BATHYAL AND ABYSSAL HYDROIDS

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CONTENTS

1. Species placed between brackets are discussed in the report but are not represented in the "Galathea" collection.

INTRODUCTION

The rich collection of Hydroids from the "Galathea" Expedition was kindly placed at my disposal by Dr. TORBEN WOLFF, Zoological Museum of the University, Copenhagen. The present report only deals with a part of the deep water material, i.e., with the Hydroids obtained between 200 and 6000 m depth. The Hydroid-material from stations exceeding 6000 m depth has previously been described by KRAMP (1956).

I want to express my sincere gratitude to Dr. TORBEN WOLFF, Dr. F. JENSENIUS MADSEN and Dr. K. W. PETERSEN, all of the Zoological Museum of the University, Copenhagen. A proper discussion of the present material would have been impossible without comparison with Hydroids from other deep sea expeditions, particularly the "Challenger" Expedition. Dr. W. J. REES, Department of Zoology, British Museum (Natural History), to whom I owe a great dept of gratitude, has very kindly helped me to make this comparison possible; the discussion of various questionable species during my stay at the British Museum (Natural History) has greatly facilitated the preparation of this report.

All the material is preserved in the collections of the Zoological Museum of the University, Copenhagen. Duplicates are in the Rijksmuseum van Natuurlijke Historie, Leiden, The Netherlands.

LIST OF THE STATIONS

St. 8. Teneriffe-Dakar (16°58'N, 18°16'W), 3.11. 1950, S 200, 400-1200 m.w., 100-300 m depth:
- *Laomedea (Phialidium) striata* (Clarke)

St. 74. Off Congo River (5°41'S, 11°32'E), 7.12. 1950, PG 0.2, 291 m, rather coarse mud:
- *Sertularella gayi* (Lamouroux)
- *Polyplumaria flabellata* G.O. Sars
- *Nemertesia perrieri* (Billard)
- *Aglaophenia elongata* (Meneghini)

St. 188. Off Durban (29°55'S, 31°13'E), 2.2.1951, ST 100, 495 m, rocky (?) bottom:
- *Halecium tenellum* Hincks
- *Sertularella leiocarpa* (Allman)
- *Halopteris polymorpha* (Billard)
- *Kirchenpaueria triangulata* (Totton)
- *Nemertesia ramosa* Lamouroux
- *Cladocarpus distomus* Clarke
- *Cladocarpus tenuis* Clarke
- *Cladocarpus sinuosus* n. sp.
- *Cladocarpus sinuosus* var. *edentatus* n. var.
- *Cladocarpus inflatus* n. sp.
- *Cladocarpus millardae* n. sp.
- *Dinotheca dofleini* Stechow

St. 196. Off Durban (29°55'S, 31°20'E), 13.2.1951, ST 100, 425 m & 14.2.1951, ST 300, 430 m, sandy mud with stones:
- *Halecium sessile* Norman
- *Halecium beanii* (Johnston)
- ? *Opercularella* sp.
- *Acryptolaria angulata* (Bale)
- *Lafoea benthophila* Ritchie
- *Lafoea gracillima* (Alder)
- *Sertularella leiocarpa* (Allman)
- *Halopteris polymorpha* (Billard)
- *Nemertesia antennina irregularis* (Quelch)
- *Plumularia setacea* (Linnaeus)
- *Dinotheca dofleini* Stechow

St. 202. Off Natal (25°20'S, 35°17'E), 21.2.1951, ST 300, D 45, D 80, 575-595 m, bottom unknown:
- *Sertularella leiocarpa* (Allman)
- *Kirchenpaueria triangulata* (Totton)
- *Nemertesia ramosa* Lamouroux
- *Cladocarpus millardae* n. sp.

St. 203. Off Natal (25°36'S, 35°21'E), 21.2.1951, HOT, 730 m, bottom unknown:
- *Branchiocerianthus imperator* (Allman)

St. 231. Madagascar-Mombasa (8°52'S, 49°25'E), 7.3.1951, ST 300, D 80, 5020 m, bottom unknown:
- *Sertularia marginata* (Kirchenpauer)
- *Cladocarpus millardae* n. sp.

St. 282. Seychelles-Ceylon (5°32'N, 78°41'E), 11.4. 1951, HOT, 4040 m, blackish mud:
- ? *Opercularella denticulata* (Clarke)

St. 301. Bay of Bengal (19°30'N, 86°32'E), 25.4. 1951, PG 0.2, 1180 m, greenish mud:
- *Stegopoma bathyale* n. sp.

St. 324. Strait of Malacca (6°38'N, 96°00'E), 9.5. 1951, ST 300, 1140 m, Globigerina ooze:
- *Aglaophenia septata* Ritchie

St. 408. South China Sea (12°47'N, 116°24'E), 4.7. 1951, ST 300, 4330 m, Globigerina ooze:
- *Thecocarpus tenuissima* (Bale)

St. 450. Celebes Sea (1°50'N, 119°20'E), 21.8.1951, HOT, 4940-4970 m, bottom unknown:
Cryptolarella abyssicola (Allman)
Halisiphonia galatheae Kramp

St. 471. Sunda (Java) Trench (10°26'S, 114°15'E), 10.9.1951, ST 300, D 45, D 80, 2810-2990 m, clay and vulcanic tuff:
? *Egmundella* sp.

St. 490. Bali Sea (5°25'S, 117°03'E), 14.9.1951, ST 300, D 45, D 80, 545-570 m, sand and clay:
Lafoea fruticosa (M.Sars)
Gymnangium expansum (Jäderholm)

St. 574. Tasman Sea (39°45'S, 159°39'E), 18.12.1951, ST 600, 4670 m, bottom unknown:
Cryptolarella abyssicola (Allman)

St. 575. Tasman Sea (40°11'S, 163°35'E), 19.12.1951, SOT, 3710 m, pteropod ooze:
Cryptolarella abyssicola (Allman)

St. 599. Tasman Sea (45°47'S, 164°39'E), 13.1.1952, ST 300, D 45, 4390 m, bottom unknown:
Cryptolarella abyssicola (Allman)

St. 601. Tasman Sea (45°51'S, 164°32'E), 14.1.1952, HOT, 4400 m, Globigerina ooze:
Acryptolaria conferta australis (Ritchie)
Cryptolarella abyssicola (Allman)

St. 626. Tasman Sea (42°10'S, 170°10'E), 20.1.1952, ST 300, HOT, 610 m, Globigerina ooze:
Stegopoma plicatile (M.Sars)
Halopteris infundibulum n.sp.
Thecocarpus tenuissima (Bale)

St. 665. Kermadec Trench (36°38'S, 178°21'E), 25.2.1952, HOT, 2470 m, grey clay:
Cryptolarella abyssicola (Allman)

St. 716. Off Costa Rica (7°23'N, 89°32'W), 6.5.1952, HOT, 3570 m, dark, muddish clay:
Cryptolarella contorta (Nutting)
Hebella cylindrica (von Lendenfeld) var. *elongata* Billard

St. 745. Gulf of Panama (7°15'N, 79°25'W), 16.5.1952, ST 600, D 45, D 80, 915 m, green clay:
? *Opercularella* sp.

List of abbreviations:

D 45	Triangular dredge, each side 45 cm.
D 80	Rectangular dredge, 80×30 cm.
HOT	Herring Otter Trawl
PG 0.2	Petersen-grab (bottom sampler), 0.2 sq. m.
S 200 C	200 cm stramin net.
SOT	Shrimp Otter Trawl
ST 100	Sledge-trawl, 1 m wide.
ST 300	Sledge-trawl, 3 m wide.
ST 600	Sledge-trawl, 6 m wide.

For further details concerning gear used, stations, etc. see BRUUN, 1958.

TAXONOMIC REPORT

FAMILY CORYMORPHIDAE

Subfamily **Branchiocerianthinae**

Branchiocerianthus imperator (Allman, 1885)

Monocaulus imperator Allman, 1885, p. 753, fig. 265; ALLMAN, 1888, p. 5, pl. 3, figs. 1-7.

Branchiocerianthus imperator, STECHOW, 1909, p. 49, pl. 7, figs. 1-8; STECHOW, 1925, p. 406; BRATTSTRÖM, 1958, p. 5, fig. 1.

Material:

St. 203, off Natal (25°36'S, 35°21'E), 21.2.1951, 730 m depth. – Four complete individuals, 73, 93, 120 and 140 cm long, with gonophores. One incomplete specimen of 55 cm length. One stalk and one detached hydranth.

Description:

The "Galathea" material is in bad condition. In the best preserved specimen the body of the hydranth is more or less disc-shaped, with the stalk externally attached. There are many fairly long marginal tentacles, that are badly damaged and are so densely packed in one row that at superficial inspection they may appear to be arranged in several rows. The hypostome is conical, but the oral part with its tentacles is missing. There are many large clusters of gonophores arranged in a row in the space between marginal tentacles and base of the hypostome; each cluster of gonophores is branched like a bunch of grapes. Many radial canals can be observed through the transparent periderm of the disc; these are unbranched. The basal part of the stalk is thickened; no rooting filaments have been observed.

Remarks:

The various species of Branchiocerianthinae have recently been discussed by BRATTSTRÖM (1958). Usually all species are brought to one single genus,

Branchiocerianthus Mark (1898, p. 147), type *Branchiocerianthus urceolus* Mark (1898, p. 148, pls. 1-3). A second genus *Branchiaria,* has been introduced by STECHOW (1921a, p. 249) for *Branchiaria mirabilis* Stechow (1921a, p. 249, type species; type locality: Misaki, Sagami Bay, Japan). The only point of difference between *Branchiocerianthus* and *Branchiaria* is the fact that the radial canals in *Branchiaria* are branched, in *Branchiocerianthus* they are unbranched. It would then be necessary to include *Branchiocerianthus urceolus* Mark into the genus with branched radial canals (cf. STECHOW, 1909, p. 54). *Branchiaria* would then become a subjective synonym of *Branchiocerianthus* and it would be necessary to substitute a new generic name for the species of Branchiocerianthinae with unbranched radial canals. I strongly doubt if the condition of the radial canals alone suffices to discriminate between two genera and I have therefore left all species of *Branchiocerianthus* in one genus. These species are: *Monocaulus imperator* Allman (1885, p. 753, fig. 265), *Branchiocerianthus urceolus* Mark (1898, p. 148, pls. 1-3), *Branchiocerianthus reniformis* Broch (1918, p. 176, pl. 1, figs. 2-5), *Branchiaria mirabilis* Stechow (1921a, p. 249), *Branchiocerianthus italicus* Stechow (1921a, p. 250), and *Branchiocerianthus norvegicus* Brattström (1956, p. 1360).

For the distribution of these various species I refer to BRATTSTRÖM (1958). *B. imperator* has so far been obtained from Sagami Bay and the northern Pacific (STECHOW, 1909), from the coasts of Oman and Baluchistan (STECHOW, 1909a), and from three localities off north-east Africa: 0°24.5'S, 42°49.4'E; 4°41.9'N, 48°38.9'E, and 6°24.1'N, 49°31.6'E, 628-1019 m depth (STECHOW, 1925). The present record is from further south along the African east coast; the specimens were obtained from a sandy bottom.

FAMILY HALECIIDAE

Halecium sessile Norman, 1867

Fig. 1.

Halecium sessile Norman, 1867, p. 196; HINCKS, 1868, p. 229, pl. 44, fig. 2; BILLARD, 1904, pp. 157-160, pl. 6, figs. 1-14; RITCHIE, 1911, p. 812, pl. 87, figs. 8, 9; HARGITT, 1927, p. 506; BILLARD, 1933, p. 20; VERVOORT, 1941, p. 195; FRASER, 1944, p. 201, pl. 37, fig. 178; PICARD, 1951, p. 110; RALPH, 1958, p. 331, figs. 9h, i, 10c, d; REES & THURSFIELD, 1965, p. 109.

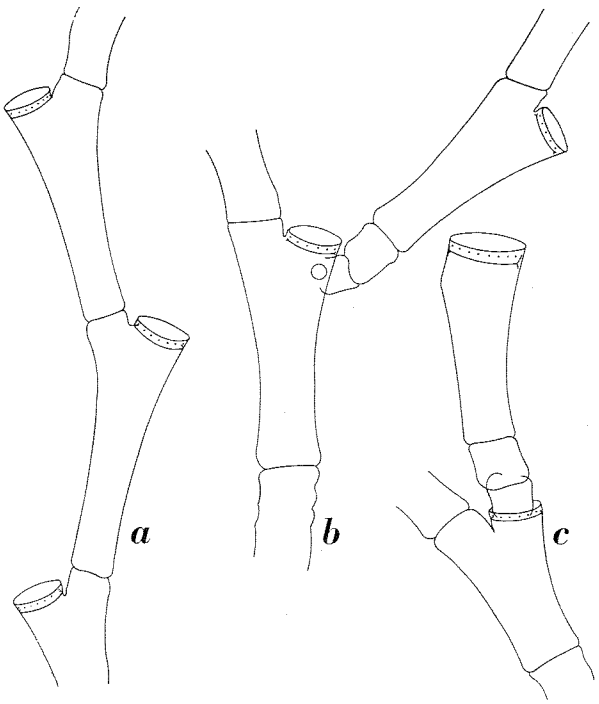

Fig. 1. *Halecium sessile* Norman, "Galathea" St. 196. a, part of hydrocaulus; b, side-branch; c, renovated hydrophore. a, b, ×55; c, ×68.

? *Halecium sessile,* PENNYCUIK, 1959, p. 175, pl. 3, fig. 3.

Halecium kofoidi Torrey, 1902, p. 49, pl. 3, figs. 32, 33; TORREY, 1904, p. 11.

Halecium lighti, NUTTING, 1927, p. 202.

Material:

St. 196, off Durban (29°55'S, 31°20'E), 13-14.2. 1951, 425-430 m depth. – One 25 mm high, polysiphonic colony and some monosiphonic fragments. No gonothecae.

Description:

The hydrocaulus is geniculated, composed of slender internodes with apically an apophysis and an almost sessile hydrotheca. The apophyses project above the level of the hydrothecae; the nodes, separating the internodes of the stem, are almost perpendicular to the length axis of the apophysis, differing in this respect from the New Zealand material described by RALPH (1958, p. 331). The lower part of the hydrocaulus of the big colonies has secondary tubes covering the internodes; the higher parts are monosiphonic. In the present material the side-branches develop in a characteristic fashion: all rise from the internodes immediately beneath a hydrotheca; a perforation of the periderm

at that place is distinctly visible (Fig. 1b), they are alternately directed left and right. Even in the older parts of the colony, where secondary tubes are present, the remnants of a hydrotheca can be observed above each side-branch. Each branch has two or more short internodes basally; the rest of the branch is composed of ordinary internodes. At times a hydrophore develops directly at the base of a hydrotheca and this process may be repeated several times, as has also been figured by RALPH (1958, Fig. 9h). All hydrothecae are sessile and collar-shaped. The abcauline margin flares only very slightly in some thecae; the majority has a straight abcauline wall. There is a row of distinct puncta on each hydrotheca. The wall of the hydrotheca is thin.

Only some hydrothecae show renovations. These are of a type different from that illustrated for North Atlantic material by HINCKS (1868, pl. 44, fig. 2). In my material a long hydrophore had developed, rising from the diaphragm at the base of the primary hydrotheca and supported by one or two short internodes (Fig. 1c). The secondary hydrophores widen slightly apically, but the secondary hydrotheca does not flare. In both secondary hydrophores present in my material the adcauline wall of the apex is distinctly depressed. From RALPH's illustrations (1958, Fig. 9i) it appears that the same type of renovated hydrothecae occurred in her material.

The "Galathea" specimens are sterile.

Measurement (in microns): –

	Malay Archipelago (VERVOORT, 1941)	New Zealand (RALPH, 1958)	"Galathea" St. 196
Internodes of side-branches, length	500-600	160-310	565-610
diameter		125	110-175
Primary hydrotheca, length	15-30	15-20	11-25
diameter	100-120	125	120-135
Secondary hydrophore, length	160-180		300-310

Remarks:

The "Galathea" material, in spite of the fact that it is sterile, is undoubtedly identical with that described from the New Zealand area by RALPH. PENNYCUIK's *Halecium sessile* from the Queensland coast, Australia (1959, p. 174) seems to me to represent *H. beanii* (Johnston, 1838) rather than *H. sessile*; I have never observed the type of renovations figured by PENNYCUIK (1959, pl. 3, fig. 3) in *H. sessile*, but it is exactly the type found in *H. beanii*. Unfortunately Miss PENNYCUIK's colonies were sterile.

Though *H. sessile* has now been recorded from many Indo-Pacific localities I am not entirely convinced of the conspecifity of the Indo-Pacific material with the North Atlantic *H. sessile*. There is a fair amount of conformity in the structure of the gonophores, as appears from a comparison of RALPH's figure 10c, d, with BILLARD's (1904, pl. 6, figs. 7-14) illustrations of the gonophores. Still there are differences in the structure of the female gonotheca. A much more prominent difference is observed in the structure of the colony; the mode of branching observed in the Indo-Pacific material has not been observed (or at least described) in the Atlantic colonies and the mode of renovation of the hydrothecae also shows differences. There are, however, also many points of resemblance as e.g., the shape of the primary hydrothecae, the large hydranths, etc. The differences in renovation may be accounted for by the occurrence of seasons in North Atlantic waters. As I have only a very scanty material of this species at my disposal I have left the question of the identity of both types of colonies undecided.

I have previously expressed the opinion that *H. lighti* Hargitt, 1924 (p. 489, pl. 4, fig. 13) might be identical with *H. sessile* (VERVOORT, 1941, p. 195). Miss PENNYCUIK (1959, p. 173, pl. 3, figs. 1, 2) has recently redescribed *H. lighti* after material originating from the Queensland coast; the species is certainly different from *H. sessile* and principally differentiated by the structure of the hydranths. The gonophores of this species are still unknown.

At the suggestion of PICARD (1951, p. 110) I have included *H. kofoidi* in the synonymy of *H. sessile*. It is worthwhile, nevertheless, to draw attention to TORREY's (1902, p. 50) statement that "the wall of the hydrotheca is especially thickened, the interior contour in profile being convex while the outer one is straight". This condition has not been observed in the Indo-Westpacific material.

Distribution:

Indo-West Pacific: Gulf of Suez (BILLARD, 1933); Jervis Bay, New South Wales (RITCHIE, 1911); Doubtless Bay and Brothers Is., New Zealand (RALPH, 1958); off Sirum Island, Philippines (NUTTING, 1927, as *H. lighti);* Malay Archipelago (BILLARD, 1933); Amoy, South China (HARGITT, 1927), and Sagami Bay, Japan (STECHOW, 1913a). PENNYCUIK's specimens of *H. sessile* are from Port Curtis and from Low Is., along the Queensland coast of Australia.

East Pacific: TORREY (1902, 1904, as *H. kofoidi)* described specimens from off Point Loma, San Diego, from San Diego harbour, from Catalina Is., California, and from Coronado Is., Mexico.

Atlantic: Widely distributed over the whole of the northern Atlantic, both along the European and the American coasts, penetrating to the north along the Norwegian coast and going as far south as the coast of Senegal (Anse Bernard, PICARD, 1951). According to PICARD (1951, p. 110) *H. sessile* also occurs in the Mediterranean.

The present record is the first from the East African coast. Usually the species has been observed in shallow waters; the present specimens undoubtedly are from deep water (425-430 m).

Halecium tenellum Hincks, 1861
Fig. 2.

Halecium tenellum Hincks, 1861, p. 252, pl. 6, figs. 1-4; KRAMP, 1935, p. 145, fig. 60a; VERVOORT, 1946, p. 164, fig. 68; KRAMP, 1947, p. 15; HAMOND, 1957, p. 307, fig. 14; MILLARD, 1957, p. 193, fig. 5; RALPH, 1958, p. 340, fig. 11f, g; VERVOORT, 1959, p. 229, fig. 8; REES & THURSFIELD, 1965, p. 109.

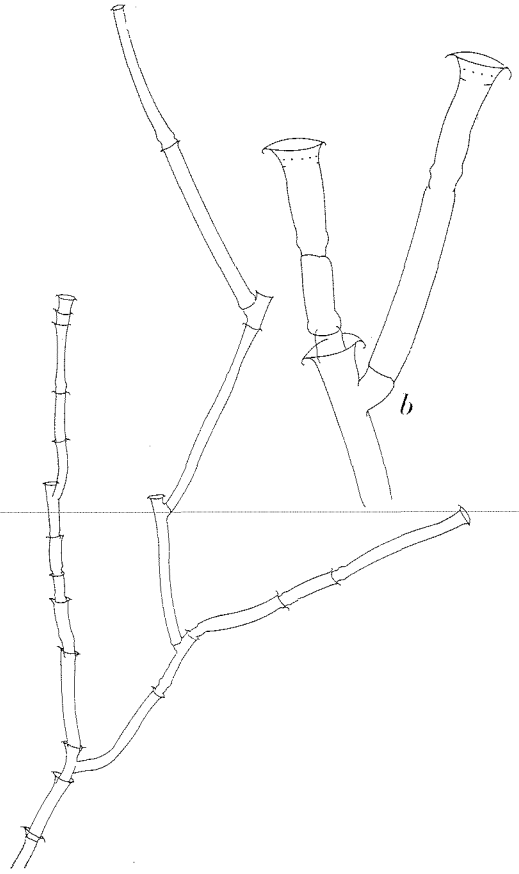

Fig. 2. *Halecium tenellum* Hincks, "Galathea" St. 188. a, fragment of a colony; b, hydrophores and hydrothecae. a, ×20; b, ×56.

Material:

St. 188, off Durban (29°55'S, 31°13'E), 2.2.1951, 495 m depth. – Several 5-15 mm high colonies, apparently detached from other hydroids. Well preserved hydranths are present. No gonothecae.

Description:

The present colonies are very delicate and are very irregularly branched. No hydrorhiza is present; the stems usually originate from repeated renovations of the hydrophores, but sometimes long and slender internodes are present, rising from an apophysis immediately under a hydrophore. Hydrophores and internodes with a few indistinct rings at their base. The hydrophores widen slightly at the apex; the hydrothecae have the characteristic flaring and strongly everted margin; there is a row of fine puncta between the hydrothecal margin and the diaphragm (Fig. 2b). Only very few athecate internodes are present; these are usually short.

The specimens are sterile.

Measurements (in microns): –

	South Africa (MILLARD, 1957)	Gulf of Guinea (VERVOORT, 1959)	"Galathea" St. 188
Stem, length of thecate internode	90-380	500-1100	875-1300
diameter at node	40-70	50-75	55-65
Hydrotheca, length (diaphragm-margin)	30-40	20-25	30-65
(puncta-margin)	20-35	15-18	25-35
diameter at margin	120-170	120-130	120-135

Remarks:

Though the present colonies have no gonothecae they are in so complete structural agreement with the male colonies collected by the Atlantide Expedition in the Gulf of Guinea (VERVOORT, 1959), that I have no doubt about their identity. *H. tenellum* is so widely distributed in tropical, subtropical and temperate parts of Atlantic, Indian and Pacific Oceans, that its geographical distribution is cosmopolitan. Along the coasts of Africa it dominates at the tropical west coast (STECHOW, 1925; VERVOORT, 1959), penetrating as far south as False Bay (MILLARD, 1957). The present record seems to be the first from the African east coast. The species is usually found on other hydroids at moderate depths.

Halecium beanii (Johnston, 1838)
Fig. 3.

Thoa beanii Johnston, 1838, p. 120, pl. 7, figs. 1, 2.
Halecium beanii, KRAMP, 1935, p. 151, figs. 61c, 63b; VERVOORT, 1942, p. 282; VERVOORT, 1946a, p. 296; HAMOND, 1957, pp. 295, 301; MILLARD, 1957, p. 188; MILLARD, 1958, p. 168; RALPH, 1958, p. 332, fig. 10a, b, e-k; VERVOORT, 1959, p. 224, fig. 6; REES & THURSFIELD, 1965, p. 105.
Halecium halecinum var. *minor,* LELOUP, 1932, p. 145, pl. 17, fig. 3.
? *Halecium beanii,* BILLARD, 1933, p. 20.

Material:

St. 196, off Durban (29°55'S, 31°20'E), 13-14.2. 1951, 425-430 m depth. – One 40 mm high fragment, with badly preserved hydranths and without gonothecae.

Description:

The present fragment agrees in every respect with part of the material from the Atlantide Expedition (Sts. 151, 153, Gulf of Guinea). The hydrocaulus is broken up into internodes of very variable length, that in the basal parts of the colony are covered by secondary tubes. The side-branches are more or less alternately arranged, so that the shape of the fragment is pinnate. The side-branches originate from a short apophysis directly under the cauline hydrophores. The shape of the primary hydrophores and hydrothecae can best be judged from Fig. 3b. Renovation of the hydrothecae occurs frequently; the resulting secondary (and tertiary) hydrophores have a slightly asymmetrical basal chamber; the plane of the opening of the secondary hydrotheca is distinctly tilted; the abcauline wall being longer. The row of puncta along the hydrothecal border is composed of very small dots (Fig. 3c).

I have compared the sterile colonies from St. 196 with fertile colonies from "Galathea" St. 648 (36°49'S, 174°50'E, between Ranitoto and Devon Port, New Zealand, 10 m depth). This material, which has the bushy appearance characteristic of this species and which richly bears female gonothecae, complies very well with RALPH's description of New Zealand material (RALPH, 1958, p. 332) (Fig. 3d, e). There is no difference in the shape of hydrocaulus and hydrothecae between the New Zealand material and that from off Durban, with the exception of the more frequent occurrence of tertiary

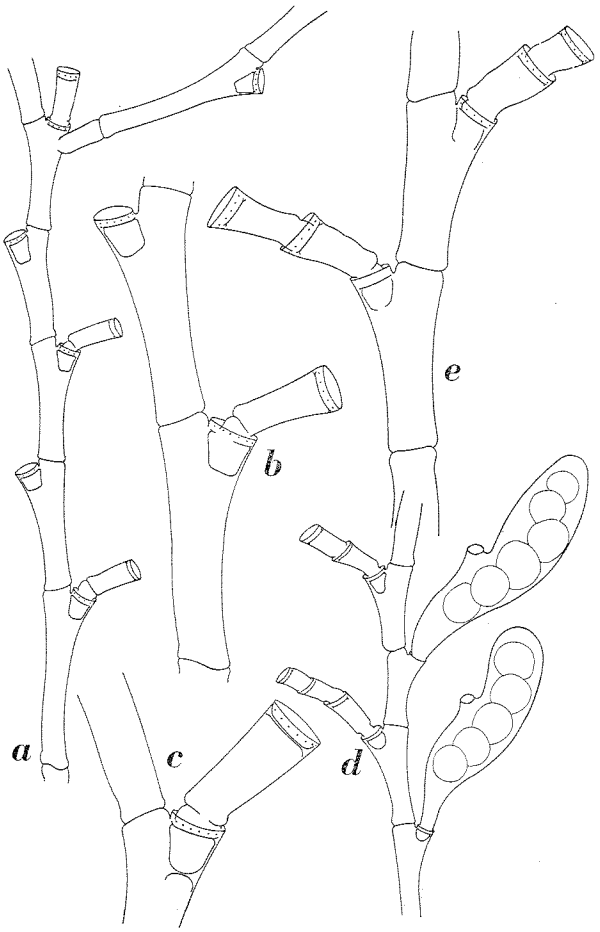

Fig. 3. *Halecium beanii* (Johnston). a-c, "Galathea" St. 196, a, part of hydrocaulus; b, two internodes of hydrocaulus with renovated hydrophore; c, renovated hydrophore. d, e, "Galathea" St. 648, d, part of colony with female gonothecae; e, part of hydrocaulus with renovated hydrophores. a, d, ×25; b, e, ×55; c, ×90.

renovations in the New Zealand material, which may be largely due to water movements. I feel justified, therefore, to record the East African material as *Halecium beanii.*

Distribution:

H. beanii is a cosmopolitan species, occurring in tropical, subtropical and temperate parts of Atlantic, Indian, and Pacific Oceans though the shape of the colonies varies greatly throughout the enormous area of distribution. It occurs along both the east and the west coasts of Africa; from the east coast it has previously been recorded from the Durban area (MILLARD, 1958), from Inhambane, Portuguese East Africa (MILLARD, 1958); it probably penetrates as far as the Gulf of Suez (BILLARD, 1933). The present record shows that the species also penetrates into deep water.

FAMILY CAMPANULARIIDAE

Laomedea (Phialidium) striata (Clarke, 1907)

Obelia striata Clarke, 1907, p. 9, pls. 6, 7.
Laomedea striata, KRAMP, 1922, p. 19; VERVOORT, 1946a, p. 343.
Clytia striata, REES & THURSFIELD, 1965, p. 98.

Material:

St. 8, Tenerife-Dakar (16°58′N, 18°16′W), 3.11. 1950, 100-300 m depth. – Six specimens of *Diacria spinosa* (Lesueur) completely covered on both sides by 5-8 mm high colonies. Many (mainly empty) gonothecae are present.

Remarks:

The present material agrees completely with the descriptions by CLARKE (1907) and KRAMP (1922). Many of the hydrothecae in the "Galathea" material are renovated, i.e., two hydrothecae are found on the same pedicel, the larger enveloping the smaller, and containing a single hydranth. The geographical distribution of this characteristic species has previously been discussed (VERVOORT, 1946); is is quite common on the Pteropod *Diacria spinosa* in the tropical and subtropical parts of the Atlantic and Indian Oceans.

Laomedea (Eulaomedea) pseudodichotoma
Vervoort, 1959

Laomedea (Eulaomedea) pseudodichotoma VERVOORT, 1959, p. 316, figs. 56, 57.

Remarks:

This species was described after material collected during the Atlantide Expedition at two stations, viz., St. 85, 5°37′N, 0°38′E, and St. 163, 13°43′N, 17°23′W. No distinct type has been indicated. The colony from St. 163, five cm high and bearing male gonothecae in all stages of development, is here designated as the lectotype. This lectotype is preserved in the collections of the Zoological Museum of the University, Copenhagen; a slide from this lectotype is in the collections of the Rijksmuseum van Natuurlijke Historie, Leiden, the Netherlands. The colonies from St. 85, several 15 mm high colonies with female gonothecae, are the paralectotypes, all preserved in the collections of the Zoological Museum of the University, Copenhagen.

FAMILY CAMPANULINIDAE

? Operculariella denticulata (Clarke, 1907)
Figs. 4 and 5.

Campanulina denticulata Clarke, 1907, p. 12, pl. 8; STECHOW, 1913, p. 122, fig. 92; REES, 1939, pp. 443, 445.
Campanulina (?) *indivisa,* FRASER, 1948, p. 216, pl. 24, fig. 7.

Material:

St. 282, Seychelles-Ceylon (5°32′N, 78°41′E), 11.4.1951, 4040 m depth. – Many colonies of 20-25 mm height rising from a hydrorhiza creeping on the basal spicules of a Hexactinellid sponge. Polyps deterriorated. Empty gonothecae present.

Description:

The colonies are composed of a rigid, unbranched or scarcely branched hydrocaulus with thick periderm, rising from a much thinner hydrorhiza, curving around and creeping on the Hexactinellid spicules. The hydrocaulus is not divided into inter-

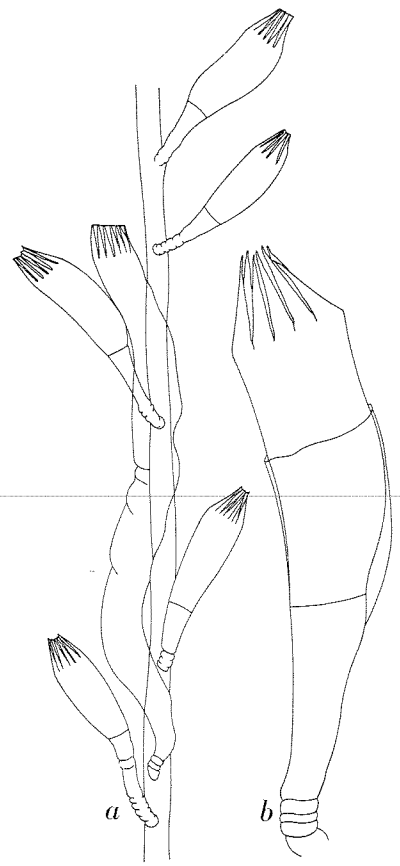

Fig. 4. ? *Operculariella denticulata* (Clarke), "Galathea" St. 282. a, part of colony with empty gonotheca; b, renovated hydrotheca. a, ×30; b, ×90.

nodes, the hydrothecae (and gonothecae) rise directly from it; the place of attachment is indicated by a circular opening in the periderm. The hydrothecae are shortly stalked, more or less cylindrical structures, at times slightly swollen at the base and without distinct demarcation between stalk and hydrotheca. The stalk is usually slightly shorter than the hydrotheca; it is wrinkled or distinctly ringed over a variable part of its length. There is a very distinct but thin diaphragm in the basal part of the hydrotheca; at the place of attachment of diaphragm to thecal wall there is no ring-shaped thickening. The hydrotheca is closed by a roof-shaped structure which is not distinctly delimitated from the rest of the hydrotheca. It is composed of thickened, triangular plates fitted together by means of a very thin part of the thecal wall and usually closing irregularly over the theca. There are only remnants of hydranths in the present specimen, but from these it can be seen that the hydranths must have been very long. They are attached to the thecal wall slightly above the diaphragm.

One of the colonies has two empty gonothecae. These are elongated, sac-shaped structures of about the same diameter as the hydrothecae and rising directly from the hydrocaulus by means of a short, ringed stalk. The wall of the gonotheca is slightly and irregularly wrinkled; its closing apparatus is the same as in the hydrothecae. Both gonothecae are completely empty.

There are distinct signs of renovation of some of the hydrothecae (Fig. 4b). Such hydrothecae have no double diaphragm, but the basal part of a renovated theca is invested by the rest of the primary hydrotheca.

Measurements (in microns): –

	"Albatross" St. D 4390	"Galathea" St. 282
Hydrocaulus, diameter	100	100-120
Hydrotheca, length pedicel from insertion to diaphragm	600-700	335-410
length theca from diaphragm to apex of closing apparatus..	560-700	400-540
diameter.....	140-160	160-240
Gonotheca, length	2,400	2,200-2,320
diameter.....	100	160-175

Remarks:

I do not hesitate to refer the "Galethea" specimens to CLARKE's *Campanulina denticulata,* with which it agrees in the thick, particularly rigid hydrocaulus, the shape of the hydro- and gonothecae, and the presence of a very fine diaphragm in the

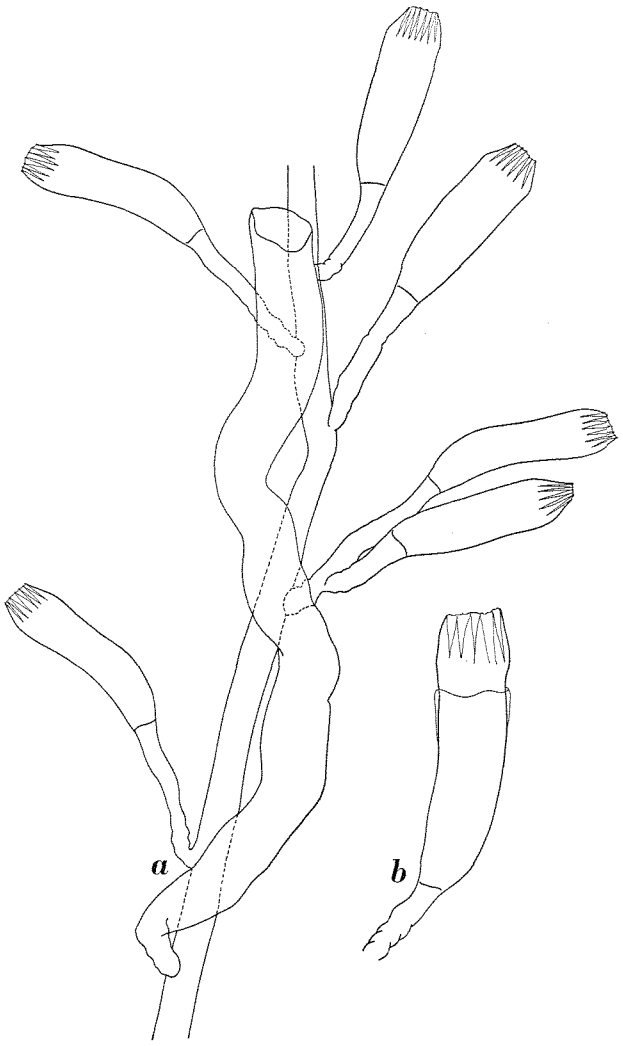

Fig. 5. ? *Opercularella denticulata* (Clarke), "Albatross" St. D 4390. a, part of colony with empty gonotheca; b, renovated hydrotheca. a, ×40; b, ×75.

basal part of the hydrotheca. There is, superficially, some difference in the structure of the operculum. In the "Galathea" specimen the triangular, thickened stips of the extreme hydrothecal margin have been made visible by staining; in the unstained specimens the folded hydrothecal margin is almost exactly as in CLARKE's figures (1907, pl. 8, figs. 5-7), particularly in the renovated hydrothecae. Moreover, I have been able to examine a slide sent on loan to the British Museum (Natural History), labelled: *Campanulina denticulata* Clarke, California, 28.3.1904, "Albatross" Coll. D 4390. This is a stained slide with a single gonotheca, in which the hydrothecae are exactly as in my specimen (Fig. 5). For the sake of comparison I have listed above the measurements of this specimen. Though well preserved hydranths are present in the "Albatross"

slide, the gonotheca is completely empty and the apical part has collapsed. I should like to point out here that the renovation of hydrothecae in which the original closing mechanism is still more or less intact (as figured by CLARKE, 1907, pl. 8, fig. 5 and as observed in the "Albatross" and "Galathea" materials) gives rise to secondary hydrothecae in which the closing apparatus basally has a more or less distinct ridge, by which it is separated from the rest of the hydrotheca. Hydrothecae of this type may easily be mistaken for the *Lovenella* type of hydrotheca.

FRASER's *Campanulina* (?) *indivisa* (1948, p. 216, pl. 24, fig. 7), is very probably identical with *O. denticulata,* but his description is extremely short, no gonothecae are described and no measurements are given. The "Galathea" and "Albatross" specimens agree with FRASER's description in the presence of a thick, rigid hydrocaulus, the general shape of the hydrothecae and the presence of the hydrothecal diaphragm. The last feature is not mentioned in FRASER's description, but it is distinctly visible in his figures (pl. 24, fig. 7b, c). The occurrence of a diaphragm in the hydrotheca seems to be an exceptional occurrence in the Campanulinidae, being recorded only for the hydroid of *Eirine ceylonensis* (Browne, 1905) (= *Campanulina ceylonensis* Browne, vide REES, 1939, p. 443). As it seems quite clear that the present species produces free medusae it cannot be maintained in the genus *Campanulina,* which according to REES's view is a monotypic genus, its sole species being *Campanulina tenuis* van Beneden, 1847. It seems almost equally certain that it is no *Aequorea;* in such cases where the gonothecae of this genus are sufficiently known (as e.g., in *A. acuminata* (Alder, 1857), *A. paracuminata* (Rees, 1938), *A. pontica* (Valkanov, 1935), *et al.)* these are differently shaped and have no roof-shaped closing apparatus. Provisionally, therefore, I have incorporated CLARKE's species in *Opercularella* Hincks, 1868.

Distribution:

O. denticulata was originally recorded from the East Pacific, 13°11.6′S, 78°18.3′W (CLARKE, 1907, type locality, depth probably about 400 fms. (about 730 m)). STECHOW (1913) recorded the species from Sagami Bay, Japan, where it was found in the littoral zone. FRASER's record of *C. indivisa* is from deep water east of Long Point, Santa Catalina Is., off California, between 347 and 267 fms. (= 635-488 m). The present record is from the Indian Ocean between the Seychelles and Ceylon, 4040 m depth. The "Albatross" specimen originates from off California, 33°02′15″N, 120°42′W, 2182-1350 fms. depth (= 3990-2468 m).

? Opercularella spec. no. 1

Fig. 6.

Material:

St. 745, Gulf of Panama (7°15′N, 79°25′W), 16.5.1952, 915 m depth. – Five hydrothecae rising from a stolon creeping on fragments of decaying wood. No gonothecae. Polyps in very bad condition.

Description:

The large hydrothecae rise singly from a thin, creeping hydrorhiza. The pedicels are very long, with lengths varying between 4 and 10 mm and have no rings basally or apically, though the periderm may be indistinctly wrinkled. Both hydrorhiza and pedicels have the same diameter of 150-160 μ. The hydrothecae are large and cylindrical, with the basal portion slightly but distinctly rounded, the length is 2.10-2.60 mm, the diameter 720 μ. There is no distinct demarcation between pedicel and hydrotheca, but there is a slightly raised ring-shaped peridermal thickening at the base of each theca, to which the remnant of the hydranth is attached. The apical part of the hydrotheca folds irregularly over the opening to form a more or less pyramidal roof-shaped structure. There are thickened strips in the apical portion of the thecal wall, connected by thin, unthickened parts of the thecal wall; I could not observe the exact shape of these strips and therefore I cannot state that they are triangular, but they may be so.

No gonothecae are present.

Remarks:

There is great conformity in the shape of the hydrothecae between the "Galathea" specimen recorded above and a specimen of *Opercularella producta* (G.O.Sars, 1874) in the British Museum (Natural History), to be described below (p. 111). The hydrothecae in the "Galathea" specimen, however, are many times larger. Furthermore, the specimen described above shows a great general resemblance with NUTTING's ? *Opercularella longicauda* (NUTTING, 1905, p. 944, pl. 3, fig. 5 and pl. 9, figs. 4-7), particularly in the shape of the hydrothecae and the great lengths of their pedicels, which are

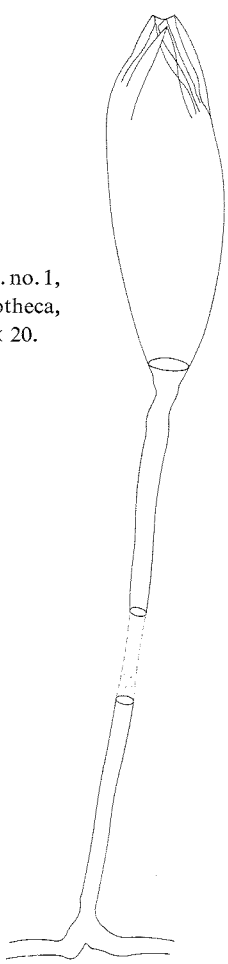

Fig. 6. ? *Operculariella* spec. no. 1, "Galathea" St. 745. Hydrotheca, part of pedicel omitted. × 20.

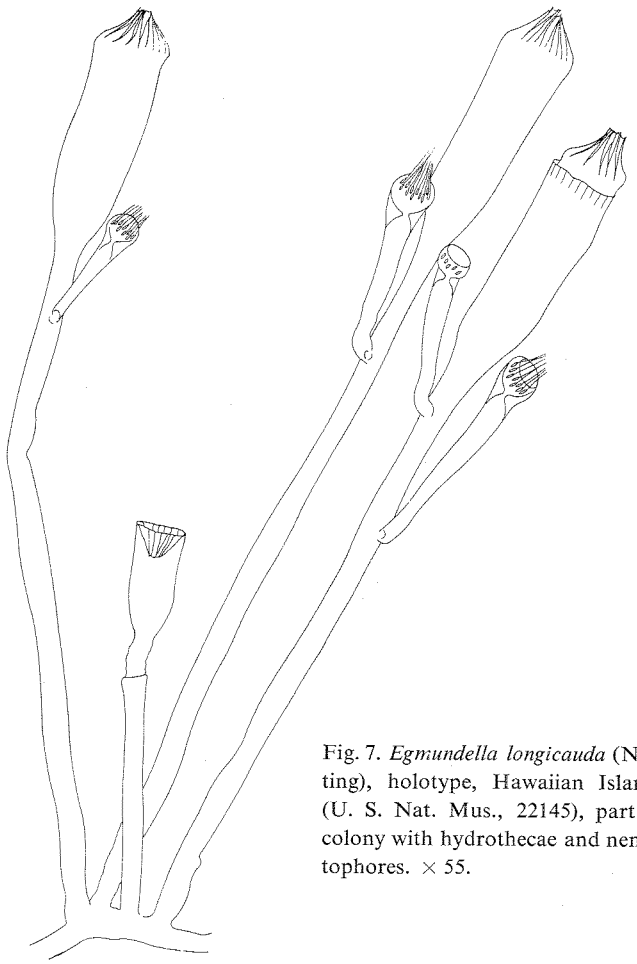

Fig. 7. *Egmundella longicauda* (Nutting), holotype, Hawaiian Islands (U. S. Nat. Mus., 22145), part of colony with hydrothecae and nematophores. × 55.

quite smooth. I was very pleased, therefore, that I could compare the "Galathea" colonies with NUTTING's holotype of ? *Operculariella longicauda,* kindly sent on loan by Dr. CHARLES E. CUTRESS, U.S. National Museum, Washington. This was particularly important since no measurements are given in NUTTING's diagnosis.

The holotype of ? *Operculariella longicauda* (U.S.N.M. holotype catalogue no. 22145), a spirit specimen, is composed of a number of apparently separate colonies creeping on a 25 mm long fragment of an unrecognizable hydroid. The pedicels rise in groups from the thin hydrorhiza and may be more or less contiguous at the base. They are 2 or 3 mm long and may have a few rings or wrinkles of the basal periderm. They widen fairly suddenly into the cylindrical theca. The closing apparatus of the hydrothecae is composed of the distal thecal wall, provided with thickened, more or less triangular segments, united by thin, unthickened parts of the thecal wall. The hydrotheca widens very slightly but distinctly just below the closing apparatus, but the roof-shaped structure is not set off from the rest of the theca by means of a ridge or thickened line. Many hydrothecae have the closing apparatus folded inwards. Some hydrothecae show signs of renovation, either by the formation of a new hydrotheca from a broken pedicel, or by the development of a secondary theca inside an older hydrotheca. There are very distinct, stalked nematophores, originating from the pedicels some distance below the base of the theca. These nematophores have a globular head, provided with many large, oval nematocysts, their threads protruding from the nematophores. The globular head is separated from the rest of the nematophore by means of a collar of periderm. Some pedicels have two nematophores (Fig. 7).

There is no diaphragm at the base of the hydrotheca, but the hydranth is attached to the internal thecal wall in the narrowed, basal part of each theca.

Measurements (in microns): –

	Between Molokai and Maui Islands, Hawaii
Pedicel, length	2,000-3,000
diameter	50-60
Hydrotheca, length	600-650
diameter	160-175
Nematophore, length stalk	500-540
diameter at apex	80-110

The presence of nematophores places this species in *Egmundella* Stechow, 1921, where it should stand as *Egmundella longicauda* (Nutting, 1905). No gonothecae have been observed in the holotype. NUTTING (l.c., pl. 9, fig. 7) figured a gonotheca, but he was doubtful whether or not this gonotheca really belonged to his new species. The type locality is the Hawaiian Islands region, between Molokai and Maui Islands, where is was found at a depth of 138 fms. (= 252 m).

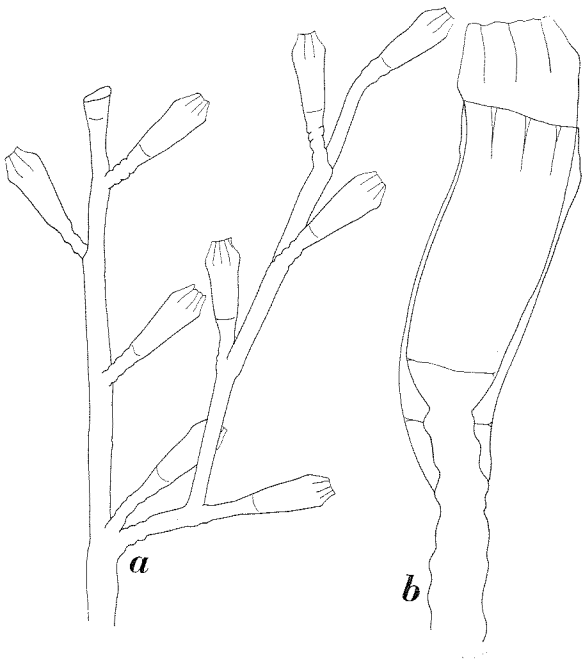

Fig. 8. ? *Opercularella* spec. no. 2, "Galathea" St. 196. a, part of colony; b, renovated hydrotheca. a, ×17; b, ×90.

? *Opercularella* spec. no. 2

Figs. 8 and 12b.

Material:

St. 196, off Durban (29°55'S, 31°20'E), 14.2. 1951, 430 m depth. – A single colony of 22 mm height, at the base with some hydrorhiza fibres. Hydranths in very poor condition; gonothecae absent.

Description:

A small, polysiphonic colony of sympodial built, monosiphonic in the highest (youngest) parts. The structure of the fragment can best be described starting with the monosiphonic parts. Here the sympodial structure is distinct; budding takes place at that region of the hydrocaulus situated immediately below the insertion of the hydrotheca; usually there is a septum separating the newly formed internode from its predecessor. The resulting hydrocaulus is straight. The hydrothecae are placed on short pedicels of variable length and continuing into the basal part of the hydrotheca without distinct demarcation. The pedicels may be more or less distinctly ringed or indistinctly wrinkled; their length never surpasses the thecal length. The hydrothecae are slender and tumbler-shaped, with a distinct but thin basal diaphragm. The distal portion of the theca, just above the diaphragm, may be slightly swollen; the margin, in those few thecae that are undamaged, flares slightly. The operculum of the hydrotheca is formed by the extreme, thin edge of the theca, folding along 10-12 longitudinal, slightly thickened striae. I have not observed the operculum in closed condition, but judging from the length of the thin edge it forms a shallow pyramidal cone when fully closed. There are only rests of the hydranth, which show that it was attached to the thecal wall slightly superior of the diaphragm; the number of tentacles or the length of the hydranth could not be observed.

In the older parts of the fragment the monosiphonic stems are covered by secondary tubes, producing hydrothecae, so that the structure of the colony becomes confused. Basally the main stem has a diameter of 400 μ.

Though many of the hydrothecae are damaged, there are only few indications of renovation and these point to renewal of complete thecae. Some hydrothecae have a distinct node in the pedicel, which can only be explained by the regeneration of a complete, new theca from the original pedicel.

No gonothecae have been observed.

Measurements (in microns): –

	"Galathea" St. 196
Hydrotheca, length from diaphragm onwards	335-365
diameter at diaphragm	120-135
diameter at margin	160-190
Pedicel, total length	100-350
diameter	70-80

Remarks:

I have been unable to identify this colony with any of the described species of Campanulinidae, though it comes nearest to ? *Opercularella denticulata* (Clarke, 1907). Unfortunately the fragment is in poor shape and gonothecae are lacking, so that it cannot possibly be described as a new species. It differs considerably from *O. denticulata* in the structure of the colony; in the shape of the hydrothecae too there are small differences, as e.g., the slightly flaring hydrothecal border and the absence of triangular, thickened zones in the operculum in the present specimen.

FAMILY LOVENELLIDAE

? *Egmundalla* sp.

Fig. 9.

Material:

St. 471, Sunda Trench (10°26'S, 114°15'E), 10.9. 1951, 2810-2990 m depth. – Creeping colony on an Antipathariid. Hydranths deterriotated, no gonothecae.

Description:

The fine hydrorhiza, covered by irregularly folded periderm, creeps on a dead Antipathariid; from it rise directly the pedicels of the hydrothecae, usually in small groups of 5 to 15 hydranths each. The pedicels are 2.5 to 5 times as long as the hydrothecae and very slender; basally they have a few distinct rings but just below the hydrotheca there are some wrinkles or some indistinct rings. There is no distinct delimitation between pedicel and hydrotheca; the pedicels widen almost imperceptably into the very slender thecae. The hydrothecae are almost tubular, with very slightly conical basal portion and are about 3 to 4 times as long as wide. They are closed by an irregularly folding closing apparatus, composed of the distal margin of the theca, which has irregularly triangular, thickened plates connected by thin portions of the thecal wall. They fold as a more or less pyradimal roof over the hydrotheca. There is no basal diaphragm, but the periderm has a distinct internal, ring-shaped thickening at the place of attachment of the hydranth. All hydranths are damaged, but the place of attachment to the thecal wall is distinctly visible. Above, but particularly below the place of attachment of the hydranth to the thecal wall, the periderm is considerably constricted.

I have observed some empty hyaline bodies along the hydrorhiza, that may either represent nematophores or Protozoa. They are very sparingly represented and ovoid in outline; the periderm is very thin.

No gonophores have been observed.

Measurements (in microns): –

	"Galathea" St. 471
Hydrorhiza, diameter	35-50
Pedicels, length	2,400-4,000
diameter	50-60
Hydrotheca, length (attachment hydranth-top operculum)	675-800
diameter	145-165
Nematophore, length	30-40

Remarks:

The genus *Egmundella* Stechow, 1921 (p. 225) has originally been established for two species of *Campanulina* – like hydroids, *Egmundella gracilis* Stechow, 1921 (p. 226) and *E. superba* Stechow, 1921 (p. 226); *E. gracilis* has been indicated by STECHOW (l.c., p. 226) as the type of the genus. *E. gracilis* has previously been described by FRASER (1911, p. 44, pl. 3, figs. 7, 10) as *Lovenella producta;* it is particularly characterized by the presence of monothalamic, globular, inmovable nematophores on the pedicels and the hydrorhiza. These nematophores, as is expressively stated by STECHOW, have a thick bundle of large, elongated nematocysts. The hydrotheca, which is of the Campanulinid-type, has no diaphragm and is closed by the apical portion of the hydrothecal wall, which folds over the opening of the theca as a pyramidal roof, having thickened, triangular sections, held together by the unthickened part of the thecal wall. No gonophores have been described. Additional species of the genus *Egmundella* have been described as *E. valdivae* Stechow, 1923 (p. 5); *E. humilis* Fraser, 1936 (p. 50, pl. 1, fig. 2); *E. grimaldii* Leloup 1940 (p. 7, pl. 1, fig. 3); *E. fasciculata* Fraser, 1940 (p. 577, pl. 32, fig. 4); *E. grandis* Fraser, 1941 (p. 82, pl. 16, fig. 8), and *E. polynema* Fraser, 1948 (p. 218, pl. 25, fig. 8). Gonothecae have only been described from *E. polynema,* where they occur directly on the hydrorhiza; they are cylindrical and have an operculum almost like that of the hydrotheca. The structure of the gonophore is fully unknown, but apparently *Egmundella* produces free medusae. The principal differences from *Lovenella* Hincks, 1868 (p. 177, type *Campanularia clausa* Lovén, 1835), in absence of detailed knowledge of the structure of the gono-

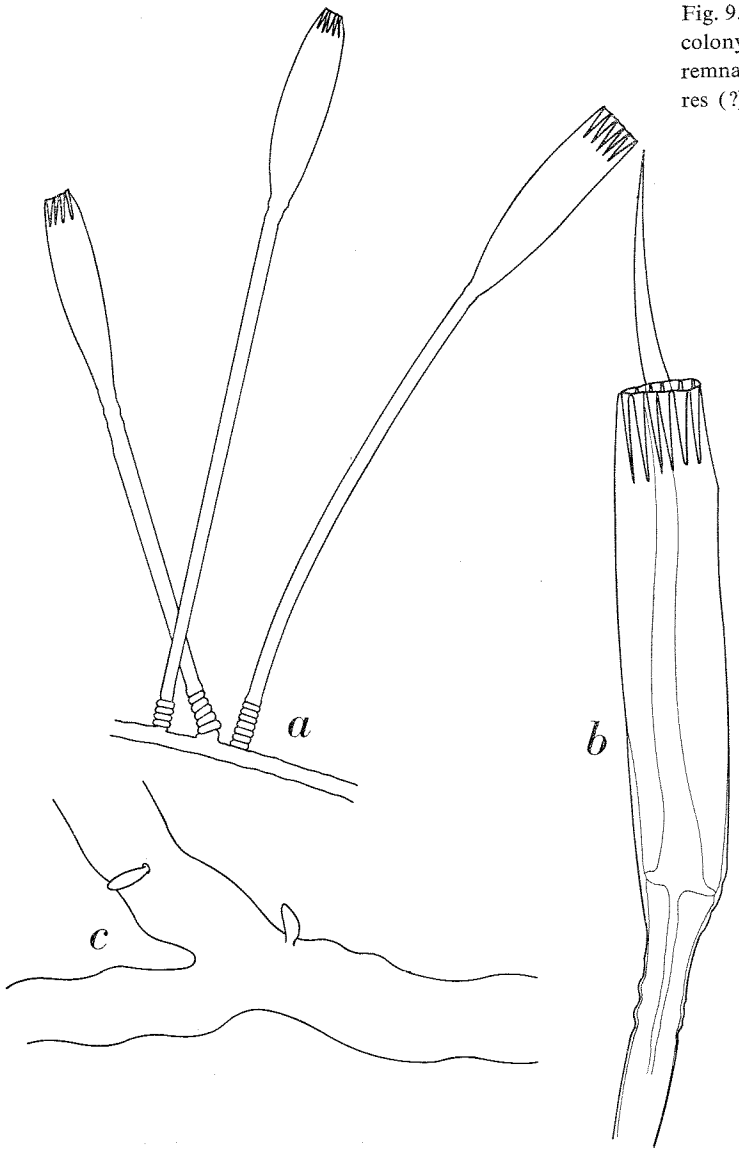

Fig. 9. ? *Egmundella* sp., "Galathea" St. 471.a, part of colony showing three hydrothecae; b, hydrotheca with remnant of hydranth; c, hydrorhiza with nematophores (?). a, ×25; b, ×75; c, ×210.

phores, are: a, the complete absence of nematothecae; b, the presence of a distinct demarcation between hydrotheca and closing apparatus, and c, the absence of a closing apparatus on the gonotheca in *Lovenella*. There are two species of *Egmundella* in which the nematophores occur exclusively on the hydrorhiza, viz. *E. superba* and *E. valdiviae*. Of both species I have been able to study the holotype, thanks to the kind cooperation of Dr. H. FECHTER, Zoologische Sammlung des Bayerischen Staates, Munick. Both types are slides.

The holotype of *E. superba* Stechow, 1921, is a carmin stained slide of 4 hydrothecae, 3 of which are attached to a fragment of hydrorhiza (Fig. 10). The hydrothecae are very near to those of the "Galathea" material described above, 540 μ long with a diameter of 280 μ. They are placed on 8 mm long pedicels. The hydrorhiza has several nematophores: 110 μ long cylindrical bodies with a slightly swollen apex of 22 μ diameter. The swollen "head" has distinct oval nematocysts; the thread protruding from the opening. The condition of the hydrothecae is fair; the hydranths are well preserved and distinctly visible. The type locality is St. Thomas, Virgin Islands.

The holotype of *E. valdiviae* Stechow, 1923, is a carmin stained slide with 3 hydrothecae, one of which is attached to a small fragment of hydrorhiza by means of a 675 μ long pedicel (Fig. 11). The hydrothecae are smaller than those of *E. superba*, 235 μ long and have a diameter of 150 μ. They are a bit more swollen but this may be largely a result of the pressure of the cover glass. The fragment of hydrorhiza has a 50 μ long body, with slightly

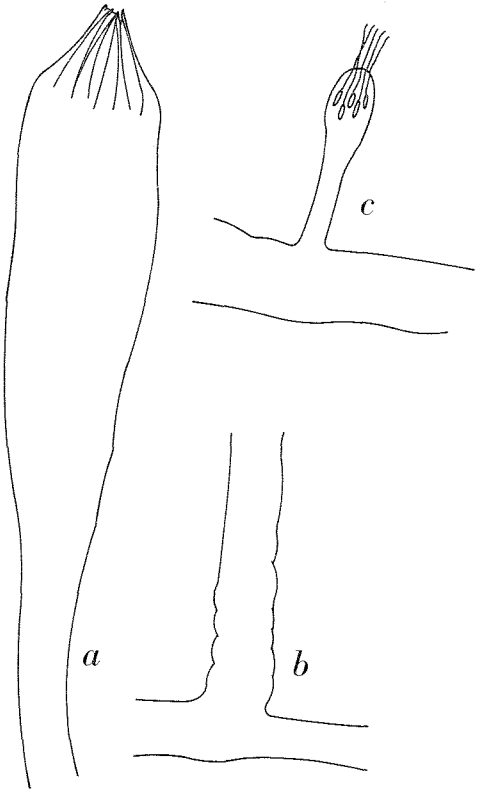

Fig. 10. *Egmundella superba* Stechow, holotype, St. Thomas, Virgin Islands (Zool. Mus. Munich). a, hydrotheca; b, basal part of pedicel; c, nematophore. a, b, ×110; c, ×215.

swollen apex with a diameter of 22 μ and more or less indented at the end. It is filled with a granular mass in which I could not detect any nematocysts. The type locality is the Indian Ocean west of Sumatra, 0°15.5'N, 98°04'E.

I have identified my material as a species of *Egmundella* largely on account of the very great resemblance of the hydrothecae with those of *E. superba;* I have not observed the type of nematophores characteristic of that species and therefore I cannot possibly identify the "Galathea" material with STECHOW's *E. superba.* It seems to me that the systematical position of *Egmundella,* because of the absence of knowledge of the gonophores, cannot be satisfactorily stated; the genus shows a great general resemblance with *Lovenella* and therefore it has provisonally been included in the Lovenellidae. It might, after the discovery of its reproduction, very well turn out to be a Campanulinid related to *Aequorea* Péron & Lesueur, 1809, or to *Opercularella* Hincks, 1868.

The present material originates from the Sunda Trench off Java, Indonesia, where it was found at great depth (2810-2990 m). It seems very probable that the specimen described by LELOUP (1940, p. 8, pl. 1, fig. 4) as *Campanulina producta* from the temperate Atlantic, 38°35.5'N, 28°05'45''W, depth 1250 m, also belongs to *Egmundella;* it is probably not *Opercularella producta* (G.O.Sars, 1873).

Dr. W. J. REES, British Museum (Nat. Hist.) has drawn my attention to the great resemblance between the "Galathea" specimen described above as ? *Egmundella* sp. and *Opercularella producta* (G. O. Sars, 1874) (= *Calycella producta* G.O.Sars, 1874). I have compared the "Galathea" material with a slide of *O. producta* in the British Museum (1954.2. 26.4), collected in the Hjeltefjord, Norway, by C. BURDON JONES. There is great conformity in the general shape of the hydrothecae and the shape of the pedicel, that has some distinct rings below and some indistinct rings just under the hydrotheca. In the specimen from Hjeltefjord there is no diaphragm basally in the theca, though a chitinized internal ring shows the place of attachment of the hydranth. The closing apparatus is composed of the collapsable distal thecal wall, provided with some more or less triangular, thickened strips, that may fold over the hydrotheca as a more or less pyramidal roof (Fig. 12a). In this specimen the hydrothecae are decidedly wider, which may to some extent be due to pressure of the cover glass. No nematophores and no gonothecae are present. I would indeed have been inclined to consider the "Galathea" specimen as closely related to or even identical

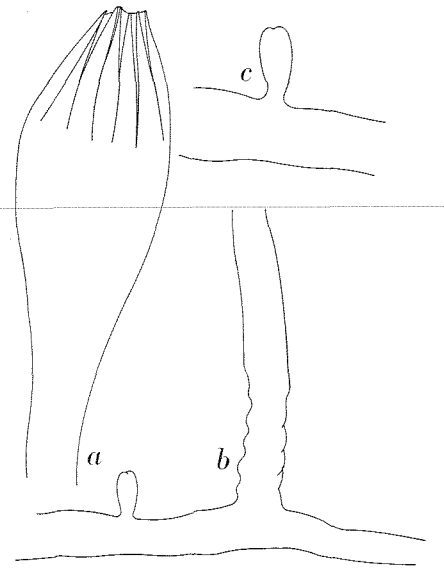

Fig. 11. *Egmundella vaidiviae* Stechow, holotype, Indian Ocean (Zool. Mus. Munich). a, hydrotheca; b, hydrorhiza with basal part of pedicel and nematophore; c, nematophore. a, b, ×130; c, ×225.

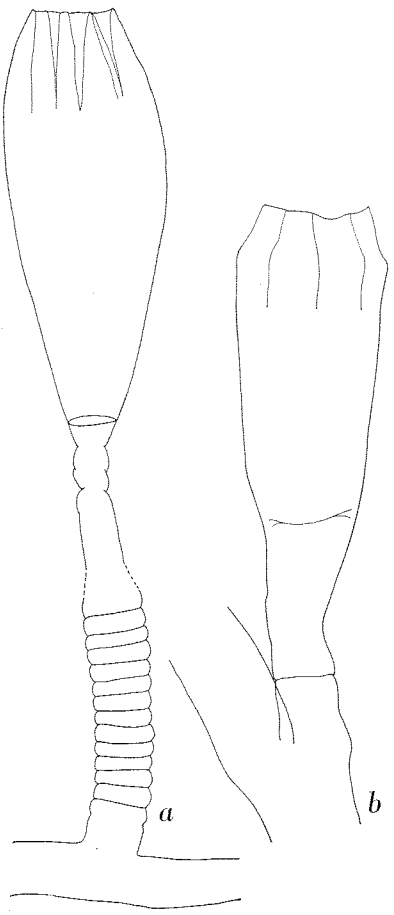

Fig. 12. a,? *Opercularella producta* (G. O. Sars), Hjeltefjord, Norway (Brit. Mus., 1954. 2.26.4), hydrotheca, part of pedicel omitted. b,? *Opercularella* spec. no. 2, Galathea, St. 196, hydrotheca. a, ×90; b, ×95.

with *Opercularella producta* but for the presence of the (questionable) nematophores.

The measurements (in microns) of the specimen from Hjeltefjord are:

Pedicels, length	4,000-5,000
diameter (at base)	90-100
Hydrotheca, length (attachment hydranth-top operculum)	760-860
diameter	260-300

STECHOW (1923a, p. 128) has drawn attention to the fact that G.O.SARS's *Calycella producta* is a distinct Campanulinid; he placed the species in *Campanulina*. He was criticized by Kramp (1935, p. 140), who drew attention to the structure of the operculum and the presence of a sharp demarcation between this operculum and the hydrothecal wall. I have little doubt that STECHOW very correctly referred the species to the Campanulinidae, but I prefer to place it in *Opercularella,* pending the discovery of its reproduction. In *Lovenella* Hincks (1868, p. 177, type *Campanularia clausa* Lovén, 1835) there appears to be a very distinct hydrothecal diaphragm. The closing apparatus is composed of very well defined, triangular plates, connected by a thin membrane, and basally fitting into rounded incisions of the distal thecal wall. Hydrotheca and closing apparatus are thus very distinctly delimitated; the hydrothecal roof, when completely closed, is a sharp, well defined pyramid. In the Campanulinids the closing apparatus is very indistinctly defined and it is never set off from the distal wall of the hydrotheca. Renovation of hydrothecae with still intact closing apparatus may easily give rise to a very confusing picture (cf. p. 106), and this has probably been observed by KRAMP (1935, p. 140). KRAMP's statement that in *Opercularella producta* hydrothecal wall and closing apparatus are separated by a distinct, sharp rim cannot possibly be correct.

Stegopoma plicatile (M.Sars, 1863)

Fig. 13.

Lafoea plicatilis M.Sars, 1863, p. 31; HINCKS, 1868, p. 208, text-fig. 25.

Stegopoma plicatile, KRAMP, 1932, p. 27, fig. 33; KRAMP, 1932a, p. 8; KRAMP, 1935, p. 131, fig. 57a; KRAMP, 1938, p. 67; KRAMP, 1943, pp. 27, 43; REES, 1952, p. 7; BEYER, 1955, p. 98; NAUMOV, 1960, p. 316, fig. 207.

Material:

St. 626, Tasman Sea (42°10'S, 170°10'E), 2.1. 1952, 610 m depth. – Three large colonies, in height varying between 10 and 15 cm, with a spread of about 10 cm. No gonothecae.

Description:

The colonies consist of a thick and repeatedly branched main stem, 3 mm in diameter at the base and rising from a very dense cluster of hydrorhizal fibres. The ramifications of the hydrocauli are irregular but more or less fan-shaped, though some of the finer branches may be at right angles to the plane of ramification. The hydrocauli and branches are very heavily fascicled, only in the younger parts of the colonies the hydrocauli are not covered by secondary tubes and here the structure of the colony can best be observed.

There are two types of hydrothecae, viz., adnate and free hydrothecae. The adnate hydrothecae, as in *Stegolaria* Stechow, 1913, are alternately directed

left and right; they are more or less tubular, with the apical portion curved outwards. The larger part of the adcauline wall of these thecae is fused with the axis, only part of the (curved) adcauline wall is free. The length of this free part varies greatly and may be as much as half the total length of the adcauline thecal wall to one tenth of that length. There usually is a distinct constriction at the base of each hydrotheca to mark its limitation from the axis. The lateral walls of the hydrothecal aperture are stiffened to form two large, triangular points; in the semicircular ab- and adcauline portions between the teeth the closing membrane is suspended, provided with a number of thickened, longitudinal folds, so that the two membranes can be closed to form a roof-shaped structure over the aperture of the hydrotheca. In many hydrothecae the closing apparatus is damaged or renovated.

The free hydrothecae are shortly stalked; the stak being composed of a single indistinct whorl. The hydrothecae are slightly conical tubes, with the adcauline margin distinctly bulging. The closing apparatus is as in the hydrothecae of the first type. The free hydrothecae originate from the axis opposite the middle of the adcauline wall of each adnate theca; as can distinctly be seen in the young branches the free hydrothecae do not originate from secondary tubes but directly from the axis.

In the older parts of the colonies the primary axis is covered by secondary tubes. Some hydrothecae of the primary axis are lengthened by renovation and still protrude between the secondary tubes. Occasionally free hydrothecae are produced by the secondary tubes; these are sparingly found on the main stem and its ramifications.

There is no diaphragm in the hydrothecae; the hydranths are swollen basally and there they are attached to the thecal wall.

No gonothecae have been observed.

Remarks:

I have compared the "Galathea" specimens with undubitable colonies from Trondheimsfjord, Norway. No distinct differences could be observed, neither in the structure of the colony, nor in the shape of the hydrothecae. The northern Atlantic material usually is densely ramified and consequently fairly bushy and robust; the "Galathea" colonies are gracefully built and more or less fan-shaped.

For the purpose of comparison I have listed below the measurements of the Norwegian and the "Galathea" material:

Fig. 13. *Stegopoma plicatile* (M. Sars), "Galathea" St. 626, monosiphonic fragment of colony. ×30.

Measurements (in microns): –

	Trondheimsfjord IX – 1961	"Galathea" St. 626
Free hydrotheca, total length	950-1,100	950-1,150
diameter	165-220	220-300
length of stalk	60-100	80-120
Adnate hydrotheca, total length	1,200-1,280	1,050-1,200
diameter	200-220	200-300
length of free part adcauline wall	120-480	200-600

Distribution:

This species has pricipally been recorded from the boreal and arctic parts of the Atlantic and Pacific Oceans, where it occurs in deep and moderately deep waters on muddy bottoms (KRAMP, 1935; NAUMOV, 1960). It is particularly common in

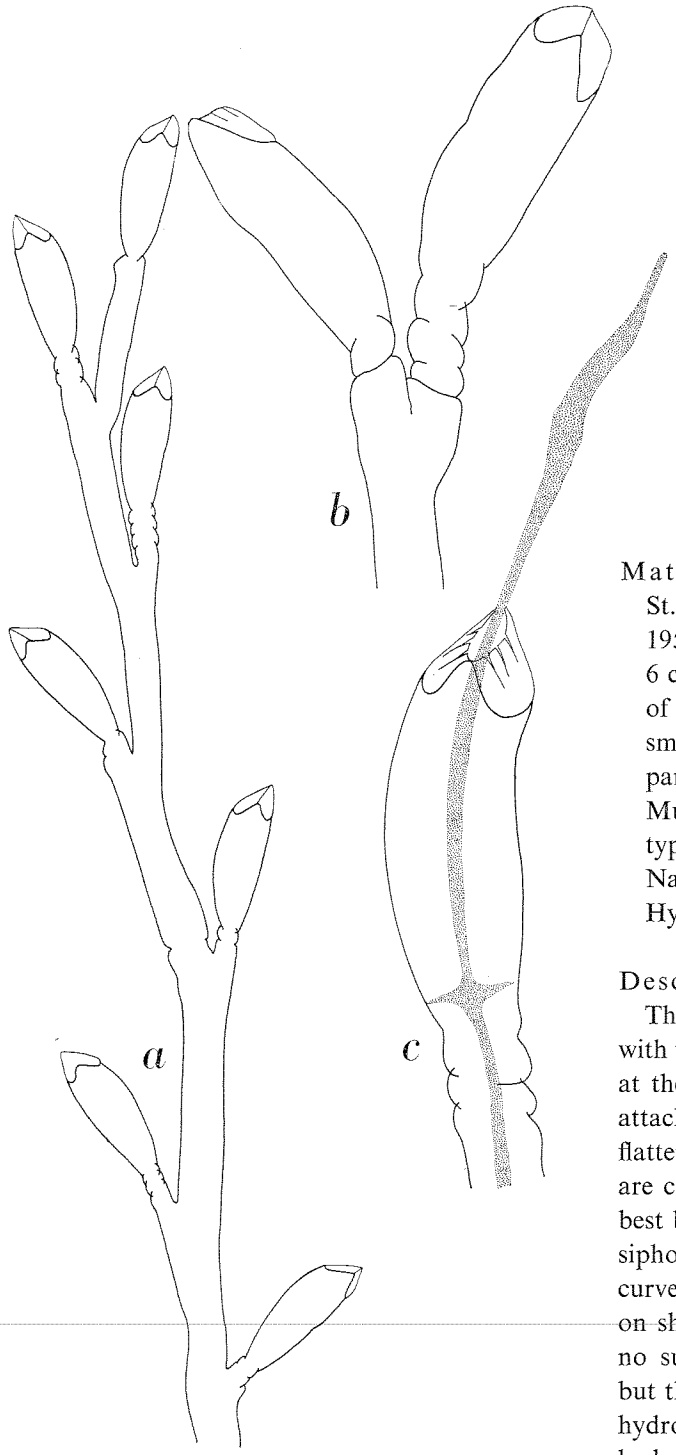

Fig. 14. *Stegopoma bathyale* n. sp., holotype, "Galathea" St. 301. a, monosiphonic fragment of colony; b, two hydrothecae from end of branch; c, hydrotheca with remnant of hydranth. a, ×40; b, ×75; c, ×145.

deeper waters of the Norwegian fjords. As far as I have been abte to ascertain this is the first incidence of its occurrence in the southern Pacific (Tasman Sea off South Island, New Zealand), but TOTTON (1930, p. 155) has recorded the occurrence of the closely allied *Stegopoma fastigiatum* (Alder, 1860) from deep water off Three Kings Islands, New Zealand.

Stegopoma bathyale n. sp.
Fig. 14.

Material:

St. 301, Bay of Bengal (19°30'N, 86°32'E), 25.4. 1951, 1180 m depth. – Two large colonies, one of 6 cm height and 3 cm spread (holotype) and one of 5 cm height and 2.5 cm spread (paratype). Two smaller fragments (paratypes). Holotype and 2 paratypes in the collections of the Zoological Museum of the University, Copenhagen; 1 paratype in the collections of the Rijksmuseum van Natuurlijke Historie, Leiden, the Netherlands. Hydranths poorly preserved; no gonothecae.

Description:

The colonies are of a sympodial type of growth, with the polysiphonic mainstem about 1.5 mm thick at the base. One of the colonies (the holotype), is attached to a fragment of wood by means of a flattened mass of hydrorhiza fibres. The hydrocauli are conspicuous. The structure of the colonies can best be described starting with the younger, monosiphonic parts. Here the monosiphonic stems are curved in zig-zag fashion, the hydrothecae are found on short pedicels at each bent (Fig. 14a). There is no subdivision of the hydrocauli into internodes, but there may be a few very indistinct rings on the hydrocaulus, slightly above the insertion of the hydrothecae. The arrangement of the hydrothecae and the structure of the monosiphonic hydrocauli strongly reminds of such species of *Laomedea* as *L. dichotoma, L. geniculata,* etc. In the older parts of the colonies the hydrocauli are soon covered by secondary tubes and there have a strongly fascicled appearance. The arrangement of the hydrothecae then also becomes obscured.

The hydrothecae are more or less tubular, with a slightly bulging adcauline wall and almost straight

abcauline wall; they are attached to the hydrocauli by means of stalks of variable length, though usually short and composed of 1 to 5 irregular rings. The closing apparatus of the hydrothecae is as in the other species of *Stegopoma;* the hydrothecal border is produced into two blunt teeth, between the teeth the ad- and abcauline distal wall of the theca forms a semi-circular depression. The closing membranes are spread in the semi-circular depressions and between the teeth; they contain a number of longitudinal thickened strips. In closed condition the closing apparatus forms a roof-like structure over each theca and the strips are next to invisible. In some of the hydrothecae the two membranes have been pressed aside by the remnants of the hydranth and here the fine strips are just visible. The closing apparatus in this species seems to be very brittle and can be seen in perfect condition on some of the hydrothecae only. There is no diaphragm in the hydrothecae; the hydranths are attached to the internal thecal wall slightly above the origin of the stalk; here the body of the hydranth forms a flattened plate. Judging from the remnants of the hydranth these could greatly be extended.

No gonothecae have been observed.

Measurements (in microns): –

	"Galathea" St. 301
Hydrothecae, total length	375-450
diameter	110-150
length of stalk	65-200
diameter of stalk	80-100

Remarks:

The following species of *Stegopoma* have so far been described: *S. fastigiatum* (Alder, 1860, as *Campanularia fastigiata); S. plicatile* (M. Sars, 1863, as *Lafoea plicatilis* = *Stegopoma caricum* Levinsen, 1893); *S. operculata* (Hartlaub, 1904, as *Lictorella (?) operculata); S. gilberti* Nutting, 1905; *S. gracilis* Nutting, 1905, and *S. plumicola* Nutting, 1905. Sympodial colonies of a type comparable to that of the present new species only occur in *S. plicatile* and *S. operculata. S. bathyale* approaches *S. operculata* closely in the shape of the hydrothecae, but the structure of the colonies is much more irregular. A comparison of the shape of the hydrothecae as this appears from HARTLAUB's (1904, pl. 1, figs. 6, 7) and VANHÖFFEN's (1910, fig. 30) drawings shows distinct differences in detailed structure, as e.g., the blunt hydrothecal teeth in *S. bathyale* and the distinctly bulging adcauline thecal wall of this species. *S. operculata,* however, is based on a very poor fragment; it may, on reinspection, turn out to be identical with *S. plicatile.*

The present new species originates from deep water of the Bay of Bengal, probably occuring there on fixed objects, as e.g., pieces of decaying wood.

The specific name *bathyale* has been derived from the greek word bathys = deep.

FAMILY LAFOEIDAE

Acryptolaria conferta australis (Ritchie, 1911)
Fig. 15.

Cryptolaria conferta var. *australis* Ritchie, 1911, p. 826, pl. 84, fig. 2 and pl. 87, fig. 1.

Acryptolaria conferta var. *australis,* TOTTON, 1930, p. 163, fig. 19 c-e; RALPH, 1958, p. 315, fig. 4 a-g; REES & THURSFIELD, 1965, pp. 82, 194.

Acryptolaria conferta australis, MILLARD, 1964, p. 9, fig. 1 d, f, g.

Material:

St. 601, Tasman Sea (45°51'S, 164°32'E), 14.1. 1952, 4400 m depth. A fragment of 18 mm length. No hydranths, no coppiniae.

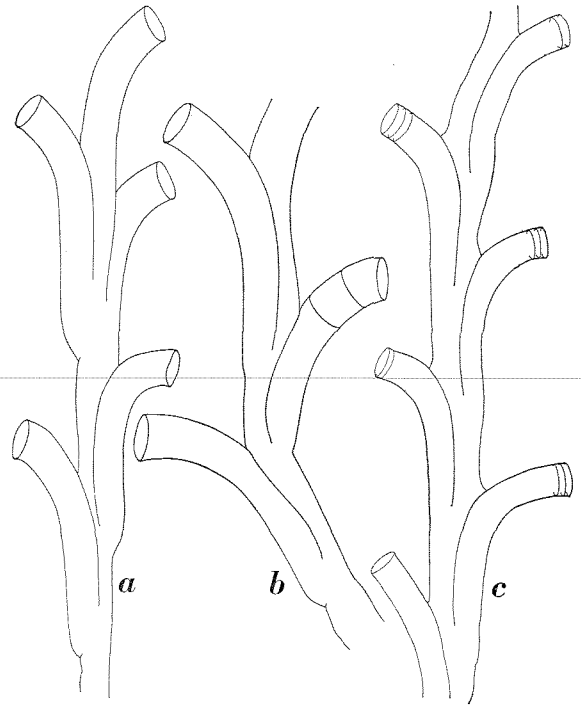

Fig. 15. *Acryptolaria conferta australis* (Ritchie). a, b, "Galathea" St. 610, two fragments from monosiphonic part of colony. c, schizosyntype, "Thetis" St. 42 (Brit. Mus., 1964. 8.7.55), monosiphonic fragment. a, b, ×27; c, ×22.

Description:

The fragment is largely monosiphonic, the proximal part of the stem is covered with some secondary tubes; there are no branches. The hydrothecae are tubular, slightly widening from the base onward, and adnate to the stems with their adcauline walls for the greater part of their length. They are alternately arranged and fairly widely spaced (Fig. 15a, b); the base of each theca lies at about half the length of the preceding hydrotheca. The hydrothecae curve gracefully outwards; in some cases they are abruptly curved. Some of the thecae only show renovations. I have listed below the measurements of the fragment along with those of South African material, taken from MILLARD's (1964) paper.

Measurements (in microns): –

	South Africa (MILLARD, 1964)	"Galathea" St. 601
Hydrotheca, length adnate part adcauline wall	670-950	650-810
free part adcauline wall, incl. renovations	200-550	450-540
diameter at base	110-140	120-165
diameter at margin	190-260	175-210
diameter, margin/base	1.54-2.18	1.35-1.45

Remarks:

Though only a fragment, the specimen agrees better with the description of the subspecies *australis* than with that of the nominal subspecies. The differences between the two subspecies, however, are small and it does not appear unlikely that these will be bridged by the discovery of intermediate specimens.

A. conferta australis has originally been described from off Wata Mooli, New South Wales, Australia (RITCHIE, 1911, type locality, 52-78 fms. = 97-143 m). Additional specimens have been recorded by TOTTON (1930) from off Three Kings Islands, New Zealand, at 300 fms. (= 579 m) depth, and by RALPH (1958) from Bay of Plenty, Mayor Island, New Zealand (50-100 fms. = 91-183 m) and from the Catham Island area, New Zealand (130-230 fms. = 241-424 m). MILLARD (1964) lists specimens from the South African coast, roughly from the area between 34°-35°S and 19°-24°E, 110-188 m depth. The present record is from very deep water to the west of southern New Zealand.

The syntypes and paratypes of this subspecies are in the Australian Museum, Sydney (REES & THURSFIELD, 1965, p. 194). I have been able to compare the "Galathea" specimen with schizosyntypes and schizoparatypes in the British Museum (Nat. Hist.) and the Royal Scottish Museum, Edinburgh (REES & THURSFIELD, 1965, p. 82), with which the "Galathea" specimens agree in all details. A drawing of the schizosyntype in the British Museum (1964.8.7.55) is included in the present report (Fig. 15c). This specimen originates from the "Thetis" Expedition, St. 42, 6-8 ½ miles off Wata Mooli, New South Wales, Australia, 13.3.1898, 70-78 fms. (= 128-143 m) depth. The measurements (in microns) of this specimen are:

	"Thetis" St. 42
Hydrotheca, length adnate part adcauline wall	600-635
free part adcauline wall, incl. renovations	215-295
diameter at base	85-125
diameter at margin	125-135
diameter, margin/base	1.47-1.59

Acryptolaria angulata (Bale, 1914)
Figs. 16 and 17.

Cryptolaria angulata Bale, 1914a, p. 166, pl. 35, fig. 1; BALE, 1915, p. 251.

Material:

St. 188, off Durban (29°55'S, 31°13'E), 2.2.1951, 495 m depth. – A fragment of 20 mm length. No hydranths, gonosome absent.

St. 196, off Durban (29°55'S, 31°20'E), 13-14.2.1951, 425-430 m depth. – Three fragments of 8-25 mm length. Badly preserved hydranths, no gonosome.

Description:

The stems are erect and largely monosiphonic; there are some accessory tubes at the basal parts of some of the hydrocauli and some short hydrorhizal fibres. The hydrothecae are alternately arranged and fairly widely spaced; the base of the following hydrotheca is at the level of the aperture of the predecessor. The more or less tubular thecae are adnate for about half their length; they bend abruptly from the hydrocaulus at about half their length. The abcauline thecal wall, at the region of the bent, is uneven, suggesting that the apical part of the hydrotheca was originally curved at right angles to the basal portion and afterwards forced upwards. The resulting shape of the hydrotheca can best be judged from Fig. 16. The hydrotheca differs from BALE's original description by the complete absence of a peridermal thickening of the adnate part of the thecal wall slightly below the

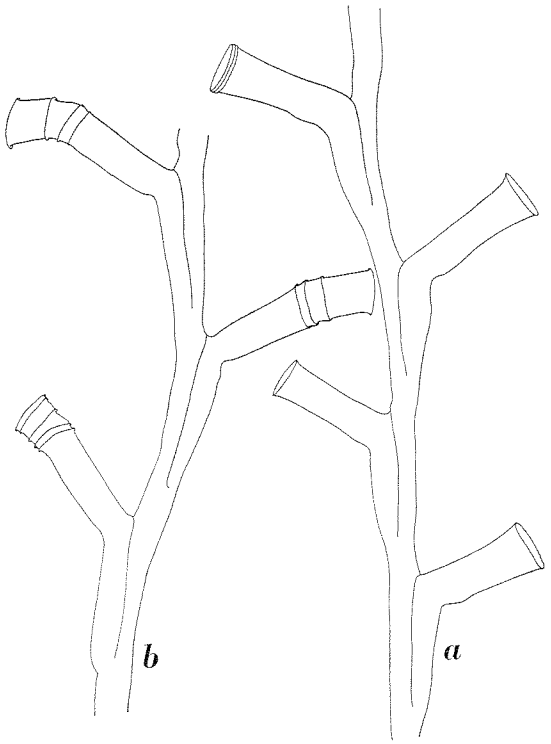

Fig. 16. *Acryptolaria angulata* (Bale). a, "Galathea" St. 188, monosiphonic fragment; b, "Galathea" St. 196, monosiphonic fragment. ×27.

axil of theca and hydrocaulus. They are, as in BALE's specimen, slightly everted at the aperture. Those from St. 188 are scarcely renovated; the thecae from St. 196 are repeatedly renovated.

Measurements (in microns): –

	"Galathea" St. 188	"Galathea" St. 196
Hydrotheca, length adnate part of adcauline wall	520-600	400-560
length free part adcauline wall (including renovations)	560-600	650-800
diameter at aperture	180-220	200-210

Remarks:

In spite of the absence of the peridermal thickening of the adnate part of the thecal wall there can be not doubt that the present specimens represent BALE's *Cryptolaria angulata*. The species clearly belongs in the genus *Acryptolaria* as defined by TOTTON (1930, p. 161) and RALPH (1958, p. 312). The species so far has only been recorded from the Great Australian Bight (the original type locality is not specified but a further locality is given as 127° 20'E), between 100 and 180 fms. (= 183-329 m) depth. The present records establish the presence of this species off the east coast of South Africa.

I have compared the "Galathea" material with a slide in the British Museum (Nat. Hist.) (1919.10.14. 47) bearing the label "*Cryptolaria angulata* Bale, Great Australian Bight, Endeavour, 1913". This is probably a schizosyntype or schizoparatype of BALE's species. The fragment on the slide, 18 mm high with a spread of 17 mm, is a part of an irregularly branched colony, probably larger and older than the "Galathea" colonies. The hydrocauli all are more or less polysiphonic, so that the basal parts of all hydrothecae have become covered by secondary tubes (Fig. 17). There is, however, great conformity in the general shape of the hydrothecae between the "Galathea" specimens and this fragment. Here, nevertheless, the hydrothecal periderm is thicker and at the bent in the abcauline hydrothecal wall there is a distinct peridermal thickening as is also, but less distinctly, present on the opposite (adcauline) side. The hydrothecal margin is circular and there are many renovations.

The measurements (in microns) are:

	B. M. 1919.10.14.47
Hydrotheca, length adnate part of adcauline wall	560-660
length free part adcauline wall (including renovations)	480-700
diameter at aperture	180-200

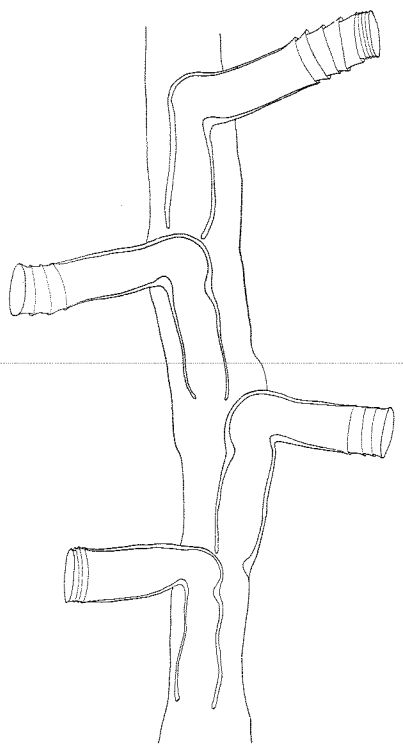

Fig. 17. *Acryptolaria angulata* (Bale), Great Australian Bight (Brit. Mus., 1919. 10.14.47), polysiphonic fragment. ×30.

Cryptolarella abyssicola (Allman, 1888)
Figs. 18-20.

Cryptolaria abyssicola Allman, 1888, p. 40, pl. 18, figs. 2, 2a.

Cryptolarella abyssicola, STECHOW, 1913, p. 138; STECHOW, 1913a, p. 29; KRAMP, 1951, p. 121, pl. 1, figs. 1-3.

Cryptolaria diffusa Allman, 1888, p. 42, pl. 21, figs. 1, 1a.

Cryptolaria humilis Allman, 1888, p. 39, pl. 18, figs. 1, 1a, 1b; BROWNE, 1907, p. 29.

Material:

St. 450, Celebes Sea (1°50'N, 119°20'E), 21.8. 1951, 4940-4970 m depth. – Many (30-40) colonies on 5 worm tubes. Colonies scarcely branched, 20-30 mm long, basally polysiphonic, with remnants of hydranths and some empty gonothecae.

St. 574, Tasman Sea (39°45'S, 159°39'E), 18.12. 1951, 4670 m depth. – Three colonies, 3-4 cm high, on pebbles. Hydrocauli irregularly branched, polysiphonic. No hydranths; some empty gonothecae present. One very young colony on an Antipathariid.

St. 575, Tasman Sea (40°11'S, 163°35'E), 19.12. 1951, 3710 m depth. – About 10, up to 5 cm high colonies from a hydrorhizal mass creeping on a worm tube. Hydranths and some gonothecae are present.

St. 599, Tasman Sea (45°47'S, 164°39'E), 13.1. 1952, 4390 m depth. – Numerous, up to 5 cm high, branched colonies with a polysiphonic hydrocaulus, rising from fine hydrorhiza fibres creeping on worm tubes. Hydranths present. No gonothecae.

St. 601, Tasman Sea (45°51'S, 164°32'E), 14.1. 1952, 4400 m depth. – A very large number of irregularly branched colonies without substratum. Hydrocauli only basally polysiphonic. Hydranths and gonothecae present. The colonies vary in colour from a deep, dark brown to a light horny yellow.

St. 665, Kermadec Trench (36°38'S, 178°21'E), 25.2.1952, 2470 m depth. – Five up to 3 cm high colonies from a hydrorhizal mass creeping on a small twig. Some gonothecae are present.

Description:

The hydrocaulus is irregularly branched, slightly feather-like in some of the colonies on worm tubes,

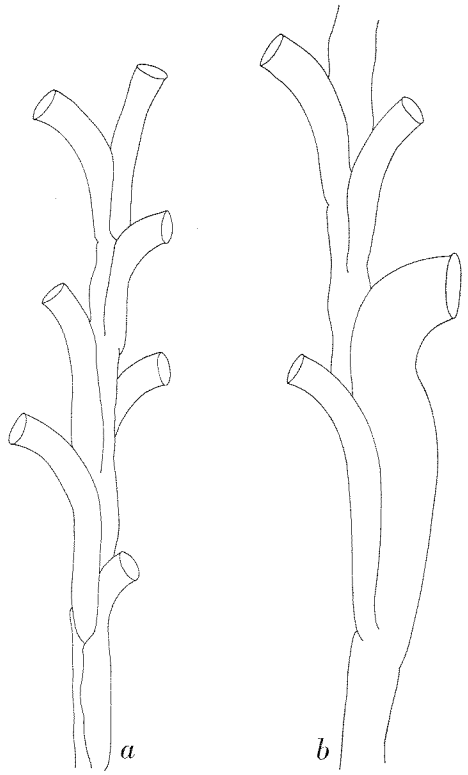

Fig. 18. *Cryptolarella abyssicola* (Allman), "Galathea" St. 450. a, monosiphonic fragment; b, monosiphonic fragment with gonotheca. ×20.

very irregular in several others, and then forming loosely intertwined, more or less bushy colonies with a scarcely distinguishable mainstem. The hydrocauli are monosiphonic in the higher parts of the colonies, but they are covered by a large number of thin accessory tubes in the lower parts of the colonies. The hydrothecae are tubular and arranged on all sides of the hydrocauli, though in some colonies they are more or less alternately arranged or show an indistinct, quadrilateral arrangement. They are adnate with a major part of the adcauline wall, moreover, they are sunken into the hydrocauli; the basal parts becoming rapidly covered with the accessory tubes. The adnate part is usually longer than half the thecal length, but by repeated renovations of the theca the free part may become much longer than the adnate part. The distance between consecutive thecae is variable, but usually the following theca begins at the level of the axil of the previous theca. The free part of the thecae initially gracefully curves away from the basal part, but the renovated part may greatly alter the shape of the theca. Particularly in the polysiphonic parts of the hydrocauli strongly curved thecae are quite common. The colonies from St. 450 are remarkable by

the fact that practically no renovations have occurred, so that the free part of the hydrothecae is short (Fig. 18a); in all the other colonies there are repeated renovations of the hydrothecae, reaching an extreme degree in the colonies from St. 665.

Gonothecae of the shape described by ALLMAN (1888) and KRAMP (1951) are present in many colonies. Though STECHOW (1913, p. 138) does not seem to doubt the fact that the flask-shaped bodies described by ALLMAN really represent the gonothecae, there is still no complete certainty, as no author ever described the contents of the "gonothecae". The fact that the "gonothecae" of *Cryptolarella* are so absolutely different from those observed in the coppinia of the evidently closely allied genus *Acryptolaria* cannot be neglected. In the "Galathea" specimens of *C. abyssicola* "gonothecae" occur in practically all colonies; they are flask-shaped bodies, the basal part usually invested by the secondary tubules, the apex drawn out into a short, curved neck with a circular aperture (Fig. 18b). None of the gonothecae inspected contained gonophores; the periderm of the gonotheca seems to be decidedly more brittle than that of the rest of the colony, as the "gonothecae" easily desintegrate when the colonies are inspected. The gonothecae, moreover, have a transversally ribbed structure.

The material from St. 574 includes a very youthfull colony creeping on an Antipathariid. The (few) hydrothecae are tubular, slightly narrower than in the adult stage, the basal portion is slightly curved and inserts directly on the hydrorhiza. Each theca has 2 or 3 renovations (Fig. 19b).

Measurements (in microns): –

	"Galathea" St. 450	"Galathea" St. 574
Hydrothecae, length adnate part adcauline wall	800-1,200	800-1,000
length free part adcauline wall (including renovations)	400-800	600-1,400
diameter at aperture	160-200	165-205
Gonotheca, total length	2,200-2,400	
diameter of aperture	400-420	

Remarks:

ALLMAN's type of *Cryptolaria abyssicola* in the British Museum (Nat. Hist.) (1888.11.13.26), from "Challenger" St. 160, 42°42'S, 134°10'E, South of Australia, 2600 fms. (= 4755 m) depth, is a much fragmented colony, with a broken, polysiphonic mainstem and very irregularly distributed, polysiphonic side-branches. There is perfect agreement in the shape of the hydrothecae between the "Galathea" specimens and the type (Fig. 20a). Several

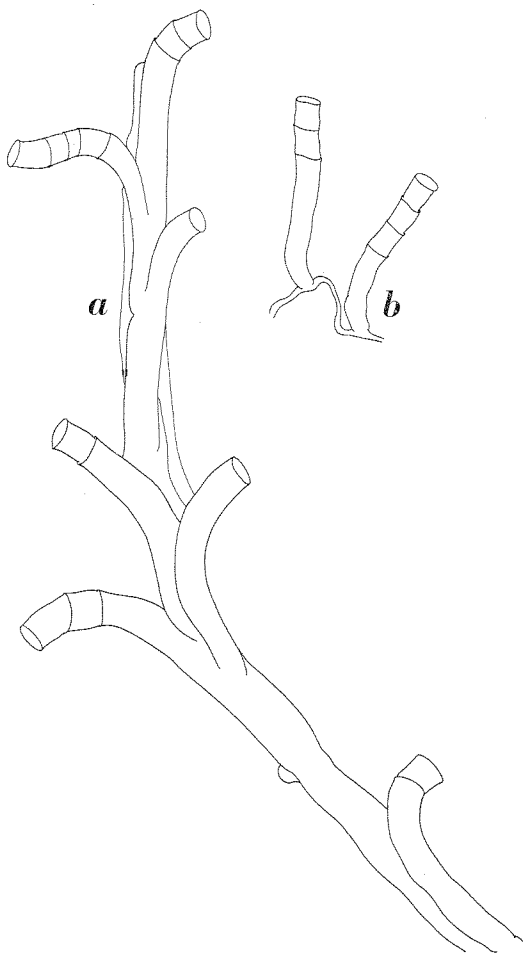

Fig. 19. *Cryptolarella abyssicola* (Allman), "Galathea" St. 574. a, slightly polysiphonic fragment; b, very young colony. ×30.

gonothecae are present, but the contents have disappeared. The measurements of the type are listed below.

I have included ALLMAN's *Cryptolaria diffusa* Allman (1888, p. 42, pl. 21, figs. 1, 1a) into the synonymy of the present species. ALLMAN's type from "Challenger" St. 101, off Sierra Leone, is still present in the British Museum (1888.11.13.32); it is a spirit specimen, which by now is completely unrecognizable, being apparently dried out formerly. The shape of the colony still resembles ALLMAN's figure (1888, pl. 21, fig. 1), but no hydrothecae are visible, the apical parts are completely lost. On some of the branches bodies are discernable that could represent the gonothecae, though their apical parts have disappeared. They are almost certainly worm tubes. The species can therefore only be recognized now from ALLMANN's figures and from these it appears that the differences with *C. abyssicola* are slight. The only difference that can be demon-

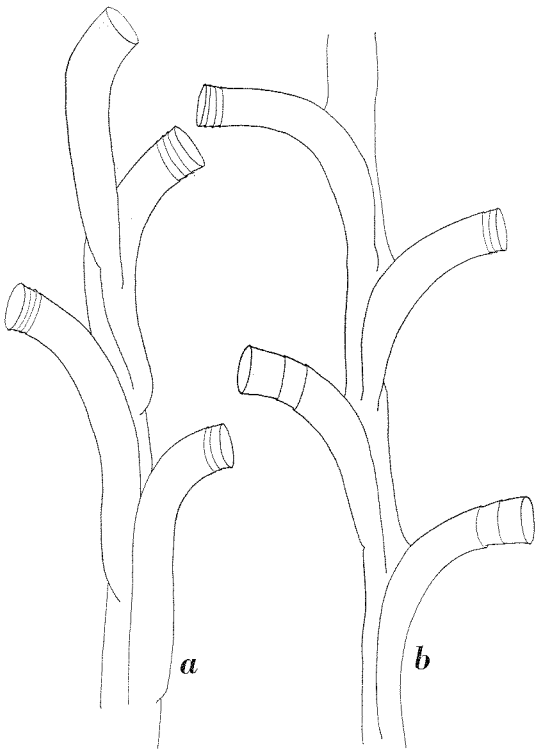

Fig. 20. a, *Cryptolarella abyssicola* (Allman), holotype, "Challenger" St. 160 (Brit. Mus., 1888.11.13.26), monosiphonic fragment. b, *Cryptolaria humilis* Allman, Bay of Biscay, E. T. BROWNE collection, monosiphonic fragment. ×70.

strated is the presence of (probably a single pair of) adnate gonothecae in *C. diffusa* (KRAMP, 1951, p. 122), which may be quite incidental. I am fully convinced that *C. abyssicola* and *C. diffusa* are identical.

The collection of the British Museum also contains a spirit specimen of the type of *Cryptolaria humilis* Allman (1888, p. 39, pl. 18, figs. 1, 1a, 1b) (1888.11.13.25, "Challenger" St. 73, near Azores, 38°30'N, 31°14'W, 1000 fms. (= 1829 m) depth). This is a 20 mm high colony with a 0.6 mm thick, polysiphonic mainstem with a basal patch of hydrorhiza fibres. It is still much as it was figured by ALLMAN, but nearly all the hydrothecae have disappeared, with the exception of some at the end of the monosiphonic branches. These are undistinguishable from those of *C. abyssicola*. *C. humulis* has subsequently been recorded by BROWNE (1907, p. 29) from the Bay of Biscay, 48°07'N, 8°13'W, 412 fms. (= 754 m) depth. A slide of BROWNE's material is in the E.T.Browne collection; I have studied this slide in the British Museum and part of it has been figured (Fig. 20b). I cannot possibly separate this specimen from *C. abyssicola*, though BROWNE seems to have been inclined to synonymize *C. humilis* with *Acryptolaria conferta* Allman, 1877. The measurements of BROWNE's material are listed below:

	C. abyssicola "Challenger" type	*C. humilis* Bay of Biscay
Hydrotheca, length adnate part adcauline wall	800-1,000	600-700
length free part adcauline wall (including renovations)	720-900	560-900
diameter at aperture.....	180-200	160-180

C. abyssicola has originally been recorded from very deep water of the South Australian Basin, 42°42'S, 134°10'E (ALLMAN, 1888, 2600 fms.); further Pacific localities now discovered by the "Galathea" are in the Celebes Sea (St. 450), the Tasman Sea (Sts. 574, 575, 599 and 601) and the Kermadec Trench (St. 665). Undubitable Atlantic material has been described by KRAMP (1951) from deep water of the northern temperate Atlantic (40°33'N, 35°24'W – 40°34'N, 35°52'W, 4540-4600 m depth).

The "Galathea" material is identical in every respect with Atlantic specimens described by KRAMP (1951, p. 121); the hydrothecae in KRAMP's material having only few renovations.

Cryptolarella contorta (Nutting, 1905)
Fig. 21.

Lafoëa contorta Nutting, 1905, p. 945, pl. 3, fig. 6 and pl. 9, figs. 8, 9.

Material:

St. 716, off Costa Rica (9°23'N, 89°32'W), 6.5. 1952, 3570 m depth. – Small colony creeping on a calcareous worm tube, exclusively consisting of hydrothecae directly rising from creeping hydrorhizal fibres.

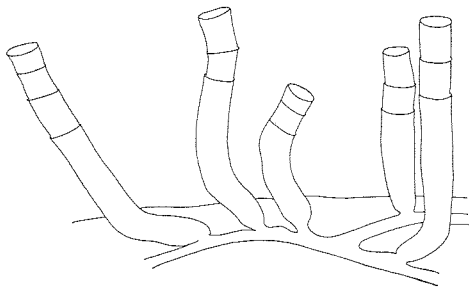

Fig. 21. *Cryptolarella contorta* (Nutting), "Galathea" St. 716, creeping hydrorhiza and some hydrothecae. ×20.

Description:

The hydrothecae rise directly from a fairly thick mat of thin hydrorhiza fibres, completely investing a calcareous worm tube. The hydrothecae are tubular, with the basal portion usually in contact with the mat of hydrorhiza fibres or the substratum, curving upwards abruptly, the apical portion with many renovations. The aperture is circular and it is not flaring. No hydranths have been observed.

Measurements (in microns): –

Hydrotheca, total length (including renovations)	800-1,800
diameter at aperture	220-300
Hydrorhiza, diameter	80-120

Remarks:

Though no measurements are given in the description there can, in my opinion, be no doubt that the present specimen is conspecific with NUTTING's *Lafoëa contorta* (Nutting, 1905, p. 945, pl. 3, fig. 6 and pl. 9, figs. 8, 9). This is not a *Lafoea* but a species of *Acryptolaria* or *Cryptolarella,* as is clearly demonstrated by NUTTING's figure (pl. 9, fig. 9). I have used the generic name *Cryptolarella* for NUTTING's species exclusively because the "Galathea" specimen is very near to the young specimen of *Cryptolarella abyssicola* from St. 574, the principal difference being the slight difference in size.

Distribution:

NUTTING's records of *Lafoëa contorta* are from north of Laysan Islands, Hawaii (59 fms., 108 m) and from between the islands Maui and Molokai, Hawaii (122 fms., 223 m). The present record is from very deep waters of the tropical western Pacific.

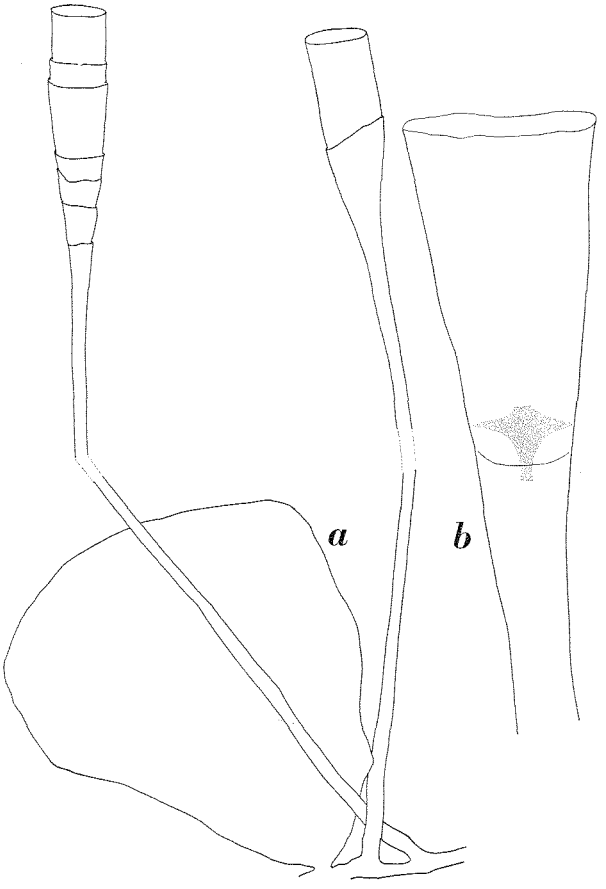

Fig. 22. *Halisiphonia galatheae* Kramp, "Galathea" St. 450. a, fragment of colony with two hydrothecae and gonotheca. b, hydrotheca with remnant of hydranth. a, ×20; b, ×55.

Halisiphonia galatheae Kramp, 1956
Figs. 22 and 23.

Halisiphonia galatheae Kramp, 1956, p. 17, fig. 3.

Material:

St. 450, Celebes Sea (1°50'N, 119°20'E), 21.8. 1951, 4940-4970 m depth. – A large number of hydrothecae and some gonothecae rising from a stolon creeping on a worm tube.

Description:

The hydrothecae, borne on slender pedicels, rise directly from a fine network of thin hydrorhiza fibres, completely investing some worm tubes. The pedicels are long and delicate; the periderm is almost smooth, some indistinct rings or wrinkles may occur along its length. Basally the pedicels do not widen. They very gradually widen into the funnel-shaped hydrothecae; there is no distinct demarcation between pedicel and theca. The hydrothecal margin is not everted, in some thecae it is smooth; in others, apparently as a result of damage, it is torn. Many thecae have repeated renovations; by this process of renovation they have the appearance of a number of tooters telescoped together, the basal periderm being fairly thick and opaque. Other hydrothecae have a single renovation and are almost hyaline. Some of such thecae have remnants of hydranths, attached to the internal thecal wall by means of a flattened portion of the body of the hydranth; the hydrothecal border shows no internal thickening. In some thecae there is an extremely delicate membrane basally of the place of attachment, in some thecae present as a hollowed meniscus, in others as a tight membrane. It may represent a very thin diaphragm.

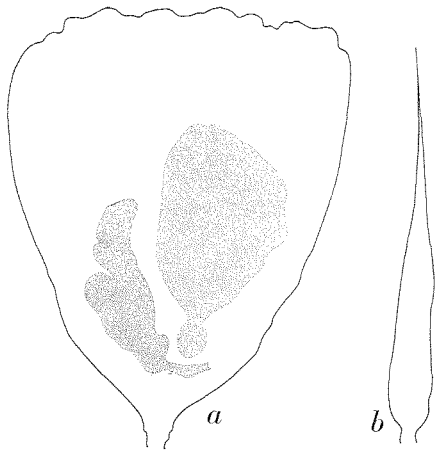

Fig. 23. *Halisiphonia galatheae* Kramp, "Galathea" St. 450. a, gonotheca, frontal view; b, gonotheca, lateral view. ×20.

The gonothecae are strongly compressed, fan-shaped structures, strongly resembling egg capsules of Gastropoda. Basally they are rounded and attached to the hydrorhiza by means of a very short stalk. Apically they thin out very gradually, the periderm becoming more or less transparent and frayed. Unfortunately the contents of the gonothecae are badly preserved, but their are 1 to 3 flattened, circular buds. There is a narrow slit between the frayed edges of the gonotheca, through which the contents of the gonotheca can be removed.

Measurements (in microns): –

	"Galathea" St. 649 (KRAMP, 1956)	"Galathea" St. 450
Pedicel, total length	20,000-25,000	8,000-15,000
diameter	80	120-140
Hydrotheca, total length	1200	1,200-1,600
diameter at "diaphragm"		150-175
diameter at aperture	400	320-370
Gonotheca, total length		2,800-3,000
total width		2,200-2,400
thickness at base		300-350

Remarks:

This species can be easily recognized from KRAMP's description (1956, p. 17); the type locality is the Kermadec Trench ("Galathea" St. 649, 35° 16′S, 178°40′W), where it was obtained between 8210 and 8300 m depth. The pedicels, in KRAMP's material, have been even longer than in the present specimens from the Celebes Sea. No gonothecae have been described by KRAMP; those in the present material tally well with those of *Halisiphonia megalotheca* Allman (1888, p. 31, pl. 16, figs. 1, 1a), though in *H. galatheae* they are broader and more compressed.

A single slide in the British Museum (Nat. Hist.) (1888.11.13.20) from "Challenger" St. 160, South of Australia, 42°42′S, 134°10′E, 2600 fms. (= 4755 m) depth, is probably all there is left of ALLMAN's type of *H. megalotheca*. It consists of two completely empty hydrotheca and one empty gonotheca. The hydrothecae have no renovations and appear to have thicker periderm. There is a distinct peridermal ring in the basal part of the hydrotheca and a very fine line may indicate the presence of an extremely thin diaphragm, though I am by no means certain of its existence. Both hydrothecae are shortly stalked, the stalk being about as long as the hydrotheca and completely smooth. The gonotheca has the shape of the young gonothecae in *H. galatheae*; they are strongly flattened. No contents are present. The measurements of the type (in microns) are:

	South of Australia ("Challenger" type)	
Pedicel, total length	1,300	2,010
diameter	160	170
Hydrotheca, total length	2,100	2,600
diameter at "diaphragm"	160	140
diameter at aperture	640	660
Gonotheca, total length	2,200	
total width	1,160	
thickness at base	610	

The hydrothecae in *H. megalotheca* are shortly stalked and larger than those of *H. galatheae;* it

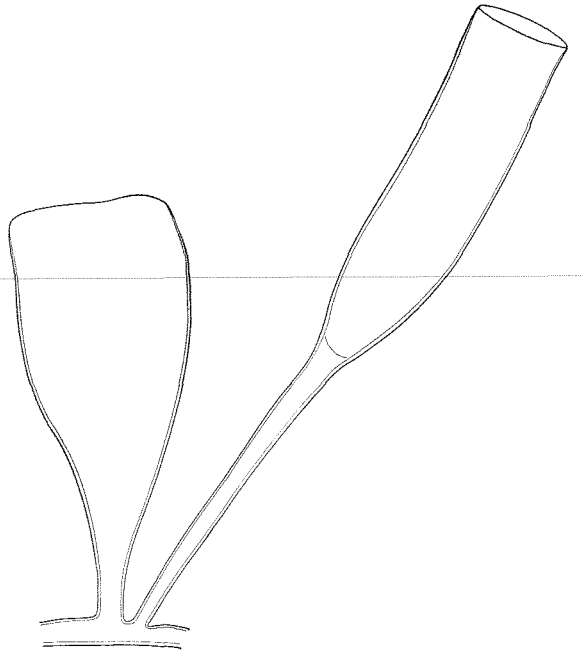

Fig. 24. *Halisiphonia megalotheca* Allman, holotype, "Challenger" St. 160 (Brit. Mus., 1888.11.13.20), hydrotheca and gonotheca. ×20.

seems best to keep both species separate, at least for the time being.

Additional material of *H. megalotheca* has been described by STECHOW (1925) from the southern Indian Ocean, 38°40'S, 77°38.6'E, at 672 m depth.

Hebella cylindrica (von Lendenfeld, 1885) var. ***elongata*** Billard, 1942
Fig. 25.

Hebella cylindrica var. *elongata* Billard, 1942, p. 67, fig. 1.

Material:

St. 716, off Costa Rica (9°23'N, 89°32'W), 6.5. 1952, 3570 m depth. – Three hydrothecae rising from a stolon creeping on a Bryozoan. No gonothecae.

Description:

The three hydrothecae rise from a very thin (45 μ thick) hydrorhiza, creeping on the zooids of a Bryozoan. The periderm of the fully adherend hydrorhiza is irregularly wrinkled and thin; there are no internal septa. The three hydrothecae, only one of which is undamaged, are deeply campanulate, with a smooth, almost cylindrical wall, the basal part gradually narrowing and only very slightly swollen; though this character is variable in the three hydrothecae present none of them has the rounded and swollen basal portion usually observed in *Hebella scandens* (Bale, 1888) and *Hebella cylindrata* Marktanner-Turneretscher, 1890. The aperture of the hydrotheca is circular, the margin is slightly but distinctly everted. The undamaged hydrotheca has a small, completely contracted hydranth with about 12 tentacles. There is no diaphragm in the basal part of the theca; the hydranth is attached to the internal thecal wall by means of a disk-shaped widening; the place of attachment to the internal thecal wall is marked by a few very fine puncta. The hypostome of the hydranth is globular. The only undamaged hydrotheca has a total length of 1,320 μ and a diameter of 440 μ.

There is practically no stalk attaching the hydrotheca to the hydrorhiza; the connecting portion is quite smooth.

Remarks:

I have compared the present specimen with descriptions and drawings of the various species of *Hebella* Allman, 1888, and I find that it tallies best

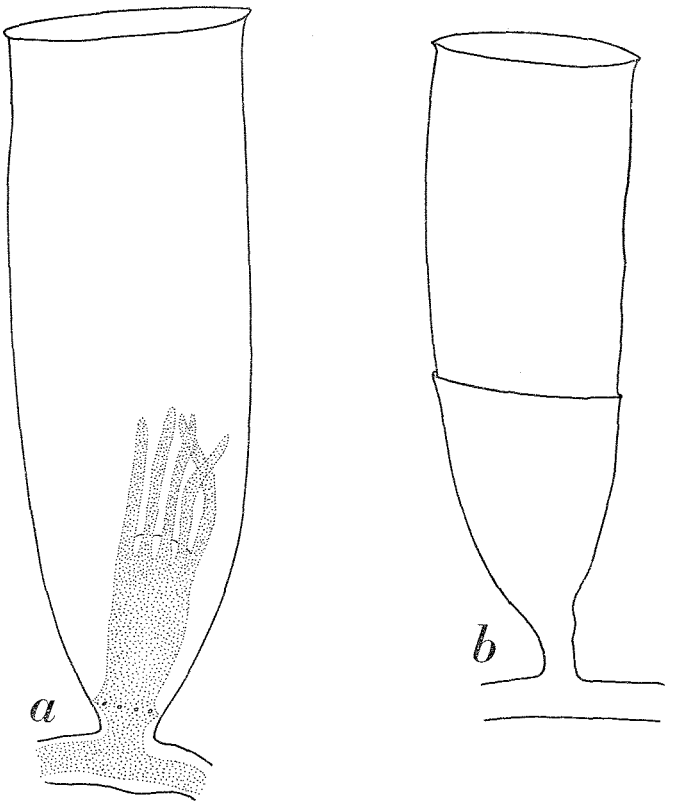

Fig. 25. *Hebella cylindrica* var. *elongata* Billard, "Galathea" St. 716. a, hydrotheca with contracted hydranth; b, renovated hydrotheca. ×72.

with BILLARD's *H. cylindrica* var. *elongata,* though in the figured specimen of this variety (BILLARD, 1942, fig. 1) the basal portion of the hydrotheca is slightly more swollen than in the thecae figured here (Fig. 25). BILLARD's specimens measured 695 to 1,005 μ hydrothecal length, with a diameter of 280-345 μ. Both shortly stalked and stalked hydrothecae have been present in BILLARD's material, which originated from the Kei Islands in the eastern part of the Malay Archipelago, occurring on *Sertularella moluccana* (von Campenhausen, 1896). The present specimens are from very deep water of the eastern Pacific.

Hebella ritchiei Vervoort, 1959
Fig. 26.

Lafoëa tenellula Ritchie, 1911, p. 820, pl. 88, fig. 5.
Hebella ritchiei Vervoort, 1959, p. 244, fig. 17; REES & THURSFIELD, 1965, pp. 74, 197.

Remarks:

This species has first been mentioned by RITCHIE (1911) from the coast of New South Wales; he

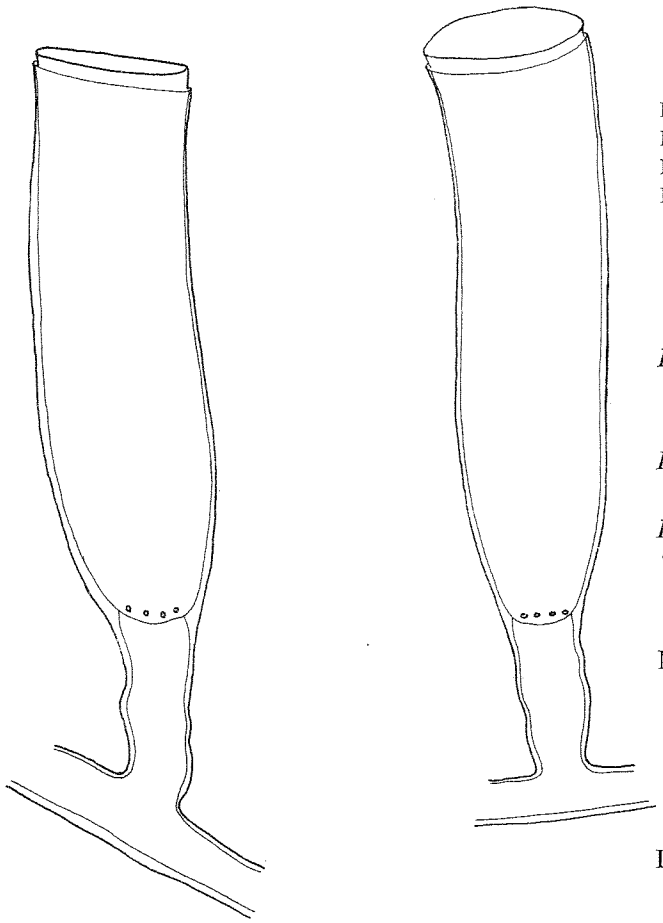

Fig. 26. *Hebella ritchiei* Vervoort, schizolectotype, "Thetis" St. 57 (Brit. Mus., 1964.8.7.43), two hydrothecae. ×210.

wrongly identified his material with *Lafoea tenellula* Allman (1877, p. 12, pl. 8, figs. 3, 4). Additional material was obtained during the Atlantide Expedition at St. 45, 9°23'N, 15°07'W, a sterile colony on *Hincksella cylindrica* (Bale, 1888). RITCHIE's material has subsequently been indicated by REES and THURSFIELD (1965, p. 75) as the lectotype; the Atlantide material is here designated as the paralectotype, preserved in the Zoological Museum of the University, Copenhagen. One schizoparalectotype slide is in the collection of the Rijksmuseum van Natuurlijke Historie, Leiden, the Netherlands.

I have been able to compare the "Atlantide" material with RITCHIE's schizolectotype slides from the Royal Scottish Museum and the British Museum (Nat. Hist.), with which it is in complete agreement. The slide in the British Museum (1964.8.7.43), from the "Thetis" Expedition, St. 57, 3½-4 miles off Wata Mooli, 22.3.1898, 54-59 fms. (= 99-108 m) depth, has been figured (Fig. 26); the measurements (in microns) are:

	"Thetis" St. 57 B. M. 1964 8. 7. 43
Length of hydrotheca (puncta-margin)	340-360
Length of pedicel (stolon-puncta)	85-110
Diameter at aperture	93-102
Diameter of stalk	43-51

Lafoea benthophila Ritchie, 1909
Fig. 27.

Lafoea gracillima var. *benthophila* Ritchie, 1909, p. 76, fig. 2; LELOUP, 1937a, pp. 5, 31; REES & THURSFIELD, 1965, pp. 81, 198.

Lafoea benthophila, STECHOW, 1923, p. 7; STECHOW, 1925, p. 455, fig. 24d; VERVOORT, 1946a, p. 303.

Lafoea gracillima, RITCHIE, 1910, p. 8.

? *Lafoea gracillima,* VANHÖFFEN, 1910, p. 312; BILLARD, 1914, p. 10.

Material:

St. 196, off Durban (29°55'S, 31°20'E), 13-14.2. 1951, 425-430 m depth. – Several small, 10-18 mm high, regularly branched colonies, detached from substratum.

Description:

The colonies consist of a regularly, more or less pinnately branched hydrocaulus, covered by secondary tubes in its lower parts. The hydrothecae are arranged on all sides of the hydrocauli; the distance between consecutive hydrothecae is variable. They are directed obliquely upwards under an angle of about 60° with the hydrocauli and are placed on short stalks, that have 2 or 3 weakly indicated spiral twists or turns. The shape of the hydrothecae can best be seen from Fig. 24b. The adcauline border is distinctly swollen at the basal part of the hydrotheca; the abcauline border is almost straight. The aperture is exactly perpendicular to the length axis of the hydrotheca, the margin flares very slightly. Usually there are several renovations, though completely smooth hydrothecae commonly occur between the renovated thecae. There is no diaphragm or peridermal ring inside the hydrotheca, but a line of very fine puncta indicates the place of attachment of the hydranths to the internal thecal wall.

No gonosome has been observed.

Measurements (in microns): –

	East Africa (STECHOW, 1925)	"Galathea" St. 196
Hydrothecae, total length (from first turn of pedicel to edge of hydrotheca)	1,050	970-1,010
diameter at aperture.....	180-210	200-220
Pedicel, total length		135-150

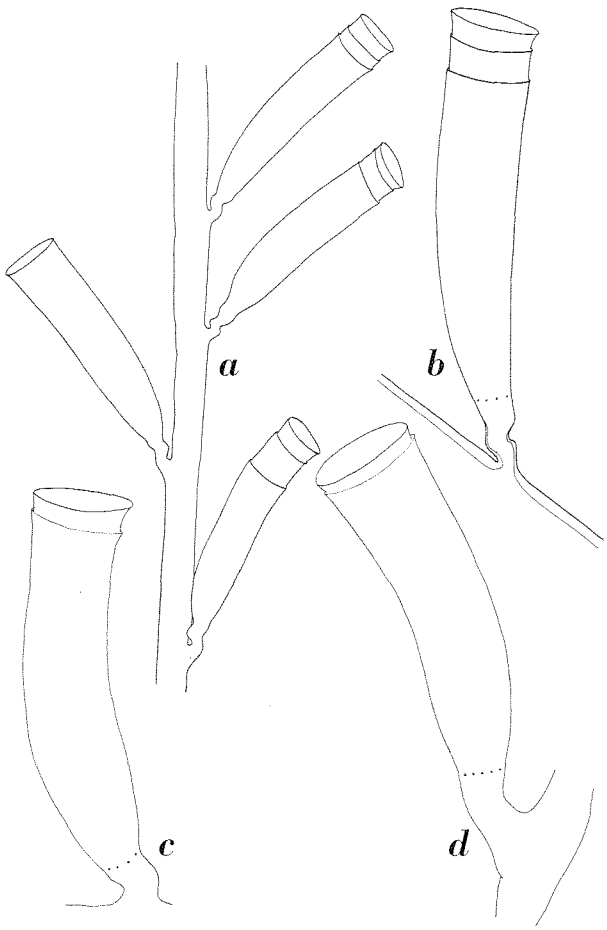

Fig. 27. *Lafoea benthophila* Ritchie. a, b, "Galathea" St. 196; a, monosiphonic fragment; b, hydrotheca. c, d, lectotype, "Scottia" St. 313 (Royal Scott. Mus., 1959.33.345), two hydrothecae. a, ×30; b-d, ×55.

Remarks:

The synonymy of the various species of *Lafoea* is exceedingly complicated and in many cases our concepts of certain of its species and their variability are far from clear. I have previously discussed the distribution of *L. benthophila* (VERVOORT, 1946, p. 303), but I have since discovered that the specimens of *L. gracillima* (Alder, 1856) recorded by VANHÖFFEN (1910, p. 312) and BILLARD (1914, p. 10), that have been considered as representing *L. benthophila* (cf. STECHOW, 1925, p. 455) and upon which some of my Antarctic records were based, are included into the synonymy of *L. dumosa* (Fleming, 1820) by TOTTON (1930, p. 158).

The "Galathea" material described above is undoubtedly identical with RITCHIE's original material from the Antarctic part of the Atlantic, near the South Orkneys (1775 fms. (= 3246 m) depth), with RITCHIE's material from the Arabian Sea near the Gulf of Aden (RITCHIE, 1910, 585 fms.), with STECHOW's material from East Africa, 1°49'N, 45°29.5'E (STECHOW, 1925, 1134 m depth), and with Mediterranean material (Positano, Gulf of Salerno, Italy, VERVOORT, 1946). LELOUP (1937a) records the species from Thug Trien, Bay of Nha Trang, Vietnam. The species usually, but apparently not exclusively, occurs on the spines of Cidarid Echinoderms. The present record extends the area of distribution southwards along the African east coast.

REES and THURSFIELD (1965, p. 81) have recently designated a lectotype of RITCHIE's *Lafoea gracillima* var. *benthophila,* a slide in the collection of the Royal Scottish Museum, Edinburgh, from the Scotia Expedition, St. 313, Coats land, 62°10'S, 41°20'W, 18.3.1903, 1775 fms. (= 3248 m) depth. The slide bears the number 1959.33.3.45. I have inspected this slide at the British Museum. It contains two fragments, one a 10 mm long monosiphonic branch with only a few intact hydrothecae, the other a 20 mm long polysiphonic branch, with a fair number of hydrothecae. Two hydrothecae are figured here (Fig. 27c, d). There is practically no difference in the shape of the hydrothecae between the lectotype and the "Galathea" specimen. In the lectotype there are few renovations, usually restricted to one or two for each hydrotheca. The basal part of the hydrotheca very gradually narrows into the pedicel; the adcauline thecal border may be very slightly bulging. Basally each hydrotheca has a row of very fine puncta; the pedicel has no distinct spiral twists. The measurements of the lectotype are:

	"Scotia" St. 313 Coats Land
Hydrotheca, total length (puncta-aperture) ...	880-920
diameter at aperture	220
Pedicel, total length (puncta-stolon)	200-240
diameter	80-120

Lafoea gracillima (Alder, 1856)
Fig. 28.

Campanularia gracillima Alder, 1856, p. 361, pl. 14, figs. 5, 6.

Lafoea gracillima, BALE, 1915, p. 255; STECHOW, 1925, p. 457, fig. 24c; TOTTON, 1930, p. 158, fig. 15; KRAMP, 1935, p. 125, fig. 52D.

Lafoea intermedia Fraser, 1938, pp. 9, 47, pl. 1, fig. 53.

Material:

St. 196, off Durban (29°55'S, 31°20'E), 13-14.2. 1951, 425-430 m depth. Four 8-20 mm high polysiphonic colonies without gonosome.

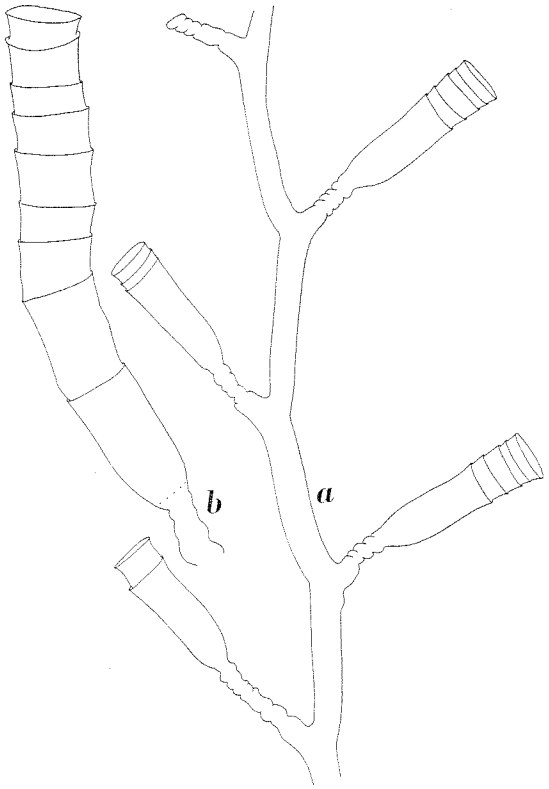

Fig. 28. *Lafoea gracillima* (Alder), "Galathea" St. 196. a, monosiphonic part of colony; b, renovated hydrotheca. a, ×50; b, ×80.

Description:

The colonies are regularly built, the monosiphonic parts of the colonies are more or less sympodially built, but the monosiphonic hydrocauli are rapidly covered by secondary tubes. In the younger parts of the colonies the hydrothecae alternate, but as they are also found on the secondary tubes, they occur on all sides of the stems in the older parts. The hydrothecae are campanulate, with a slightly swollen, but asymmetrical basal portion; their shape appears clearly in Fig. 28a. The aperture is circular and at right angles to the length axis of the theca; the margin flares very slightly. Usually the thecae are renovated many times; Fig. 28b illustrates a very extreme case. The pedicels of the hydrothecae are well developed and usually composed of 3 or more distinct whorls. Some pedicels are such that renovation of complete thecae from the remnants of older pedicels must have occurred. The present colonies have no well preserved hydranths, though in some thecae fragments are present. There is no diaphragm or peridermal ridge in the theca; the place of attachment of the hydranth is marked by a line of very small puncta.

Measurements (in microns): –

	"Galathea" St. 196
Hydrotheca, total length, including renovations	450-650 (945)
diameter at aperture	120-135
Pedicel, length	115-335

Remarks:

For the identification of this species I have based myself largely on TOTTON's redescription of ALDER's holotype (1930, p. 158, fig. 15). In the "Galathea" material the hydrothecae have the same asymmetrical shape as those figured by Totton (l.c.). though the asymmetry in the "Galathea" material may be brought about by a more convex adcauline wall as well as a more convex abcauline wall; furthermore, the twists of the pedicel are more distinctly marked in my material. Comparing my material with BROCH's figures of northern representatives of this variable species (BROCH, 1910, p. 156, figs. 17, 18) I find that it approaches *L. gracillima* f. *elegantula* Broch, 1903, in many respects. The taxonomic importance of his f. *elegantula,* which is linked with f. *typica* by many intermediates, in my opinion is very small and I have therefore refrained from recording it under that name.

Distribution:

The geographical distribution of *L. gracillima* has been reviewed by STECHOW (1925, p. 457); it seems that the species is cosmopolitan, occurring under Arctic, temperate, subtropical and tropical conditions, usually in deeper waters. The species is here recorded from the Indian Ocean off Durban; I have been unable to trace any previous Indian Ocean records.

Lafoea fruticosa (M. Sars, 1851)
Fig. 29.

Campanularia fruticosa M. Sars, 1851, p. 138.
Lafoea fruticosa, G.O. SARS, 1873, p. 114, pl. 4, figs. 16-18; ALLMAN, 1888, p. 34, pl. 16, figs. 2, 2a; BROCH, 1910, p. 158, fig. 19; BROCH, 1918, p. 12; STECHOW, 1925, p. 456, fig. 24B; TOTTON, 1930, p. 157, fig. 13; LELOUP, 1940, p. 14; FRASER, 1944, p. 223, pl. 46, fig. 206; FRASER, 1948, p. 230; MILLARD, 1964, p. 13, fig. 3.

Material:

St. 490, Bali Sea (5°25'S, 117°03'E), 14.9.1951, 545-570 m depth. – Some colonies of 5-8 mm height rising from a stolon creeping on unidentifiable hydroid. No gonosome.

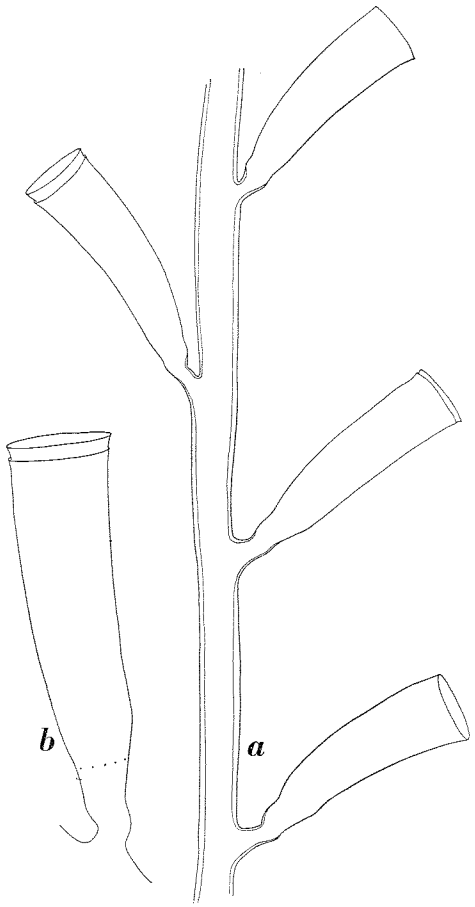

Fig. 29. *Lafoea fruticosa* (M. Sars), "Galathea" St. 490. a, monosiphonic part of colony; b, hydrotheca. a, ×50, b, ×80.

Description:

From the creeping, smooth, tubular stolons rise monosiphonic stems, along which the hydrothecae are arranged in all directions; they are widely spaced. The hydrothecae are very slightly asymmetrical, usually with a more or less straight abcauline and a slightly swollen adcauline wall; their shape appears clearly from Fig. 29. The aperture is circular and its plane not exactly perpendicular to the length axis of the theca but slightly tilted in adcauline direction. The margins of the thecae are very slightly everted but not flaring. There are only very few renovations. The pedicels of the hydrothecae have a single indistinct whorl; the thecae are directed upwards under an angle of about 60° with the length axis of the hydrocaulus. There are remnants only of hydranths in the "Galathea" material; a row of exceedingly fine puncta markes the place of attachment of the hydranth to the internal thecal wall.

Measurements (in microns): –

	"Galathea" St. 490
Hydrotheca, total length (including renovations)	525-620
Diameter at aperture	150-165
Pedicel, length	120-135

Remarks:

My material is identical with that recorded from the Agulhas Bank, South Africa, 35°26.8′S, 20° 56.2′E (100 m depth) by STECHOW (1925) and with that from the south and west coasts of Africa by MILLARD (1964). Owing to the great variability of this species, the unstability of the various species of *Lafoea* and the frequent confusion of *L. fruticosa* with either *L. dumosa* (Fleming, 1820) or *L. gracillima* (Alder, 1856) it is impossible to state accurately its geographical distribution. Available evidence, however, seems to suggest that it is cosmopolitan, living in deeper waters of Arctic, temperate, subtropical, tropical and subantarctic seas. This appears to be the first record from the seas of the Malay Archipelago.

FAMILY SERTULARIIDAE

Sertularella gayi (Lamouroux, 1821)
Fig. 30.

Sertularia gayi Lamouroux, 1821, p. 12, pl. 66, figs. 8, 9.

Sertularella gayi, BALE, 1915, p. 283; LELOUP, 1940, p. 17; KRAMP, 1943, p. 45; KRAMP, 1947, p. 14; LELOUP, 1947, p. 31, fig. 23; REES, 1952, p. 7; HAMOND, 1957, p. 320; VERVOORT, 1959, p. 273, figs. 33b, c, 34b.

Material:

St. 74, off Congo River (5°41′S, 11°32′E), 7.12. 1950, 291 m depth. – One colony of 25 mm height, with some fibres at the base, and a number of fragments. No gonothecae.

Remarks:

The colony has a slightly polysiphonic stem, from which the side-branches rise alternately, so that is has a pinnate shape. Neither hydrocaulus nor side-branches are broken up into internodes; the stem is almost straight and only in the very young ramifications it is faintly twisted in zig-zag fashion. The periderm of the stem and side-branches is thick. The shape of the hydrothecae can best be described by reference to Fig. 30; they correspond

in shape with part of the "Atlantide" material (from Atlantide St. 163); they occur on both stems and side-branches and are alternately directed left or right in one plane. The free part of the adcauline wall is almost as long as the adnate part; it is almost perfectly smooth in the majority of the thecae; some only have weak indications of wrinkles along the adcauline wall. The oral part of the theca is more or less set off from the rest by a distinct curve in the abcauline thecal wall. The hydrothecal margin has 4 low teeth of equal development; the closing mechanism consists of plates. No intrathecal teeth are present and no renovations have been observed. Polyps are only present in some of the fragments.

Measurements (in microns): –

	"Atlantide" St. 163	"Galathea" St. 74
Internode, length	630-990	
diameter across node	270-360	200-325
Hydrotheca		
length abcauline wall	650-720	700-750
length adnate part adcauline wall	530-580	510-550
length free part adcauline wall	470-490	510-600
total depth of theca	775-850	750-850
diameter at aperture	290-300	300-350

Distribution:

This species seems to be mainly confined to the Atlantic, where it has been found along nearly the whole of the African West coast; from the Gulf of Guinea it had previously also been recorded by the "Atlantide" (VERVOORT, 1959, pp. 273-275). From the Pacific area the species has been recorded by BALE (1915, p. 283), this author, however, has synonymized *S. gayi* with *Sertularia annulata* Allman (1888, p. 52, pl. 24, figs. 2, 2a). BILLARD (1910, p. 10, fig. 3), who has inspected ALLMAN's type, has reduced this species to the rank of a variety *(Sertularella Gayi* var. *Allmani* Billard, 1910). Judging from ALLMAN's and BILLARD's figures this seems to be only partly justified; ALLMAN's *S. annulata* being separated from *S. gayi* by a number of very distinct characters (i.a., the reduced length of the free part of the hydrotheca, with its strongly undulated periderm, and the smaller overall size of the species). Its proper name, if considered a variety of *G. gayi,* should run: *Sertularella gayi* var. *annulata* (Allman, 1888). BALE unfortunately gives no figure of his specimens and the description is very short ("the hydrothecae are large and nearly smooth, with very inconspinuous teeth; the gonothecae with the annulations irregular, often almost wanting, and usually with three short teeth on the summit", BALE, 1915, p. 284). The type locality of *S. annulata* is off Port Jackson, Australia; BALE's specimens are from Bass Strait.

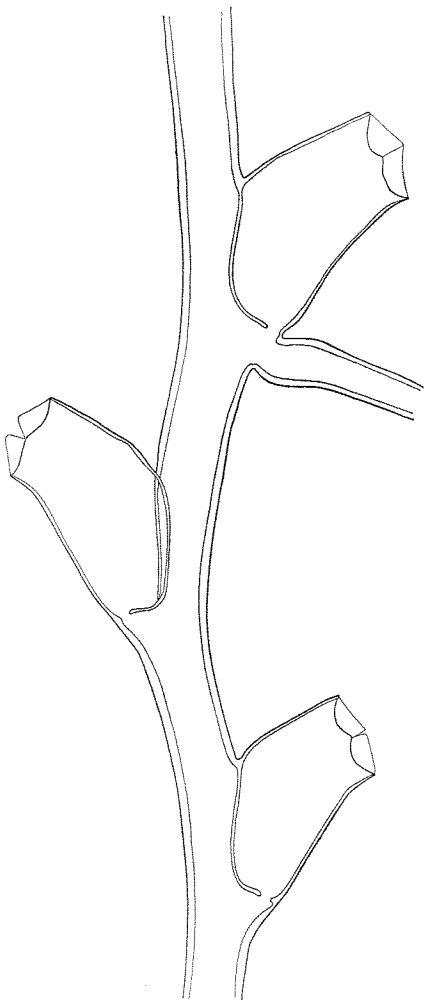

Fig. 30. *Sertularella gayi* (Lamouroux), "Galathea" St. 74, monosiphonic fragment. ×30.

Sertularella leiocarpa (Allman, 1888)
Figs. 31 and 32.

Sertularia leiocarpa Allman, 1888, p. 52, pl. 25, figs. 1, 1a.
Sertularella leiocarpa, STECHOW, 1925, p. 477, fig. 35.

Material:

St. 188, off Durban (29°55'S, 31°13'E), 2.2.1951, 495 m depth. – Four 1-2 cm high monosiphonic colonies and some fragments. No gonothecae.

St. 196, off Durban (29°55'S, 31°20'E), 13-14.2.1951, 425-430 m depth. – Two 15 mm high,

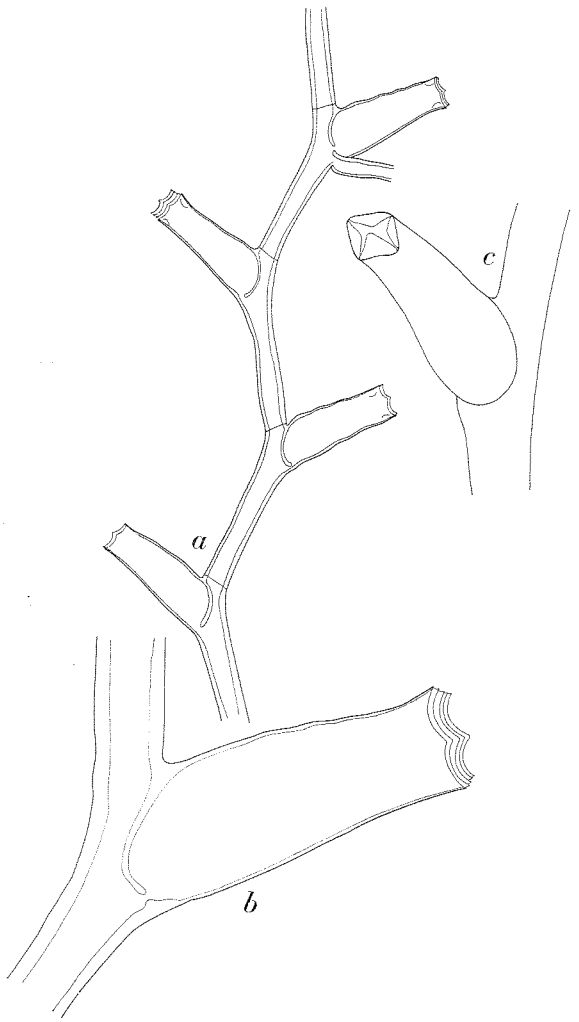

Fig. 31. *Sertularella leiocarpa* (Allman), "Galathea" St. 196. a, fragment of colony; b, hydrotheca; c, hydrotheca, oblique view. a, ×20; b, ×56; c, ×38.

monosiphonic, slightly branched colonies and a fragment. No gonothecae.

St. 202, off Natal (25°20'S, 35°17'E), 21.2.1951, 575-595 m depth. – One slightly branched, monosiphonic colony of 40 mm height. No gonothecae.

Description:

The few stems present in the material rize directly from thin hydrorhiza fibres; they are only slightly branched. The side-branches are alternately arranged, pointing left and right and are strictly in one plane with the hydrothecae; they insert on the stems directly below each theca. All stems are monosiphonic. The stems and side-branches are broken up into internodes and are fairly strongly twisted in zig-zag fashion; the nodes are very indistinct and marked by slight depressions of the fairly thick periderm of the stems or branches; there are no rings on the internodes.

The hydrothecae are of characteristic shape and more or less tubular; they diverge very strongly and characteristically from the internodes. They are adnate for a short distance of the adcauline wall only, the free part being three times as long as the adnate part. Normally the thecae are smooth-walled, slightly wider basally than at the aperture, but there are many hydrothecae with slightly undulating adcauline or abcauline wall or with both walls undulated. The oral part of each theca is very slightly everted and usually repeatedly renovated. There are 4 marginal teeth, separated by very shallow, rounded incisions. The closing apparatus is composed of four triangular plates; in some thecae only it is present in undamaged form. The majority of the hydrothecae has no intrathecal teeth, but in some thecae there are four very low internal ribs, that may represent small teeth. They can only be

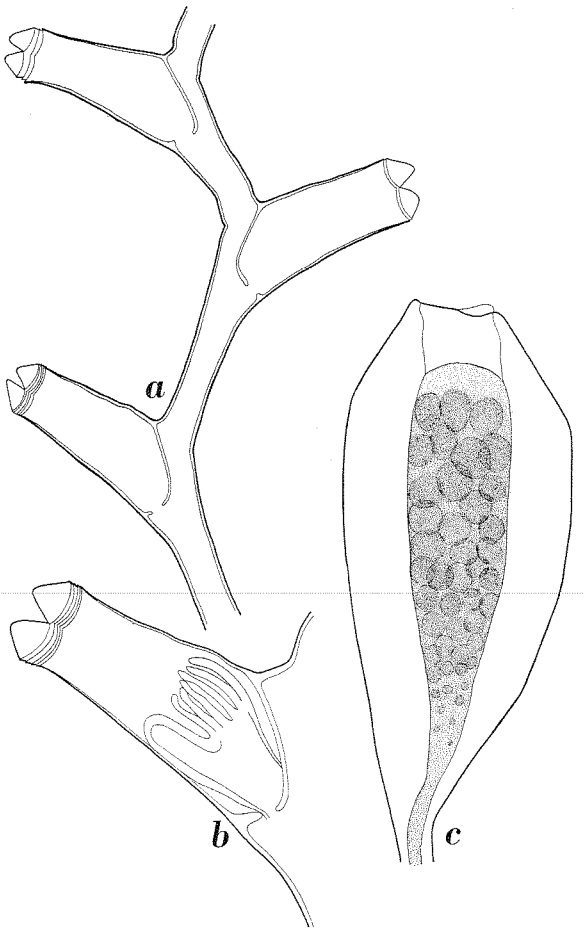

Fig. 32. *Sertularella leiocarpa* (Allman), schizoholotype, "Challenger" St. 135 C (Brit. Mus., 1888.11.13.40). a, part of colony; b, hydrotheca with contracted hydranth; c, female gonotheca. a, c, ×20, b, ×30.

observed when looking obliquely into the theca, in such cases where the closing apparatus is absent. Only remnants of hydranths are present in the Galathea material.

No gonothecae are present.

Remarks:

This species was originally described by ALLMAN (1888, p. 52, pl. 25, figs. 1, 1a) from "Challenger", St. 135 C, Nightingale Island, Tristan da Cunha, between 100 and 150 fms. (= 183-275 m). The British Museum (Nat. Hist.) has a schizoholotype slide (1888.11.13.40); the rest of the holotype could not be traced. The British Museum slide contains a fragment of 13 mm length, with 9 hydrothecae and one (female) gonotheca. There can in my opinion be no doubt at all that the "Galathea" material is conspecific with this specimen, a figure of which is presented here (Fig. 32). In the "Challenger" material the hydranths are in perfect condition; they have a very large abcauline blindsac. The measurements of the Challenger specimen are given below.

The species has also been recorded by STECHOW (1925, p. 477) from south of St. Paul in the Indian Ocean, 38°40'S, 77°38.6'E, collected by the "Valdivia" at 672 m depth. STECHOW's material was sterile and furthermore characterized by repeated renovations of the hydrothecae. The "Galathea" material differs from that of STECHOW by the faint undulations of the walls of some of the hydrothecae; these have also been observed in ALLMAN's material.

Measurements (in microns): –

	"Challenger" St. 135 C	"Valdivia" St. 165	"Galathea" St. 196
Internode, length .	1,160-1,880		1,215-1,350
diameter	240-260	300	150-300
Hydrotheca			
length abcauline wall	1,040-1,120		745-850
length adnate part adcauline wall	400-560	560-620	410-450
length free part adcauline wall ..	800-860	880-1,040	675-900
total depth of theca	1,100-1,160	960-1,200	810-1,050
maximal diameter	480-500	480-500	310-500
diameter at aperture	340-420	260-270	220-250
Gonotheca, length	3,260		
diameter	1,460		

The present records of *S. leiocarpa* are all from the Indian Ocean off southern Africa. *Sertularella undulitheca* Vervoort (1959, p. 269, fig. 32), a species described from the Gulf of Guinea, has the same general shape of hydrothecae. Here, however, both hydrothecae and gonothecae are strongly ringed and 3 very distinct intrathecal teeth are present.

Sertularia marginata (Kirchenpauer, 1864)

Figs. 33 and 34.

Dynamena marginata Kirchenpauer, 1864, p. 13, fig. 8.

Sertularia marginata, TOTTON, 1930, p. 204, fig. 48b; LELOUP, 1935, p. 49; VANNUCCI, 1946, p. 567, pl. 3, fig. 31a and pl. 4, figs. 36, 37; VANNUCCI, 1951a, pp. 106, 109-111, 113, 116, 117; MILLARD, 1957, p. 224, fig. 13; VAN GEMERDEN-HOOGEVEEN, 1965, p. 39, figs. 13-17.

Sertularia marginata f. *typica,* VANNUCCI, 1949, p. 248; VANNUCCI, 1951, p. 84; VANNUCCI, 1954, p. 115.

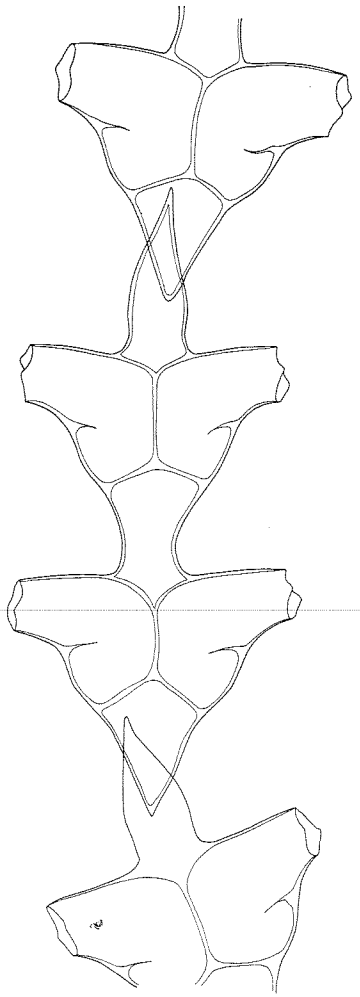

Fig. 33. *Sertularia marginata* (Kirchenpauer), "Galathea" St. 231, single, unbranched stem. ×75.

Material:

St. 231, Madagascar-Mombassa (8°52′S, 49°25′ E), 7.3.1951, 5020 m depth. – A large number of unbranched, 5 mm high stems, rising from a hydrorhiza covering a root-like vegetable fragment. No hydranths and no gonothecae.

Description:

The creeping, tubiform hydrorhiza has no internal peridermal ridges and has thin, slightly wrinkled periderm. There are many apophyses, terminating in a hinge-joint and bearing the short, unbranched stems. The stems are completely broken up into short internodes, entirely separated by hinge-joints. Each short internode has two pairs of hydrothecae; very occasionally there is a straight node in the internode immediately above a pair of thecae; this node is only weakly indicated. The hydrothecae can best be described by referring to Fig. 34; they are distinctly though moderately swollen basally and fairly abruptly curved outwards; the bent in the abcauline wall is marked by an internal peridermal ridge, visible in nearly all thecae. The adnate part of the adcauline wall (measured from the place on the frontal part of each pair where the thecae gain contact), is very slightly shorter than the free adcauline wall. The free parts of the adcauline walls of each pair of thecae form an almost straight line. The opening of each theca is almost parallel to the length axis of the internode; the margin is provided with two distinct though obtuse lateral teeth of equal size and a very small adcauline tooth. There are only very few undamaged thecae; none has the closing mechanism intact. The pairs of hydrothecae are all stricktly opposite and placed on the frontal part of each internode; they point laterally and slightly forward. On the frontal part of the stem the hydrothecae of all pairs are contiguous for a considerable distance (Fig. 34a); dorsally they are separated by a part of the internode (Fig. 34b).

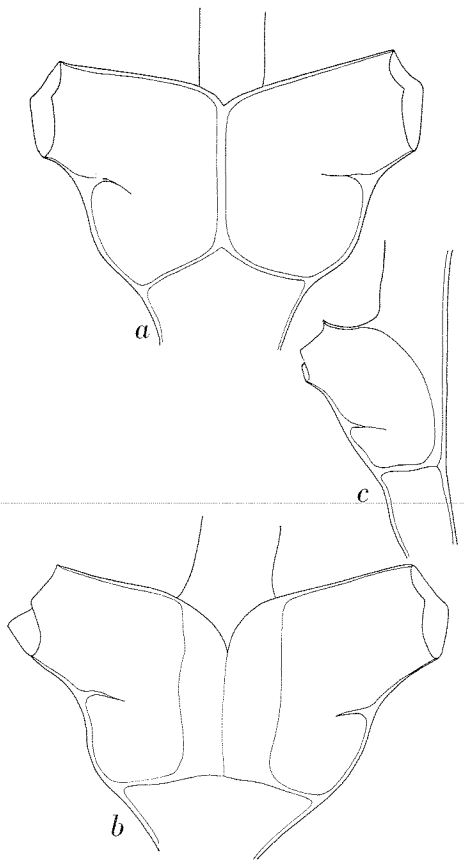

Fig. 34. *Sertularia marginata* (Kirchenpauer), "Galathea" St. 231. a, pair of hydrothecae, frontal view; b, idem, dorsal view; c, hydrotheca, lateral view. a, b, ×90; c, ×56.

Measurements (in microns): –

	"Galathea" St. 231
Internode, total length	1,000-1,500
diameter, between pairs	95-135
interval between pairs	240-400
Hydrotheca,	
length abcauline wall	250-270
length adnate part adcauline wall	300-310
length free part adcauline wall	200-215
length contiguous part adcauline wall	220-240
diameter at aperture	80-95

Remarks:

In spite of the poor condition of the colonies and the absence of gonothecae the present colonies very probably belong to KIRCHENPAUER's species. I base this conclusion largely on the conformity of the "Galathea" specimens with (part of) the material described by TOTTON (1930, pp. 204, 205) and MILLARD (1957, p. 224); both authors also describe pinnate colonies that are not present in my material. It is, of course, impossible to be quite certain in absence of the gonosome. The synonymy of *S. marginata* is extensively discussed by TOTTON.

Distribution:

VAN GEMERDEN-HOOGEVEEN (1965, p. 45) discussed the geographical distribution. The species occurs in tropical and subtropical parts of Atlantic, Indian and Pacific Oceans, though in the Atlantic it appears to be more common and more widely distributed. The present specimens very evidently did not live at the depth from which they were recorded; they very probably have been introduced from elswhere. They probably had been dead a considerable time before being captured.

FAMILY PLUMULARIIDAE

Subfamily **Halopterinae**

Halopteris polymorpha (Billard, 1913)
Fig. 35.

Plumularia polymorpha Billard, 1913, p. 24, figs. 15, 16.

Material:

St. 188, off Durban (29°55'S, 31°13'E), 2.2.1951, 495 m depth. – One 8 mm long fragment with obliterated hydranths. No gonothecae.

St. 196, off Durban (29°55'S, 31°20'E), 13-14.2.1951, 425-430 m depth. – Four colonies of 15-23 mm height, with badly preserved hydranths; no gonothecae.

Description:

The best developed colonies rise from a smooth hydrorhiza with fairly thick periderm and without nematothecae. The base of the colonies, which is of variable length, is formed by a long apophysis on the hydrorhiza, bearing scattered, two-chambered nematothecae of the type also observed on the cauline internodes. The rest of the hydrocaulus is made up of one or two athecate internodes, bearing some nematothecae, and a series of thecate internodes. Both athecate and thecate internodes are separated by oblique hinge-joints, particularly well marked between the athecate internodes of the basal part of the stem. The thecate internodes of the hydrocaulus each have a hydrotheca, an infracalicine and a supracalicine nematotheca, two pleurohydrothecal nematothecae, a reduced axillary nematotheca behind the hydrotheca and an apophysis. The hydrothecae and nematothecae are as on the hydrocladial internodes and will be described below. The apophyses are alternately arranged and directed to left or right sides; they are short and have no nematothecae or sarcophores. There are no secondary tubes on the hydrocaulus in any of my specimens, but in some colonies the basal thecate internodes of the stem are thick, have a thick, rich brown periderm and an almost obliterated hydrotheca.

The hydrocladia, alternately directed left and right, consist of a basal athecate internode and 4 or 5 thecate internodes. The basal athecate internode is separated from the apophysis by a straight node; apically it has an oblique hinge-joint. All thecate internodes are separated by such hinge-joints. The basal internode bears a single two-chambered nematotheca.

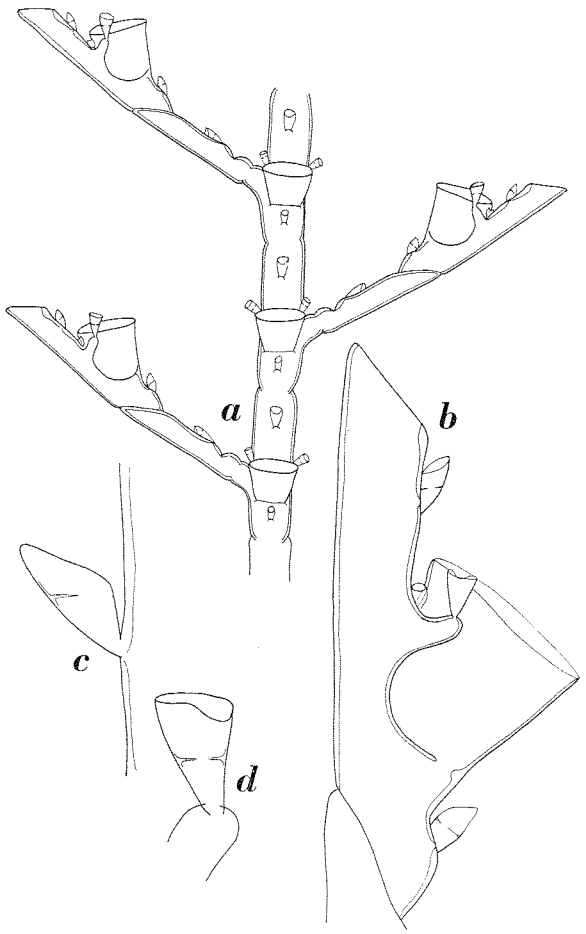

Fig. 35. *Halopteris polymorpha* (Billard), "Galathea" St. 196. a, part of colony; b, hydroclade; c, infracalicine nematotheca; d, pleurohydrothecal nematotheca. a, ×30; b, ×90; c, d, ×220.

Each thecate internode has a hydrotheca, an infracalicine and a supracalicine nematotheca, a pair of pleurohydrothecal nematothecae, and a reduced nematotheca in the axil of the hydrotheca. The hydrotheca is about as long (measured abcaudally) as wide; the margins are not flaring and the opening has no elevations or marginal teeth. Its shape appears in Fig. 35b. The infracalicine nematotheca is two-chambered and cut off obliquely at the apex; it is attached by means of a broad base and seems to be immovable. The supracalicine nematotheca has the same general shape as that found under the hydrotheca, but it has a gradually tapering base and is movable. The pleurohydrothecal nematothecae are placed on conspicuous, elevated parts projecting besides each theca. They are strictly conical and two chambered; the apical chamber is not globular or swollen. There is a faint though distinct bent in the margin, as appears clearly in Fig. 35d. They project far above the margin of the

hydrotheca. The reduced nematotheca behind the hydrotheca is a small, cup-like structure; apparently it is one-chambered.

Occasionally there is a faint transversal peridermal node just above the reduced nematotheca, which suggests that the apical part of the hydrocladial internode may become separate, resulting in heteromerous condition of the hydroclades.

Measurements (in microns): –

	"Galathea" St. 196
Hydrocladial internode, total length	675-1,080
diameter	108-135
Hydrotheca	
length of abcauline wall	240-255
length free part adcauline wall	54-68
diameter at opening	245-270
Length pleurohydrothecal nematotheca	55-60
diameter	45-55

Remarks:

The "Galathea" specimens agree perfectly with BILLARD's description of *Plumularia polymorpha* which species, according to MILLARD's (1962, pp. 267-273) system of classification of the Plumulariidae, should be placed in the genus *Halopteris* Allman, 1877. BILLARD (1913, pp. 24-26), whose material was much more extensive than mine, has drawn attention to the variability of this species, demonstrated by the presence of one or two supracalicine nematothecae and the presence, complete absence or variable development of the straight septum in the internodes of the hydrocladia. The "Galathea" material cannot be separated from the form recorded from "Siboga" St. 77.

STECHOW (1925, p. 497) has suggested that the species be removed to *Schizotricha* Allman, 1883, basing this conslusion on two remarks in BILLARD's description. The first (BILLARD, 1913, p. 24) clearly points to the presence of two hydroclades on the same internode (probably one pointing left and one pointing right), which condition is also observed in one of the colonies from "Galathea" St. 196. The second (BILLARD, 1913, p. 26, in the description of *P. polymorpha* var. *sibogae)* points out the presence of two secondary hydroclades in one of the colonies. As it seems quite clear that the presence of secondary hydroclades is quite incidental I see no reason for such a procedure.

Distribution:

H. polymorpha has previously been recorded from some localities in the Malay Archipelago, viz., Borneo bank ("Siboga" St. 77, 3°27'S, 117°36'E and St. 80, 2°25'S, 117°43'E) and south of the island Rotti ("Siboga" St. 299, 10°52.4'S, 123°1.1'E), the depth varied between 34 and 59 m. The present records are from off the coast of south-east Africa.

Halopteris infundibulum n. sp.

Fig. 36.

Material:

St. 626, Tasman Sea (42°10'S, 170°10'E), 20.1. 1952, 610 m depth. – One colony of 35 mm height, with very young gonophores (holotype).

Description:

The following description is based on the above mentioned specimen (holotype), deposited in the collections of the Zoological Museum of the University, Copenhagen. A fragment of the top of the colony has been removed, stained and mounted on a slide. This schizoholotype is now in the collections of the Rijksmuseum van Natuurlijke Historie, Leiden, the Netherlands.

The colony is composed of a monosiphonic hydrocaulus of 35 mm length, basally with a tuft of hydrorhiza fibres, and 15 hydroclades, alternately arranged along the hydrocaulus and leaving the basal part of about 20 mm length completely free. There are some secondary tubes at the extreme base of the hydrocaulus, suggesting that a polysiphonic condition of the hydrocaulus may be present in older colonies. About 17 mm of the basal part of the hydrocaulus has no nematothecae and no apophyses. It is followed by two athecate internodes, separated by hinge-joints and bearing nematothecae. The rest of the hydrocaulus is composed of short, thecate internodes, separated by straight internodes, that may at times be very obscure or fully absent. Each cauline internode has a hydrotheca, flanked by two pairs of pleurohydrothecal nematothecae, and two infrahydrothecal nematothecae. The hydrothecae are slightly less deep than those observed on the hydroclades; both hydro- and nematothecae will be described below. The apophyses of the cauline internodes are to be found besides the hydrothecae, they are short, bear no nematothecae or sarcothecae and alternately point left or right. They support hydroclades with 8 to 12 hydrothecae. The division of the hydroclades into internodes is indistinct; internodes, when present, are to be found just above each hydrotheca; they are straight and only occasionally present. As on the hydrocaulus each internode has a hydrotheca with two pairs of pleurohydrothecal nematothecae and two infra-

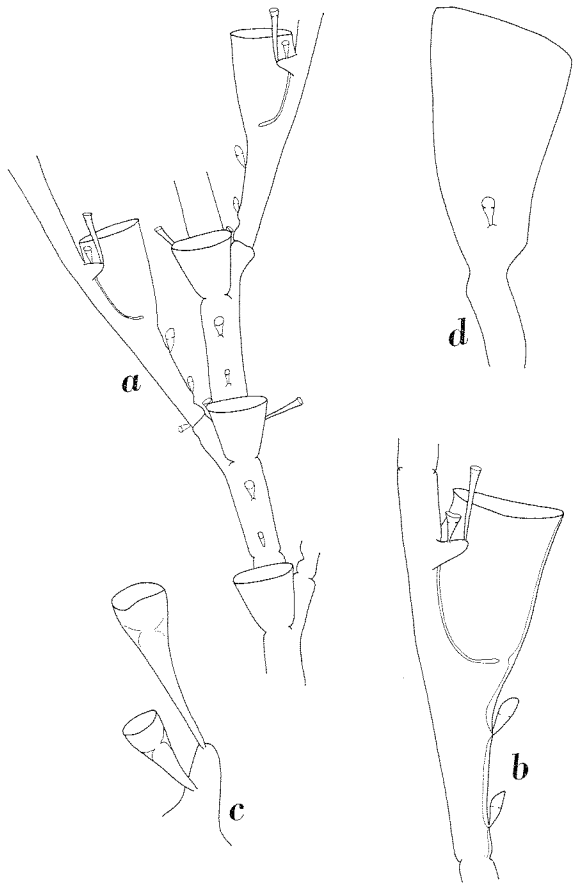

Fig. 36. *Halopteris infundibulum* n. sp., holotype, "Galathea" St. 626. a, part of colony; b, hydroclade; c, pleurohydrothecal nematotheca; d, gonotheca. a, ×30; b, ×100; c, d, ×135.

calicine nematothecae. The hydrotheca is almost cylindrical, fairly deep and with sligthly flaring margin; the aperture is circular. Only a fraction of the adcauline wall is free, its length being about one third of the adnate part. There is no reduced nematotheca in the axil behind the hydrotheca. On each side of the hydrotheca there is a conspicuous swelling; each swelling has two nematothecae: a long, funnel-shaped nematotheca at the end, projecting far above the margin of the theca, and a much smaller one halfway the swelling which reaches the margin of the hydrotheca. Both nematothecae are two-chambered; their shape appears in Fig. 36c. The infrahydrothecal nematothecae are movable and two-chambered. Badly preserved hydranths are present. Very young gonothecae occur just under each hydrotheca of the hydroclades; they are shortly stalked and have the shape of a small cone. Two nematothecae occur on the body of the gonotheca just above the insertion of the stalk (Fig. 36d). The sex of the gonothecae could not be ascertained.

Measurements (in microns): –

	"Galathea" St. 626
Cauline internode, length	620-700
diameter	110-300
Cauline hydrotheca, total depth	240-245
diameter	215-220
Hydrocladial internodes, length	810-1,080
diameter	95-120
Hydrotheca, length abcauline wall	375-385
length free part adcauline wall	65-70
length adnate part adcauline wall	280-290
diameter	270-290
Pleurohydrothecal nematotheca	
long pair, length	220-230
diameter	50-55
short pair, length	95-100
diameter	45-50

Remarks:

I have been unable to trace a description of a species of *Halopteris* corresponding with the characters listed above for *H. infundibulum*. The arrangement of the internodes in the hydroclades, the shape of the hydrothecae and particularly the presence of two pairs of pleurohydrothecal nematothecae tallies well with such species of *Antennella* as *A. quadriaurita* Ritchie, 1909, *A. africana* Broch, 1914 and *A. ritchiei* Totton, 1930. The present species, however, is a very distinct *Halopteris*. The long nematothecae, projecting far above the hydrothecal margin, are easily removed and only few hydroclades show a complete arrangement of pleurohydrothecal nematothecae. The gonothecae undoubtedly are very youthful.

The specific name has been derived from the latin word infundibulum = funnel, indicating the condition of the long, pleurohydrothecal nematothecae.

Polyplumaria flabellata G.O.Sars, 1874

Fig. 37.

Polyplumaria flabellata G.O.Sars, 1874, p. 93, pl. 2, figs. 16-22; KRAMP, 1935, p. 162, fig. 66a; KRAMP, 1938, pp. 37, 60, 63, 68, 73; LELOUP, 1940, p. 22; VERVOORT, 1942, p. 301; KRAMP, 1943, p. 44; KRAMP, 1947, p. 15; REES & THURSFIELD, 1965, p. 165.

Polyplumaria pumila Allman, 1883, p. 31, pl. 4, figs. 7, 8.

Material:

St. 74, off Congo River (5°41'S, 11°32'E), 7.12. 1950, 291 m depth. – Fragments of a 8 cm high

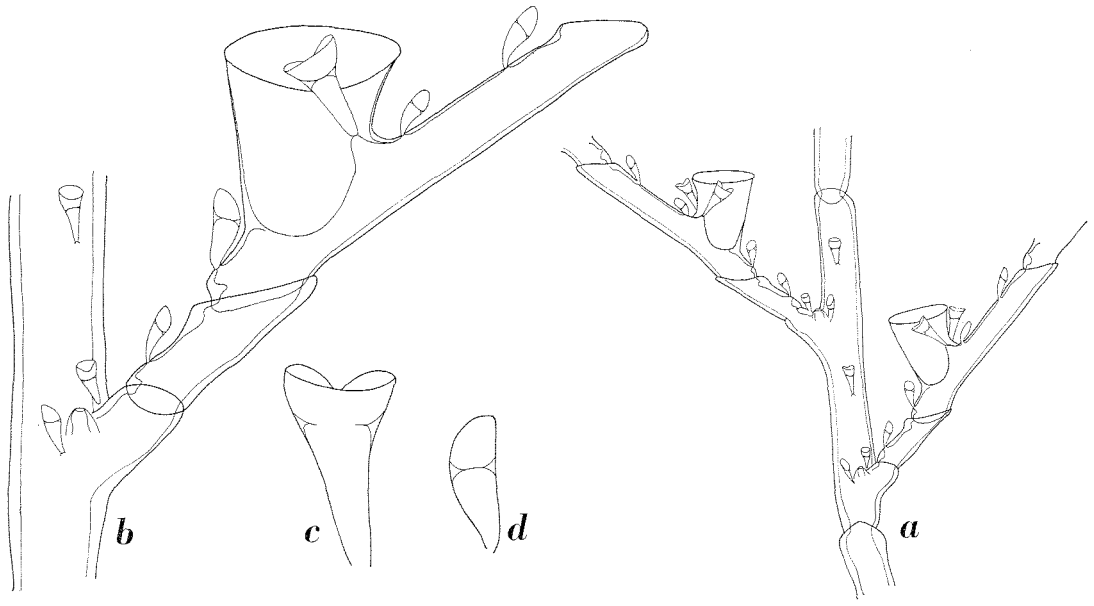

Fig. 37. *Polyplumaria flabellata* G. O. Sars, "Galathea" St. 74. a, fragment of colony; b, part of hydrocaulus with apophysis and side-branch; c, pleurohydrothecal nematotheca; d, infracalicine nematotheca. a, ×55; b, ×135; c, d, ×225.

colony, without gonothecae but with well preserved hydranths.

Description:

The colony is composed of a main stem of about 8 cm length (partly fragmentated), bearing opposite primary ramifications and opposite secondary ramifications, all arranged in one plane. The distal parts of the secondary ramifications are monosiphonic and will first be described. Here the main axis (secondary ramification) is composed of more or less distinct internodes, bearing 1 to 3 apophyses. In the slightly older parts the division into internodes is lost. The apophyses alternately point left and right but are also directed foreward; the hydrocladia which they support originally point obliquely foreward but further on gracefully curve backward. The external appearance of the colony, therefore, is very characteristic. Each apophysis has a large, elevated "mamelon" almost at its axil, flanked by two nematothecae. In addition there is a row of nematothecae along the frontal aspect of the stem. The apophyses support short hydroclades of 3 to 5 hydrothecae. They are homomerously segmented; the first internode, however, is invariably a short athecate internode, bearing a single nematotheca. It is separated from the internode by a straight septum and from the next thecate internode by an oblique septum. All thecate internodes are separated by oblique septa. Each short thecate internode has an infrahydrothecal nematotheca, a pair of pleurocalicine nematothecae and two supracalicine nematothecae. The hydrotheca is large and more or less cylindrical; the adcauline wall is free for a considerable part of its length; it is concave. The opening of the hydrotheca flares slightly and is circular.

The unpaired nematothecae are all of the same pattern; they have a very deep bent of the adcauline wall and a distinct diaphragm. The place of the supracalicine nematothecae is slightly variable, particularly that of the proximal one of those two, that may become almost axillary. It is, however, never reduced.

The larger colony results from the development of many secondary tubes covering the primary tube and which form the opposite ramifications. The original primary tube with its two rows of hydroclades can be recognized throughout the whole colony and though many secondary tubes run parallel to it, it never becomes completely covered or hidden by the secondaries. All ramifications result from secondary tubes; branching of the primary tube has not been observed. The secondary tubes divide into internodes just as the primary tube does.

The pleurohydrothecal nematothecae are trumpet-shaped and placed on a small elevation on each side of the hydrotheca. The apical chamber is set off from the rest of the nematotheca by means of a

distinct septum. The aperture has a distinct, though at times not very deep, incision.

Measurements (in microns): –

	"Galathea" St. 74
Stem, diameter at base	1,500
length of internode	400-810
diameter of internode	95-110
distance between 2 successive apophyses	270-375
Athecate internode, length	175-190
Thecate internode, length	375-400
diameter	60-76
Hydrotheca, length abcauline wall	200
length adcauline wall	110
diameter at aperture	160
Unpaired nematotheca, length	55-65
maximum diameter	35-40
Pleurohydrothecal nematotheca	110
diameter at aperture	55-65

Remarks:

This specimen differs from previously described specimens by the complete absence of branched hydroclades, so that the "Galathea" specimen, in its built, is exactly like a *Plumularia*. There is, nevertheless, such complete conformity in the structure of the hydroclades, that there can be no doubt about its real identity; the absence of branched hydroclades being probably due to youthfulness of the present specimen.

Distribution:

The distribution of *P. flabellata* has, to some extent, been discussed previously (VERVOORT, 1942, p. 301); it is widely distributed in deep water of the tropical, subtropical and temperate Atlantic. The precent record is from the Gulf of Guinea.

Subfamily **Kirchenpaueriinae**

Kirchenpaueria triangulata (Totton, 1930)

Figs. 38 and 39.

Plumularia triangulata Totton, 1930, p. 225, fig. 61.
Kirchenpaueria triangulata, MILLARD, 1962, p. 292, fig. 6 e-j.

Material:

St. 188, off Durban (29°55'S, 31°13'E), 2.2.1951, 495 m depth. – Two pinnate stems, rising from a stolon creeping on an unidentifiable hydroid, 25 and 35 mm high, with some female gonothecae. Some simple stems rising from a stolon creeping with *Halecium tenellum* Hincks on *Cladocarpus inflatus* n.sp.

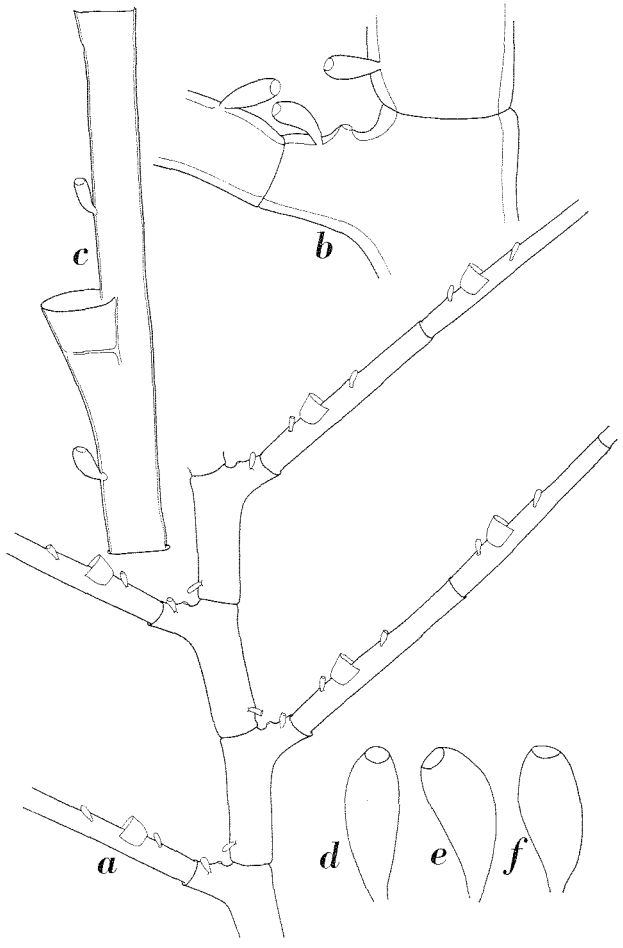

Fig. 38. *Kirchenpaueria triangulata* (Totton), "Galathea" St. 202. a, fragment of pinnate colony; b, stem apophysis with side-branch; c, hydroclade; d-f, nematothecae. a, ×30; b, c, ×90; d-f, ×220.

St. 202, off Natal (25°20'S, 35°17'E), 21.2.1951, 575-595 m depth. – Two pinnate stems, 30 and 35 mm high, rising from a stolon creeping on *Dinotheca dofleini* Stechow. Some female gonothecae are present.

Description:

The hydrocaulus of the pinnate stems is divided into regular internodes, separated by distinct, straight septa; they have very thick periderm. Each internode has a distinct distal apophysis, bearing the hydroclade; the apophyses of the consecutive articles alternately point left and right. Each apophysis has a distinct sarcotheca ("mamelon"), flanked by a single nematotheca. There is another nematotheca on the proximal part of the article, at the side of the preceding apophysis. Many internodes have a distinct interruption of the periderm at about half their length, suggesting the presence of an additional node. The hydroclades are long

and slender, being composed of as many as 16 internodes, separated by fine, straight septa; they are about 1.5 times as long as the internodes of the stem; the first hydrocladial internode usually being slightly shorter. Each article has a small, cup-shaped hydrotheca, the shape of which appears from Fig. 38c, and two nematothecae, one under and one above the hydrotheca. There are no other reduced nematothecae or sarcothecae on the hydrocladial articles. The nematothecae are all of the same shape; they are more or less flask-shaped, the greatest diameter slightly above the middle and with a small, circular opening. As far as I can see they are one-chambered, though in some nematothecae parts of a diaphragm may be visible, that may either be rests of the soft parts of the nematophore or a narrow band of periderm.

The hydrotheca is adnate with the whole length of the abcauline wall; it has thin periderm, so that consequently it is easily damaged. There are remnants only of the polyps.

Gonothecae occur on the colonies from both stations. The female gonothecae are elongated, pear-shaped structures, truncate at the apex and containing a single, large egg (Fig. 39c). The male gonothecae are fan-shaped, triangular bodies, strongly compressed and with a more or less frayed edge. There are several young male gonothecae, one mature male gonotheca and one empty gonotheca. The mature gonotheca has a large ball of spermatocytes; it lies in a circular cavity, which opens laterally (Fig. 39a). The empty gonotheca is a very large, fan-shaped structure with strongly frayed edges and opening along the whole of the apical border (Fig. 39b).

Both male and female gonothecae have a short stalk, composed of two short internodes, that attach the theca to the articles of the stem slightly below the sarcotheca. Some articles show a transparent circular spot under the sarcotheca, indicating that a gonotheca has been present there.

The simple stems from St. 188 consist of hydroclades of 5 to 10 hydrothecate internodes, rising from apophyses on the creeping stolon; the hydroclades always have one or two short, athecate internodes between the apophysis and the first thecate internode.

Occasionally athecate internodes may be observed between the thecate internodes, resulting from the development of an additional straight node in the thecate internodes. They occur in the proximal as well as in the distal parts of the hydroclades.

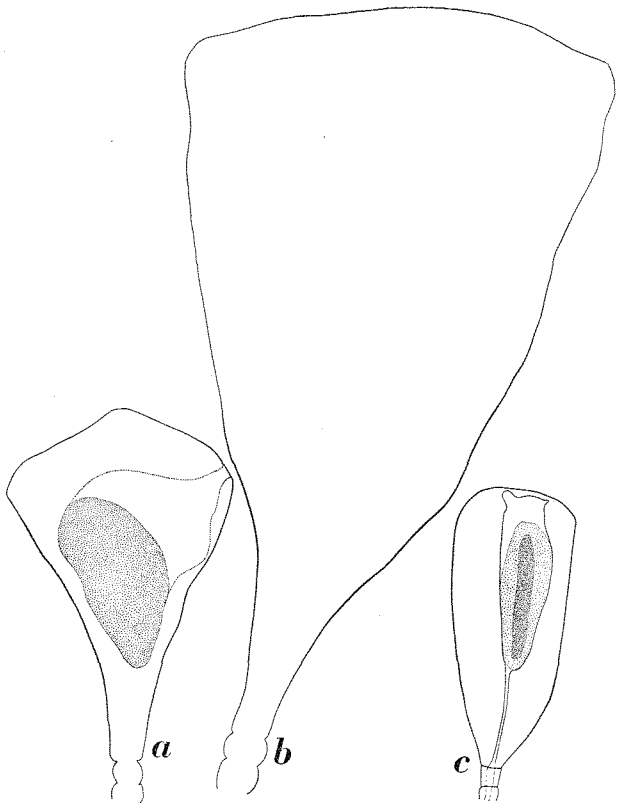

Fig. 39. *Kirchenpaueria triangulata* (Totton). a, b, "Galathea" St. 202, male gonothecae; c, "Galathea" St. 188, female gonotheca. a, b, ×55; c, ×20.

Measurements (in microns): –

	South Africa (Millard, 1962)	"Galathea" St. 202
Internode of stem, length	480-750	580-635
diameter	70-160	162-230
Hydrocladial internode, length	660-885	785-835
diameter at distal end	55-75	80-95
Hydrotheca, length abcauline wall	70-95	68-85
length adnate part adcauline wall		68-73
diameter at aperture	100-120	100-110
Nematotheca, length		68-85
maximum diameter		30-40
Male gonotheca, length	1,740-2,460	850-1,755
maximum diameter	800-850	575-1,015
Female gonotheca, length (St. 188)		2,130
maximum diameter (St. 188)		810

Remarks:

The "Galathea" specimens are in complete agreement with the descriptions by Totton (1930) and Millard (1962). The species was originally described from off Three Kings Islands, Northern New Zealand, 549 m depth (Totton, 1930, type locality), the stems up to 7 mm high and rising from

a stolon creeping on *Plumularia tenuissima* Totton. Additional material, including both the pinnate and the simple form, was recorded from 34°20'S, 23°31'E, off South Africa, at 111 m depth, by MILLARD (1962). I agree with MILLARD that the species can best be classified in the genus *Kirchenpaueria* Jickeli, 1883. The present specimens are from bathyal depths off the coasts of south-east Africa.

Subfamily **Plumulariinae**

Nemertesia perrieri (Billard, 1901)

Fig. 40.

Antennularia perrieri Billard, 1901, p. 73.
Nemertesia perrieri, 1917, p. 45; VERVOORT, 1946a, p. 327; VERVOORT, 1959, p. 292, fig. 46a.
Antennularia dendritica Stechow, 1907, p. 195.

Material:

St. 74, off Congo River (5°41'S, 11°32'E), 7.12. 1950, 291 m depth. – Two hydrocauli of 10 and 15 mm length from some communal hydrorhiza fibres. No gonothecae.

Description:

The hydrocaulus consists of a straight tube, in the basal parts of the two colonies with some indistinct straight nodes; it is non-fasciculated and non-canaliculated. There are two rows of apophyses; in the lower parts of the colony these apophyses are strictly opposite while there is no decussate arrangement, so that the apophyses are all arranged in one plane. In the higher parts of the colonies the apophyses are alternately arranged and point left or right. Each apophysis is fairly short; it has a distinct "mamelon" and two flanking nematothecae. They support heteromerously segmented hydrocladia with a maximum length of 8 mm, bearing from 5 to 8 hydrothecate internodes and several athecate internodes. The first internode of a hydroclade is invariably an short athecate internode bearing a single nematotheca and with a basal peridermal septum. It is followed by a regular succession of thecate and athecate internodes, separated by slightly oblique septa. The slender thecate internodes have a basal septum, an infrahydrothecal nematotheca, a small hydrotheca and two pleurohydrothecal nematothecae. The distal part of the articles varies greatly in length but it never supports additional supracalicine nematothecae. The athecate articles (with the exception of the very first) have two nematothecae.

The hydrotheca is small and cup-shaped; its shape appears in Fig. 40b; the adcauline wall is completely adnate to the internode. The pleurohydrothecal nematothecae are variable in length but generally are 1.5-2.5 times the depth of the hydrotheca. They are regularly funnel-shaped, with distinctly widening apical chamber, a circular margin and a distinct diaphragm. The remaining nematothecae are shorter, slightly curved, with the basal part or stalk

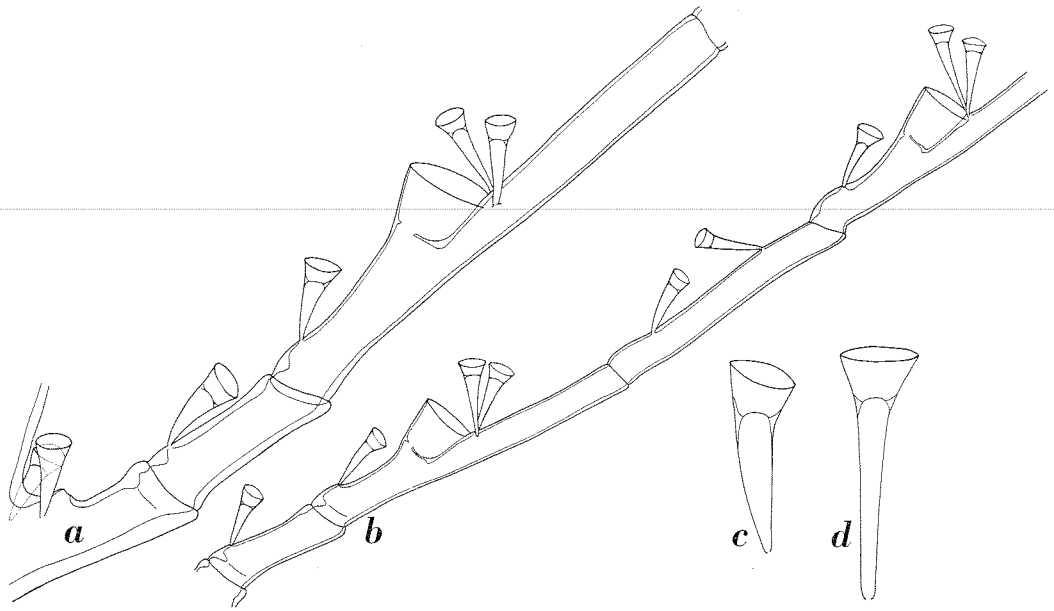

Fig. 40. *Nemertesia perrieri* (Billard), "Galathea" St. 74. a, apophysis with hydroclade; b, basal part of hydroclade; c, infracalicine nematotheca; d, pleurohydrothecal nematotheca. a, ×125; b, ×90; c, d, ×240.

gradually widening into the apical chamber. The aperture usually is not so distinctly circular; the diaphragm is distinct. Some of the apophyses show an additional nematotheca on the distal part, above the "mamelon". The regular arrangement of thecate and athecate internodes is sometimes interrupted by the presence of short internodes without nematothecae.

Measurements (in microns): –

	"Atlantide" St. 163	"Galathea" St. 74
Hydrocaulus, diameter at base	450-540	270-300
distance between 2 successive apophyses	720-900	400-550
Hydroclade, length first athecate internode		120-135
length thecate internode	450-540	445-810
diameter	54-72	40-45
length intermediate athecate internode	250-320	300-580
Hydrotheca, length abcauline wall	75-90	45-55
length adnate part adcauline wall		55-60
diameter at aperture	90-110	60-70
Pleurohydrothecal nematotheca, length		95-165
diameter at aperture		40-45
Unpaired nematotheca, length		80-95
diameter at aperture		40-45

Remarks:

The "Galathea" specimens undoubtedly are young, which probably accounts for the fact that the measurements of internodes and hydrothecae are inferior to those of the "Atlantide" specimen, a 7 cm high colony. I have previously pointed out that the geographical distribution of this species cannot accurately be given, owing to its frequent confusion with other species and varieties of *Nemertesia*. It has, nevertheless, been recorded from various subtropical and tropical localities off the African west coast (VERVOORT, 1959, p. 293). The "Atlantide" Expedition obtained specimens off Senegal; the present records are from off Congo river.

Nemertesia ramosa Lamouroux, 1816
Fig. 41.

Nemertesia ramosa Lamouroux, 1816, p. 164.
Nemertesia ramosa, BEDOT, 1911, p. 226; BILLARD, 1913, p. 58, fig. 49; BEDOT, 1917, p. 46; BEDOT, 1921, p. 18; BROCH, 1933, p. 38, fig. 14; LELOUP, 1934, p. 15; KRAMP, 1935, p. 166, figs. 67a, 68b; LELOUP, 1937, pp. 109, 116, fig. 12; LELOUP, 1937a, pp. 5, 47, fig. 32; KRAMP, 1938, pp. 38, 60, 68, 73; VERVOORT, 1942, p. 302; KRAMP, 1943, p. 44; LELOUP, 1947, p. 33, fig. 27; VERVOORT, 1949, p. 147; HAMOND, 1957, p. 320; MILLARD, 1957, p. 235; MILLARD, 1961, p. 206; MILLARD, 1962, p. 299, fig. 7a-d.

Material:

St. 188, off Durban (29°55'S, 31°13'E), 2.2.1951, 495 m depth. – Five colonies of 5-8 cm height, the largest with female gonothecae. Badly preserved hydranths present.

St. 202, off Natal (25°20'S, 35°17'E), 21.2.1951, 575-595 m depth. – Two colonies of 8 cm height and some fragments. No gonothecae. Badly preserved hydranths present.

Description:

The colonies, all comparatively young, are unbranched and are composed of an erect hydrocaulus, non-fasciculated and in some of the older colonies canaliculated. Some of the larger colonies have the basal part of the stem invested by secondary tubes, originating from a small mass of hydrorhizal fibres at the extreme base of each colony. The hydrocaulus only occasionally shows some nodes, particularly in the small, young colonies and there only at the base. The hydroclades are borne on strong, curved apophyses; the number of apophyses is highly variable. In the basal parts of the older colonies there are whorls of 4 apophyses each, the apophyses of two consecutive whorls are alternately arranged, so that eight rows of hydroclades result. In the highest parts of the young colonies the apophyses are arranged in one plane, pointing alternately left and right. All transitional stages between these extreme cases occur. Each apophysis normally has a "mamelon", a pair of flanking nematothecae and an unpaired distal nematotheca. The number of distal nematothecae may increase; as many as three have been observed. There is usually a distinct septum in the distal part of the apophyses. The hydroclades are primarily homomerously segmented; they are 8 to 10 mm long and have 5 to 8 thecate internodes. These internodes have an infracalicine nematotheca, a small, cup-shaped hydrotheca, a pair of pleurohydrothecal nematothecae and usually a supracalicine nematotheca.

The small hydrotheca has the adcauline wall completely adnate with the internode; the circular opening is slightly tilted in abcauline direction. The

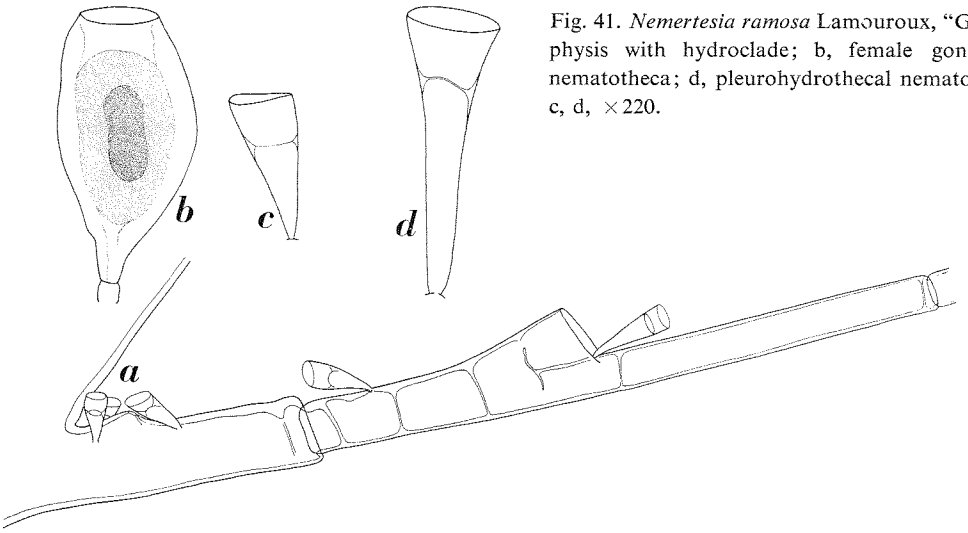

Fig. 41. *Nemertesia ramosa* Lamouroux, "Galathea" St. 188, a, apophysis with hydroclade; b, female gonotheca; c, infracalicine nematotheca; d, pleurohydrothecal nematotheca. a, ×90; b, ×55; c, d, ×220.

nematothecae are exactly as in *N. perrieri* and will not be described in detail here.

Each internode normally has a distinct basal and a distal septum. Additional septa may develop just above the pleurocalicine nematothecae. The septum at the level of the hydrothecal floor is incomplete. There is great variability in the development of the septa, as well as in the length of the part of the hydroclade above each hydrotheca. In some hydroclades the distal parts of the internode may be split off by a straight septum from the rest of the internode; it may then bear one nematotheca or no nematotheca at all.

One of the colonies from St. 188 bears female gonothecae. These are more or less pear-shaped, sometimes slightly curved, with a circular opening, the plane of which is oblique. The gonothecae are not so strongly curved as is usually observed in European colonies of this species; this, however, may largely be the result of the young state of the Galathea colonies.

Measurements (in microns): –

	"Galathea" St. 188
Hydrocaulus, diameter at base	900
distance between two successive apophyses	400-810
Hydroclades, length thecate internodes	600-945
diameter at node	65-80
Hydrotheca, length abcauline wall	55-60
length adnate part adcauline wall	80-95
diameter at aperture	85-95
Pleurohydrothecal nematotheca, length	120-190
diameter	45-55
Unpaired nematotheca, length	95-110
diameter	40-45
Female gonotheca, length	800
diameter	400-420

Remarks:

MILLARD (1962, p. 299) has drawn attention to the great variability in appearance and structure of this species, largely resulting from differences in age and mode of growth of the various colonies. This also accounts for the many specific names under which the species has been described (cf. BEDOT, 1917, p. 46); I would not be surprised if the number of synonyms still increased after a (much needed) revision of this genus. So far the species has principally been recorded from the Atlantic, ranging from boreal to tropical waters. *H. ramosa* undoubtedly also occurs in Pacific waters, from where it has been recorded by BILLARD (1913, waters of the Malay Archipelago). MILLARD (1962) mentions localities from the west and the south coast of South Africa; she also specifies a locality from Natal, 29°46'S, 31°17'E, depth 110-130 m. The present records are from off the coast of south-east Africa.

Nemertesia antennina irregularis (Quelch, 1885)

Fig. 42.

Antennularia irregularis Quelch, 1885, p. 8; FRASER, 1938, pp. 10, 59, pl. 13, fig. 67; FRASER, 1938a, p. 135; FRASER, 1948, p. 266.

Antennularia Janini Marktanner-Turneretscher, 1890, p. 259, pl. 6, figs. 9, 9a.

Antennularia americana Nutting, 1900, p. 69, pl. 9, figs. 3, 4.

Antennularia antennina var. *longua* Billard, 1904, pp. 216, 219, 230, 232.

Antennularia antennina var. *longa* Billard, 1906, p. 332.

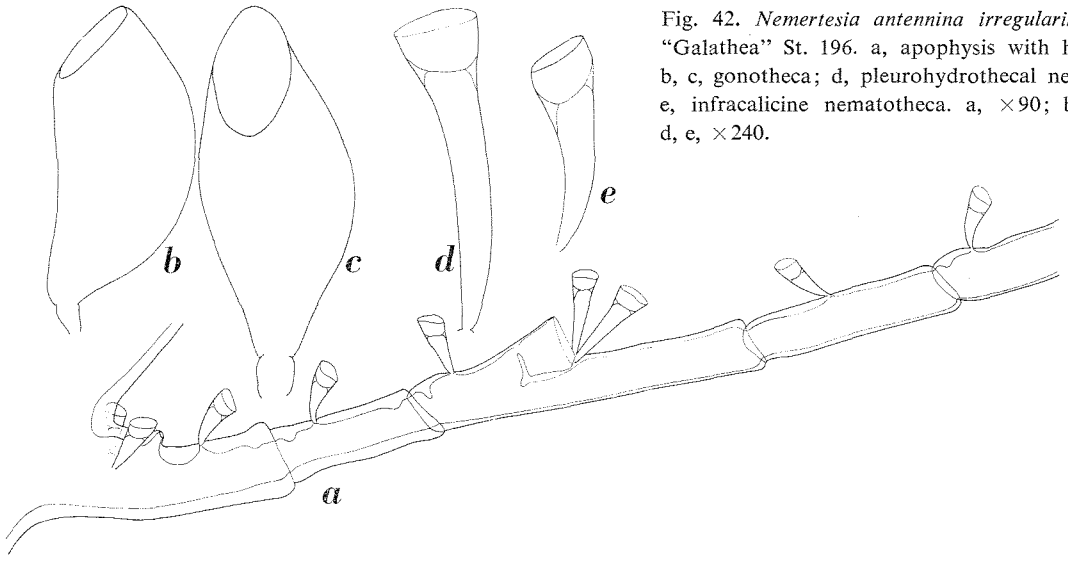

Fig. 42. *Nemertesia antennina irregularis* (Quelch), "Galathea" St. 196. a, apophysis with hydroclade; b, c, gonotheca; d, pleurohydrothecal nemetotheca; e, infracalicine nematotheca. a, ×90; b, c, ×55; d, e, ×240.

Antennularia perrieri var. *antennoides* Billard, 1904, pp. 217, 219, 220, 230, 232.

Antennularia perrieri var. *irregularis* Stechow, 1909, p. 83.

Nemertesia irregularis var. *antennoides,* Stechow, 1913, p. 94.

Nemertesia irregularis var. *longa,* Stechow, 1913, p. 94.

Nemertesia antennina var. *irregularis,* Bedot, 1917, p. 42; Bedot, 1921, p. 23.

Material:

St. 196, off Durban (29°55'S, 40°20'E), 13-14.2. 1951, 425-430 m depth. – A tuft of 5 hydrocauli, rising from a communal mass of fibres, and some fragments. Empty gonothecae present.

Description:

The hydrocauli reach a maximum height of 55 mm; they are fused together basally and there are covered by some secondary tubes. There is a small though dense cluster of hydrorhiza fibres. The hydrocauli are non-fasciculated and only basally show the beginning of canaliculation. There are no internodes and four to three apophyses for each whorl. The apophyses of successive whorls do not alternate, so that the arrangement of the hydroclades is tri- or tetrastichous. Each apophysis has a distinct "mamelon", preceded by a pair of nematothecae. On the distal part of the apophysis an unpaired nematotheca may be present. The periderm of the hydrocauli is very thick and rich brown coloured.

The hydroclades are 5 to 8 mm long, heteromerously segmented and comprise 6 to 8 hydrothecate articles. The first article is invariably an athecate article, bearing a single (basal) nematotheca. There is also a basal peridermal ring, but no septum. The hydrothecate articles have a basal, unpaired nematotheca, a small hydrotheca and a pair of slender pleurocalicine nematothecae. The athecate distal portion of the article varies greatly in length. The various thecate internodes are separated by intermediate, athecate articles, bearing a single, or exceptionally two, nematothecae. In many instances the intermediate internode is divided in two or more short articles, that may or may not bear a nematotheca.

The hydrotheca is small and cup-shaped; the adcauline wall is fully adnate with the internode. The aperture is circular.

The unpaired nematothecae are slightly curved, funnel-shaped structures, with a circular opening and a globular apical chamber. The pleurohydrothecal nematothecae are long and slender; they are symmetrically trumpet-shaped and have an almost circular aperture.

Many empty gonothecae occur on the apophyses, borne on short stalks, incerting laterally of the "mamelon". They are globular, more or less pear-shaped, with the opening strongly tilted in adcauline direction. The lids of the thecae have disappeared; the sex could not be ascertained.

Measurements (in microns): –

	"Galathea" St. 196
Hydrocaulus, diameter at base	850
distance between two successive apophyses	540-680
Hydroclades, length thecate internodes	335-600
diameter at node	50-55
length first athecate internode	200-270
length intermediate athecate internodes	200-410

	"Galathea" St. 196
Hydrotheca, length abcauline wall	65-70
length adnate part adcauline wall	80-105
diameter	80-85
Pleurocalicine nematotheca, length	120-165
maximum diameter	60-65
Unpaired nematotheca, length	105-125
diameter at margin	35-45
Gonotheca, length	810-900
maximum diameter	400-450

Remarks:

The present material is characterized by extreme variability in the segmentation of the hydroclades on the same hydrocaulus and on separate hydrocauli. Thus the first athecate internode is of variable length and may bear no, one or two nematothecae. The distal, athecate part of the hydrothecate article varies extremely in length; sometimes it is cut off just above the hydrotheca. There is normally one intermediate article with a single nematotheca, but two nematothecae may be present and a further division of this internode into two or more short internodes, with or without nematotheca, is commonly observed and is quite irregularly distributed over the colonies. I have no doubt that my material conforms to *Nemertesia antennina* var. *irregularis* (Quelch) as described by BEDOT (1917, 1921). It is absolutely intermediate in every respect between typical specimens of *Nemertesia antennina* (Linnaeus, 1758) and *N. perrieri* (Billard). I do not think this is just a variety of *N. antennina* or *N. perrieri* but a distinct and separate subspecies or species in the *N. antennina* group. Description of more material, particularly of the changes that take place during development of the colony, is urgently needed.

Distribution:

N. antennina irregularis is now known to occur in subtropical and tropical waters of the Atlantic and Pacific Oceans. As far as I can see this is the first record from the east coast of South Africa.

Plumularia setacea (Linnaeus, 1758)
Fig. 43.

Sertularia setacea Linnaeus, 1758, p. 813.

Plumularia setacea, HINCKS, 1868, p. 296, pl. 66, fig. 1; BEDOT, 1911, p. 222; RITCHIE, 1911, p. 851; BILLARD, 1913, p. 32, fig. 24; BEDOT, 1921, p. 10; BILLARD, 1931, p. 247; BROCH, 1933, p. 34; LELOUP, 1933, p. 27; KRAMP, 1935, p. 161, fig. 64c; LELOUP, 1935, p. 3; LELOUP, 1937a, pp. 5, 46; FRASER, 1938, pp. 10, 66; FRASER, 1938a, p. 111; FRASER, 1938b, p. 136; KRAMP, 1938, pp. 35, 63, 68, 72; LELOUP, 1938, p. 8; VERVOORT, 1942, p. 300; KRAMP, 1943, p. 44; VANNUCCI, 1946, p. 579, pl. 5, fig. 51; VERVOORT, 1946, p. 323, fig. 6; LELOUP, 1947, p. 33, fig. 25; FRASER, 1948, p. 287; VANNUCCI, 1949, p. 254; VERVOORT, 1949, p. 146; ROSSI, 1950, p. 22; VANNUCCI, 1950, p. 89, pl. 1, fig. 5; PICARD, 1951, p. 112; VANNUCCI, 1951, pp. 106, 108, 109, 111, 113, 115, 117; HAMOND, 1957, p. 318; MILLARD, 1957, p. 232; MILLARD, 1958, p. 212; MILLARD, 1959a, p. 252; MILLARD, 1962, p. 301.

Plumularia corrugata Nutting, 1900, p. 64, pl. 6, figs. 1-3; FRASER, 1938, pp. 10, 63; FRASER, 1938a, p. 111, FRASER, 1938b, p. 136; FRASER, 1948, p. 276; VANNUCCI, 1951, pp. 113, 114.

Plumularia palmeri Nutting, 1900, p. 65, pl. 6, figs. 4, 5.

Plumularia milleri Nutting, 1905, p. 951, pl. 5, fig. 1 and pl. 12, figs. 6, 7.

Material:

St. 196, off Durban (29°55'S, 31°20'E), 13-14.2. 1951, 425-430 m depth. – One colony of 40 mm height and a fragment. No gonothecae.

Description:

The hydrocaulus is monosiphonic and straight, even in the highest parts of the small colony; it is indistinctly divided into internodes by straight septa, that have become completely lost in the older parts of the colony. At times there is an additional straight septum in one of the stem internodes. Each stem internode has a distinct apophysis, alternately pointing slightly forward and to left or right; the hydroclades are borne on the apophyses. They are not strictly in one plane, but directed towards the frontal part of the colony. Each apophysis has a small but distinct "mamelon" and an axillary nematotheca; there are two additional stem nematothecae on each internode on the side opposite to the apophysis. There is a septum in the apophysis just below the insertion of the hydroclade.

The hydroclades are homomerously segmented, each internode beginning with a short athecate internode, with septum but without nematotheca. The length of the thecate internodes varies greatly, generally there are 8 to 10 internodes to each hydroclade. The thecate internode has 2 infracalicine nematothecae, a small hydrotheca and a pair of

pleurohydrothecal nematothecae; in addition there is a proximal and a distal septum. The hydrotheca is cup-shaped, usually slightly deeper than wide, with a straight or very slightly convex abcauline wall. The margin may be very slightly everted; the plane of the aperture is not perpendicular to the length axis of the internode, but slightly tilted in abcauline direction. The hydrothecal margins are not thickened. The unpaired nematothecae are slightly curved, more or less horn-shaped structures (Fig. 43d); the pleurohydrothecal nematothecae are slender and trumpet-shaped, with slightly widering apical portion and globular apical chamber (Fig. 43e). They are attached to the internode slightly above the end of the completely fused adcauline thecal wall.

In some instances a part of the thecate internode, usually the basal part, has become split off by the development of an extra septum; it usually bears one of the unpaired nematothecae.

No gonothecae have been observed, but the presence of circular spots of thin periderm on the apophyses suggests that they have originally been present.

Measurements (in microns): –

	"Galathea" St. 196
Stem internodes, length	540-810
diameter at node	190-215
distance between 2 successive apophyses	470-610
Hydroclade, length proximal internode	65-80
length thecate internode	710-950
diameter at node	80-95
Hydrotheca, length abcauline wall	100-120
length adnate adcauline wall	135-150
diameter at aperture	125-135
Pleurohydrothecal nematotheca, length	110-120
diameter at margin	40-45
Unpaired nematotheca, length	80-110
diameter at margin	35-40

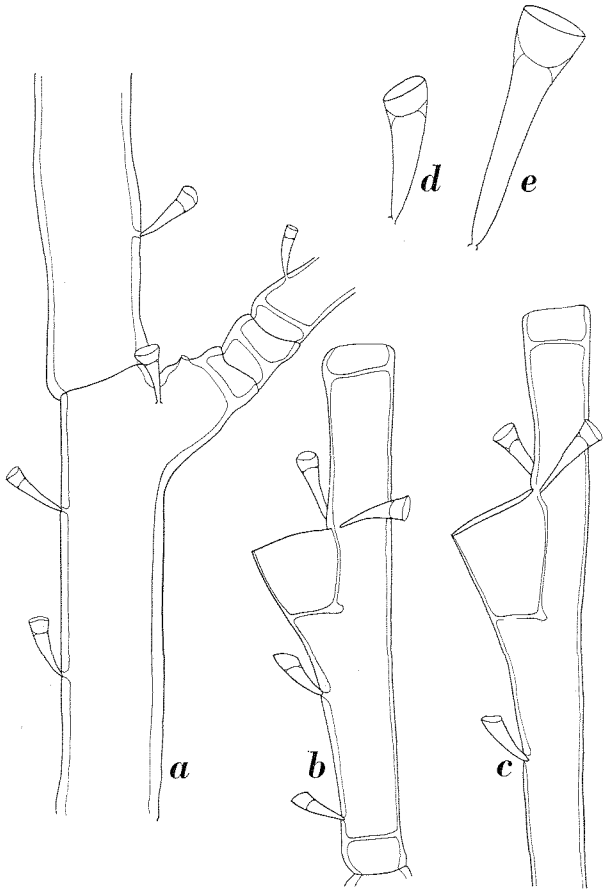

Fig. 43. *Plumularia setacea* (Linnaeus), "Galathea" St. 196. a, part of hydrocaulus with apophysis; b, c, hydrocladial internode; d, infracalicine nematotheca; e, pleurohydrothecal nematotheca. a-c, ×90; d, e, ×220.

Remarks:

The present specimens, in proportional lengths of hydrothecate article and hydrotheca, agree with f. *microtheca* Broch (1912, p. 21). *P. setacea,* of which several varieties and formae have been described, is extremely variable, probably as a result of its cosmopolital distribution. I do not think that Broch's two formae (f. *typica* and f. *microtheca)* have any real taxonomic importance, as there is a very great variability in the length of the thecate internode in the same colony. The synonymy of this species given in the heading has no claim to completeness; there probably are many other synonyms. I have excluded from the synonymy two species, that have formerly been regarded as synonymous, viz., *Plumularia lagenifera* Allman (1886, p. 157, pl. 26, figs. 1-3) and *Plumularia turgida* Bale (1888, pp. 779, 786, pl. 20, figs. 12, 13).

P. lagenifera Allman (= *P. californica* Marktanner-Turneretscher, 1890, p. 255, pl. 6, fig. 4) has recently been redescribed by Millard (1957, p. 230) and it appears that this species can readily be separated from *P. setacea* by characters of the hydrotheca.

P. turgida Bale seems to differ from *P. setacea* by the constant occurrence of two axial nematothecae on the apophyses. Bale's species may be identical with *P. diploptera* Totton (1930, p. 222, fig. 59a, b); a reinspection of Bale's type material seems to be indicated. The differences between *P. diploptera* and *P. turgida* have been listed by Ralph (1961, p. 33).

Distribution:

P. setacea is a cosmopolitan species, occuring in boreal, subtropical and tropical parts of the Atlantic,

Indian and Pacific Oceans. It has been observed along the whole of the South African coast (MILLARD, 1957, 1958, 1959, 1962), where it occurs in shallow and deeper waters.

Subfamily **Aglaopheniinae**

Aglaophenia septata Ritchie, 1909
Figs. 44 and 45.

Aglaophenia septata Ritchie, 1909, p. 526; RITCHIE, 1910, p. 15, pl. 14, figs. 6, 7; BEDOT, 9121a, p. 341.

Aglaria septata, STECHOW, 1923, p. 16; REES & THURSFIELD, 1965, pp. 184, 194.

Material:

St. 324, Strait of Malacca (6°38'N, 96°00'E), 9.5.1951, 1140 m depth. – 5 complete colonies of 4-9 cm height and some fragments. The colonies all have a basal tuft of hydrorhiza fibres; two have one corbula each. Hydranths present.

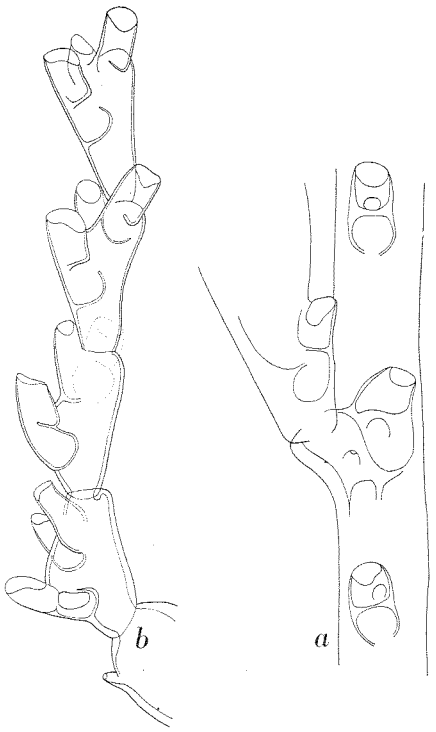

Fig. 44. *Aglaophenia septata* Ritchie, "Galathea" St. 324. a, part of hydrocaulus with cauline nematothecae and apophysis; b, nematoclade. ×90.

Description:

The general shape of the colony reminds strongly of *Thecocarpus myriophyllum* (L.); it is feather-shaped, with a basal tuft of fine hydrorhiza fibres, a fairly long, slender hydrocaulus, of which the first part is devoid of hydrocladia, and two tows of hydroclades on the frontal aspect of the hydrocaulus, gracefully curving laterally and alternately arranged. The hydrocaulus is primarily a monosiphonic tube with fairly thick, rich brown periderm. In the basal parts of the colony it is reinforced by several secondary tubes, running parallel to the primary tube but never covering it completely. There are a few oblique septa in the basal part of the colony, that separate some internodes from the basal part of the stem with its hydrorhiza fibres, and the rest of the stem, bearing the hydroclades. There is one longitudinal row of immovable, large nematothecae on the frontal aspect of the colony. Some of these nematothecae may also occur on the above mentioned stem articles. The basal part of the hydroclade-bearing portion of the stem has a variable number of modified hydroclades (or better nematoclades), preceding the normally developed hydroclades and just as these alternately arranged on the stem apophyses. These nematoclades are 3 to 10 mm long and broken up into short internodes by means of straight septa. Each internode bears 3 two-chambered nematothecae of the type also observed along the hydrocaulus. The basal chamber of these nematothecae is sunken more or less into the internode and communicates with the internode by means of a circular hole. The apical chamber has a gutter-shaped opening. The number of internodes varies between 4 and 15. The apical part of the hydrocaulus, in addition to the nematothecae, has on its frontal aspect a row of short apophyses, alternately pointing obliquely left or right. One of the nematothecae is then found more or less axillary and faces the opposite direction of the apophysis. In addition there is a "mamelon" on the median surface of each apophysis. The nematothecae on the hydrocaulus are two-chambered, with a distinct septum separating the two chambers, and a gutter-shaped aperture. The apical chamber has a circular hole through which the nematotheca communicates with the cavity in the hydrocaulus. Each apophysis supports a 8-10 mm long hydroclade, bearing 9-12 hydrothecae. All hydroclades are completely divided into hydrothecate internodes; the first internode of each hydroclade is hydrothecate. Each internode has an unpaired infrahydrothecal nematotheca, a hydrotheca and a pair of pleurocalicine nematothecae. The shape of the hydrotheca can best be described by referring to Fig. 45; it is fairly deep; the extreme

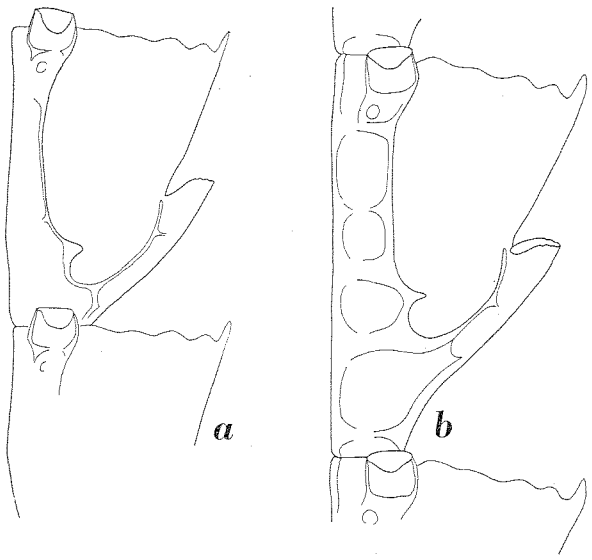

Fig. 45. *Aglaophenia septata* Ritchie, "Galathea" St. 324. a, hydrotheca from distal part of hydroclade; b, hydrotheca from basal part of hydroclade. ×90.

basal part has a chitinized ridge projecting into the cavity of the theca from the adcauline side. The margin of the theca is circular and the plane almost perpendicular to the length axis of the hydroclade; there is, however, a slight and variable tilt in abcauline direction. The hydrothecal margin on each side has 4 weak teeth with rounded edges, gradually and almost imperceptibly increasing in height medially. There is a fairly strong, triangular median tooth.

The unpaired nematotheca reaches halfway the adcauline thecal wall; it has a distinct septum; the aperture is notched and deepened at the place of contact with the hydrotheca. The pleurohydrothecal nematothecae project slightly above the margin of the hydrotheca; the adcauline margin is scooped out, there is a distinct septum and the communication with the cavity of the internode is by means of a hole in the basal chamber. There are septa of variable development in the internode. The greatest number observed is five (at the bottom of the internode, at the bottom of the theca, slightly above the thecal ridge, halfway the base of the nematotheca and at the base of the paired nematothecae), but they fade away very gradually near the younger parts of the colony. In the young hydroclades there are only two thin septa, one above the thecal ridge and one at the base of the paired nematothecae.

Two of the colonies bear empty corbulae. These are 5 mm long structures, found on normal hydroclades in the higher parts of the colony. Each corbula is attached to the internode by means of two normal, hydrothecate internodes. The corbula itself is an elongated, ovoid body, composed of about 11 pairs of gonohydroclades, rising directly from the rhachis without a basal hydrotheca. Each gonohydroclade has a conspicuous, curved, strongly chitinized leaf-like costa, forming with those of the other gonohydroclades a completely closed structure. Each costa has two spurs of variable length: a basal spur, that may curve away from the gonohydroclade and may be strongly flattened, and a usually slightly shorter apical spur. The spurs are set with a row of two-chambered nematothecae along both edges; the nematothecae of the apical spur continue on the costae until the basal spur is reached. The rhachis of the corbula projects forward as un unpaired spur with a row of nematothecae along both its edges.

Measurements (in microns): –

	"Galathea" St. 324
Hydrocaulus, diameter at base	610
Hydrothecate internode, length	580-635
diameter at node	55-110
Hydrotheca, total depth	400-410
length free part abcauline wall	245-270
diameter at aperture	190-270
Median nematotheca, total depth	190-240
Lateral nematotheca, total depth	120-125
diameter	65-80

Remarks:

The "Galathea" specimens agree in detail with RITCHIE's description of *Aglaophenia septata,* particularly his description of the characteristic corbula. RITCHIE apparently failed to observe the almost complete absence of septa in the hydroclades of the younger parts of the colony or, what seems more likely, he had a fragment of an older colony; one of the hydrothecae he figures has as many as 7 internodial septa, 5 being the highest number observed in my specimens.

I have compared my material with the type of *Aglaophenia* (?) *galatheae* Kramp (1956, p. 19, figs. 6, 7), kindly placed at my disposal by Dr. F. JENSENIUS MADSEN of the Zoological Museum of the University, Copenhagen. Though there is undoubted similarity between both species, *A. galatheae* has no distinct septa in the internodes, the hydrothecae are deeper and slenderer, with a differently shaped margin and the plane of the aperture is tilted in adcauline direction (Fig. 46c). Moreover, the type has only 10 hydroclades, 5 on each side, about 10 mm apart. This specimen, the only colony known, was taken at "Galathea" St. 465, Sunda (Java)

Trench, 10°20′S, 109°55′E, 6900-7000 m depth. The label with the type specimen reads "uncertain whether taken on bottom".

A. septata has originally been recorded from the Bay of Bengal near the Andaman Islands (type locality), 490 fms. (= 896 m) depth; RITCHIE's only specimen measured 65 mm height; the corbula described by RITCHIE was found entangled in the tuft of hydrorhiza fibres at the base of the colony. It has now definitely been established that the type of corbula described by RITCHIE really does belongs to *A. septata.* The present specimens are all from the Strait of Malacca.

STECHOW (1923, p. 16) erected the genus *Aglaria* for the reception of this species; his motivation being the aberrant structure of the corbula. Though the shape of the corbula of this species after a first, superficial inspection may appear to be curious, its structure is not basically different from the type generally met with in *Aglaophenia.* I have therefore not accepted STECHOW's genus *Aglaria* but placed the species in *Aglaophenia,* where in my opinion it belongs.

Aglaophenia elongata (Meneghini, 1845)
Fig. 46a, b.

Plumularia elongata Meneghini, 1845, p. 12, pl. 13, fig. 2.

Aglaophenia elongata, BEDOT, 1921, p. 47, pl. 2, figs. 39, 40; BEDOT, 1921a, p. 339; BROCH, 1933, p. 56, figs. 18f, 21; LELOUP, 1937, pp. 112, 117; VERVOORT, 1941, p. 232.

Material:

St. 74, off Congo River (5°41′S, 11°32′E), 7.12. 1950, 291 m depth. – 10 plumes of 10-25 mm height, rising from a creeping stolon. No corbulae.

Description:

The hydrocaulus is fairly thick and not divided into internodes; it has a longitudinal row of nematothecae on its frontal aspect. The apophyses, also observed on the frontal aspect of the stem, alternately point obliquely forward and to left or right; there is one nematotheca in the axil, which appears to be one-chambered. No "mamelon" has been observed. The hydroclades, originating from the apophyses, gracefully curve to the left or right side; they are completely broken up into hydrothecate internodes. They are 5-12 mm long and may bear as many as 20 hydrothecae. Each internode has a long and slender hydrotheca, an unpaired median nematotheca and a pair of pleurohydrothecal nematothecae. The hydrotheca is deep and tubular, basally with a thin, upwardly directed lip. The margin has a distinct and fairly acute median tooth and four pairs of lateral teeth, the last of which is almost hidden by the lateral nematothecae. The hydrothecal teeth are blunt and separated by rounded incisions. The median nematotheca leaves about two thirds of the frontal thecal wall uncovered; it has a small, round aperture, pointing obliquely forward. It communicates with the interior of the internode by means of a round foramen. The lateral nemato-

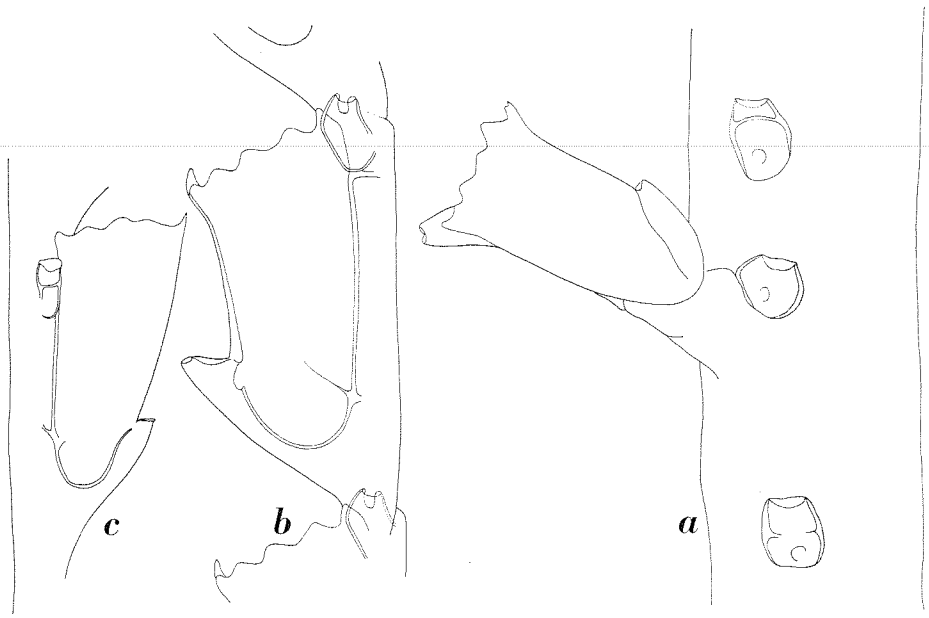

Fig. 46. a, b, *Aglaophenia elongata* (Meneghini), "Galathea" St. 74. a, part of hydrocaulus with cauline nemetothecae and apophysis; b, hydrotheca. c, *Aglaophenia* (?) *galatheae* Kramp, "Galathea" St. 465, hydrotheca. a, ×90; b, c, ×110.

thecae have a very indistinctly developed septum; they point slightly above the hydrothecal margin and have a deeply scooped out adcauline margin. There are two septa in the internode, one at the level of the hydrothecal diaphragm and one at the base of the lateral nematothecae.

No corbulae have been observed.

Measurements (in microns): –

	"Galathea" St. 74
Diameter of stem	295-400
Hydrocladial internode, length	595-655
diameter at node	68-80
Hydrotheca, total depth	460-485
length free part abcauline wall	270-325
diameter at margin	175-190
Median nematotheca, length free part	68-95
Lateral nematotheca, total depth	115-135
diameter at aperture	45-60

Remarks:

The present colonies agree with BEDOT's (1921, p. 48) description. *A. elongata* has probably frequently been confused with *A. pluma* (Linnaeus, 1758) and its many varieties, so that the geographical distribution cannot be given accurately. The species is probably distributed over the tropical and subtropical parts of Atlantic, Indian and Pacific Oceans (VERVOORT, 1941, p. 233). In the western Atlantic it has been observed off the French coast and near the Azores (BEDOT, 1921). LELOUP (1937) also mentions the Cape Verde Islands. Its presence further south in the Gulf of Guinea has now also been established.

Thecocarpus tenuissima (Bale, 1914)
Fig. 47.

Aglaophenia tenuissima Bale, 1914, p. 179, pl. 37, figs. 1, 2; KRAMP, 1956, p. 18, figs. 4, 5.

Aglaophenia (Thecocarpus) tenuissima, BALE, 1915, p. 322.

Material:

St. 408, South China Sea (12°47'N, 116°24'E), 4.7.1951, 4330 m depth. – One fragmentary specimen, consisting of the basal part of a colony with a single hydroclade. No corbula.

St. 626, Tasman Sea (42°10'S, 170°10'E), 20.1. 1952, 610 m depth. – Three well developed colonies, up to 12 cm high, with tufts of hydrorhiza fibres. No corbulae.

Description:

The structure of the colony in this species is very characteristic. From a dense cluster of hydrorhiza fibres the primary plume arises. This is a feather-shaped colony, with a fairly thick main stem, a short basal part devoid of hydroclades, and two rows of hydroclades. The main stem is composed of a primary axis, partly broken up into internodes, covered by parallel secondary tubes. At about one third the length of the plume the secondary tubes suddenly curve upwards, to form the stem of a secondary plume, while the primary tube continues in the primary plume. The secondary plume has the same structure as the primary, but it takes its origin from the stem of the primary plume. In exactly the same fashion a tertiary plume is found on the secondary, a quaternary on the tertiary, etc. The sympodial main axis of the colony, resulting in this fashion, is thus composed of the basal parts of main stems of the successive plumes, it is more or less spirally twisted. In the largest specimen from St. 626 the stem basally has a diameter of 1,100 μ, it gradually diminishes in diamter apically.

The various plumes are composed of a monosiphonic axis, only partly and indistinctly divided into internodes. The frontal aspect of the axis has a longitudinal row of nematothecae and two rows of apophyses, directed obliquely forward and alternately left and right. The arrangement of the nematothecae is such that each apophysis is accompanied by three nematothecae: two on the frontal aspect (belonging to the longitudinal row) and found under and above the apophysis respectively, and one nematotheca on the backside, almost hidden in the axil of the apophysis. No "mamelon" has been observed. The hydroclades arise from the apophyses and are alternately and gracefully curved left or right. They are 15-25 mm long, completely broken up into thecate internodes and may bear as many as 20 hydrothecae. The first internode of each hydroclade is a hydrothecate internode. These internodes have one hydrotheca, an unpaired median nematotheca and a pair of pleurohydrothecal nematothecae.

The hydrotheca is not particularly deep and cup-shaped; in the basal part there is a low ridge, projecting into the cavity of the theca from the septum at the back. The aperture is circular, its plane is not perpendicular to the length axis of the theca but slightly tilted in abcauline direction. The margin has 4 pairs of low, rounded teeth, separated by shallow, rounded incisions, and a fairly strong, pointed median tooth.

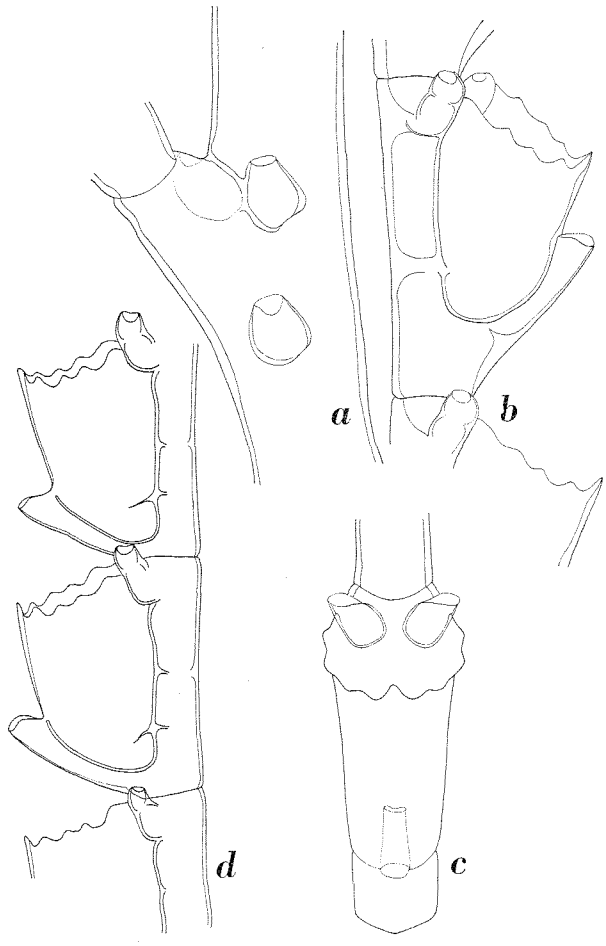

Fig. 47. *Thecocarpus tenuissima* (Bale). a-c, "Galathea" St. 626; a, part of hydrocaulus with apophysis and cauline nematothecae; b, hydrotheca, lateral view; c, hydrotheca, frontal view. d, lectotype, Great Australian Bight (Brit. Mus., 1919.10.14.40). ×70.

The median nematotheca reaches slightly beyond the middle of the abcauline thecal wall; its opening is gutter-shaped; there is no septum. It corresponds with the cavity of the internode by means of a hole at its base. The paired nematothecae are short, two-chambered structures, reaching slightly beyond the hydrothecal margin; the septum in these nematothecae is incomplete.

There are, in the internode, two strong septa; one corresponding with the hydrothecal ridge and one at the base of the paired nematothecae.

No corbulae are present in the "Galathea" material, but these have shortly been described by BALE (1914, p. 181). From BALE's description it appears that the gonohydroclades have spurs bearing hydrothecae, so that the species must be removed from *Aglaophenia,* into which it has been described by BALE, to *Thecocarpus* (cf. BEDOT, 1921a, p. 334).

Measurements (in microns): –

	"Endeavour" Great Australian Bight	"Galathea" St. 626
Hydroclade, length of internode.	350-390	400-495
diameter at node.....	93-102	80-125
Hydrotheca, total depth	315-350	420-430
length free part abcauline thecal wall	185-190	148-162
diameter.....	175-180	150-165
Paired nematotheca, length.....	100-115	120-125
diameter.....	35-38	40-45

Remarks:

The present material agrees in detail with Bale's description, but for a small difference in the structure of the colony, also noted by KRAMP (1956, p. 19). All of BALE's material originated from the Great Australian Bight, between 130°40′ and 126° 45′15″E, 160-320 fms (= 293-585 m) depth. Additional material has been recorded by KRAMP (1956) from the Kermadec Trench ("Galathea" St. 658, 35°51′S, 178°31′W) at 6660-6770 m depth. The present material, from the South China Sea and the Tasman Sea, considerably extends the geographical range of this characteristic deep water species.

I have inspected a slide of *T. tenuissima* in the British Museum (Nat. Hist.), bearing the label "*Aglaophenia tenuissima* Bale, Great Australian Bight, Endeavour, 1913" and the number 1919.10. 14.40. This specimen is from W.M.BALE's collection; it is here designated as the lectotype. There is perfect agreement between the "Galathea" specimens and the lectotype; in the latter the plane of the hydrothecal aperture is not so strongly tilted as in the "Galathea" colonies and the hydrotheca is slightly less deep (Fig. 47d). In the "Galathea" material the unpaired nematotheca covers a greater portion of the frontal hydrothecal wall than in the lectotype, but in both the lectotype and the "Galathea" specimens there is some variability in this respect. The measurements of the lectotype are listed above.

Aglaophenia coarcta Allman (1883, p. 39, pl. 19, figs. 7-9) seems to possess a similar structure of the colony (cf. ALLMAN's figure 7 on pl. 19). Though the differences in the shape of the hydrotheca between this species and *T. tenuissima* might largely be explained by incorrectnesses of ALLMAN's figure, there is a very close approximation of the hydrothecae in *A. coarctata,* which is never encountered in *T. tenuissima.* ALLMAN's type of *A. coarctata* could not be found in the British Museum, so that very probably it has become lost.

Genus *Cladocarpus* Allman, 1874

This genus was described by ALLMAN (1874, p. 477) for *Cladocarpus formosus* Allman (1874, p. 478, pl. 68, figs. 1-1 b), which species, by monotypy, becomes the type of the genus. Many species have since been added to *Cladocarpus;* I have tried to enumerate these species as completely as possible below. At the suggestion of BEDOT (1921, p. 321) I have included in *Cladocarpus* the genus *Cladocarpella* Bale (1915, p. 303; type: *Cladocarpella multiseptata* Bale, 1915, p. 304, pl. 47, figs. 1-5). The various species of *Cladocarpus* can only with certainty be referred to this genus if the gonosome (phylactocarp) is present. Even then its limitations from *Aglaophenopsis* Fewkes (1881, p. 132; type: *Aglaophenopsis hirsuta* Fewkes, 1881, p. 133, pl. 1, figs. 2, 10 and pl. 2, fig. 3) and *Nematocarpus* Broch (1918, p. 74; type: *Halicornaria ramulifera* Allman, 1874, p. 477, pl. 67, figs. 3-3 d) are far from clear.

The following species are now referred to *Cladocarpus*. Those marked by an asterisk (*) are doubtfully included as no gonosome has been described.

**Cladocarpus alatus* Jarvis, 1922, p. 351, fig. 2, pl. 26, fig. 25;

**C. bathyzonathus* Ritchie, 1911, p. 861, pl. 89, figs. 2, 6, 11;

C. bicuspis (G.O.Sars, 1874, p. 98, pl. 2, figs. 7-10, as *Aglaophenia bicuspis);*

**C. bocki* Jäderholm, 1919, p. 24, pl. 6, figs. 3, 4;

C. bonneviae Jäderholm, 1909, p. 110 (= *Aglaophenia compressa* Bonnevie, 1899, p. 94, pl. 7, fig. 7);

C. campanulatus Ritchie, 1912, p. 226, figs. 4, 5;

C. carinatus Nutting, 1900, p. 117, pl. 29, figs. 3-7;

**C. cartieri* Bedot, 1921, p. 56, pl. 6, figs. 59, 60;

C. compressus Fewkes, 1881, p. 135, pl. 1, figs. 5, 9 and pl. 3, fig. 1;

**C. crenatus* (Fewkes, 1881, p. 132, as *Aglaophenia crenata);*

C. crenatus var. *allmani* Ritchie, 1909, p. 313, fig. 2;

C. diana Broch, 1918, p. 87, fig. 47;

C. distomus Clarke, 1907, p. 17, pl. 14 (= *Cladocarpus sibogae* Billard, 1911, p. 70, fig. 15; *Cladocarpella multiseptata* Bale, 1915, p. 304, pl. 47, figs. 1-5; *Cladocarpus plumularioides* Jarvis, 1922, p. 352, fig. 3);

C. dolichotheca Allman, 1877, p. 501, pl. 30;

C. dollfusi Billard, 1934, p. 229, figs. 3-5;

C. dubius Broch, 1910, p. 207 (= *Aglaophenia formosa* Bonnevie, 1898, p. 16, pl. 2, figs. 3-3 b);

C. flexilis Verrill, 1885, p. 517, pl. 9, fig. 29;

**C. flexuosus* Nutting, 1900, p. 114, pl. 27, figs. 11-13;

C. formosus Allman, 1874, p. 478, pl. 68, figs. 1-1 b (= *Cladocarpus crenulatus* Levinsen, 1893, p. 210, pl. 8, figs. 13, 14);

C. formosus var. *acacia* Naumov, 1960, p. 487;

C. formosus var. *murmanica* Ushakov, 1948, p. 286, figs. a, b;

**C. gracilis* Fraser, 1948, p. 269, pl. 36, fig. 39;

C. grandis Nutting, 1900, p. 115, pl. 28, figs. 3-5;

**C. hjorti* Broch, 1914, p. 9, figs. 10, 11;

C. holmi Levinsen, 1893, p. 209, pl. 7, figs. 15-18;

C. integer (G.O.Sars, 1874, p. 100, pl. 2, figs. 11-15, as *Aglaophenia integra* = *Aglaophenia moebii* Schulze, 1875, pp. 123, 124, pl. 2, figs. 3-5);

C. integer var. *ritchiei* Broch, 1918, p. 83 (= *Halicornaria integra* Ritchie, 1912, p. 228);

C. leloupi Millard, 1962, p. 304 (= *Cladocarpus flexilis* Leloup, 1939, p. 14, fig. 10);

C. lignosus (Kirchenpauer, 1872, pp. 27, 37, pl. 1, fig. 13 and pl. 4, fig. 13, as *Aglaophenia lignosa);*

C. longipinna Fraser, 1945, p. 22, fig. 3;

C. moderatus Fraser, 1948, p. 270, pl. 36, fig. 40;

C. multiapertus Billard, 1911, p. lxxi, fig. 16;

C. obliquus Nutting, 1900, p. 113, pl. 27, figs. 1-3;

C. paradiseus Allman, 1877, p. 53, pls. 32, 33 (as *Cladocarpus paradisea);*

C. pectiniferus Allman, 1883, p. 50, pl. 17 (= *Aglaophenia pharetra* Broch, 1918, p. 80, fig. 42);

C. pinguis Fraser, 1948, p. 271, pl. 36 and pl. 37, fig. 41;

C. pourtalesi Verrill, 1879, p. 309;

**C. savignyanus* (Kirchenpauer, 1872, pp. 29, 41, 44, pl. 1, fig. 24, as *Aglaophenia savignyana);*

C. septatus Nutting, 1900, p. 113, pl. 27, figs. 4-8;

C. sigma (Allman, 1877, p. 45, pl. 26, figs. 9, 10, as *Aglaophenia sigma);*

C. sigma var. *elongata* Bedot, 1921, p. 53, pl. 6, figs. 48, 49;

C. sigma var. *folini* Billard, 1906, p. 333;

C. speciosus Verrill, 1879, p. 311;

C. tenuis Clarke, 1879, p. 247, pl. 5, figs. 31, 31 b;

C. tortus Fraser, 1938, p. 60, pl. 14, fig. 69;

**C. valdiviae* Stechow, 1923, p. 116;

C. vancouverensis Fraser, 1914, p. 204;

C. ventricosus Allman, 1877, p. 52, pl. 31.

The following new species are now added to the genus;

C. sinuosus n.sp.

C. sinuosus var. *edentatus* n. var.

C. inflatus n.sp.

C. millardae n.sp.

Cladocarpus distomus Clarke, 1907
Fig. 48–50.

Cladocarpus distomus Clarke, 1907, p. 17, pl. 14; BEDOT, 1921a, p. 326; STECHOW, 1925, p. 506, fig. 47.

Cladocarpus sibogae Billard, 1911, p. 70, fig. 15; BILLARD, 1913, figs. 57, 58, pl. 4, fig. 39; BEDOT, 1921a, pp. 321, 325.

Cladocarpella multiseptata Bale, 1915, p. 304, pl. 47, figs. 1-5; BALE, 1919, p. 356.

Cladocarpus plumularioides Jarvis, 1922, p. 352, fig. 3.

Material:

St. 188, off Durban (29°55'S, 31°13'E), 2.2.1951, 495 m depth. – One colony of 40 mm height, bearing 5 hydroclades. One fragment, a hydroclade with 5 hydrothecae and well preserved hydranths. Gonosome absent.

Description:

The colony consists of a single, unbranched plume. The hydrocaulus basally is polysiphonic by the presence of a number of accessory tubes, running parallel with the main axis and rising from a small cluster of hydrorhiza fibres. The main axis has almost the same diameter over its whole length; it carries a longitudinal row of nematothecae on its frontal aspect and is divided into internodes of variable length by means of oblique septa. In addition there are 5 apophyses; 3 on one and 2 on another internode, pointing obliquely forward and alternately directed left and right. There usually are two nematothecae between the apophyses; there is also an axillary nematotheca which is one of the axial nematothecae, slightly displaced by the apophysis. No "mamelon" has been observed. The structure of the axial nematothecae can best be seen in Fig. 49 b, c; they are monothallamic, communicating with the cavity in the axis by means of a circular hole in the basal part of the nematotheca. The upper wall of this hole forms a lip projecting into the cavity of the nematotheca. The opening is large and slit-like.

The hydroclades, borne on the apophyses, are long and slender; they are separated by slightly oblique septa and bear an unpaired infracalicine nematotheca, a large hydrotheca, a pair of lateral nematothecae and an unpaired supracalicine nematotheca some distance above the hydrothecal margin. Both unpaired nematothecae resemble the axial

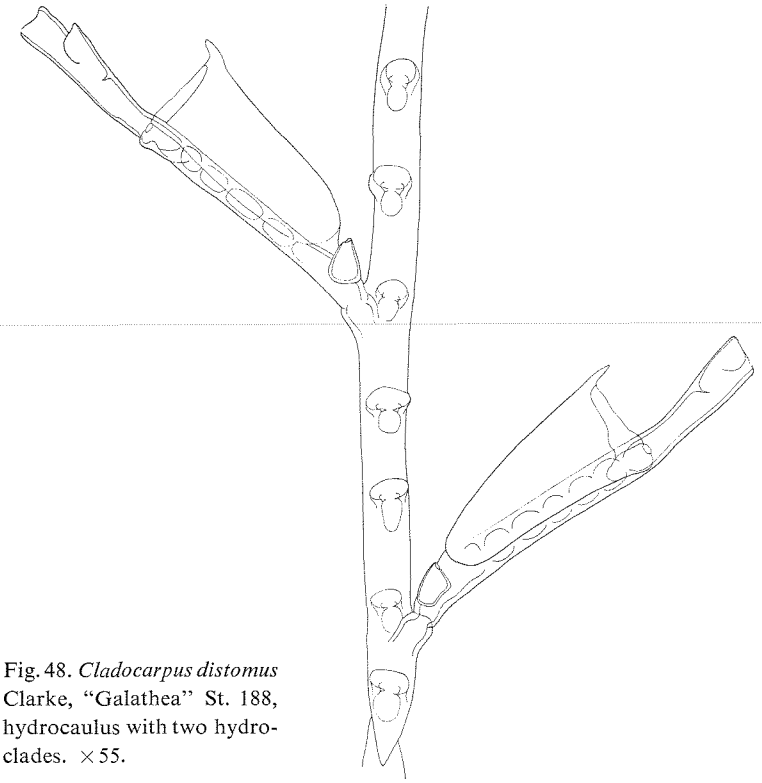

Fig. 48. *Cladocarpus distomus* Clarke, "Galathea" St. 188, hydrocaulus with two hydroclades. ×55.

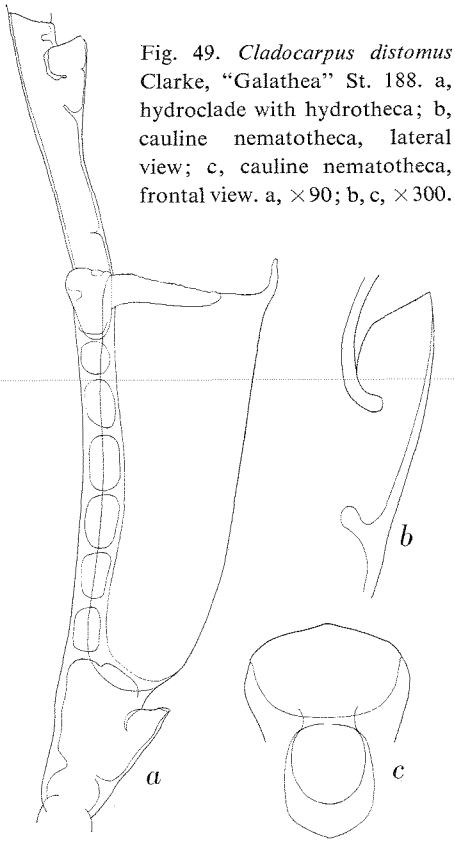

Fig. 49. *Cladocarpus distomus* Clarke, "Galathea" St. 188. a, hydroclade with hydrotheca; b, cauline nematotheca, lateral view; c, cauline nematotheca, frontal view. a, ×90; b, c, ×300.

nematothecae, but the aperture is narrower. The hydrotheca is deep and has a straight abcauline wall, rounded in the basal part of the theca and near the aperture curving outward into a strong median tooth. The infracalicine nematotheca does not reach the bottom of the hydrotheca. The lateral, paired nematothecae are rounded basally and gradually widen near the top. The apical part is rounded and has a narrow, circular opening. The hydrothecal aperture is almost circular, from the lateral nematotheca a flap-like structure is usually developed, duplicating part of the hydrothecal wall (cf. Fig. 49a) and forming a lip, with slightly crenulated margin, on both sides of the hydrothecal aperture. In the "Galathea" material all hydrothecae, without exception, have this duplication of the hydrothecal margin. There are 7 distinct septa in the internode behind the adcauline wall of the hydrotheca. In addition there is an imperfect septum in the basal part of the internode and one in the distal part of the internode just above the hydrothecal margin. The lateral nematothecae have a very indistinct septum or a chitinous ridge.

The apical 5 mm of the hydrocaulus, projecting above the last apophysis, also bears some hydrothecae and is divided into internodes.

No gonosome has been observed.

Measurements (in microns): –

	"Galathea" St. 188
Hydrocaulus, diameter at base	270
length cauline nematotheca	110-120
maximum diameter	95-110
Hydroclade, length internode	1,000-1,100
diameter at node	80-85
Hydrotheca, total depth	500-565
diameter at aperture	230-245
Unpaired nematotheca, length	95-110
Lateral nematotheca, length	105-110
diameter	65-70

The internodes of the fragment differ in the following respects from the above described colony:

a. The internodes are shorter, the part projecting above the hydrotheca is shorter and has no extra nematotheca. The septa in the internode number 16 and are very strong and thick.

b. The unpaired nematotheca is long and tubular, it has two distinct apertures, one at the apex and one at the base close to the abcauline wall of the hydrotheca.

c. The hydrotheca is slenderer and deeper, it has no duplication of the margin.

d. The lateral nematothecae are tubular, indistinctly two-chambered and project far above the hydrothecal margin.

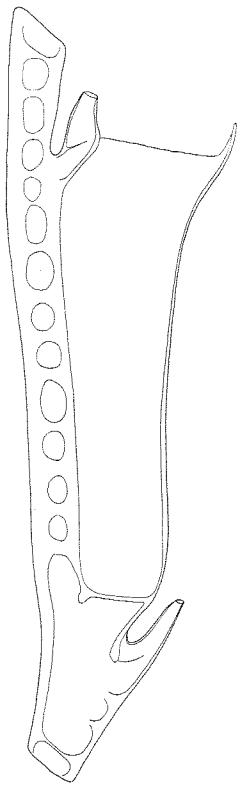

Fig. 50. *Cladocarpus distomus* Clarke, "Galathea" St. 188, hydroclade from fragment, with hydrotheca. ×90.

Measurements (in microns): –

	"Galathea" St. 188
Internode, length	950-1,055
diameter at node	80-95
Hydrotheca, total depth	565-660
diameter at margin	225-245
Unpaired nematotheca, length	175-180
diameter at apex	13-15
Lateral nematotheca, length	200-215
diameter at apex	35-40

This fragment resembles *Cladocarpella multiseptata* Bale (1915, p. 304, pl. 34, figs. 1-5) extraordinary much. This species, however, has been synonymized by STECHOW (1925) with *C. distomus*. My material is too scanty to throw any light on the variability of this species.

Remarks:

The synonymy of this species is complicated. *Cladocarpus distomus* was originally described by CLARKE (1907) from the eastern Pacific (6°52′N, 81°42.5′W, 556 fms (= 1017 m) depth); his material was sterile, had no duplication of the hydrothecal margin or septa in the internode and a single nematotheca on the prolonged part of the internode above the theca. CLARKE's species was synonymized

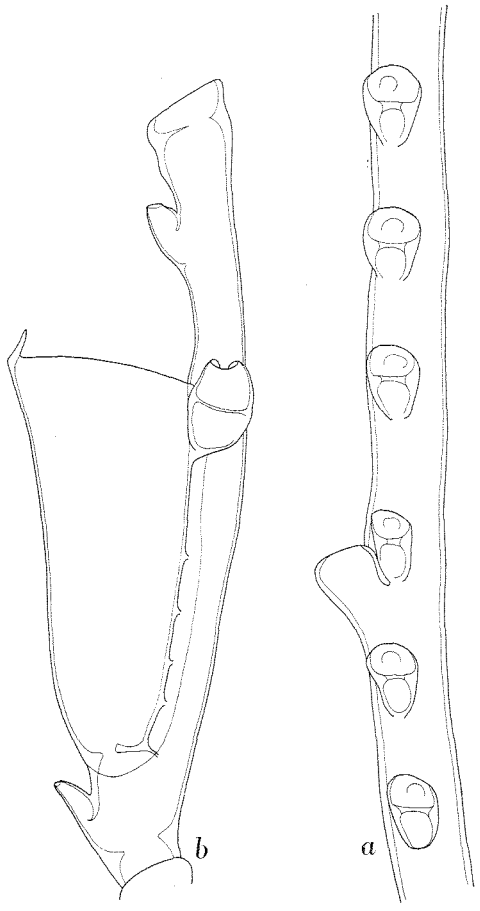

Fig. 51. *Cladocarpus plumularioides* Jarvis, holotype, Indian Ocean (Brit. Mus. 1923.2.15.155). a, part of hydrocaulus with apophysis; b, hydroclade with hydrotheca. ×115.

by STECHOW (1925, p. 506) with *C. sibogae* Billard, described by BILLARD from a single locality in the Arafoera Sea (55°33.8′S, 132°48.8′E, 560 m depth). His material possessed the gonosome and was characterized by the presence of internodial septa in some of the internodes; no nematotheca was found above the hydrotheca. BILLARD (1918, p. 26) subsequently synonymized his *C. sibogae* with *Cladocarpella multiseptata* Bale, a species agreeing with *C. sibogae* in nearly all particulars, but having a large number of internodial septa. The "Galathea" material is in complete agreement with the colonies described by STECHOW (1925, p. 506) from off the East African coast (2°58.5′N, 46°50.8′E, 1362 m depth and 6°18.8′N, 49°32.5′E, 1079 m depth); STECHOW's material also shows the highly characteristic duplication of the hydrothecal margin; the number of supracalicine nematothecae in his material varied between 1 and 3. All other material identified with *C. distomus* and discussed above has no duplication of the hydrothecal margin.

Cladocarpus plumularioides Jarvis should, if the above synonymy is accepted, also be included in *C. distomus*. Of this species I have inspected the holotype slide in the British Museum (Nat. Hist.) (1923.2.15.155) bearing the label "Cargados, Carajos, Shoals, Indian Ocean, 30 fms., J.S.Gardiner Colln., presented by Dr. H.W.M.Tims". This is a stained slide of a 8 mm long fragment with 3 about 10 mm long hydroclades. This material agrees best with the "Galathea" material from St. 188, though the hydrothecae in the type of *C. plumularioides* are less deep, the number of weakly developed septa is reduced and the lateral nematothecae project less far above the hydrothecal margin. There is one nematotheca on each hydrothecate internode above the hydrotheca. The measurements (in microns) of this specimen are:

	Cargados, Indian Ocean
Hydroclade, length internode	978-1,105
diameter at node	100-105
Hydrotheca, total depth	650-665
diameter at aperture	230-255
Unpaired nematotheca, length	120-130
Lateral nematotheca, length	127-135
diameter	68-76
Hydrocaulus, diameter	130
length cauline nematotheca	120-135
maximum diameter	78-85

A closely allied species has been described by JARVIS (1922, p. 351, pl. 26, fig. 2, textfig. 2) as *Cladocarpus alatus*. Of this species I have seen a schizoholotype slide in the British Museum (1923.2.15.169), bearing the label "Cargados, Carajos, Indian Ocean, 45 fms., J.S.Gardiner Colln., presented by Dr. H.W.Tims". This is quite a different species, with short hydrocladial internodes and small hydrothecae (Fig. 52). The species is particularly characterized by the lateral nematothecae; these have a median prolongation, running parellel to the hydrothecal margin and almost meeting under the median hydrothecal tooth. Each curiously shaped nematophore has 5 apertures: one axial and distinctly elevated aperture and 5 circular apertures opening along the hydrothecal margin. There are 5 internodial septa behind each theca; in addition there is a distinct septum at the bottom of each internode and the indication of a septum at the distal end of each internode. On the hydrocaulus there are 6 cauline nematothecae between 2 successive apophyses. The measurements of this specimen are:

	Cargados, Indian Ocean
Hydrocaulus, diameter	170
length cauline nematotheca	75-95
maximum diameter	60-70
Hydroclade, length internode	600-700
diameter at node	80-90
Hydrotheca, length	400-410
diameter at aperture	175-195
Unpaired nematotheca, length	55-60
Lateral nematotheca, height	95-105
spread	185-195

I have also studied some slides of *Cladocarpus bathyzonatus* Ritchie (1911, p. 861, pl. 89, figs. 2, 6, 11), viz., 2 schizosyntype slides from the Royal Scottish Museum (1959.33.742-743) and one schizosyntype slide in the British Museum (1964.8.7.250) (vide REES & THURSFIELD, 1965 p. 179). The material in the British Museum (Fig. 53) bears the label "Thetis, St. 57, 3½-4 miles off Wata Mooli, 22 March 1898, 54-59 fms.". This slide contains a 8 mm long stem fragment and 2 loose hydroclades. As in *C. distomus* the stem fragment bears apophyses on its frontal aspect; these are alternately directed obliquely left and right, so that the general shape

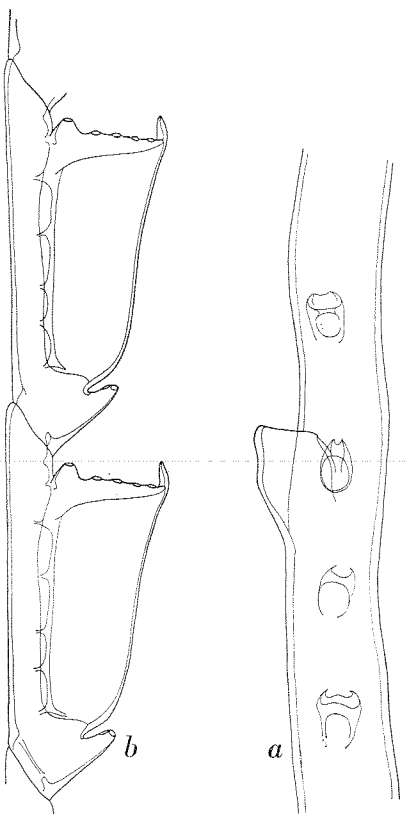

Fig. 52. *Cladocarpus alatus* Jarvis, schizoholotype, Indian Ocean (Brit. Mus. 1923.2.15.169). a, part of hydrocaulus with cauline nematothecae and apophysis; b, hydroclades with hydrothecae. × 90.

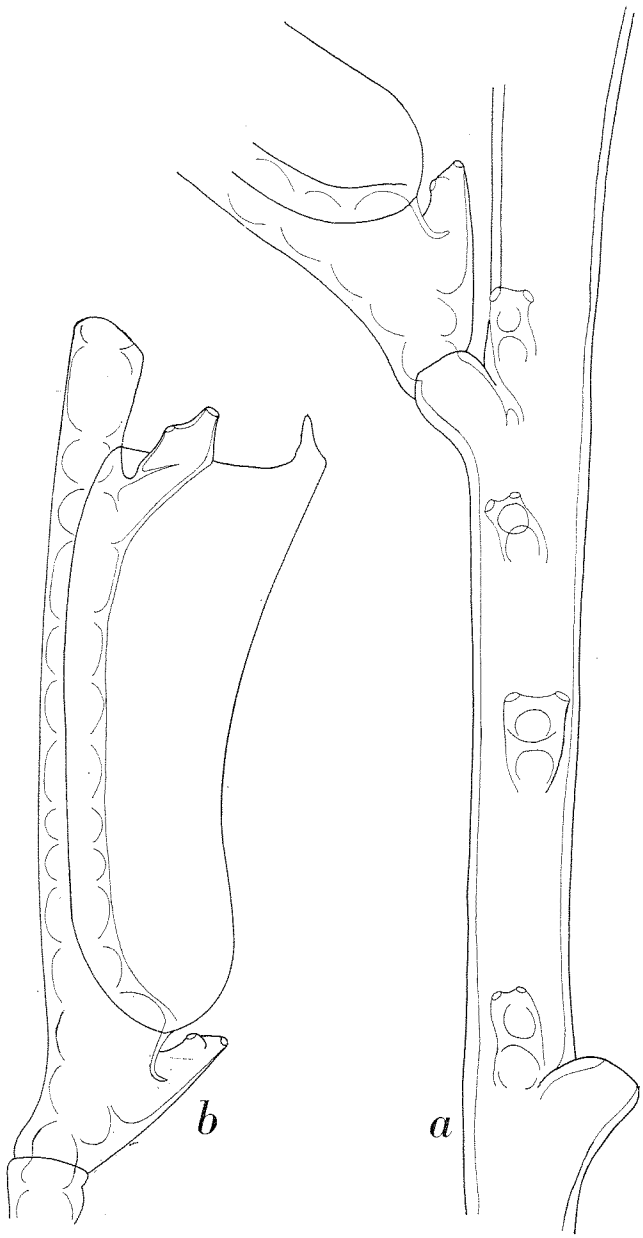

Fig. 53. *Cladocarpus bathyzonathus* Ritchie, schizosyntype, "Thetis" St. 57 (Brit. Mus. 1964.8.7.250). a, part of hydrocaulus with cauline nematothecae and apophysis; b, hydroclade with hydrotheca. × 140.

of the colony must have been feather-like. The stem is not divided into internodes; the number of nematothecae between two successive apophyses is 2 or 3. The cauline nematothecae are monothallamic, with a lip projecting into the interior of the nematothecae. There are two openings at the end of the nematotheca.

The hydroclades are divided into internodes that have a distinct, basal curvature; there are 15 septa, but two of the basal septa are incomplete. The

hydrotheca, though slender, shows a distinct basal curvature of the abcauline hydrothecal wall; close inspection of the internode shows that this curvature is brought about by the very beginning of the process of curvature of the hydrotheca, resulting ultimately in hydrothecae as in *C. inflatus* n.sp. and *Dinotheca dofleini* Stechow. The abcauline hydrothecal wall terminates in a distinct tooth; the hydrothecal margin is circular and smooth. The unpaired nematotheca does not touch the basal part of the hydrotheca; it has two apertures: one apical and one adcauline. The paired, lateral nematothecae are more or less tubular and project above the hydrothecal border. There are two openings on each nematotheca, one apical (placed at the end of a short funnel) and one adcauline. In addition each nematotheca has an oblique septum. The measurements of this specimen (in microns) are:

	"Thetis" St. 57
Hydrocaulus, diameter	102-110
length cauline nematotheca	93-119
maximum diameter	51-60
Hydroclade, length internode	740-850
diameter at node	68
Hydrotheca, total depth (tooth not included)	450-525
diameter at aperture	195-205
Unpaired nematotheca, length	75-85
Lateral nematotheca, length	110-170
diameter at aperture	25-35

In my opinion this species is quite different from *C. distomus*. No other records since RITCHIE's original description of this species from off the coast of New South Wales, Australia, appear to have been published.

Cladocarpus tenuis Clarke, 1879
Fig. 54.

Cladocarpus tenuis Clarke, 1879, p. 247, pl. 5, figs. 31, 31b; NUTTING, 1900, p. 114, pl. 28, figs. 1, 2; JÄDERHOLM, 1904, p. 301; BEDOT, 1921a, p. 326.

Material:

St. 188, off Durban (29°55'S, 31°13'E), 2.2.1951, 495 m depth. – Two colonies of 40 mm height, one with an empty phylactocarp.

Description:

Colony of very fine and graceful built, composed of a slender, monosiphonic axis bearing 3 or 4

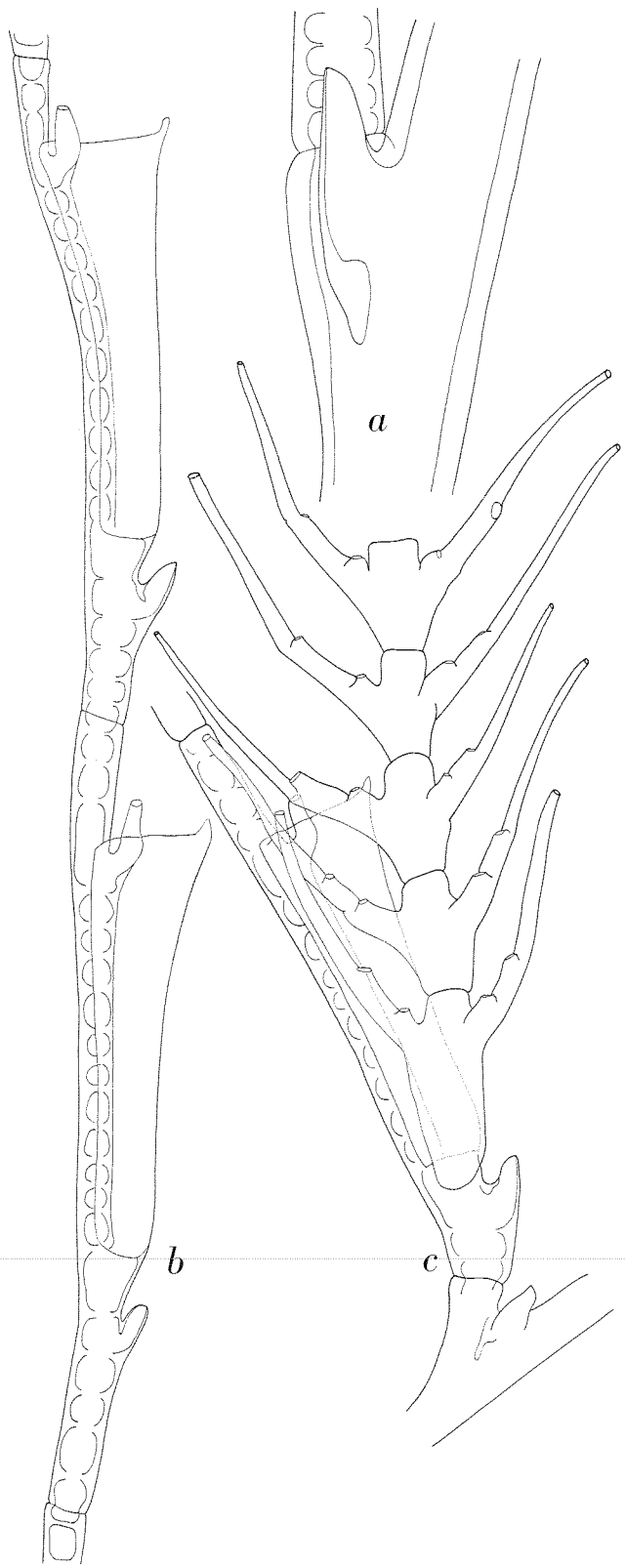

Fig. 54. *Cladocarpus tenuis* Clarke, "Galathea" St. 188. a, fragment of hydrocaulus with axillary nematotheca and apophysis; b, hydroclade with hydrothecae; c, phylactocarp. a, ×175; b, c, ×75.

hydroclades. The basal part of the axis has some hydrorhiza fibres and a few secondary tubules; there are some oblique nodes in the basal part of the stem. The frontal aspect of the axis has a longitudinal row of one-chambered nematothecae with a large fan-shaped opening. The apophyses are alternately directed left and right and point obliquely forward; they occur besides an axial nematotheca. The number of nematothecae between two successive apophyses varies between 3 and 10.

The hydroclades are 5 to 10 mm long and composed of hydrothecate internodes; each internode bearing an unpaired infracalicine nematotheca, a very slender hydrotheca and a pair of pleurohydrothecal nematothecae. The internodes are weakly sigmoidally curved, so that the basal part of an internode projects over the aperture of the preceding hydrotheca. There is a considerable portion of the internode under and above the hydrotheca. The infracalicine nematotheca is just as the axial nematothecae. The hydrotheca is extremely long and deep; the abcauline wall is very slightly curved and terminates in a strong median tooth. The margin of the hydrotheca is slightly crenulated and in some instances shows distinct signs of duplication. The pleurohydrothecal nematothecae are tubular, with slightly swollen basal portion and a circular opening, projecting far above the margin of the hydrotheca.

There are about 20 very distinct and strong septa in each internode; 12 of which occur behind the hydrotheca, 5 in the basal and 3 in the distal part of the internode.

One of the colonies has a phylactocarp, borne besides the infracalicine nematotheca of the first internode of a hydroclade. There are 5 internodes, each with a pair of very long nematothecae with 3 apertures each. The very long and slender nematothecae curve gracefully upwards so as to form an open basket. No gonothecae have been observed, nor could the place of origin of the gonothecae on the phylactocarp be discovered.

Measurements (in microns): –

	"Galathea" St. 188
Hydrocaulus, diameter at base	135
Hydroclade, total length	1,050-1,160
diameter at node	80-85
Hydrotheca, total depth (excl. median tooth)	730-880
diameter at aperture	190-215
Unpaired nematotheca, length	110-135
Lateral nematotheca, length	148-160
diameter at aperture	25-30

Remarks:

This species was originally described by CLARKE (1879) from the Gulf of Mexico, 25°33'N, 84°21'W, 101 fms (184 m) depth, and doubtfully referred to the genus *Cladocarpus* because of absence of the gonosome. An additional specimen has been recorded from Virgin Island, West Indies, by JÄDERHOLM (1904), obtained at 200-300 fms. (= 366-549 m) depth. I have little doubt that the "Galathea" specimens belong to the same species, which is very well characterized by the very deep and slender hydrothecae. The discovery of the phylactocarp definitely places this species in *Cladocarpus*. The "Galathea" record seems to be the first from the Indo-Pacific.

Clarke originally compared his species with *Cladocarpus dolichotheca* Allman (1877, p. 50, pl. 30), with which the hydrothecae have a certain resemblance. In *C. tenuis*, the hydrothecae are even deeper, the hydroclades have longer internodes and the median nematotheca is well removed from the base of the hydrotheca. The two species undoubtedly are different.

I feel certain that the specimens recorded by FRASER (1943, p. 84, pl. 20, fig. 1b; 1944, p. 411) as *Cladocarpus tenuis* in reality belong to another species. The shape of the hydrotheca in Fraser's specimens differs considerably from that observed in *C. tenuis*.

Cladocarpus sinuosus n. sp.

Figs. 55-57.

Material:

St. 188, off Durban (29°55'S, 31°13'E), 2.2.1951, 495 m depth. – One colony of 30 mm height (holotype) with a basal tuft of hydrorhiza fibres and 10 hydroclades. One empty phylactocarp is present. In addition there is a 15 mm long fragment of a hydrocaulus with 7 hydroclades and hydranths, but without gonosome. The holotype and the fragment are in the collections of the Zoological Museum, Copenhagen. A slide of one hydroclade of the holotype (schizoholotype) is in the collections of the Rijksmuseum van Natuurlijke Historie, Leiden, The Netherlands.

Description:

The colony is small, gracefully built and feather-shaped. The hydrocaulus is monosiphonic, but covered with a colony of *Kirchenpaueria triangulata* (Totton). There are no nodes or septa and the distal part carries a number of apophyses on the frontal aspect of the hydrocaulus, alternately directed left

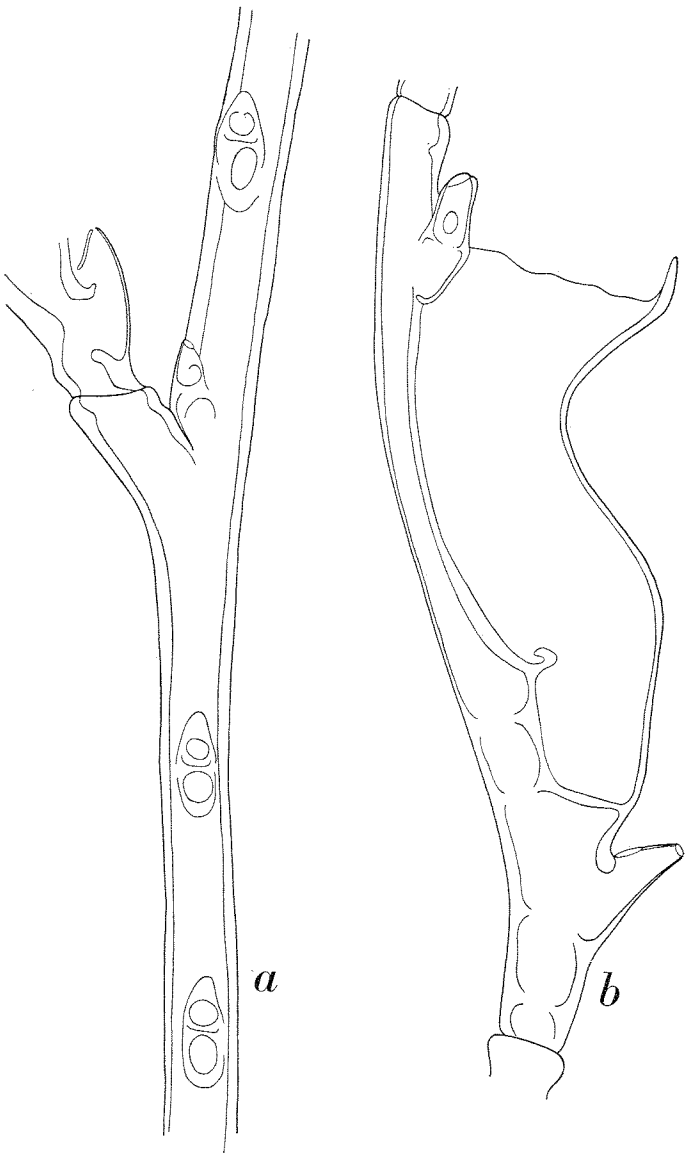

Fig. 55. *Cladocarpus sinuosus* n. sp., holotype, "Galathea" St. 188. a, part of hydrocaulus, with cauline nematothecae and apophysis; b, hydrocladial internode with hydrotheca. ×140.

or right and pointing obliquely foreward. Each apophysis has a single axillary nematotheca; there are only few cauline nematothecae on the hydrocaulus between the apophyses. The cauline nematothecae are scale-shaped and imperfectly two-chambered. In the basal part there is a large hole communicating with the interior of the hydrocaulus; about halfway there is a lip, formed by the upper wall of the aforementioned hole, projecting into the cavity of the nematotheca. The upper free part has the shape of a conical funnel with two holes, one at the apex and one directed towards the hydrocaulus. The axillary nematothecae are slightly shorter and smaller, but have the same structure. The apophyses are short and cut off obliquely at the top. They support alternately arranged hydroclades, gracefully curved to left and right.

The hydroclades are divided into sigmoidally curved, hydrothecate internodes; the length of the hydroclades varies between 3 and 15 mm; there are 3 to 10 hydrothecate articles on the hydroclades. These are separated by straight septa; each has a median nematotheca, a curved hydrotheca and a pair of pleurohydrothecal nematothecae. The median nematotheca is short and completely free from the hydrotheca; it has, as the axial nematothecae, the shape of a short, conical funnel with two openings: one apical, one adaxial. The shape of the hydrotheca can best be described by reference to Fig. 55b; the abcauline wall is strongly sigmoidally curved and terminates in a strong median spine. The aperture of the hydrotheca is circular but not completely flat, showing crenulated undulations. From the backside of the hydrotheca a short lip projects into its interior; the lip occurs in the basal fourth of the hydrotheca.

The paired nematothecae are tubular and in some instances slightly curved, projecting above the hydrothecal margin for about half their length. There is an incomplete septum; the upper chamber has two apertures, one terminal and one just above the thecal margin. There are four septa in the internode; two in the basal part of the internode and two near the basal part of the hydrotheca.

There is one (empty) phylactocarp at the base of the first hydrotheca of a hydroclade. This is an 8 mm long, curved structure, composed of short internodes, each bearing a parir of long, inwardly curved nematothecae (Fig. 56a). Each of these nematothecae has four apertures, one at the top and three dispersed along the frontal edge. No gonothecae have been observed, nor could the place of attachment of the gonothecae be discovered.

Variability:

The 15 mm high fragment (Fig. 57) differs from the holotype in the following particulars: –

a. There are 2 to 5 nematothecae between two successive apophyses on the hydrocaulus.

b. The internodes of the hydroclades are longer, a considerable part of the internode projects above the lateral nematothecae; in some hydroclades the extreme distal part of the internode is ringed.

c. The hydrothecae are slenderer, the abcauline wall is more strongly sigmoidally curved; the aper-

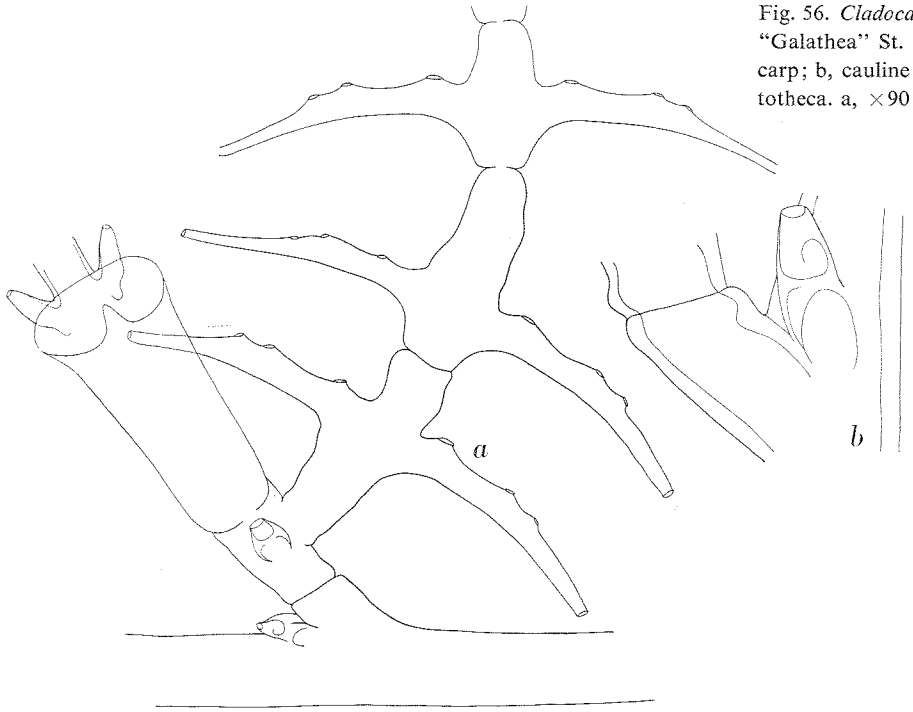

Fig. 56. *Cladocarpus sinuosus* n. sp., holotype, "Galathea" St. 188. a, basal part of phylactocarp; b, cauline apophysis with axillary nematotheca. a, ×90; b, ×210.

ture of the hydrotheca is almost flat and has no median tooth. The inwardly projecting lamina of the abcauline thecal wall is at about two thirds that wall from the thecal aperture.

This fragment differs only little from the holotype. As only very scanty material of this new species is available the variability cannot properly be evaluated. In the majority of the internodes of the fragment there are 4 distinct septa behind the basal part of the hydrotheca, whilst only two are present in the holotype. This particular character is subject to great variability in *Cladocarpus* and I am therefore inclined not so consider it of great importance. For the time being it seems best to consider the fragment as representing no more than a variety of *Cladocarpus sinuosus,* for which the name *C. sinuosus* var. *edentatus* is proposed here. This name has been derived from the latin edentatus = toothless.

Measurements (in microns): –

	"Galathea" St. 188	
	Holotype	var. edentatus
Hydrocaulus, diameter (at base).	135	108
Cauline nematotheca, length ...	105-110	80-110
maximum diameter	58-62	40-45
Hydroclade, length of internode.	875-985	715-875
diameter at node.....	80-95	68-73
Hydrotheca, depth	445-475	460-485
diameter at aperture.....	230-235	125-135
Unpaired nematotheca, length ..	90-98	110-120
Lateral nematotheca, length ...	120-125	120-135
diameter at aperture.....	20-23	20-23

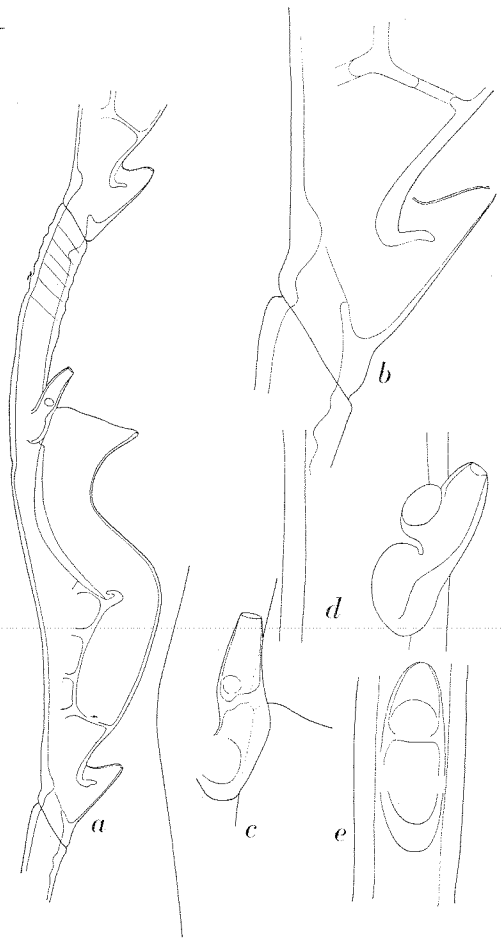

Fig. 57. *Cladocarpus sinuosus* var. *edentatus* n. var., holotype, "Galathea" St. 188. a, part of hydroclade with hydrotheca; b, infracalicine nematotheca; c, pleurohydrothecal nematotheca; d, cauline nematotheca, oblique view; e, cauline nematotheca, frontal view. a, ×90; b-e, ×210.

Remarks:

Cladocarpus sinuosus resembles *C. cartieri* Bedot, 1921 (p. 56, pl. 6, figs. 59, 60), from which it differs by the presence of a median marginal tooth at the hydrotheca, the longer lateral nematothecae, projecting far above the margin of the hydrotheca, and the strongly sigmoidally curved hydrothecae.

The specific name has been derived from the latin sinuosus = full of bendings.

Cladocarpus inflatus n.sp.

Figs. 58 and 59.

Material:

St. 188, off Durban (29°55'S, 31°13'E), 2.2.1951, 495 m depth. – A colony of about 30 mm height with 7 hydroclades (holotype) and 4 colonies of 30-50 mm height with 5-10 hydroclades and partly covered with *Kirchenpaueria triangulata* (Totton) (paratypes). The holotype and 2 paratypes are in the collection of the Zoological Museum of the University, Copenhagen; 2 paratypes (one a slide) are in the collection of the Rijksmuseum van Natuurlijke Historie, Leiden, the Netherlands.

Description:

Small and extremely delicate colonies composed of a monosiphonic, thin axis and some short hydroclades, more or less spirally arranged along the upper part of the hydrocaulus. No oblique or straight nodes occur in the hydrocaulus, but it is completely loculose by the presence of straight septa or nodes, very distinct in the younger parts of the hydrocaulus and much less distinct near the base. One of the colonies has some fine hydrorhiza fibres adhering to the stem. There are nematothecae on the hydrocaulus, originally arranged in a single longitudinal row, but each of the irregularly distributed apophyses has one of these nematothecae in its axil, so that the distribution in the higher parts of the colony is irregular. The axial nematothecae are one-chambered, but with a chitinized ridge projecting into the cavity of the nematotheca from the middle of the adcauline wall; they communicate with the interior of the axis by means of a circular hole under the ridge; the aperture is circular.

The hydroclades, borne on the short apophyses, are composed of 3 to 5 hydrothecate internodes; these are separated by slightly oblique nodes and sigmoidally curved. Each internode has a fairly long basal and apical portion without nematothecae, an unpaired median infracalicine nematotheca, a hydrotheca of highly characteristic appearance and a pair of pleurohydrothecal nematothecae. The whole of the internode is loculose. The abcauline wall of the hydrotheca is very strongly sigmoidally curved; it seems as though the hydrotheca, during the development of the extreme curve of its abcauline wall and cavity, first curved the internode and subsequently ruptured the axis of the internode just above the median nematotheca, the free part remaining in contact with the rest of the internode, the part adnate with the hydrotheca becoming detached just at the base of the median nematotheca and curving together with the hydrotheca, tearing three of the internodial septa. The resulting condition can best be observed in Fig. 58a; there is a fairly large cavity immediately above the median nematotheca, filled with coenosarc, communicating with the hydranth through a narrow hole in the frontal part of the hydrotheca. The depressed part of the abcauline wall runs into a conspicuous, flat median tooth. The aperture of the hydrotheca is more or less circular, in lateral aspect it is slightly sinuous and crenulated.

The median nematotheca, the position of which appears in Fig. 58a, is tubular and has two apertures, one apical and one adcauline.

The lateral nematothecae are tubular structures, projecting for about half their length above the hydrothecal margin. Each has three apertures, one apical, one adcauline and one medial, the last one just above the hydrothecal margin.

Measurements (in microns): –

	"Galathea" St. 188
Diameter of stem	110
Axial nematotheca, length	99-110
maximum diameter	77-83
Internode, length	1,000–1,050
diameter at node	65-70
Hydrotheca, depth (margin-bottom)	375-380
diameter at aperture	215-220
Unpaired nematotheca, length	105-110
Lateral nematotheca, length	145-150

Remarks:

In spite of the absence of the gonosome there can scarcely be any doubt that this is a species of *Cladocarpus*. Compared with *C. distomus* and *C. sinuosus* n.sp. the curvature of the hydrotheca, only moderately present in the latter, has here reached a considerable degree, leading to the extreme condition observed in *Dinotheca dofleini* Stechow, 1911. The "Galathea" material of *C. inflatus* is scanty and the

Fig. 58. *Cladocarpus inflatus* n. sp., holotype, "Galathea" St. 188. a, part of hydroclade with hydrotheca, lateral view; b, idem, dorsal view. ×140.

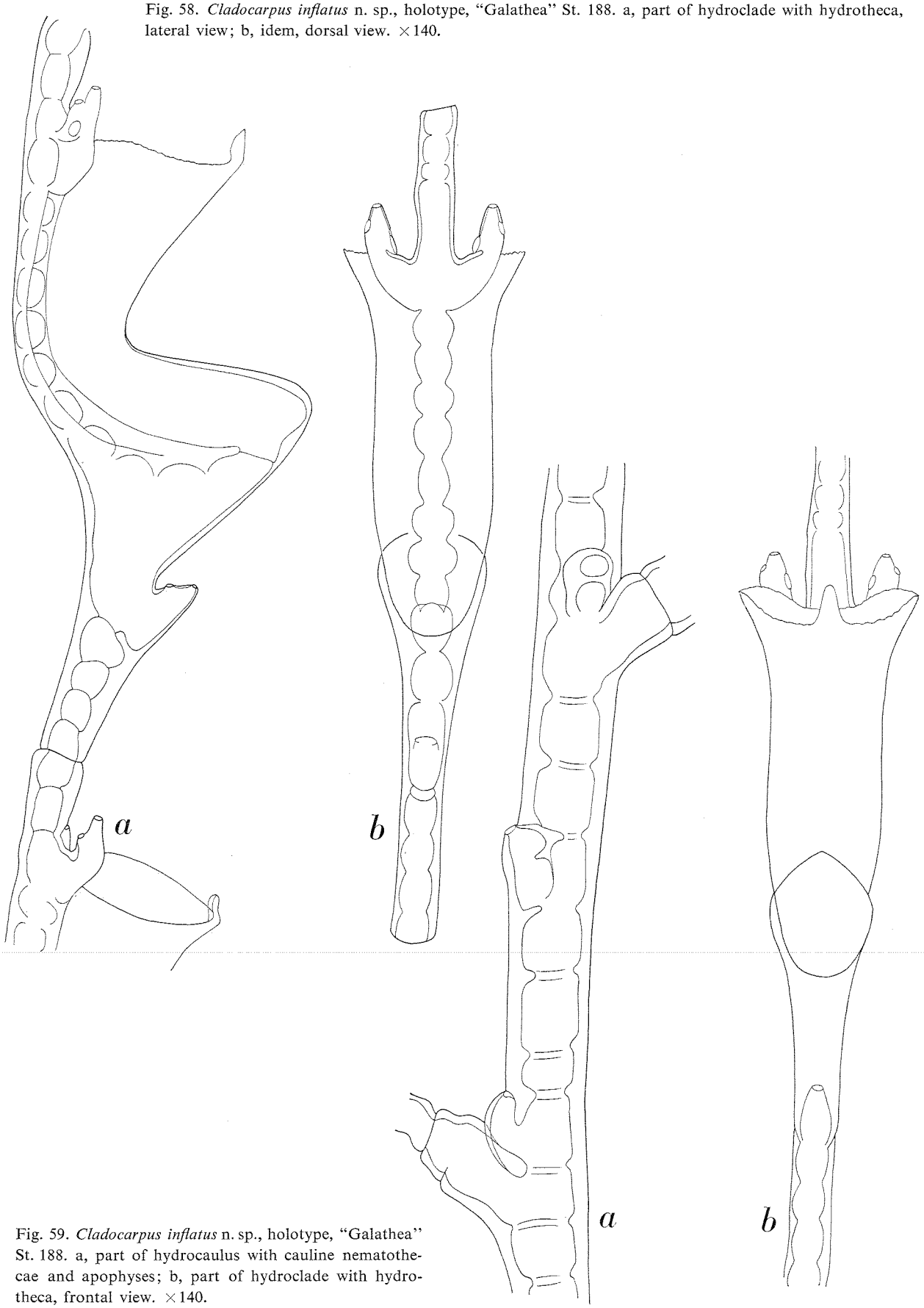

Fig. 59. *Cladocarpus inflatus* n. sp., holotype, "Galathea" St. 188. a, part of hydrocaulus with cauline nematothecae and apophyses; b, part of hydroclade with hydrotheca, frontal view. ×140.

species, because of its very delicate structure, is easily overlooked. Yet it can be recognized at a glance because of the highly characteristic appearance of the hydrothecae.

The specific name has been derived from the latin inflatus = puffed up, swollen.

Cladocarpus millardae n. sp.

Figs. 60-62.

Material:

St. 188, off Durban (29°55'S, 11°13'E), 2.2.1951, 495 m depth. – Three colonies of 2-4 cm height and some fragments. No gonosome.

St. 202, off Natal (25°20'S, 35°17'E), 21.2.1951, 575-595 m depth. – About one hundred colonies (type lot) of 2 to 10 cm height, many with phylactocarps and gonothecae. One specimen of 95 mm height, with phylactocarps and gonothecae, has been selected as the holotype. This holotype along with 83 paratypes is deposited in the Zoological Museum of the University, Copenhagen. 15 paratypes are in the collection of the Rijksmuseum van Naturlijke Historie, Leiden, the Netherlands.

St. 231, Madagascar-Mombasa (8°52'S, 49°25'E), 7.3.1951, 5020 m depth. – Five colonies of 3 to 5 cm height, the largest with phylactocarp and gonothecae.

Description:

The following description is based on the whole type lot; consequently it is not a concise description of the holotype.

The colonies are feather-shaped, with a slender, laterally compressed hydrocaulus, composed of many parallel tubes, basally provided with an elongated tuft of fine hydrorhiza fibres. In the very young colonies the hydrocaulus is monosiphonic, with a strongly chitinized axis, of which the basal portion is nude and has some oblique septa. On the frontal apsect of the hydrocaulus there is a longitudinal row of large nematothecae, beginning after the last oblique node. The higher part of the axis also carries apophyses, borne on the frontal aspect of the axis and pointing obliquely forward and alternately left and right. There are no septa in this part of the axis and 2 or 3 nematothecae may be found between two successive apophyses, one of the apophyses being the axillary nematotheca. In the older colonies many parallel tubes fuse to the originally monosiphonic main tube, resulting in a compressed structure, oval on cross section, with the original hydrocaulus along the whole frontal part of this polysiphonic structure and leaving both nematothecae and apophyses on this main axis completely free. In the young monosiphonic colonies there is a reduced number of apophyses (and consequently a reduced number of hydroclades, numbering about 10); in the older colonies the total number of apophyses may be between 50 and 80.

Fig. 60. *Cladocarpus millardae* n. sp., holotype, "Galathea" St. 202, whole colony, frontal view. ×1.75.

The cauline nematothecae are large and indistinctly two-chambered. They communicate with the cavity in the axis by means of a hole in the basal portion, the distal lip of which protrudes into the cavity of the nematotheca. The apical part of the

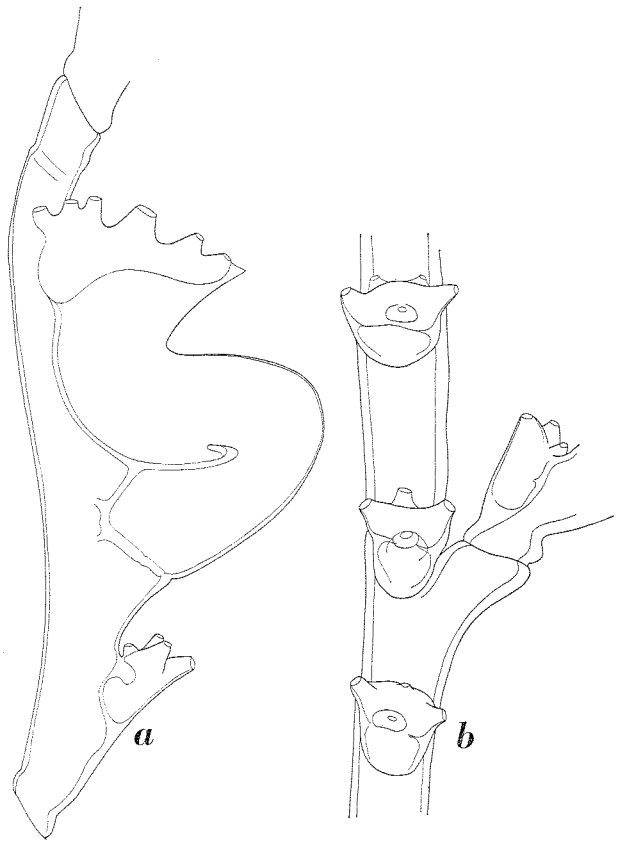

Fig. 61. *Cladocarpus millardae* n. sp., paratype, "Galathea" St. 188. a, part of hydroclade with hydrotheca; b, part of hydrocaulus with cauline nematothecae and apophysis. ×90.

nematotheca has four apertures, placed at the ends of more or less distinct funnels. Two point laterally (one left and one right), one points forward and one axially.

The apophyses are short; they support 15-20 mm long hydroclades, alternately directed left or right, and having 15 to 20 hydrothecate internodes, separated by oblique septa.

The hydrocladial internodes are slightly sigmoidally curved and have one infracalicine nematotheca, a large hydrotheca of highly characteristic appearance and a pair of curious, antler-shaped lateral nematothecae with many apertures. The infracalicine nematotheca is just as the cauline nematothecae and has 4 apertures; its distance below the thecae is subject to some variability; in the first of the hydroclades it occurs just below the hydrotheca; in more distal hydroclades this distance gradually increases; in the highest internodes there is a space of about the length of the nematotheca between the base of the hydrotheca and the adcauline wall of the nematotheca.

The hydrotheca has a strongly sigmoidally curved abcauline wall; the exact shape appears best from Fig. 61a. A strongly chitinized lip projects into the strongly vaulted part of the hydrotheca from the adcauline thecal wall. There are two incomplete septa in the internode behind the basal portion of

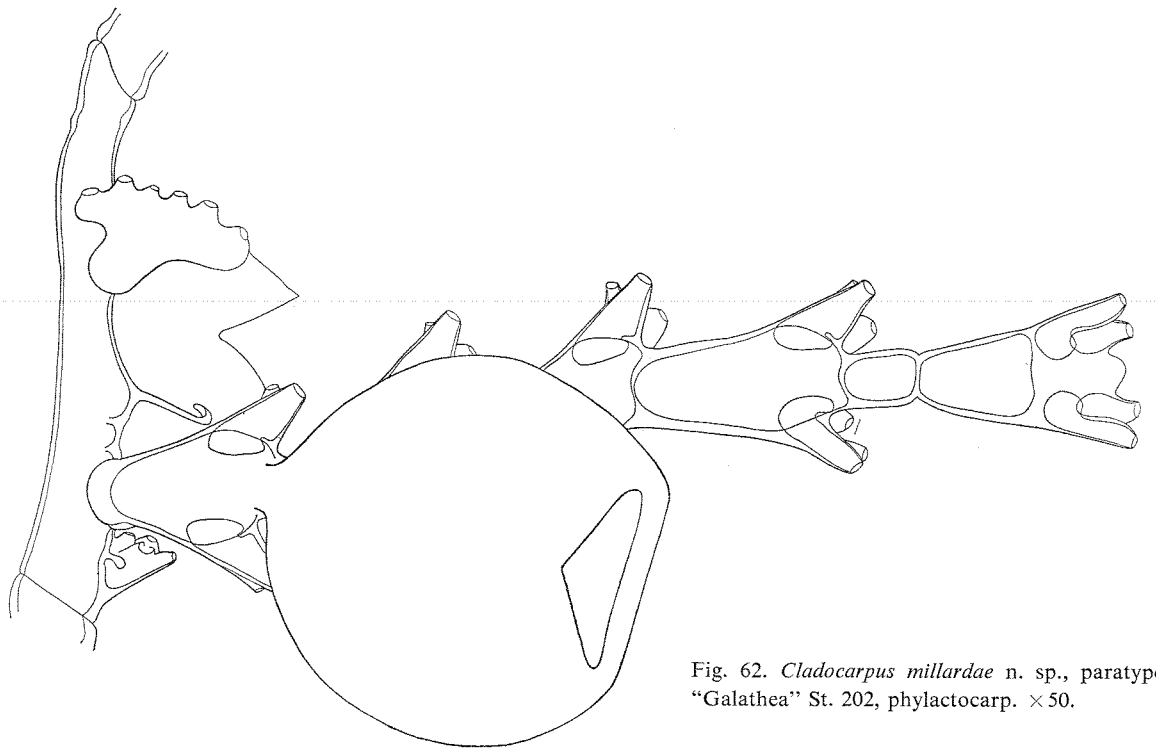

Fig. 62. *Cladocarpus millardae* n. sp., paratype, "Galathea" St. 202, phylactocarp. ×50.

the adcauline thecal wall. The margin of the hydrotheca is apparently circular and fairly smooth, without median tooth, but it is almost completely encircled by the very large lateral nematothecae, that curve around the hydrothecal border and only leave the median zone free. The shape of the lateral nematothecae also appears clearly in Fig. 61a; the number of apertures varies between 5 and 7; usually there are 6.

Many colonies have phylactocarps, occurring on the first or first two internodes of a number of basal hydroclades. The phylactocarps are about 2 mm long, slightly curved structures, rising from the internode just at the base of the hydrotheca, curving axially and investing one or two large, globular gonothecae. Each phylactocarp is broken up into 5 or 6 internodes, separated by straight septa; each internode bears at the end of the lateral wall a large nematotheca with one to three apertures. Usually there are 2 apertures in the basal pair of nematothecae and three in the following pairs, with the exception of the last pair, which has only one. The gonothecae arise from the basal or basal two internodes of a phylactocarp by means of very short stalks; the apex of the gonotheca is truncate. Slightly under the apex the gonotheca is indented and there it has a large, triangular aperture. All gonothecae are empty, so that the sex could not be ascertained.

Measurements (in microns): –

	„Galathea" St. 202
Hydrocaulus (monosiphonic), diameter	205
distance between 2 successive apophyses	810-945
cauline nematotheca, length	120-150
maximum diameter	135-150
Hydroclade, length	850-1,080
diameter at node	80-95
Hydrotheca, total depth	485-500
diameter at aperture	230-270
Unpaired nematotheca, length	150-165
Lateral nematotheca, height	145-155
breadth	270-310
Gonotheca, length	675
maximum diameter	600

Remarks:

This is a very characteristic species of *Cladocarpus,* with very peculiar lateral nematothecae and hydrothecae. I have great pleasure in dedicating this fine species to Dr. N. A. H. MILLARD, Zoology Department, University of Cape Town, in recognition of her work on South African Hydroida.

Dinotheca dofleini Stechow, 1911
Fig. 63 and 64.

Dinotheca dofleini Stechow, 1911, p. 194, fig. 1; STECHOW, 1920, p. 401, figs. 1, 2; BEDOT, 1921a, p. 348; STECHOW, 1923, p. 17; STECHOW, 1925, p. 509.

Material:

St. 188, off Durban (29°55'S, 31°13'E), 2.2.1951, 495 m depth. – 2 complete colonies of 30 mm height and some fragments. No gonosome.

St. 196, off Durban (29°55'S, 31°20'E), 13-14.2.1951, 425-430 m depth. – 5 complete colonies of 20-35 mm height. Remnants of hydranths present. No gonosome.

Description:

The originally monosiphonic colonies are feather-shaped and delicate; the maximum number of hydroclades is 15. In the young, completely monosiphonic colonies, the hydrocaulus has a small basal tuft of hydrorhiza fibres, it has some basal oblique nodes, above which a frontal row of nematophores

Fig. 63. *Dinotheca dofleini* Stechow, "Galathea" St. 196. a, infracalicine nematotheca; b, part of hydrocaulus with cauline nematothecae, apophysis and part of hydroclade with hydrotheca. a, ×220; b, ×90.

Fig. 64. *Dinotheca dofleini* Stechow, "Galathea" St. 196. a, hydrocladial internode with hydrotheca; b, pleurohydrothecal nematotheca. a, ×115; b, ×330.

may be observed. The hydroclades are borne on fairly long apophyses, alternately directed left and right; there are 2 to 5 nematothecae between two successive apophyses, one of which is always an axillary nematotheca. The cauline nematothecae are indistinctly two-chambered, the septum in the nematotheca is very thin and apparently incomplete. The basal chamber has a hole for communication with the cavity in the axis; the apical chamber has a terminal and an adcauline aperture. In the older colonies there are some parallel tubes fused to the hydrocaulus, leaving the frontal row of nematothecae uncovered.

The hydroclades are 8-12 mm long and have 5 to 7 hydrothecae. They have very oblique and distinctly marked nodes; the first node, separating the hydroclade from the apophysis, is also oblique. The internodes are very slightly curved and have an infracalicine nematotheca, a curiously shaped hydrotheca and a pair of lateral nematothecae. The infracalicine nematotheca is completely free from the hydrotheca; it has an apical hole placed at the end of a conical funnel, and an adcauline hole, the position of which is slightly variable; usually this opening lies against the thecal base.

The hydrotheca is strongly curved; the basal part being curved upward and forward, carrying with it the adnate portion of the internode with its septa. The originally basal part of the hydrotheca is pointed, the apex lies above the hydrothecal aperture; the development of the point varies slightly. There are 7 septa on the adnate hydrothecal wall, 6 of which have the character of chitinized rings; the seventh, the originally most distal, now farthest

adcauline, septum, is a complete septum, though perforated for the passage of the coenosarc. The circular aperture in this septum is bordered by a fibrous "cuff", with frayed edges. The aperture of the hydrotheca is weakly sinuous; there is a strong, flattened, slightly recurved median tooth.

The lateral nematothecae project far above the hydrothecal margin; they are tubular, with slightly swollen base and with an incomplete or badly visible septum. The basal chamber has a large hole for communication with the interior of the internode; there is one apical hole in the funnel-shaped distal chamber.

The basal part of the internode, just above the oblique node, has an incomplete septum.

Measurements (in microns): –

	"Galathea" St. 196
Monosiphonic hydrocaulus, diameter	95-110
length cauline nematotheca	105-120
maximum diameter	55-60
distance between two successive internodes	740-1,080
Hydroclade, length	875-985
distance at node	65-80
Hydrotheca, distance between internode and apex theca	470-515
diameter at aperture	190-215
Median nematotheca, length	150-160
Lateral nematotheca, length	210-215
diameter at apex	35-40

Remarks:

The "Galathea" specimens differ from STECHOW's description in the following details: –

a. STECHOW's colony was larger, about 13 cm high, with a thick polysiphonic hydrocaulus of 1 mm diameter. The smaller size of the "Galathea" specimens is undoubtedly due to youthfulness.

b. In STECHOW's specimen the septa are more numerous and stronger developed; there are 10 septa behind the hydrotheca and two more in the proximal part of the internode. In the "Galathea" specimens there are 7 (partly incomplete) septa and one incomplete septum in the proximal part of the internode.

c. The hydrothecal margin in STECHOW's specimen was distinctly sinuous; in the "Galathea" specimens the margin is almost straight.

d. The lateral nematothecae have only one aperture, which is situated at the end of the "funnel". A second aperture, as described by STECHOW and situated just above the hydrothecal margin, could not be observed in my specimens.

In spite of these differences there can be no doubt that the "Galathea" specimens are conspecific with STECHOW's. The species seems to be rare; STECHOW originally recorded the species from off the coast of East Africa, 0°24.5'S, 42°49.4'E (type locality), 1019 m depth. The present specimens are from further south and from less deep water.

Undoubtedly *Dinotheca* is very closely related to *Cladocarpus,* so much so that the necessity of *Dinotheca* as a separate genus might seriously be questioned. The discovery of the gonosome of *Dinotheca* by STECHOW (1923, 1925), which is identical with that observed in *Cladocarpus,* and the discovery of *C. inflatus* n.sp., which might be considered a transitory form between the "normal" species of *Cladocarpus* (i.e., without a strongly curved hydrotheca and without a "ruptured" internodial axis) and *Dinotheca dofleini,* has made *Dinotheca* as a separate generic entiety even more problematic.

Genus ***Gymnangium*** Hincks, 1874
(= *Halicornaria* Allman, 1874)

It is generally assumed that the genus *Halicornaria* dates from 1874 when it was defined by ALLMAN (1874, p. 476), who included as only species *H. ramulifera* Allman (1874, p. 477, pl. 67, figs. 3-3d). ALLMAN had taken the generic name from a manuscript by BUSK, but since the description of the genus was ALLMAN's he should be considered its author; *H. ramulifera,* by monotypy, becomes the type species of the genus *Halicornaria* Allman, 1874. Now unfortunately, the generic name *Halicornaria* had previously been used by HINCKS (1865, note on page 409) in the combination *Halicornaria (Plumularia) catharina.* Though HINCKS gives no motivation for his action, it makes him the author of *Halicornaria* with *Plumularia catharina* Johnston, 1833, as the type by monotypy. *P. catharina* is now generally classified in *Halopteris* Allman (1877, p. 32, type: *H. carinata* Allman, 1877, p. 33, pl. 19, figs. 3-7).

BROCH (1918, p. 74) has described the new genus *Nematocarpus* for *Halicornaria ramulifera,* without apparently noticing that this species is the type of *Halicornaria* Allman, 1874. *Nematocarpus* Broch, 1918, therefore is an objective synonym of *Halicornaria* Allman, 1874. Now the perfectly legitimate way would be to drop the generic name *Halopteris* Allman, 1877, in favour of *Halicornaria* Hincks, 1865, and to substitute another or a new generic name for *Halicornaria* Allman, 1874. Both procedures will course much confusion, as many species

of *Halopteris* Allman, 1874, and *Halicornaria* Allman, 1874 are known. Though the introduction of another generic name for *Halicornaria* Allman, 1874 cannot be escaped, the International Commision on Zoological Nonemclature will be asked to suppress the use of the generic name *Halicornaria* Hincks, 1865, and to place *Halopteris* Allman, 1877, on the list of Official Generic Names.

The next available generic name for *Halicornaria* Allman, 1874, is *Gymnangium* Hincks, 1874, p. 128; the type of this genus, by designation of STECHOW, 1923a, p. 237, is *Aglaophenia pennatula* Hincks, 1868 (p. 292, pl. 63, fig. 3), a species now known as *Gymnangium montagui* (BILLARD, 1912, p. 459).

Gymnangium expansum (Jäderholm, 1904)

Figs. 65 and 66.

Halicornaria expansa Jäderholm, 1904, p. 303, pl. 14, figs. 5-7; STECHOW, 1907, p. 200; STECHOW, 1909, pp. 5, 103.

Halicornaria sibogae Billard, 1918, p. 25, fig. IV.

Material:

St. 490, Bali Sea (5°25'S, 117°03'E), 14.9.1951, 545-570 m depth. – One colony of 50 mm height, with hydranths and gonothecae.

Description:

The fragment consists of the upper part of a larger colony; no hydrorhiza is present; the (pseudo) hydrocaulus is monosiphonic. The structure of the colony is sympodially: the main axis is formed by the basal parts of successive plumes, arranged in spiral fashion, each succeeding plume rising about 8 mm from the base of the preceding plume. There are, on the fragment, 6 of such plumes and several short remnants of broken plumes. Each plume is composed of an axis, broken up into short internodes, separated by straight septa, each internode bearing an apophysis, a pair of axillarly nematothecae and a basal nematotheca. The basal nematothecae of the axis are all arranged in one row on the frontal aspect; the apophyses point obliquely forward and alternately are directed left or right. The axial nematothecae are oval, two-chambered structures; the basal chamber has a hole for communication with the interior of the internode: the apical chamber has two openings, one terminal and one adcauline. The position of the axillary nematothecae can best be judged from Fig. 66; they occur one on each side of the apophysis. The apophyses

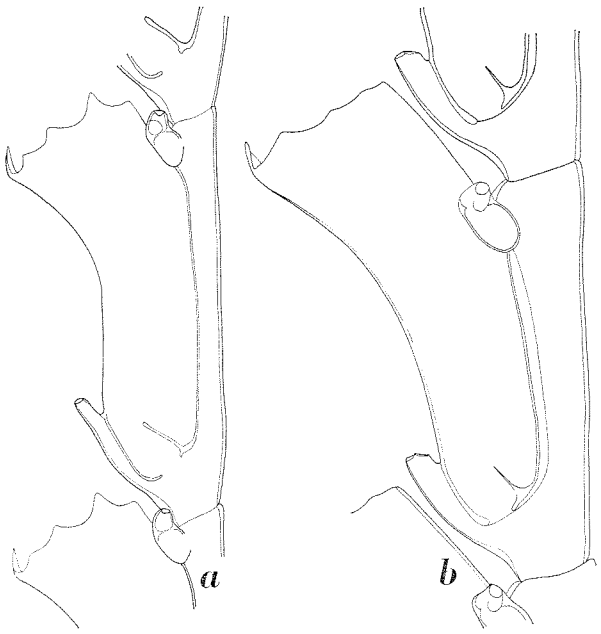

Fig. 65. *Gymnangium expansum* (Jäderholm). a, "Galathea" St. 490, part of hydroclade with hydrotheca; b, schizoholotype, "Vega" 1107 (Brit. Mus. 1960.8.29.39), part of hydroclade with hydrotheca. a, ×75; b, ×90.

support 5 to 7 mm long hydroclades, divided into 5-7 hydrothecate internodes by means of straight septa. The node separating the hydroclade from the apophysis is slightly oblique. The hydroclades gracefully curve to left and right. Each internode has an unpaired, infracalicine nematotheca, a large hydrotheca and a pair of lateral nematothecae.

The median nematotheca is fused with about one fourth of the abcauline hydrothecal wall; it has a short apical funnel, bearing a terminal and an adcauline aperture.

The hydrotheca is long and slender, with an incomplete septum in the extreme basal part of the theca. The apical portion of the hydrotheca is very slightly widened and curved abcaudally; the aperture has three pairs of lateral teeth, separated by rounded incision, and a large, flattened median tooth. The exact shape of the hydrotheca appears from Fig. 65a.

The lateral nematothecae are small; they do not reach the hydrothecal margin. They are two-chambered; the apical part, which is slightly curved adaxially, has two apertures, one terminal, which is more or less gutter-shaped, and one opening in the space between adaxial thecal wall and internode.

The hydrothecae are fairly closely approximated, the lateral nematothecae reach the base of the succeeding hydrotheca.

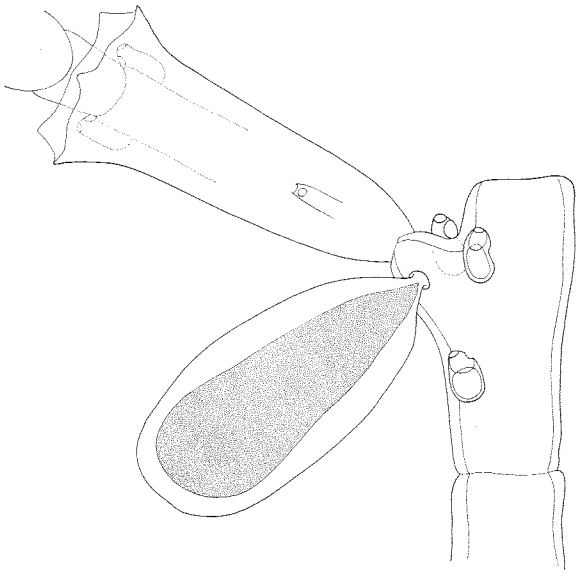

Fig. 66. *Gymnangium expansum* (Jäderholm), "Galathea" St. 490, internode with hydroclade and gonotheca. ×55.

The gonothecae are to be found on the apophyses of the internodes of the plumes; they are large, oval structures, inserting with a very short stalk just under the oblique node of the apophysis. As far as I could make out they are filled with a large mass of developing spermatocytes. Holes in the apophyses of many internodes indicate that more gonothecae have been present.

Measurements (in microns): –

	"Vega" St. 1107	"Galathea" St. 490
Axial internode, length	495-510	580-675
diameter at node	255	245-260
distance between 2 successive apophyses	425	540-600
cauline nematotheca, length	100-110	135-150
maximum diameter	68-75	95-105
Hydrocladial internode, length	595-680	865-950
diameter at node	85	135-148
Hydrotheca, length	690-725	865-890
diameter at aperture	255	310-350
Unpaired nematotheca, length		
free part	35-50	55-65
diameter at apex	17-35	40-48
Lateral nematotheca, length	130	150-160
diameter at aperture	68	35-40
Gonotheca, length	725	800-850
maximum diameter	340-365	300-350

Remarks:

This is a very rare species, recorded only three times before; all records will be discussed here. JÄDERHOLM (1904, p. 303) originally described the species after a 10-12 cm long colony from south of Japan. The type locality is not accurately given in JÄDERHOLM's paper; the depth record is 50-57 fms. (= 91-104 m). I have seen a fragment of JÄDERHOLM's type in the British Museum (Nat. Hist.) (1960.8.29.39), bearing the label: Vega 1107, 29.10. 1879, 29°20'N, 125°40'E, 57 fms. A drawing of the hydrothecae of this schizoholotype is given here (Fig. 65b); the measurements are listed above. I have no doubt that the "Galathea" material and JÄDERHOLM's species are conspecific, though there are some slight differences. The hydrothecae in the schizoholotype, though not as long as in the "Galathea" specimen, have a larger portion of the adcauline hydrothecal wall free; the apical, curved part of the hydrothecae in the holotype must have been generally longer, unless this character is subject to variability in the various parts of a colony. In the "Galathea" specimen the teeth at the hydrothecal margin are better developed. The structure of the colony in the holotype is different too. Each plume, at the place of origin of the next plume, is bifurcated. I do not consider this structural difference of great importance; my specimen may very well be the top of a larger colony that shows a different built in its lower parts.

An additional specimen was described by STECHOW (1907, 1909) from Sagami Bay, Japan; his specimen differs in several respects from both JÄDERHOLM's and my specimens. In STECHOW's specimen the structure of the colony appears to be monopodially, with a distinct main axis with side-branches directed in one direction, each side-branch divides into three: the two lateral branches, that are strong and divide each into three smaller secondary branches, and the original branch, not dividing again and much finer. Hydroclades occur on the secondary branches and on the fine part of the primary ramification. There are no internodial septa in STECHOW's specimen and the hydrothecae are more widely spaced. STECHOW noted the two openings of the lateral and medial nematothecae, a condition overlooked by JÄDERHOLM but distinctly visible in the schizoholotype.

BILLARD (1918, p. 25, fig. iv) briefly described and figured the species as *Halicornaria sibogae;* no locality is specified in his paper. As the material on which BILLARD's description is based originated from the Siboga Expedition his material must have been collected in the seas of the eastern part of the Malay Archipelago.

The present record is from the Bali Sea.

List of Hydroids from Depths Exceeding 2000 Metres[1]

Species	Records exceeding 2000 m depth				Other records			
	Depth in m	Ocean	Approximate locality	Author or record	Depth in m	Ocean	Approximate locality	Author or record
TUBULARIIDAE								
Tubularia cornucopia Bonnevie	2438	Atl.	Greenland Sea	BONNEVIE 1899: 31	1700-2000	Atl.	extreme N. Atlantic	BROCH, 1910: 197
Tubularia larynx Ellis & Solander	3403	Atl.	Norwegian Sea	BONNEVIE, 1899: 28	0-100	Atl.	many boreal localities	*vide* VERVOORT 1946: 106
						Pac.	N. Pacific	NAUMOV, 1960: 221
Tubularia sp.	2077-2379	Atl.	S.W. of Iceland	BROCH 1916: 28				
CORYMORPHIDAE								
Branchiocerianthus imperator (Allman)	3431-5307	Pac.	N. Pacific and off Japan	ALLMAN 1888: 5	900-995	Ind.	off Oman and Baluchistan	STECHOW 1909a: 296
					628-1019	Ind.	off N.E. Africa	STECHOW 1925: 406
Corymorpha groenlandica (Allman)	2222	Atl.	Norwegian Sea	BONNEVIE, 1899: 21	730	Ind.	off Natal	present record
					45-1372	Atl.	N. Atlantic	BROCH, 1916: 33
BOUGAINVILLIIDAE								
Bythotiara depressa Naumov[2]	1200-6000	Pac.	Bering Sea, Sea of Okhotsk and N. Pacific	NAUMOV, 1960: 192	330-1000	Pac.	N. W. Pacific	NAUMOV, 1960: 192
					500-1000			
					0-800			
Hydractinia arctica (Jäderholm)	2000	Arc.	Between Greenland and Jan Mayen	JADERHOLM 1902: 5	1200	Arc.	Baffin Bay	KRAMP 1932: 12
Hydractinia ingolfi Kramp	2344-3229	Atl.	Davis Strait and N. Atlantic	KRAMP 1932: 13				
Rathkea jaschnovi Naumov[2]	2000	Pac.	Bering Sea and Sea of Okhotsk	NAUMOV, 1960: 197	500-640	Pac.	Bering Sea and Sea of Okhotsk	NAUMOV, 1960: 197
					200-500			
					500-100			
CYTAEIDAE					30-50			
Stylactella vermicola (Allman)	5307	Pac.	N. Pacific	ALLMAN 1888: 2				
Stylactella spongicola Haeckel	4209-5307	Pac.	Central and N. Pacific	HAECKEL 1889: 80				
Stylactella abyssicola Haeckel	4209-5307	Pac.	Central and N. Pacific	HAECKEL 1889: 81				
MYRIOTHELIDAE								
Myriothela gigantea Bonnevie	2195	Atl.	Greenland Sea	BONNEVIE, 1899: 38				
Myriothela mitra Bonnevie	2222	Atl.	Norwegian Sea	BONNEVIE, 1899: 40				
Myriothela phrygia (Fabricius)	2195	Atl.	Greenland Sea	BONNEVIE, 1899: 38	13-1850	N. Atl.	extreme N. Atlantic and N. Pacific	BROCH, 1918: 19 NAUMOV, 1960: 243

1. This list does not claim completeness. NAUMOV's (1960) references are only partly included.
2. Medusa only.

Species	Records exceeding 2000 m depth				Other records			
	Depth in m	Ocean	Approximate locality	Author or record	Depth in m	Ocean	Approximate locality	Author or record
CAMPANULINIDAE								
? *Opercularella denticulata* (Clarke)	4040	Pac.	Seychelles-Ceylon	present record	730	Pac.	East Pacific	CLARKE 1907: 12
					?	Pac.	Sagami Bay, Japan	STECHOW 1913: 122
	2460-3990	Pac.	off California	present record	488-635	Pac.	off California	FRASER 1948: 216
LOVENELLIDAE								
? *Egmundella* sp.	2810-2990	Pac.	Sunda Trench	present record				
LAFOEIDAE								
Acryptolaria conferta (Allman)	2377	Atl.	S.W. of Iceland	BROCH 1918: 17	100-2000	Atl.	Central and N. Atlantic	STECHOW 1925: 459
	± 2500	Atl.	off N.W. Africa	STECHOW 1925: 459	90-140	Ind.	Providence	JARVIS 1922: 335
Acryptolaria conferta australis (Ritchie)	4400	Pac.	Tasman Sea	present record	1463	Pac.	S.W. of Panama	CLARKE 1894: 76
					97-143	Pac.	off N.S. Wales, Australia	RITCHIE 1911: 826
					579	Pac.	off New Zealand	TOTTON 1930: 163
					91-424	Pac.	off New Zealand	RALPH 1958: 315
					110-188	Ind.	off Sth Africa	MILLARD 1964: 9
Cryptolarella abyssicola (Allman)	4755	Pac.	S. of Australia	ALLMAN 1888: 40	1829	Atl.	near Azores	ALLMAN 1888: 39
	4570	Atl.	off Sierra Leone	ALLMAN 1888: 42	754	Atl.	Bay of Biscay	BROWNE 1907: 29
	4540-4600	Atl.	N. Atlantic	KRAMP 1951: 121				
	4940-4970	Pac.	Celebes Sea	present record				
	3710-4670	Pac.	Tasman Sea	present record				
	2470	Pac.	Kermadec Trench	present record				
Cryptolarella contorta (Nutting)	3570	Pac.	off Costa Rica	present record	223	Pac.	Hawaii	NUTTING 1905: 945
Cryptolarella flabellum (Allman)	628-2400	Pac.	Bering Sea and Sea of Okhotsk	NAUMOV, 1960: 279	713	Atl.	near Puerto Rico	ALLMAN, 1888: 40
Cryptolaria profunda Naumov	3330	Pac.	Bering Sea	NAUMOV, 1960: 277				
Grammaria serpens (Hassal)	6-3300	Pac.	N.W. Pacific and	NAUMOV, 1960: 281	0-450	Atl.	many boreal localities	*vide* VERVOORT, 1946: 195
		Atl.	N. Atlantic					
Halisiphonia megalotheca Allman	4755	Pac.	S. of Australia	ALLMAN 1888: 31	672	Ind.	S. Indian Ocean	STECHOW 1925: 452
Halisiphonia galatheae Kramp	8210-8300	Pac.	Kermadec Trench	KRAMP 1956: 17				
	4940-4970	Pac.	Celebes Sea	present record				
Hebella corrugata (Thornely)	2458	Ind.	off Birma	RITCHIE 1900: 4	7-22	Ind.	Mergui Arch.	REES & THURSFIELD 1965: 72
Hebella cylindrica (von Lendenfeld) var. *elongata* Billard	3570	Pac.	off Costa Rica	present record	?	Ind.	Kei Is.	BILLARD 1942: 67

Lafoea benthophila Ritchie ...	3246	Ant-arc.	near Sth Orkneys	RITCHIE 1909: 76	1071	Ind.	Gulf of Aden	RITCHIE 1910: 8
					1134	Ind.	off E. Africa	STECHOW 1925: 455
					?	Pac.	Bay of Nha Trang, Vietnam	LELOUP 1937a: 31
					?	Med.	Gulf of Salerno	VERVOORT 1946a: 303
Lafoea fruticosa (M. Sars)	7-2000	Pac. Atl.	N. W. Pacific and N. Atlantic	NAUMOV, 1960: 270	20-1000	Atl.	many boreal localities	*vide* VERVOORT, 1946: 200
SERTULARIIDAE								
Abietinaria variabilis (Clarke).	25-4000	Pac.	Bering Sea, Sea of Okhotsk and N. Pacific	NAUMOV, 1960: 377	25-312	Pac.	N. Pacific	NUTTING, 1904: 116
Idiellana pristis (Lamouroux).	2458	Ind.	off Birma	RITCHIE 1910: 11	shallow waters	Ind. Atl. Pac.	many tropical localities	*vide* VERVOORT 1959: 252
Sertularella gigantea Mereschkowsky	10-4820	Atl.	N. Atlantic	NAUMOV, 1960: 338	25-200	Atl.	N. Atlantic	BROCH, 1918: 101
		Pac.	N. Pacific			Pac.	N. Pacific	NAUMOV, 1960: 338
Sertularella tricuspidata (Aller)	2438	Atl.	Greenland Sea	BONNEVIE, 1899: 78	10-200	Atl.	N. Pacific	BROCH, 1918: 98
	2-3000	Pac.	N. Pacific	NAUMOV, 1960: 349		Pac.		NAUMOV, 1960: 349
Tamarisca tamarisca (Linnaeus)	2379	Atl.	N. Atlantic	BROCH 1918: 46	?	Atl.	many boreal localities	*vide* VERVOORT 1946: 222
Thuiaria hippuris Allman	146-2290	Pac.	Northern Kurile Islands	NAUMOV, 1960: 416	1170	Atl.	between Shetland Is.	ALLMAN, 1874: 473
	2195	Atl.	Davis Strait	BROCH, 1918: 141				
PLUMULARIIDAE								
Aglaophenia (?) *galatheae* Kramp	6900-7000	Ind.	Java Deep	KRAMP 1956: 19				
Cladocarpus millardae n. sp...	5020	Pac.	off Madagascar	present record	495	Ind.	off Durban	present record
					575-595	Ind.	off Natal	present record
Plumularia microtheca Naumov, 1960	110-2300	Pac.	N. W. Pacific incl. Sea of Okhotsk	NAUMOV, 1960: 462				
Schizotricha gracilis Naumov, 1960	2300	Pac.	N. W. Pacific incl. Sea of Okhotsk	NAUMOV, 1960: 472	414	Pac.	N. W. Pacific incl. Sea of Okhotsk	NAUMOV, 1960: 472
Thecocarpus tenuissima (Bale).	6660-6770	Pac.	Kermadec Trench	KRAMP 1956: 18	293-585	Pac.	off Australia	BALE 1914: 179
	4330	Pac.	Sth China Sea	present record	610	Pac.	Tasman Sea	present record

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