing 6 or less tuberculated root-like structures arising from the base of the spine (Fig.1c: 1). Size, when well developed, 0.37 x 0.36 mm. Other spicules represented are
(2) Spindles, 0.35 x 0.33 mm (Fig.1c: 2).
(3) Triradiates (Fig.1c: 3)
(4) Tetraradiates (Fig.1c: 4).
(5) Multiradiates (Fig.1c: 5).

Colour : Coenenchyma brown; axis dark brown and spicules colourless.
General distribution : Arakan coast, 24 m depth.
Local distribution : Kovalam off Chennai, 65 m depth.
Size attained : Up to 80 cm in height with a lateral expansion of about 70 cm.
Commercial name : 'Black type'

Genus : *Pseudothesea* (Nutting)

Colonies branched in one plane, calyces low and verruciform; wall filled with thorn-like spicules whose concave side is provided with larger spines called *Thesea* type. These spicules are imbricately arranged at the surface.

5. *Pseudothesea pallida* (Nutting)

Thesea pallida Nutting, 1910, v.13b, p.51, pl.8, f.3, 3a; pl.20, f.10.
Pseudothesea pallida Kukenthal, 1924, p.228, f.135.
Material: Several specimens from Kovalam (Chennai).
Description

Colony (incomplete) flabellate, 10.6 cm. in height and a diameter of 3.3 cm. The main branches are 1.9 cm. from the base of the stem, projecting at right angles branch with coenenchyma arising 2 cm. above the bend. The individual calyces are low verrucae, a typical one measuring 0.5 mm. in height and 1.5 mm. in width at the base. The calyx walls are filled with irregular plates from the sides of which sharp

points arise, a crown of such points on the margin, and the edges of the plates are imbricated. The polyps are retractile. The operculum consists of delicate spindles arranged in the ordinary way.

Spicules : The spicules are unilateral with a sharp point arising from an expanded and foliaceous base. There are also spicules with irregular heavy and with rounded edges and with oval discs.

Colour : Colony yellow in colour, the axis brown and the spicules light yellow in colour.

General distribution : Malayan Archipelago and in Indian Ocean

Local distribution : Kovalam off Chennai and in Gulf of Mannar.

Commercial name : 'White' type.

Family : Ellisellidae Gray

Axis strongly calcified, calcification in concentric lines. Central chord not soft and chambered. Colonies unbranched, sparingly branched or sometimes reticulate. Spicules small, usually dumbbells to which clubs and double spindles may be added.

This family is represented in commercial landings f India by 5 genera and 7 species and in this respect ranks next to the family Paramuriceidae Bayer.

Genus : *Gorgonella* Valenciennes

Colonies flabellate to reticulate; calyces low, dome-shaped or low truncated cones. Axis calcareous and devoid of horny lamellae. Cortex thin with dumbbells and spindles. Many other spicules such as crosses, stars, etc. are also present.

6. Gorgonella umbraculum (Ellis and Solander) (Fig.1a; Pl.1A)

Gorgonia reticulum Pallas, 1766, p.167

Thomas and Rani Mary George, 1986, p.109.

Material: Several specimens from Kovalam (Chennai).

Description

Colonies fan shaped and closely reticulate measuring 22 cm in height and spreads about 18.5 cm . Stalk robust, often ridged and usually with an expanded attachment zone. In some the main branches originating from the stalk may be seen up to the tip of the lamella. Branchlets divide and redivide and get interconnected in a scalariform pattern producing small meshes of 4 x 5 mm on an average; meshes may be rectangular or polygonal in shape. The expanded lamella may be oval, but in larger specimens the lamella may show a tendency to get cut up into lobes. Calyces crowded at actively growing parts of the colony, conical to hemispherical in shape, diameter 1 mm and height 0.7 mm on an average; calyces small at older parts and may show some preference to lateral surfaces of the branchlets. Coenenchyma granular.

Spicules : (1) Spindles. Size, 0.063 x 0.022 mm (Fig.1a: 1).

(2) Dumbbells size, 0.062 x 0.035 mm (Fig.1a: 2).
(3) Smaller Dumbbells, size 0.021 x 0.20 mm (Fig.1a: 3).

Colour : Colony orange in colour when fresh and flesh coloured on drying, spicules light yellow and axial part pale orange in colour.

General distribution : Indian Ocean and Red Sea. Local distribution: Kovalam off Chennai, distributed up to 100 metres depth and common along the southwest and southeast coasts of India and Andamans.

Size attained : Up to 100 cm in height and expands about 80 cm.

Commercial name : 'Red' type. This is the most dominant species of this type and is well distributed in the Gulf of Mannar.

Genus: *Juncella* (Pallas)

Colonies simple, occasionally dividing in a dichotomous pattern but never signs of anastomosis. Calyces prominent, scattered or biserial. Cortex thick with an inner layer of dumbbells covered externally by a layer of flattened clubs. Axis with alternating layers of horny and calcareous matter.

7.*Juncella juncea* (Pallas) (Fig.1b; Pl.1B)

Gorgonia juncea Pallas, 1766, pp.180.

Juncella juncea, *J. gemmacea* and *J. fragilis* var. *rubra*

Thomson and Henderson, 1905, v.3 nr.20 p.313, 314 pl. 4 f. 4,5; Nutting, 1910, v. $13b^3$, pp. 18, pl.3, f.1-4;

Thomas and Rani Mary George, 1986, pp.10

Material: Several specimens from Kovalam (Chennai).

Description

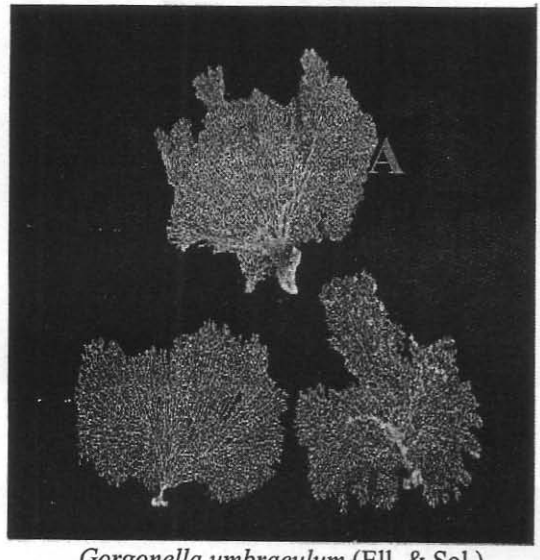
Colonies usually unbranched and whip-like rarely branched; when dividing often dichotomous. Diameter of the colony may vary from 3 to 7 cm. Colony with a median line on either side.

Calyces papillate and directed towards the growing tips; height 2 mm and diameter about 1 mm but subject to considerable variation from place to place; evenly distributed over the surface or rarely in rows; median line devoid of calyces. Polyps small. Clubs ornament the surface and dumbbells in deeper parts of the cortex.

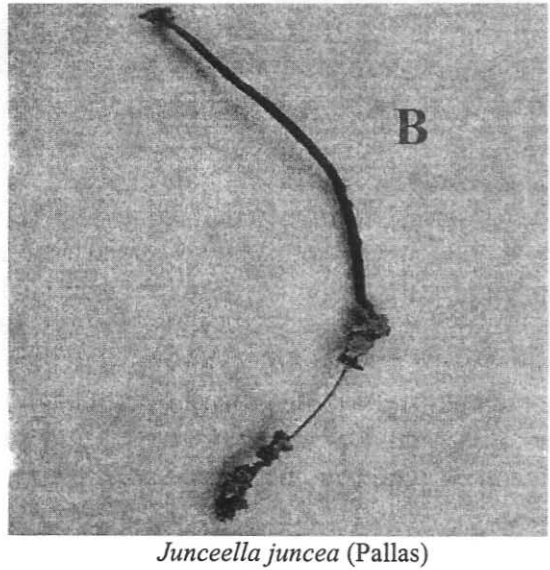
Spicules : (1) Dumbbells, size up to 0.1 x 0.05 mm (Fig.1b: 1).
(2) Clubs size 0.1 x 0.05 mm (Fig.1b: 2).

Colour : Colony coral red when alive; axis white internally and pale brown externally. Dumbbells transparent and clubs light yellow.

General distribution : Indo-pacific. Littoral.
Local distribution : Common along the southwest and southeast (Kovalam off Chennai) coasts of India and Andamans and Gulf of Mannar.
Size attained : Up to 2 metres.
Commercial name : 'Monkey tail' type and in some places it is known as 'Sea rope'.



Gorgonella umbraculum (Ell. & Sol.)



Junceella juncea (Pallas)

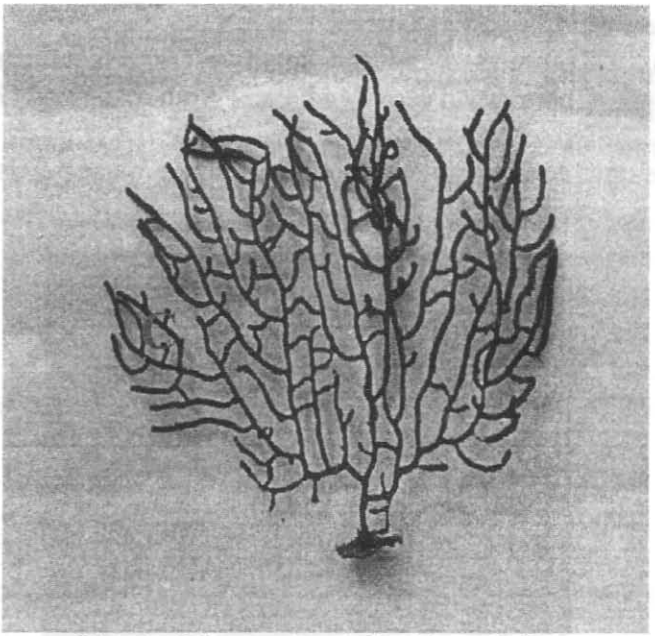


Plate 1: *Echinomuricea indica* Thom. & Simp

Discussion

The occurrence of 7 species of gorgonids, of which three (*Gorgonella umbraculum, Echinomuricea indica* and *Pseudothesea pallida*) in moderately good numbers was observed in Kovalam water off Chennai. They formed the extensive beds where the specimens attained a size of 70 to 100cm. Similarly, Thomas and Rani Mary George (1995) have reported the abundance of *Gorgonella umbraculum* and *Echinomuricea indica* in the northeast coast of India. A more or less similar composition of species could be noticed from the beds off Bombay reported by Thomas and Rani Mary George (1990) also.

The commercial exploitation of gorgonids initiated in 1975 has resulted in the depletion of many of our erstwhile rich gorgonid bed. The average size of specimen fished out from the inshore areas has come down considerably in recent years, and hence a ban on the export of this commodity will only help in enriching our gorgonid resource (Thomas and Rani Mary George, 1987). Since many of the chemicals extracted from Gorgonids (Prostaglandins and the like) have biodynamic properties, we suggest that attempts should be initiated in India to extract various 'life saving drugs' from the raw material available in our inshore areas.

The bed now discovered off Chennai is rich in seven species, therefore, like junceellin and praelolide compound, attempts should be made to isolate other bioactive compounds from the above-mentioned species.

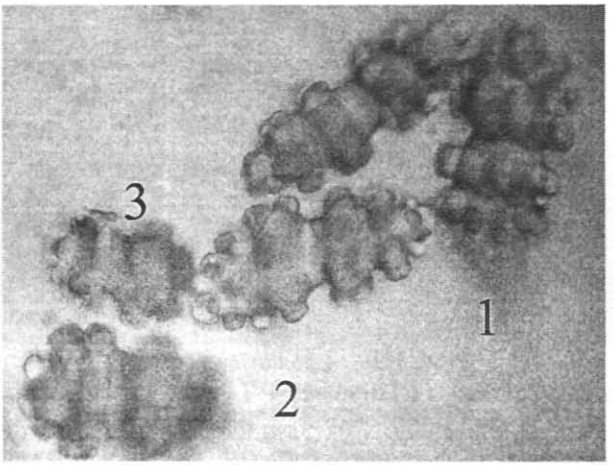


Plate 1a: *Gorgonella umbraculum.*
1. Spindles 2.Dumbbells 3. Small dumbbells (40x)

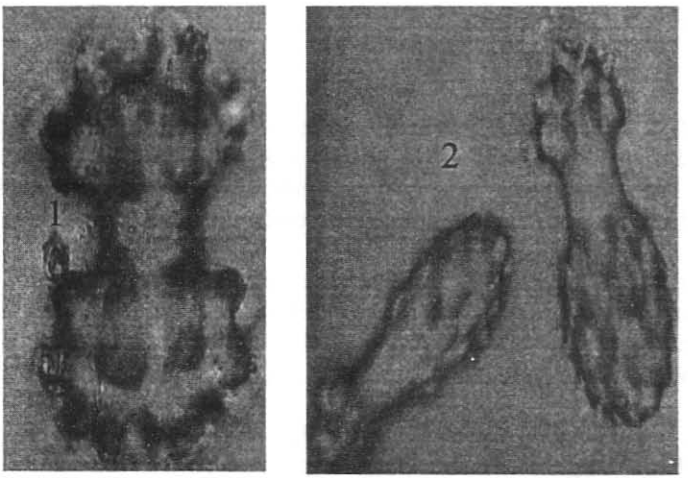


Plate 1b: *Juncella juncea*
1. Dumbbells 2. Clubs (40x)

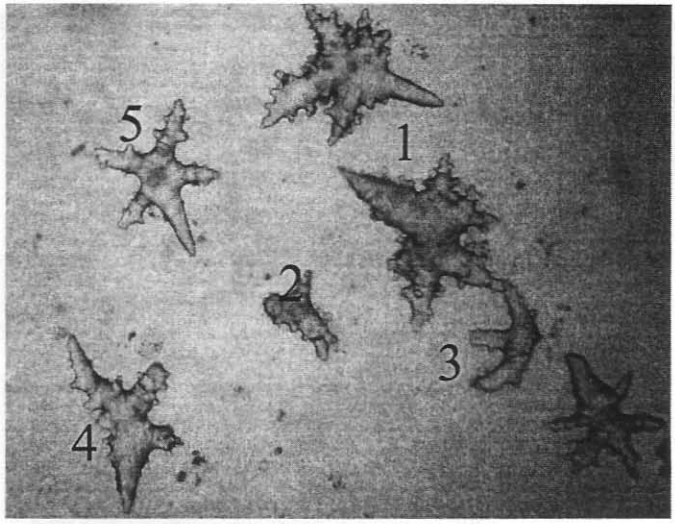


Plate 1c: *Echinomuricea indica*
1.Thorn spicules 2.Spindles 3.Triradiates 4. Tetraradiates 5. Multiradiates (10x)

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