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ON A COLLECTION OF HYDROIDS FROM SOUTH INDIA¹

II. SUBORDER THECATA

(EXCLUDING FAMILY PLUMULARIIDAE)

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Suborder : THECATA

THE families included in this suborder are characterised by the presence of thecae for the hydranth and the gonozooid.

The following key will serve for the identification of the Thecata families

I. Diaphragm when present annular.

1. Operculum absent.

(i) Hypostome conical.

(A) Endoderm of hydranth not differentiated into digestive and non-digestive parts. LAFCEIDAE

(B) Endoderm of hydranth differentiated into a proximal digestive and distal non-digestive parts. HALECIIDAE

(ii) Hypostome trumpet-shaped. CAMPANULARIIDAE

2. Operculum present.

(i) Operculum sharply demarcated from the hydrotheca. Annular diaphragm present. THYROSCYPHIDAE

(ii) Operculum sharply demarcated from the hydrotheca, annular diaphragm absent. (Subfamily CAMPANOPSINAE) or operculum not sharply demarcated from the hydrotheca, an annular diaphragm may or may not be present. (Subfamily CALYCELLINAE) CAMPANULINIDAE.

¹ Part I of this series (Suborder Athecata) has already appeared in Vol. V, No. 1 of this Journal. The numbering of Text-figures and Tables is continued from Part I.

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Such a procedure seems premature especially since the gonosome of *H. corrugata* is unknown.

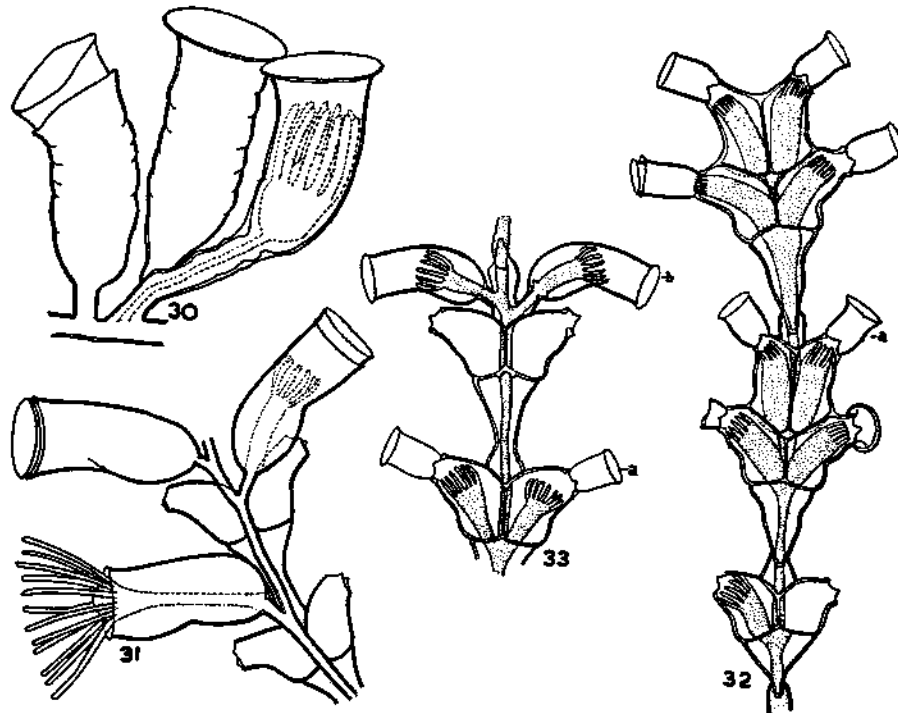


FIG. 30. *Hebella corrugata*; 31. *Hebella scandens* growing over *Sertularia distans* var. *gracilis*; 32. *Hebella thankasseriensis* in *Dynamena thankasseriensis* (a) Hydrotheca represented by a collar fused to the hydrotheca of the host; 33. *Hebella thankasseriensis* in *Dynamena thankasseriensis* (a) Hydrotheca represented by a collar fused to the hydrotheca of the host (b) free hydrotheca.

***Hebella scandens* (Bale)**

(Fig. 31)

- ? *Desmoscyphus humilis* Armstrong, 1879, p. 101, Pl. IX (Gonosome only)
- Lafaea scandens* Bale 1888, p. 758, Pl. XIII, figs. 16-18.
- Lictorella scandens* Borradaile, 1905, p. 840.
- Lafaea calcarata* Billard 1906, 174.
- Lafaea scandens* Warren 1908, p. 341, text-fig. 21.
- Hebella scandens* Thornely 1916, p. 148.
- ? *Hebellopsis indica* Stechow 1922, p. 146.
- ? *Hebellopsis indica* Stechow 1924a, p. 138.
- Hebellopsis scandens* Stechow 1925a, p. 442.
- Hebella scandens* Millard 1957, p. 202.
- Hebella scandens* Millard 1958, p. 176.

The hydrotheca is two to two and a half times as long as broad, tubular with hemispherical base, margin often reduplicated, diaphragm short, borne on short smooth asymmetrically placed peduncle: hydranth with 12 tentacles. Gonosome was not observed.

Length of hydrocaulus	..	..	upto 5.5 mm.
Breadth of hydrocaulus	..	..	0.02-0.03 mm.
Breadth of hydrothecal mouth	..	..	0.19-0.22 mm.
Length of hydrotheca	..	..	0.50-0.55 mm.
Length of hydrothecal peduncle	..	..	0.06-0.07 mm.

Locality—This species was collected from Kovilam and Neendakara. Kovilam specimens were epizoic on *Sertularia distans* Lamouroux var. *gracilis* (Hassall), where hydrotheca alternated with the hydrotheca of the supporting colony. Neendakara specimens were found growing on the central rachis of *Halocordyle pennaria* (Cavolini) var. *australis* (Bale). In the Indian region this species was previously recorded from St. George Island, off west of India (Armstrong 1879) and from the Male Atoll in the Maldives (Borradaile 1905).

***Hebella thankasseriensis* n.sp.**

(Figs. 32-33)

This species is found endozoic in *Dynamena thankasseriensis* n.sp. The endozoic tenant usually occupies the entire hydrocaulus of the host losing its separate identity. However, in one of the specimens a part of the tenant is found growing beyond the tip of the host colony and this region showed the typical character of the genus. Free hydrotheca is alternate, campanulate, slightly curved towards one side with distinct diaphragm; hydrothecal peduncle attached to the middle of the hydrotheca; hydranth highly extensile, endoderm not demarcated into digestive and non-digestive regions; nematocysts on tentacles arranged in conspicuous transverse bands. In other specimens, where the tenant inhabits the hydrocaulus and the hydrothecae of the host, it is difficult to say whether the hydranth belongs to the tenant or the host. The tenant enters through an opening on the side of the basal joint. Inside the host the tenant faithfully follows the course of the host-coenosarc giving off polyps to every hydrotheca of the host. In such cases the hydrotheca of the tenant is represented by a short perisarcal tube fused to the distal margin of the host theca. Gonosome has not been observed.

Height of colony	..	..	..	upto 2.5 mm.
Length of free hydrotheca	..	..	..	0.35-0.37 mm.
Length of hydrothecal peduncle	..	..	..	0.06 mm.
Length of tenant hydrotheca fused to the host theca	..	..	..	0.15-0.16 mm.
Breadth of hydrothecal mouth	..	..	..	0.14-0.16 mm.

Locality—Several specimens of *Dynamena thankasseriensis* n.sp. collected from Thankassery were inhabited by this tenant hydroid. Although a large quantity

of the material was obtained at Thankassery, only a few specimens were preserved, since the value of the material was not realised at that time.

Remarks—The characters of the free hydrotheca clearly prove the identity of the material to *Hebella* and the habit of living inside the perisarc of another hydroid identifies the species as new. Within the host colony, the tenant has completely adapted that its presence is almost impossible to detect. In the free condition, the tenant hydranths are subalternate, but in regions where it occupies the coenosarc of the host, it follows the arrangement of the hydrotheca of the host. The presence of a cup-like hydrotheca fused to the distal part of the host hydrotheca is very interesting. There are only two explanations: 1. the proximal part of the hydrotheca has fused with the hydrotheca of the host forming an inner lining, or alternately, 2. since the basal part of the polyp of the tenant is well protected, a separate hydrotheca is superfluous. The latter view is in accordance with the economy of material usually associated with such a habit.

Allman (1888) created the genus *Hypopyxis* mainly on the presence of a cup-like structure at the tip of the hydrotheca. The presence of a cup-like collar secreted by the tenant in the present case throws some doubt on the identity of this genus. The absence of blind-sac (Stechow, 1924a) in Allman's material also lends some evidence in support of this doubt.

Family HALECIIDAE Hincks

Hydrocaulus is branched; hydrotheca usually reduced; hydranth large, usually not retractile into the theca, endoderm differentiated into proximal digestive and distal non-digestive regions, hypostome conical; reproduction through medusa or fixed gonophore.

Only two genera of Haleciidae are known to occur in the Indian region and these are distinguished as follows:

Nematophores present on the hydrocaulus.	<i>Hydrodendron</i> Hincks
Nematophores absent.	<i>Halecium</i> Oken

Hydrodendron Hincks

Ophiodes Hincks 1868.
Hydrodendron Hincks 1874.
Diplocyathus Allman 1888.
Ophiodissa Stechow 1919a.

Hydrotheca is short, funnel-shaped, incapable of accommodating retracted hydranth, with annular diaphragm and a circlet of dots at the middle of the hydrotheca; hydranth large with distinct constriction at the base of the tentacles; nematophore monothalamic, arising close to the hydrotheca, with highly extensile sarcostyle; gonotheca present; gonophores fixed.

Stechow (1919a) recognised four different genera belonging to Haleciidae having nematocysts (viz. *Hydrodendron* Hincks, *Diplocyathus* Allman, *Ophiodissa* Stechow (*Ophiodes* Hincks) and *Phylactotheca* Stechow). Billard (1910) pointed

out the close similarity between *Ophiodes* and *Diplocyathus*. Later authors (except Stechow) accepted his view and Leloup (1939) gave the name *Diplocyathus* to the combined genus. Blackburn (1938) in his review of the nematophore bearing Haleciidae pointed out that Bonnevie (1898) had recorded a nematotheca for *Hydrodendron* and hence treated *Ophiodes* and *Diplocyathus* as synonyms of *Hydrodendron*. The only species of *Hydrodendron* represented in the Indian region is *Hydrodendron caciniiformis* (Ritchie).

***Hydrodendron caciniiformis* (Ritchie)**

(Fig. 34)

Ophiodes caciniiformis Ritchie 1907a, p. 500, Pl. XXIV, XXV.

Diplocyathus caciniiformis Leloup 1939, p. 4, fig. 3.

Hydrodendron caciniiformis Millard 1957, p. 186, fig. 3a-c.

The species is represented in collections from two localities. The Thankassery specimens had regular nodes, internodes and nematophores associated with each hydranth, while the Kovilam specimens had irregularly folded perisarc, not demarcated into internodes and nematophores only rarely associated with hydrotheca. However, specimens from both collections agree in having funnel-shaped hydrotheca with a row of dots and annular diaphragm, nematophores with highly extensile sarcostyle and hydranth with 20-22 tentacles, with an aggregation of nematocysts between the tentacles; hypostome hemispherical and mouth quadrate; gonosome arising directly from the hydrorhiza, gonotheca large, transparent, cylindrical, with 4-6 broad transverse annulations, with flared margin; gonophores fixed.

Height of colony	..	..	upto 5.2 mm.
Length of internode	..	..	0.20-0.36 mm.
Length of hydrothecal peduncle	..	..	0.11-0.13 mm.
Breadth of hydrothecal mouth	..	..	0.17-0.18 mm.
Height of nematotheca	..	..	0.10-0.11 mm.
Breadth of nematothecal mouth	..	..	0.07-0.08 mm.
Height of gonotheca	..	..	0.85-0.95 mm.
Diameter of gonothecal mouth	..	..	0.30-0.35 mm.

Locality—This species was collected from Thankassery (from Sargassum weeds) and Kovilam (from a piece of sand stone encrusted with sponge). *H. caciniiformis* has not been previously recorded from the Indian region and the gonotheca is here described for the first time.

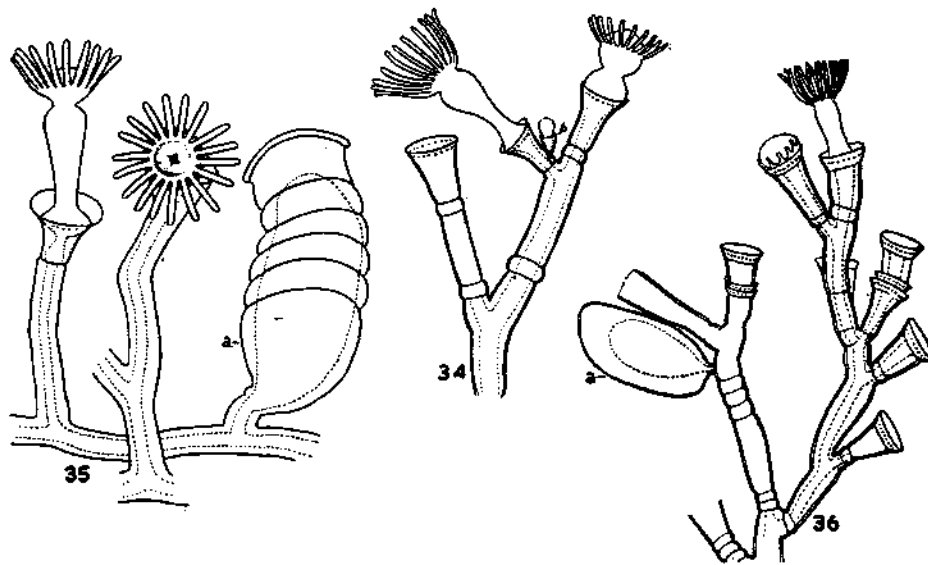


FIG. 34. *Hydrodendron caciniiformis* Thankassery specimen showing nodes and internodes ; 35. *Hydrodendron caciniiformis* Kovilam specimen without differentiation into nodes and internodes ; 36. *Helecium tenellum* (a) gonotheca.

Helecium Oken

Helecium Oken 1815

Hydrocaulus is branched ; hydrotheca short, funnel-shaped, incapable of accommodating the fully retracted polyps, with short distinct diaphragm and a row of dots ; nematophores absent ; reproduction through fixed gonophores.

The species of *Helecium* recorded from the Indian region may be identified as follows :

I. Branches alternate, internodes short ; hydrotheca tubular, slightly everted and regularly alternating.

1. Hydrocaulus unbranched and unsegmented, hydrotheca saucer-shaped.
H. simplex Pictet

2. Hydrocaulus short, slightly branched, hydrotheca funnel-shaped.
H. halecium (Linnaeus) var *minor* (Pictet)

II. Branches irregular, internodes highly variable ; hydrotheca irregularly disposed, funnel-shaped with a slightly everted margin. *H. tenellum* Hincks

***Halecium tenellum* Hincks**

(Figs. 35-36)

Halecium tenellum Hincks 1861, p. 252, Pl. VI, figs. 1-4.*Halecium flexile* Allman 1888, p. 11, Pl. V, figs. 2, 2a.*Halecium gracile* Bale 1888, p. 759, Pl. XIV, figs. 1-3.*Halecium flexile* Thornely 1904, p. 112.*Halecium flexile* Ritchie 1907, p. 525, Pl. II, fig. 4.*Halecium tenellum* Ritchie 1910a, p. 808.*Halecium flexile* Stechow 1913a, p. 81, figs. 45-49.*Halecium tenellum* Stechow 1925a, p. 418, fig. 28.*Halecium tenellum* Leloup 1932, p. 146.*Halecium tenellum* Leloup 1935, p. 9.*Halecium tenellum* Fraser 1937, p. 110, Pl. XXIII, fig. 124.*Halecium tenellum* Millard 1957, p. 193, fig. 5.

Hydrocaulus is monosiphonic, regularly or irregularly branched, internodes long; hydrophore small, with a ring of dots around the middle, margin slightly flared, occasionally reduplicated; gonotheca oval, elongate, membraneous and attached to the hydrocaulus by short peduncles, gonophores fixed.

Height of the colony	..	..	up 10 mm.
Length of internode	..	..	0.28-0.32 mm.
Breadth of internode	..	..	0.08-0.10 mm.
Length of hydrotheca	..	..	0.03-0.04 mm.
Breadth of hydrothecal mouth	..	..	0.12-0.14 mm.
Length of gonotheca	..	..	0.36-0.44 mm.
Breadth of gonotheca	..	..	0.24-0.27 mm.

Locality—*H. tenellum* was collected from a piece of *Sargassum* at Kovilam. It was previously recorded from Ceylon (Thornely, 1904) and Pamban (Leloup, 1932) from the Indian region.

Remarks—The vegetative characters of the hydroid are seen to vary considerably. In young and fast growing colonies the internodes are long and regular, whereas in older colonies and colonies growing in rough water the internodes are short and the hydrothecal margin irregularly duplicated.

and 10 bicuspidate teeth ; gonotheca bell-shaped, arising either from axils of hydrothecal peduncle or directly from the hydrorhiza ; peduncles short and annulated and medusae growing around a central blastostyle. Hydroid reared in the laboratory liberated medusae exactly identical to the medusae of *Obeleia geniculata* Linnaeus. Even one or two hours before the liberation of the medusa, the marginal tentacles showed regular rhythmic movements. The medusa is liberated with 12-16 tentacles and is typically saucer-shaped with the manubrium projecting out as a result of eversion of the bell. The velum is very narrow and hardly noticeable. Immediately after liberation 8 otocysts appear at the plane of the adradial tentacles, each quadrant having two. The number of tentacles gradually increases, but seldom exceeds 32.

Height of colony	..	..	upto 4.30 mm.
Length of hydrothecal peduncle	..	..	0.18-0.38 mm.
Breadth of hydrothecal mouth	..	..	0.13-0.20 mm.
Length of hydrotheca	..	..	0.28-0.33 mm.
Length of gonotheca	..	..	0.35-0.43 mm.
Breadth of gonothecal mouth	..	..	0.12-0.16 mm.

Locality—This species was collected from Cochin, Neendakara, Thankassery and Cape Comorin. It was usually found attached to Sargassam and occasionally to large hydroids like *Halocordyle pennaria* (Cavolini) var. *australis* (Bale) and *Garveia franciscana* (Torrey).

Remarks—*Obelia gelatinosa* (Pallas), *O. neglecta* Alder, *O. corona* Torrey, *Gonothyraea hyalina* Hincks, *G. longicyatha* Thornely, *Clytia geniculata* Thornely, *Obelia austrogeorgiae* Jaderholm, *O. bifurca* Hincks, *Laomedea bicuspidata* Clark var. *picteti* Leloup and *Campanularia spinulosa* Bale* are the species of Campanulariidae possessing bicuspidate teeth. A critical examination of the descriptions of these species shows that the specific differences in most of these species are not quite satisfactory. 1. The character of monosiphonic or polysiphonic hydrocaulus is not dependable as several cases are known where from the same hydrorhiza large polysiphonic and small monosiphonic colonies arise. 2. The annulation of the hydrothecal peduncle has often been mentioned as specific. However, in the present material they are found to vary from 3-26, confined to the ends or spread over the entire length of the peduncle. 3. In the present material the diaphragm is oblique. The same diaphragm when rotated through 90° appears horizontal and placed at a higher or lower level, depending upon whether the lower or upper surface is focussed. It is very likely that the difference in the disposition of the diaphragm attributed to some of the species is one or other of these conditions. 4. As regards the number of the hydrothecal teeth, in all species it usually varies from 10-12 though occasionally it goes up to 16. 5. In *Obelia neglecta*, *O. bicuspidata*, *O. austrogeorgiae* and *O. bifurca*, some of the authors have referred to the presence of longitudinal folds running downwards between the hydrothecal teeth. Similar folds have been observed to be only an indication of age. 6. The hydrothecae in the present specimens are twice as long as wide. This seems to be the relative proportion in other species also. *O. neglecta* according to Hincks (1868) is only as deep as wide, while the same species according to Broch (1933) is four times as deep as wide. Since many of the authors neither give measurements nor magnifications to their diagrams, it is difficult to get any idea of their exact size.

* Bale gives *C. spinulosa* in text and *C. bispinosa* in figure.

At present the species of Campanulariidae possessing bicuspidate teeth are included under genera *Clytia*, *Obelia* and *Gonothyrea*. A perusal of the previous literature of *Clytia geniculata* Thornely does not show a single instance in which *Clytia*-medusa has been observed. So it may be presumed that the generic identification was based only on the unbranched nature of the colony. An external marsupium has been observed in *Gonothyrea hyalina* by several authors and so this may be taken as valid species. In *G. longicyatha*, only Thornely (1904) has observed an external marsupium-like structure. But her statement 'If what appears to be an external marsupium is in reality an escaping medusiform zooid, the species may be an *Obelia*', makes her generic identification doubtful. In the present material since a typical *Obelia* medusa is liberated, there can be no doubt about the generic position. A critical re-examination of the original material of these Campanulariids will very likely prove that some of the separately maintained species are only synonyms.

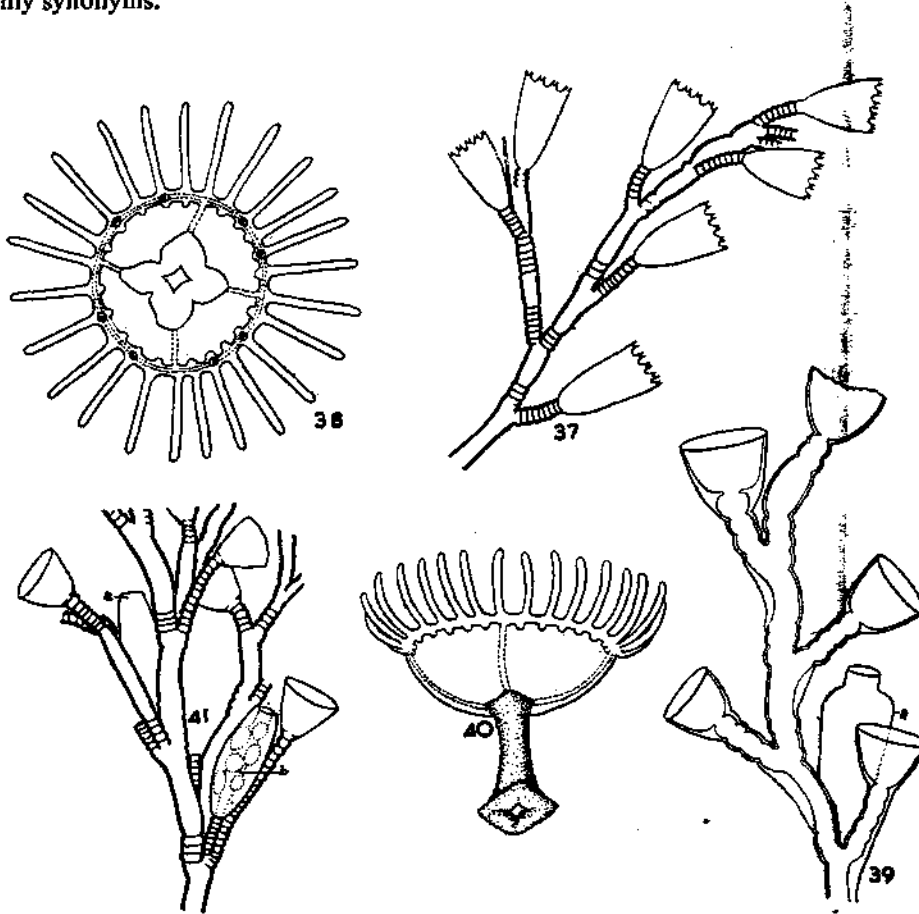


FIG. 37. *Obelia bicuspidata*; 38. Medusa of *Obelia bicuspidata*; 39. *Obelia geniculata*; 40. Medusa of *Obelia geniculata*; 41. *Obelia commissuralis* (a) gonotheca (b) developing medusa.

***Obelia geniculata* Linnaeus**

(Figs. 39 & 40)

Obelia geniculata Bedot 1925, p. 304.*

The hydrocaulus is sparingly branched, perisarc of internodes asymmetrically thickened, broadest just below the insertion of peduncles ; peduncle short, Gonotheca campanulate usually with truncated apex, when mature with a small distal collar with free margin deflected inward ; medusa with 16 tentacles at the time of liberation, usually swimming with everted bell.

Height of colony	..	..	upto 10 mm.
Length of internode	..	..	0.60-0.70 mm.
Breadth of internode	..	..	0.10-0.14 mm.
Length of hydrothecal peduncle	..	..	0.20-0.32 mm.
Length of hydrotheca	..	..	0.20-0.28 mm.
Breadth of hydrothecal mouth	..	..	0.20-0.28 mm.
Height of gonotheca	..	..	0.40-0.52 mm.
Breadth of gonothecal mouth	..	..	0.10-0.17 mm.

Locality—The present collection was obtained from Kovilam and Thankassery from drifting weeds. Although *Obelia geniculata* has wide distribution in the tropical and subtropical waters, it has not hitherto been recorded from the Indian region.

***Obelia commissuralis* McCrady**

(Fig. 41)

Obelia commissuralis McCrady 1858, p. 96.*Obelia commissuralis* L. Agassiz 1862, p. 315.*Obelia commissuralis* Nutting 1901a, p. 382, fig. 17.*Obelia commissuralis* Fraser 1911, p. 38.*Obelia commissuralis* Nutting 1915, p. 83, Pl. XXI, figs. 1-5.*Obelia commissuralis* Fraser 1937, p. 84, Pl. XVII, fig. 84.

Hydrocaulus is profusely branched, branches arising from the axils or the middle of internode, lower branches of hydrocaulus often fallen off ; hydrothecal peduncle alternate,** usually annulated at both ends, occasionally along the entire length ; hydrotheca funnel-shaped, with entire margin, low diaphragm and small basal chamber ; hydranth large, typically with 12-14 tentacles ; gonosome arising singly

* See for full list of synonyms.

** Nutting's statement that the colonies are dichotomously branched is neither corroborated by the accounts of other workers nor by his own figures.

or occasionally in pairs from the axils of branches; gonotheca campanulate, with conical base and slightly narrowed distal part; blastostyle large, carrying medusa buds around.

Height of colony	..	..	upto 42 mm.
Length of cauline internode	..	..	0.60-0.97 mm.
Length of hydrothecal peduncle	..	..	0.25-0.82 mm.
Height of hydrotheca	..	..	0.25-0.32 mm.
Breadth of hydrothecal mouth	..	..	0.25-0.26 mm.
Height of gonotheca	..	..	0.55-0.68 mm.
Breadth of gonothecal mouth	..	..	0.25-0.27 mm.

Locality—This species was obtained from Royapuram beach, Madras,* attached to *Balanus* shells. This is the first record from the Indian region.

Remarks—The present specimens agree in general with the description and figures of Nutting (1901, 1915), except in the shape of the hydrotheca. The hydrotheca is funnel-shaped or conical resembling the specimens recorded by Fraser (1911, 1937) and not campanulate as described by Nutting. *O. commissuralis* McCrady shows considerable similarity to *O. hyalina* Clarke, which has been recorded by Thornely (1904) from the Gulf of Manaar. The presence of a distal collar on the gonotheca is the only reliable specific difference between *O. hyalina* and *O. commissuralis*. It is not clear whether such a collar is present in the specimens of Thornely. If a re-examination of Thornely's specimens shows that a gonothecal collar is absent, then the species collected by her is likely to be the same as *O. commissuralis*.

Clytia Lamouroux emend Hincks

Clytia Lamouroux 1816.

Clytia Hincks 1868.

Hydrocaulus is usually unbranched, at times sparingly branched; hydrotheca campanulate, somewhat thick, diaphragm conspicuous; gonophores develop into free swimming medusae; just liberated medusa** deep bell-shaped with well developed velum, four marginal tentacles and 8 adradial otocysts.

The species of *Clytia* recorded from the Indian region may be identified as follows:

I. Hydrothecal margin serrate (asymmetrical).

- | | |
|--|------------------------------|
| 1. Hydrotheca twice as deep as broad. | <i>C. gracilis</i> (Sars) |
| 2. Hydrotheca nearly as deep as broad. | <i>C. brevicyathus</i> n.sp. |

* Supplied by Dr. J. P. Joshua, Madras Christian College, Tambaram, for which the author is very thankful to him.

** The medusae of three species of *Clytia* [viz. *C. gracilis* (Sars) *C. noliformis* (McCrady) and *liguliformis* n. sp.] reared in the laboratory were nearly identical in shape and size and all of them were referable to *Phialidium hemisphericum* (Gronovices). This medusa is supposed to have a cosmopolitan distribution and has been previously recorded from the Trivandrum coast (Nair, 1951). So far *Phialidium hemisphericum* was considered as the medusa of *Clytia johnstoni*. But from the present study it has been possible to show that at least three more species of *Clytia* produce medusae which agree with the description of *Phialidium hemisphericum*.

II. Hydrothecal margin dentate.

1. Hydrothecal teeth broadly triangular and keeled. *C. hendersonae* Torrey

III. Hydrothecal margin with rounded teeth and rounded interspaces.

1. Gonotheca barrel-shaped, with an ascending spiral fold. *C. johnstoni* (Alder)
2. Gonotheca roughly oval, with distinct neck and without annulations.
C. noltiformis (McCrary)

***Clytia gracilis* (Sars)**

(Figs. 42-45)

- Laomediea gracilis* M. Sars 1857, p. 160, Pl. II, figs. 1-3 and 5 (not 4).
Gonothyraea gracilis Hincks 1868, p. 183, Pl. XXXVI, fig. 1.
Campanularia raridentata var. Marktanner 1890, p. 205, Pl. III, fig. 31b.
Gonothyraea gracilis Hartlaub 1879, p. 451.
Gonothyraea gracilis Billard 1905, p. 172.
Gonothyraea gracilis Hartlaub 1905, p. 583, fig. H1, H2.
Gonothyraea gracilis Ritchie 1907a, p. 503.
Campanularia raridentata Jaderholm 1909, p. 61, Pl. V, fig. 12.
Gonothyraea gracilis Jaderholm 1909, p. 64.
Laomedea gracilis Broch 1912, p. 53, text-fig. 18.
Campanularia raridentata Stechow 1913a, p. 122, fig. 29.
Campanularia acuta Stechow 1919, p. 54.
Clytia gracilis Stechow 1923a, p. 105.
Clytia gracilis Stechow 1924a, p. 113.
Clytia stechowi Hargitt 1927, p. 504, fig. 3.
Clytia gracilis Millard 1957, p. 106.

This is a delicate hydroid, usually branching; hydrothecal peduncle fairly long, with annulations at the proximal and distal ends, middle part smooth; hydrotheca deeply campanulate, twice as long as broad, thin walled, in a few cases with a pair of lateral projections towards the base of the hydrotheca, not visible when rotated through 90° (Fig. 53); in still others the hydrotheca showing longitudinal folds extending backwards between the hydrothecal teeth; hydrothecal margin serrate, with 10-13 teeth; diaphragm thin, placed quite close to the base of the theca; gonosome arises from the hydrothecal peduncle; gonotheca campanulate, with conical base and truncated apex; blastostyle axial, bearing medusa around, expanding distally to form a plugging device for closing the gonothecal mouth.

Hydroid reared in the laboratory liberated medusae. In the newly liberated medusa the bell is transparent, hemispherical with 4 marginal tentacle-like rudiments with a broad velum and a squarish manubrium suspended from the roof of the bell. The medusa undergoes rapid change in the first few hours. At the end of the first

hour the tentacles become larger, manubrium gets slightly elongated and rudiments of otocysts appear. In the two hour stage the tentacles are closely coiled and tendril-like, manubrium extended to one-third the height of the bell and the otocysts are quite distinct. In 4-5 hour old medusa the tentacles are in the form of loose spiral, the length of manubrium nearly equals half the height of the bell and is free and stouter and more granular in appearance. In about 8 hours after liberation, the tentacles uncoil into long whip-like structures and the manubrium shows distinct nematocysts and a terminal mouth. At this stage the medusa starts feeding. The rest of the development is gradual, the bell enlarges, tentacles elongate and the rudiments of one or two per-radial tentacles arise. In no instance are all the interradial tentacles seen to arise simultaneously.

At the end of the first day, some of the medusa became sluggish, gradually sank down and died. Others which continued to be active grew rapidly and by the end of the second day, the bell increased to nearly double the size, with 6-7 and occasionally 8 tentacles. By this time the rudiments of the gonads were also developed on the radial canals as diverticulae. By the end of the third day the gonads enlarged and projected slightly into the cavity of the bell, showing differentiation into inner and outer layers. Apparently there was no difference between male and female medusae, except that in the male the inner layer was less granular than in the female. All the medusae died before the 7th day without liberating gametes.

Height of colony	..	..	2.25-7.70 mm.
Length of hydrotheca	..	..	0.52-0.62 mm.
Breadth of hydrothecal mouth	..	..	0.28-0.30 mm.
Length of hydrothecal peduncle	..	..	0.80-1.38 mm.
Breadth of hydrothecal peduncle	..	..	0.04-0.05 mm.
Length of gonotheca	..	..	0.40-0.48 mm.
Breadth of gonothecal mouth	..	..	0.20-0.28 mm.
Diameter of newly liberated medusa	..	..	0.30-0.35 mm.
Diameter of mature medusa	..	..	0.70-0.82 mm.

Locality—A rich collection of this hydroid was obtained from drift weeds washed ashore at Quilon in January 1955. A small collection was also obtained at Kovilam. This species has been previously known from Mergui Archipelago (Ritchie 1839). An examination of the illustrations of *C. acuta* given by various authors shows that even under *C. acuta* there are two forms one with dentate (symmetrical teeth) and the other with serrate (asymmetrical teeth). The latter clearly agrees with the present collection. Sars (1857) who was the first to record such a serrated condition, described it as *Laomedea gracilis*. Later Hincks (1868) transferred this species to *Gonothyrea* Allman because of the presence of an external marsupium in one of the figures of Sars. However, Stechow explained that the presence of a small bit of *Gonothyrea loveni* Allman in the tube containing *C. gracilis* (Sars) might have misled Sars. Further it may be remarked that no other author was able to observe an external marsupium. *Clytia* medusa obtained during the present study supports this view and the material has been identified as *Clytia gracilis* (Sars).

The present investigation has shown that some of the vegetative characters of *C. gracilis* are variable. The presence of longitudinal folds running downwards between the hydrothecal teeth are merely indications of age. The annulations of

the hydrothecal peduncles vary considerably. *Clytia stehowi* Hargitt is characterised by a pair of lateral protections. Exactly the same condition is observed in some of the hydrotheca of the present collection also (Fig. 43). It is therefore possible that *C. stehowi* Hargitt is not different from *C. gracilis* (Sars).

***Clytia brevicyathus* n. sp.**

(Fig. 46)

Hydrocaulus usually branched, more than one secondary branch usually arise from the same point on the primary peduncle and many in turn give rise to tertiary branches in cymose pattern; hydrothecal peduncle usually with 4-9 proximal and 2-4 distal annulations; hydrotheca short, nearly hemispherical, as deep as broad, walls fairly thick, margin cut into 10-12 serrate teeth exactly as in *C. gracilis* (Sars); diaphragm thick, enclosing a moderately large basal chamber; gonosome arise directly from the hydrothiza or from the middle of the hydrothecal peduncle; gonotheca large and campanulate with truncated distal end.

Height of unbranched colony	..	..	1.20-1.45 mm.
Height of branched colony	..	..	upto 4.0 mm.
Length of hydrothecal peduncle	..	..	0.35-0.49 mm.
Breadth of hydrothecal peduncle	..	..	0.06-0.08 mm.
Height of hydrotheca	..	..	0.38-0.41 mm.
Breadth of hydrothecal mouth	..	..	0.30-0.35 mm.
Height of gonotheca	..	..	0.70-0.80 mm.
Breadth of gonothecal mouth	..	..	0.24-0.26 mm.

Locality—The material was collected from underneath the Neendakara bridge.

Remarks—This species agrees with *Clytia gracilis* (Sars) in the mode of growth, nature of annulations of the peduncle, serrated nature of the margin of the hydrotheca, thicker diaphragm, larger basal chamber and longer gonotheca. In *C. gracilis*, the hydrotheca is twice as long as broad, whereas in the present species it is only one to one and a quarter times as broad. Broch (1918) has shown that the length breadth relationship (B : T) is nearly constant for any species. The present species is therefore described as new and the name *brevicyathus* refers to the short nature of the hydrotheca.

***Clytia hendersonae* Torrey**

(Fig. 47)

Clytia hendersoni Torrey 1904, p. 18, figs. 10-11.

Clytia hendersoni Fraser 1911, p. 35.

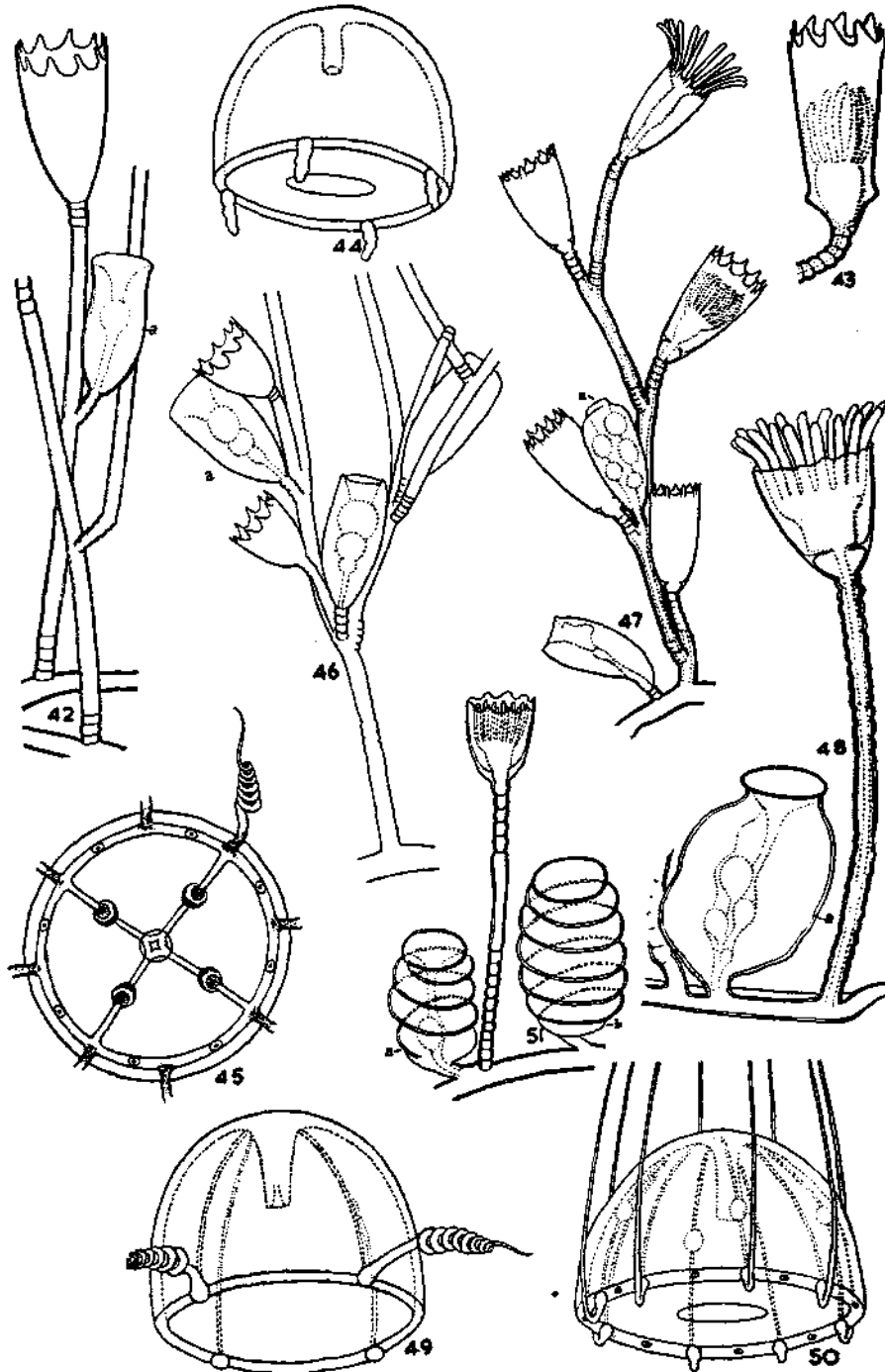
Clytia hendersoni Fraser 1915, p. 62, Pl. XV, figs. 2 & 3.

Clytia hendersonae Stechow 1924a, p. 109.

? *Clytia alternata* Hargitt 1924, p. 483, Pl. II, fig. 7.

Laomedea (Obelia) bistrata Leloup 1932, p. 153, Pl. XVII, figs. 15a, b; text-figs. 20-23.

Clytia hendersoni Fraser 1937, p. 73, Pl. XVI, fig. 781-c.



FIGS. 42. *Clytia gracilis* (a) gonotheca; 43. A type of hydrotheca of *Clytia gracilis* showing a pair of lateral projections; 44. Just liberated Medusa of *Clytia gracilis*; 45. Mature medusa of *Clytia gracilis*; 46. *Clytia brevicyathus* (a) gonotheca; 47. *Clytia hendersonsa* (a) gonotheca; 48. *Clytia noliformis* (a) gonotheca; 49. Just liberated medusa of *Clytia noliformis*; 50. Mature medusa of *Clytia noliformis*; 51. *Clytia johnstani* (a) young gonotheca (b) older gonotheca.

TABLE II

	<i>Clytia hendersonae</i> Torrey	<i>Clytia alternata</i> Hargitt	<i>Laomedea (Obelia)</i> <i>bistriata</i> Leluop	Present specimen	Remarks
Height of colony	9 mm. (50 mm. according to Fraser 1937).	10-20 mm.	5-7 mm.	6-10 mm.	Agree.
Breadth of hydrocaulus.	?	0.10-0.15 mm.*	0.10-0.15 mm.*	0.11-0.13 mm.	Agree.
Length of cauline internode.	?	0.74-0.90 mm.*	0.75-1.0 mm.	0.82-1.12 mm.	Agree.
Length of hydrothecal peduncle.	?	0.32-0.55 mm.*	0.35-0.44 mm.	0.32-0.38 mm.	Agree.
Height of hydrotheca.	?	0.65-0.75 mm.*	0.75-1.0 mm.	0.64-0.84 mm.	Agree.
Breadth of hydrotheca.	?	0.28-0.40 mm.*	0.25-0.50 mm.	0.38-0.40 mm.	Agree.
Height of gonotheca.	?	?	upto 1.5 mm.	0.80-1.04 mm.	Gonotheca slightly smaller in the present specimens.
Maximum breadth of gonotheca.	?	?	upto 0.50 mm.	0.36-0.42 mm.	Agree.
Mode of growth of colony.	Unbranched, pedicels alternate.	Sparingly branched. Hydrocaulus geniculate.	Branches disposed alternately.	Hydrocaulus geniculate.	Agree.
Margin of hydrotheca	12-14 keeled teeth.	12 acute teeth, keeled nature seen in the figure.	Keeled teeth present. Number not mentioned. 12-14 in figure.	12 sharp, keeled teeth with a slightly emarginated interspinous margin.	Agree.
Gonotheca.	Borne on pedicels and hydrorhiza. Campanulate.	Obconical, mounted on short annulated peduncle.	Nearly short with short annulated peduncle.	Campanulate, with a narrow neck and mounted on short annulated peduncle.	Agree.

* Dimensions not given in text, and so computed from figure.

Hydrocaulus is geniculate, with 3-4 annulations above the base of each peduncle ; peduncles alternate, arise at an angle with the hydrocaulus ; hydrothecal peduncle with 4-8 annulations distributed over its entire length ; hydrotheca large, deeply campanulate, twice as long as broad ; marginal teeth 12, each tooth strengthened by a keel-like spine, extending down to one-fourth the height of the hydrotheca ; inter-spinous space semicircular, diaphragm well developed and enclose a large basal chamber ; hydranth typical with a cirlet of 24 tentacles ; gonosome arising from the axils of peduncles or directly from the hydrorhiza ; gonotheca with a conical base, cylindrical body and a slightly narrow collar like distal end ; blastostyle axial, distally expanding to form a plugging device for closing the gonothecal mouth.

Locality—This material was collected from Vizhinjam at a depth of 10 fathoms and from submerged timber at Cochin harbour. This species was previously recorded from Port Blair (Andamans), off Puri and Chandipore (Orissa) by Leloup (1932).

Remarks—*Clytia alternata* Hargitt and *C. bistrinata* (Leloup) show a great deal of similarity in their specific characters to *C. hendersonae* Torrey. Hargitt did not justify the creation of *C. alternata*. He observes 'this species resembles somewhat *Clytia linearis*, but a careful comparison only emphasises its distinctiveness.' Unfortunately the description of *C. linearis* Thornely is so brief that it is impossible to compare the two species. On the other hand Leloup compared his specimens with *C. alternata*, but like Hargitt overlooked *C. hendersonae*. According to him *C. bistrinata* differs from *C. alternata*, in the smaller size of the colonies, less pointed hydrothecal teeth and the different arrangement of the medusa buds. The question for consideration is whether *C. alternata* Hargitt and *C. bistrinata* Leloup are specifically different from *C. hendersonae* Torrey. As regards the measurements of the entire colony and its component parts, the accompanying table (Table II) shows that the differences are insignificant. The arrangement of the medusa is subject to considerable variations depending on the degree of maturity of the gonosome. Thus it will be seen that the specific characters given for each species are such that collectively they only come within the extent of variation met with in *C. hendersonae*. The only character which can claim some degree of specific significance is the angular nature of the space between the hydrothecal teeth of *C. bistrinata*. Regarding the condition of *C. alternata* published accounts do not give any information. However, the difference by itself cannot be regarded as sufficient for considering the two species as distinct from *C. hendersonae*.

Clytia noliformis (McCrary)

(Figs. 48-50)

Campanularia noliformis McCrary 1858, p. 92, Pl. XII, fig. 4.

Clytia noliformis Nutting 1915, p. 57, Pl. II, figs. 7-10.

Clytia noliformis Stechow 1925a, p. 427.

Campanularia (Clytia) noliformis Leloup 1932, p. 150.

Colony unbranched ; hydrothecal peduncle partly or completely annulated ; hydrotheca large, margin worn out presenting an irregular outline, diaphragm high, hydranth somewhat large with 16 tentacles ; gonotheca bottle-shaped with irregularly bulged middle and narrow neck.

The changes that precede the liberation of the medusae are somewhat rapid and conspicuous. A streaming protoplasmic movement at the distal end of the blastostyle is followed by a contraction of the blastostyle, so that the distal end which plugs the gonotheca retracts, providing an opening for the medusa to escape from the gonotheca. The just liberated medusa is spherical with 4 well developed marginal tentacles, but without otocysts. Rudiments of inter-radial tentacles arise in about 18-24 hours after liberation. The tentacles are all curved upwards and not coiled. The gonads appear on the four radial canals in about 48 hours and the development of interradial tentacles completed in 72 hours. At this stage the gonad has an oval shape. Further development of the gonads was not noticed even four days after liberation.

Height of hydrocaulus	..	..	1.20-3.40 mm.
Breadth of hydrocaulus	..	..	0.11-0.13 mm.
Height of hydrotheca	..	..	0.38-0.44 mm.
Breadth of hydrothecal mouth	..	..	0.33-0.38 mm.
Height of gonotheca	..	..	0.65-0.76 mm.
Breadth of gonothecal mouth	..	..	0.31-0.35 mm.
Diameter of mature medusa	..	..	0.62-0.68 mm.
Height of mature medusa			0.52-0.55 mm.

Locality—This species was collected at Kovilam and Thankassery. The Thankassery specimens carried mature gonosome which liberated medusae. In the Indian region *C. noliformis* has been previously recorded from Port Blair (Andamans), Bay of Bengal, Ennore backwater and Madras harbour (Leloup 1932).

Remarks—A large number of *Clytia* species resemble *C. noliformis* (McCrary) in their trophosome. It is difficult to fix their specific identity without getting adequate information about their gonosomes. The irregular oval gonotheca with narrow neck easily distinguishes this species from all its allies. The worn out condition of the thecal margin, which is a constant feature in all the specimens of the present collection appears to be probably due to the very thin nature of the hydrothecal margin and consequent breaking of teeth. Pictet (1893) has figured a gonotheca for *C. noliformis*, which is so different from those of other authors that it has been excluded from the synonymy in the present paper. So also Pictet's view that *Campanularia denticulata* Clarke is a variety of *C. noliformis* does not seem to be correct. Evidently Pictet has erred in his specific identification and if so the relationship which he sought to establish is equally incorrect.

Clytia johnstoni (Alder)

(Fig. 51)

Campanularia johnstoni Alder 1856, p. 359, pl. XIII, fig. 8.

Clytia johnstoni Hincks 1868, p. 144, Pl. XXIV, fig. 1.

Clytia johnstoni Jaderholm 1909, p. 61, Pl. V, fig. 12.

Clytia johnstoni Ritchie 1910b, p. 830.

Clytia johnstoni Vanhoffen 1910, p. 301.

Clytia johnstoni Fraser 1911, p. 36.

Clytia johnstoni Nutting 1915, p. 354, Pl. XI, figs. 1-6.

Campanularia (Phialidium) johnstoni Broch 1933, p. 91.

Clytia johnstoni Fraser 1937, p. 74, Pl. XV, fig. 71.

Hydrocaulus is branched, arising from a creeping hydrorhiza, perisarc thick, with a number of deep annulations at the proximal and distal ends, the middle portion usually being smooth; hydrotheca campanulate $1\frac{1}{4}$ times as long as broad, thecal walls thick; diaphragm placed slightly above the base of the theca; basal chamber proportionately small, because of the thickening of the basal part of the theca; hydrothecal margin thick, wavy and formed of 10 perfectly rounded teeth, with semicircular interspaces; hydranth typical, with 16-18 tentacles; gonangia arising directly from hydrorhiza on short, inclined peduncles; gonotheca barrel-shaped with walls folded in a loose spiral; young gonotheca short, with a few distinctly spiral annulations.

Height of hydrocaulus	..	..	upto 3.4 mm.
Breadth of hydrocaulus	..	..	0.08-0.09 mm.
Height of hydrotheca	..	..	0.38-0.42 mm.
Breadth of hydrothecal mouth	..	..	0.26-0.32 mm.
Height of gonotheca	..	..	0.60-0.85 mm.
Breadth of gonothecal mouth	..	..	0.34-0.38 mm.
Maximum breadth of gonotheca	..	..	0.43-0.50 mm.

Locality—*Clytia johnstoni* colonies were collected from Sargassam weeds at Vizhinjam. This is the first record of this species along the Indian coast.

Clytia liguiliformis n. sp.

(Figs. 52-55)

Hydrocaulus is short, unbranched or sparingly branched; perisarc stout, of moderate length, distinctly annulated at the distal and proximal ends, the middle part usually wavy and occasionally smooth; annulations well spaced; hydrothecal teeth 9-10, tongue-shaped with slightly displaced protuberance at the summit, interspace narrow and deeply incised with the proximal longitudinal ridge running down the hydrothecal wall; hydrothecal walls between the ridges flat, giving a many sided appearance; diaphragm moderately thick, somewhat obliquely placed a little above the base of the hydrotheca; hydranth typical with 16 well-developed tentacles; gonangia arising directly from the hydrorhiza in unbranched colonies and from the axils of hydrothecal peduncles in branched colonies; gonothecal peduncle short and annulated; gonotheca barrel-shaped with a rounded base, cylindrical body and a slightly narrowed neck, with 4 longitudinal, equidistant ridges running into a circular ridge situated immediately below the mouth; blastostyle axial with developing medusae arranged around.

Mature colonies were reared in the laboratory to follow the development of the medusa. Each gonotheca liberated 20-35 medusae in quick succession. Newly liberated medusa had a broad velum, hemispherical bell, four coiled tentacles, eight adradial otocysts and a squarish manubrium that evenly expanded towards the base. In about two hours after liberation, the radial and circular canals were visible,

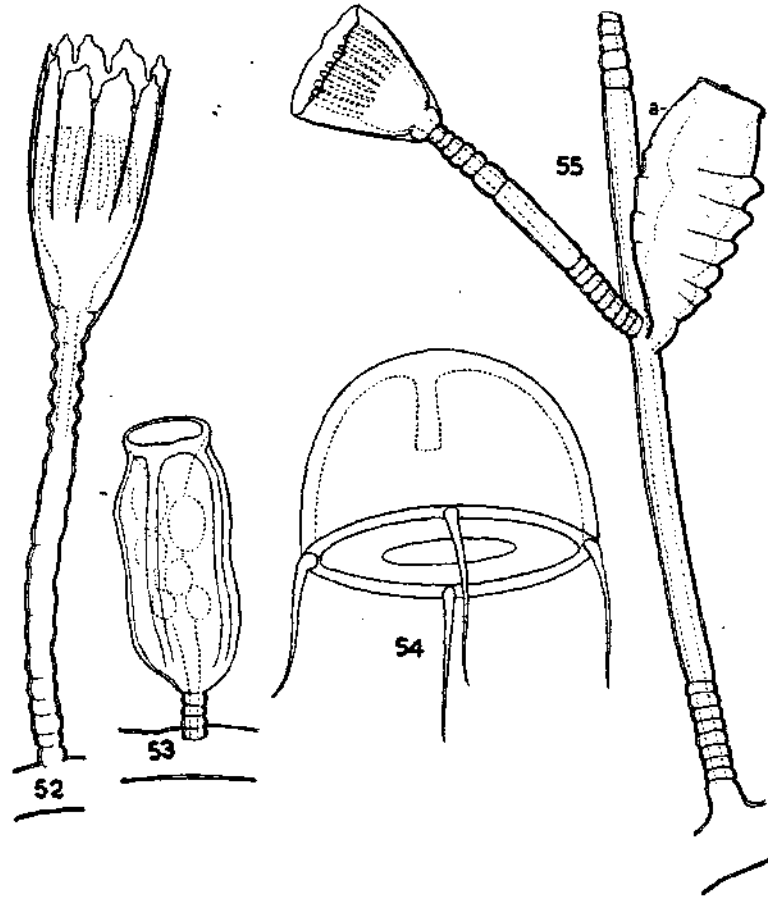


FIG. 52. *Clytia liguliformis*; 53. Gonotheca of *Clytia liguliformis*; 54. Medusa of *Clytia liguliformis*; 55. *Clytia crenata* (a) gonotheca.

the tentacular base was swollen and granulated. The medusae were active for the first one or two days, but gradually some of them became sluggish and settled down. Others which continued to be active started feeding. Even though the medusae were reared till the sixth day there was no trace of inter-radial tentacles or gonads.

Height of hydrocaulus	..	..	upto 3.4 mm.
Breadth of hydrocaulus	..	..	0.08 mm.
Length of hydrotheca	..	..	0.64-0.70 mm.
Breadth of hydrotheca	..	..	0.30-0.33 mm.

Height of gonotheca	..	..	0.72-0.92 mm.
Breadth of gonothecal mouth	..	..	0.24-0.31 mm.
Diameter of just liberated medusa	..	..	0.42-0.47 mm.
Height of just liberated medusa	..	..	0.37-0.41 mm.

Locality—This hydroid was collected from Neendakara and Kovilam. The Neendakara specimens were seen in a perfectly healthy condition growing on a sea snake *Enhydrina valakkadian*, captured alive in a stake net. The snake died a few hours later, but the hydroid continued to be healthy and it was possible to rear the medusa from them. The Kovilam specimens were obtained from *Sargassum*.

Remarks—The identification of the present material was facilitated by a study of medusa reared in the laboratory. The present material resembles *Clytia gracilis* (Sars) and *Clytia brevicyathus* n. sp. in the asymmetrical hydrothecal teeth. But the tongue-shaped appearance of the hydrothecal teeth, the presence of longitudinal ridges on the hydrothecal wall and similar ridges on the gonotheca that merge with a circular thickening around the base of the mouth are characters which distinguish this species from all others. The specific name refers to the shape of the hydrothecal teeth.

Clytia crenata n. sp.

(Fig. 55)

Hydrocaulus is unbranched or sparingly branched; hydrothecal peduncle long and annulated at the ends, proximal annulations narrow, distal ones broader; hydrotheca large, bell-shaped, walls proximally thickened, gradually thinning towards the margin; hydrothecal teeth 10, crenate, occasionally crumpled or smooth; hydranth large with 24 tentacles. Gonangia arise either from the hydrocaulus or from the hydrorhiza; gonotheca elongate, barrel-shaped, traversed by 5-7 transverse folds, which are more prominent on the adaxial side than the abaxial side; medusa buds arising around an axial blastostyle.

Height of hydrocaulus	..	..	upto 5.0 mm.
Breadth of hydrocaulus	..	..	0.09-0.12 mm.
Length of hydrothecal peduncle	..	..	1.50-3.10 mm.
Length of hydrotheca	..	..	0.40-0.48 mm.
Breadth of hydrothecal mouth	..	..	0.38-0.45 mm.
Length of gonotheca	..	..	0.82-0.94 mm.
Maximum width of gonotheca	..	..	0.32-0.36 mm.
Width of gonothecal mouth	..	..	0.27-0.30 mm.

Locality—Tufts of this hydroid were collected from an empty *Balanus* shell from Vizhinjam.

Remarks—Though the medusa of this species was not obtained, the feeble branching and the disposition of the diaphragm show that the present species very likely belongs to *Clytia*. The crenate margin of the hydrotheca recalls the condition in *Obelia dichotoma* Linnaeus. But the longer hydrothecal peduncle with smooth

intermediate part and above all the annulations of the gonotheca distinguish this species from all other *Obelia* and *Clytia* and so the present material is described as new. The specific name refers to the crenate nature of the hydrothecal margin.

Campanularia Lamarck *Emend* Hincks

Laomedea Lamouroux 1812 in part

Campanularia Lamarck 1836

Campanularia Hincks 1868

Non-*Campanularia* Broch 1914

Hydrocaulus is branched, hydrotheca campanulate, diaphragm usually thin, gonophores fixed.

Of the several generic names available, *Laomedea* has distinct priority, but as the most important character of the genus, namely the fixed nature of the gonophore was pointed out by Hincks (1868) under the generic name *Campanularia*, Hincks' generic name has been followed.

The Indian species of *Campanularia* may be identified as follows :

- | | |
|---|--------------------------------|
| I. Hydrothecal margin with sharp teeth. | <i>C. erythraea</i> (Thornely) |
| II. Hydrothecal margin smooth. | <i>C. ? chelonae</i> Allman |

Campanularia erythraea (Thornely)

(Fig. 56)

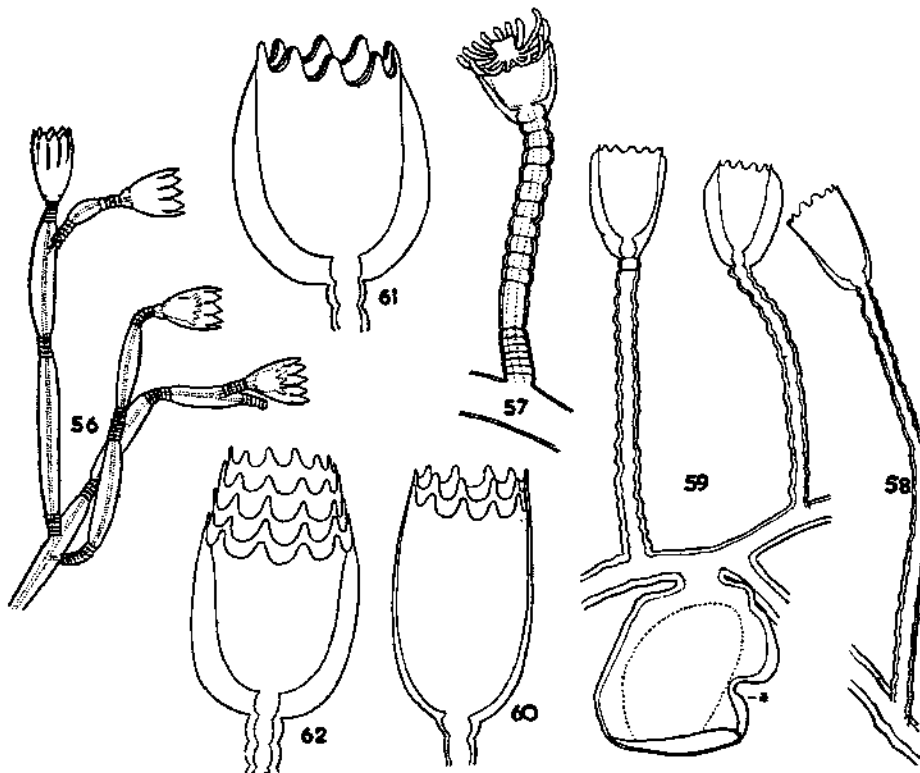
Campanularia denticulata Thornely 1908, p. 82, Pl. IX, fig. 3.

Laomedea erythraea Stechow 1924a, p. 118.

Colony branched, extremely delicate ; hydrothecal peduncles long, with annulations at the proximal and distal ends, occasionally annulations appear at the middle of the intermediate regions also, but never along the entire peduncle ; annulations at the distal end more numerous and relatively wider apart ; annulated regions narrow, intermediate regions slightly bulged, the bulging more prominent in the older peduncles, each secondary peduncle with a characteristic knee bend at the upper end of the proximal annulations ; hydrotheca campanulate, with a distinct diaphragm enclosing a fairly large basal chamber ; thecal margin with 10-12 broad triangular teeth with angular interspaces ; hydranth simple ; gonosome not observed.

Height of colony	..	..	upto 4.3 mm.
Height of hydrothecal peduncle	..	..	0.52-2.20 mm.
Breadth of hydrothecal peduncle	..	..	0.05-0.06 mm.
Length of hydrotheca	..	..	0.27-0.29 mm.
Breadth of hydrotheca	..	..	0.18-0.22 mm.

Locality—The material of the present species was collected from Cochin harbour from a piece of drifting sea-weed on which this hydroid formed a moss-like growth.



FIGS. 56. *Campanularia erythraea*; 57. *Orthopyxis clytioides*; 58. *Orthopyxis intermedia* hydrotheca appear thin. 59. *Orthopyxis intermedia* hydrotheca appear thick, (a) gonotheca. 60. *Orthopyxis intermedia*, Type A. magnified view of hydrotheca with close set reduplicated margin. 61. *Orthopyxis intermedia*, Type B. hydrotheca with close set reduplicated margin. 62. *Orthopyxis intermedia*, Type B. hydrotheca with widely separated reduplicated margin.

Orthopyxis L. Agassiz

(Figs. 56-62)

Orthopyxis L. Agassiz 1862.

Eucopella von Lendenfeld 1883 (in part).

Agastra Hartlaub 1883 (in part).

Orthonia Stechow 1923.

Hydrocaulus is usually unbranched, undulated, but occasionally smooth, hydrothecae campanulate with internal radial symmetry; gonophores developing into medusoids with marginal sense organs.

Bale (1914, 1919, 1924) in his reviews on the genus *Orthopyxis* L. Agassiz, treated *Eucopella* Hartlaub (in part) and *Agastra* Hartlaub 1897 as synonyms. Bale has also pointed out that the lower part of the hydrotheca is laterally compressed making it

to appear as broad and narrow depending on the orientation. This character according to him broadly distinguishes *Orthopyxis* from the closely related *Silicularia* Meyen. A careful comparison of *Orthopyxis* and *Silicularia* reveals another striking distinction. The position of the hydrothecal margin in relation to the thickening of the hydrothecal wall gives an indication as to whether the thickening is internal or external. If the hydrothecal margin is a straight continuation of the inner surface of the hydrotheca, then the thickening is external as in *Orthopyxis*, if on the other hand the hydrothecal margin is a straight continuation of the outer surface of the hydrothecal wall, the thickening is internal as in *Silicularia*. Moreover in *Orthopyxis*, where the thickening is external, the hydrotheca shows an internal symmetry, while in *Silicularia*, where the thickening is internal, the thickening encroaches upon the space of the theca and distorts the symmetry of the hydranth.

The Indian species of *Orthopyxis* may be identified as follows :

- I. Hydrotheca slightly thickened, without teeth. *O. clytioides* (Lamouroux)
- II. Hydrotheca considerably thickened, margin cut into a number of rounded teeth. *O. intermedia* Stechow

***Orthopyxis clytioides* (Lamouroux)**

(Fig. 57)

Tubularia clytioides Lamouroux 1824, p. 620, Pl. XCV, figs. 6-8.

Silicularia gracilis Mayen 1834, p. 206, Pl. XXXV, figs. 12-13.

Campanularia clytioides Ritchie 1909, p. 71.

Orthopyxis clytioides Nutting 1915, p. 15, Pl. XVI, fig. 12.

Hydrocaulus is branched, of moderate length with close annulations at the base and wider annulations at the distal end, the middle part usually smooth, with a spherical segment immediately below the hydrotheca ; hydrotheca cup-shaped, thick-walled and edentate ; thecal wall and diaphragm unevenly thickened, appearing to have different thickness in different orientation ; diaphragm a little above the base of the theca ; hydranth with 13-15 tentacles ; gonosome not observed.

Length of hydrocaulus	..	..	..	1.20-2.10 mm.
Breadth of hydrocaulus	..	..	..	0.11-0.13 mm.
Length of hydrotheca	..	..	..	0.39-0.40 mm.

Locality—This species was collected from sea-weeds at Thankassery and Pamban. It is a new record for the Indian region.

***Orthopyxis intermedia* (Stechow)**

(Figs. 58-62)

Campanularia (?) *intermedia* Stechow 1919, p. 66, fig. Va-f.

Orthopyxis everta Gravelly 1927, p. 11, Pl. II, fig. 10.

Two distinct types of trophosome were obtained. Both agree in the possession of long peduncles arising from creeping hydrorhiza; hydrotheca thin and conical in one view and thick and tubular with rounded base in another view, its margin is cut into a number of rounded teeth with concave interspaces; diaphragm is placed low enclosing a small basal chamber. The difference is in the structure of the thecal teeth. In type A (Fig. 60) the hydrotheca is somewhat elongate with 12-14 perfectly rounded teeth with concave interspaces and without reduplicated margins. This type resembles the Figures Va-Vf of Stechow (1919). In the type B, 3-4 successive rows of reduplicated teeth are very usual. The different rows of teeth may either be well separated (Fig. 62) or occasionally be close together (Fig. 61), each row with 9-12 elongated teeth with rounded tips, interspaces concave, wider than bases of teeth. Gonosomes were found in the colonies of Type A only. Gonotheca usually bean-shaped, laterally compressed and distally truncated; gonothecal peduncle short and curved.

	Type A	Type B
Length of hydrocaulus	1.04-4.60 mm.	0.90-3.32 mm.
Breadth of hydrocaulus	0.10-0.12 mm.	0.12-0.14 mm.
Length of hydrotheca (excluding reduplication)	0.48-0.65 mm.	0.42-0.56 mm.
Breadth of hydrothecal mouth	0.28-0.34 mm.	0.32-0.38 mm.
Length of gonotheca	0.85-0.90 mm.	
Breadth of gonotheca	0.62-0.70 mm.	

Locality—All the specimens of this species of the present collection were obtained from Thankassery. It has been previously reported from Krusadai island, Shingle island and Pamban, all in the Gulf of Manaar (Gravely 1927).

Remarks—Type B differs from Type A in the lesser number of hydrothecal teeth separated by wider interspaces and the presence of reduplicated margin. Stechow (1919) has recorded such extreme variations in this species. However, it is not possible to say whether types A and B belong to the same species, because the gonosome is found only in type A. The two types are therefore provisionally identified as one and the same species. Stechow (1919) has described an unusual gonotheca (Fig. Vg.). He also expressed doubt about its true nature and suspected that it might be a monstrosity. The occurrence of an entirely different type of gonotheca in the present collection confirms this suspicion.

Family THYROSCYPHIDAE n. fam.

Hydrocaulus is branched; hydrotheca stalked, symmetrical with annular diaphragm and operculum; hydranth simple, endoderm not differentiated into 'blind-sac' and digestive or non-digestive regions; gonophore fixed.

Thyroscyphus Allman is the type genus of this family. This was originally included under Campanulariidae, but recent authors have shifted it to Sertulariidae. The existence of an opercular apparatus and the shortness of the hydrothecal peduncle seems to be the main justification for doing so. The mode of formation of the hydrothecal diaphragm is an important factor in the classification, though it

has not attracted sufficient notice. The diaphragm may arise either as an annular thickening of the hydrothecal wall as in Campanulariidae or as a result of the flexure of the base of the hydrotheca as in Sertulariidae and Plumulariidae. The inclusion of Thyroscyphinae Stechow with annular diaphragm in the family Sertulariidae characterised by eccentric diaphragm does not seem to be justifiable. At the same time Thyroscyphinae Stechow cannot be referred to Campanulariidae because of the presence of an opercular apparatus and conical hypostome. Its relationship with Campanulinidae (a family of diverse evolutionary trends) is also equally remote. In the majority of Campanulinidae, an operculum is not demarcated from the hydrothecal teeth, in others where an opercular apparatus is present, a diaphragm is absent. The only alternative therefore is to give Thyroscyphinae Stechow a family status.

The family is represented in the Indian region by a single genus *Thyroscyphus* Allman.

Thyroscyphus Allman Emend Spletstösser

Thyroscyphus Allman 1877

Leptoscyphus Pictet 1893

Thyroscyphus Spletstösser 1929

Hydrocaulus is branched ; hydrotheca short stalked, symmetrical ; operculum four-valved and deciduous ; cnidoblasts large, bean-shaped, present on the hydranth only ; gonotheca simple, tubular and often dimorphic ; gonozooids fixed.

The three species of *Thyroscyphus* recorded from the Indian region may be identified as follows :

I. Hydrothecal peduncle comparatively long and annulated.

1. Peduncle with a single annulation. *T. juncea* Allman
2. Peduncle with two annulations. Live specimens pink in colour. *T. ramosus* Allman

II. Hydrothecal peduncle short and without annulations. Live specimens yellowish. *T. fruticosus* Esper

Thyroscyphus ramosus Allman

(Fig. 63)

Thyroscyphus ramosus Allman 1877, p. 11, Pl. VI, figs. 5, 6.

Thyroscyphus ramosus Allman 1888, p. 24, Pl. XII, figs. 2, 2a.

Thyroscyphus ramosus Jaderholm 1903, p. 272.

Thyroscyphus ramosus Leloup 1932, p. 158.

The species is easily distinguished by the pink colour of the polyp and the longer peduncle with transverse annulations. Gonosome was not present in the collection.

Height of colony	.. ..	upto 46 mm.
Breadth of hydrocaulus	.. ..	0.30-0.56 mm.
Length of hydrothecal peduncle	.. ..	0.27-0.38 mm.
Breadth of hydrothecal peduncle	.. ..	0.18-0.24 mm.
Length of hydrotheca	.. ..	0.85-1.08 mm.
Breadth of hydrothecal mouth.	.. ..	0.37-0.45 mm.

Locality—This species was collected from Shingle island and from the vicinity of Pamban bridge. All previous records of this species in the Indian region are from the same locality. As pointed out by Leloup (1932) the distribution of *T. ramosus* is rather interesting, since it has been recorded only from the Gulf of Manaar and the Atlantic coast of America.

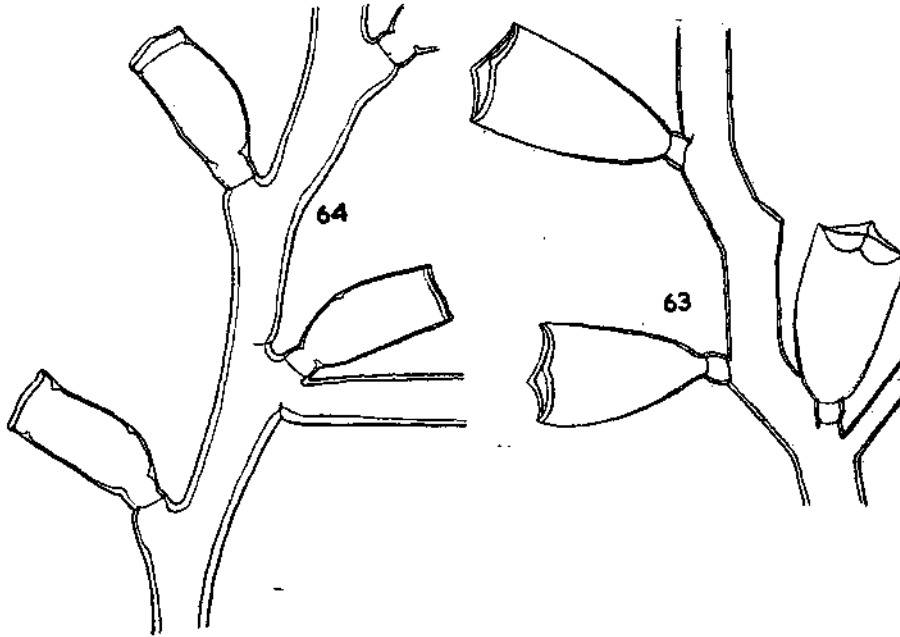


FIG. 63. *Thyrosocyphus ramosus*

FIG. 64. *Thyrosocyphus fruticosus*

***Thyrosocyphus fruticosus* (Esper)**

(Fig. 64)

- Laomedea fruticosa* Esper 1788-1830, p. 162, Pl. XXXIV.
Campanularia fruticosa Marktanner 1890, p. 205.
Thyrosocyphus torresi Jaderholm 1903, p. 272, Pl. XII, fig. 6.
Campanularia juncea Thornely 1904, p. 113, Pl. I, fig. 1, 1b.
Thyrosocyphus vitiensis Billard 1907b, p. 343.
Lytoscyphus fruticosus Stechow 1925, p. 215, fig. G.
Thyrosocyphus fruticosus Spletstösser 1929, pp. 7, 122.
Thyrosocyphus fruticosus Leloup 1932, p. 158.
Thyrosocyphus fruticosus Millard 1952, p. 199.

This species is identified by the relatively tall nature of the colony, its yellowish colour and the absence of annulations on the hydrothecal peduncle. Gonosome was not obtained.

Height of hydrocaulus	..	..	upto 20 cms.
Breadth of hydrocaulus	..	..	0.32-0.50 mm.
Length of hydrothecal peduncle	..	..	0.18-0.29 mm.
Breadth of hydrothecal peduncle	..	..	0.23-0.29 mm.
Length of hydrotheca	..	..	1.01-1.18 mm.
Breadth of hydrothecal mouth	..	..	0.40-0.58 mm.

Locality—A very rich collection was obtained from Pamban. In the Indian region it has been previously reported from Ceylon (Marktanner 1890), Pamban (Jaderholm 1903, Leloup 1932).

Family SERTULARIIDAE Hincks.

Hydrocaulus is branched or unbranched, monosiphonic or polysiphonic; hydrothecae biserial, sessile, with eccentric diaphragm; hydrothecal mouth with teeth and opercular plates, hydranth asymmetrical, with conical hypostome and a single whorl of filiform tentacles, endoderm differentiated into proximal digestive and distal non-digestive regions; reproduction through fixed gonophores.

The hydrotheca of Sertulariidae is provided with an eccentric diaphragm. The diaphragm of Sertulariidae has hitherto been thought to be homologous with the annular diaphragm of Campanulariidae, but a detailed examination of the diaphragm in the present study has shown that they are only analogous structures. As in Plumulariidae, the primitive tubular sessile hydrotheca has undergone a sharp adcauline flexure. This resulted in the formation of an adcauline inward folding of the hydrothecal wall and the disposition of the body of the hydrotheca parallel to the long axis of the hydrocaulus and the hydrocladia. The formation of the eccentric diaphragm in Sertulariidae is exactly similar to the formation of the adcauline intrathecal septum in Plumulariidae. In several species of Sertulariidae, an abaxial intrathecal septum is developed as a result of subsequent outward flexure of the hydrothecae. In *Salacia* Lamouroux the abaxial bending of the hydrotheca is not sharp and so instead of a definite abcauline septum, a number of radiating lines appear. The mode of formation of the abaxial septum in Sertulariidae and the abaxial and the adaxial septum in Plumulariidae is generally accepted. So far such a hypothesis has never been advanced with regard to the eccentric diaphragm of Sertulariidae.

Recent systematists have attached much importance to the presence or absence of the 'blind-sac' in the polyp of Sertulariidae.

A careful study of the figures given by Hartlaub (1900), Nutting (1904) and Kuhn (1909) and the sections prepared in the present work throws light on the formation of the 'blind-sac.' The absence of any indication of 'blind-sac' in expanded fresh material is significant. Materials used for microtomy are invariably killed in strong fixative and the polyps are apt to get contracted. In well expanded colonies, the

polyps are usually projecting beyond the hydrothecal mouth by about one-half or one-third the length. Therefore the sections of Sertulariid polyps represented as belonging to expanded polyps in the illustrations of Hartlaub (1900) and Kuhn (1909) are really contracted hydranths, because the hydranth hardly projects beyond the hydrothecal mouth. The contractions due to fixation affects the hydranth as a whole, including the 'protractors' and 'retractors.' This contraction is different from the contractions that take place in life. During voluntary contractions the 'protractors' relax and the 'retractors' contract. However, when it contracts under the action of fixative, both the 'protractors' and 'retractors' are contracted simultaneously, resulting in a downward pull from the middle of the basal half of the abaxial side and an opposite upward pull from the middle of the adcauline side of the hydranth. This results in the formation of 'blind-sac' (Text Figs. 65-66). This also explains the thin endoderm of the 'blind-sac' and the greatly thickened side of the opposite side. In such of those genera, where a 'blind-sac' is reported to be absent (for example *Dynamena* Lamouroux) the 'protractor' is very thin. In contracted polyps of such genera, the thin 'protractors' are unable to make an effective contraction, because of a stronger pull exerted by the retractors in the opposite direction. However, several specimens of *Dynamens* in the present collection showed broken 'protractors' which have obviously snapped because of the contraction in opposite directions. Thus it will be seen that wherever a 'blind-sac' has been observed, it merely indicates the presence of a 'protractor' sufficiently strong to raise up a part of the polyp wall during fixation. It is doubtful, whether this variable and transitory structure can claim any specific significance.

The genera of Sertulariidae represented in the Indian region may be identified with the aid of the following key :

- I. Hydrothecal mouth provided 4 teeth and 4 valved operculum.
 1. Hydrotheca pedunculate, arising directly from hydrothiza.
Calamphora Allman
 2. Hydrotheca sessile and adnate to the hydrocaulus and hydrocladia.
Sertularia Gray EMEND Stechow
- II. Hydrothecal mouth provided with 2 teeth (excluding a median adcauline tooth which is occasionally found) and two valved operculum.
 1. Hydranth with a 'blind-sac.' *Sertularia* Linnaeus
 2. Hydranth without a 'blind-sac.' *Dynamena* Lamouroux
- III. Hydrothecal mouth with a single tooth and a single valve.

Hydrothecal tooth and valve lateral, hydrotheca alternate and contiguous with one another. *Idiella* Stechow
- IV. Hydrothecal mouth without teeth, with one valve.
 1. Hydrotheca long, arranged laterally on the hydrocaulus and hydrocladia, operculum adcauline. *Salacia* Lamouroux
 2. Hydrotheca short, arranged on the front side of the hydrocaulus and hydrocladia, operculum adcauline. *Nigellastrum* Oken

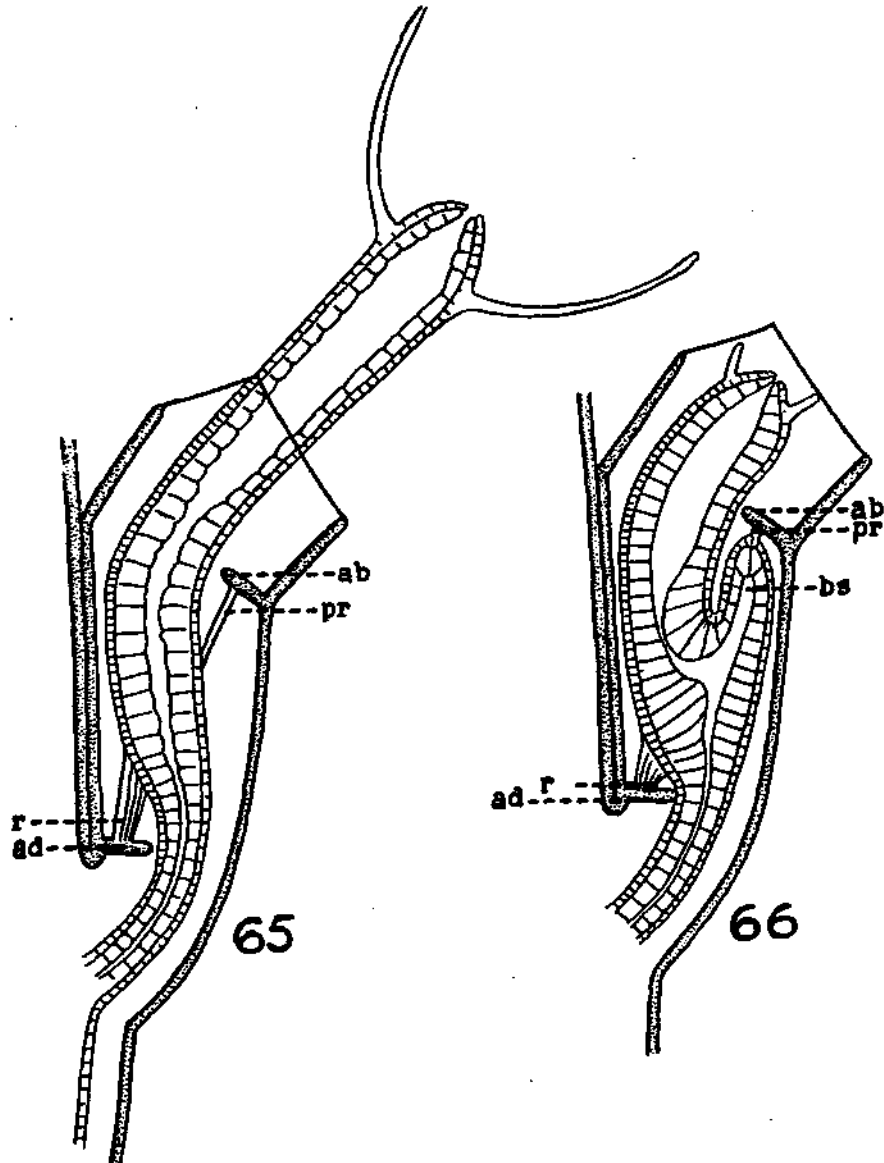


FIG. 65. An expanded sertulariid polyp. FIG. 66. The same sertulariid polyp after (Diagrammatic) fixation (Diagrammatic). ab. abcauline intrathecal septum, ad. adcauline intrathecal septum; bs. blind-sac; pr. protractor; r. retractor.

Calamphora Allman

Calamphora Allman 1888

Hydrotheca arises directly from the hydrorhiza, pedunculate, with an eccentric diaphragm, 4 marginal teeth and a 4 valved operculum; gonotheca similar to the hydrotheca. The only species represented in the Indian region is *C. campanulata* (Warren).

Calamphora campanulata (Warren)

(Fig. 67)

Sertularia campanulata Warren 1908, p. 300, Pl. XLVII, figs. 21-22.*Calamphora campanulata* Stechow 1919, p. 83.*Calamphora campanulata* Gravely 1927, p. 12, Pl. II, fig. 9.

Hydrothecal peduncles are half as long as the hydrotheca, with 3-5 or gradually expanding to form hydrotheca; hydrotheca solitary, barrel-shaped 8-10 transverse annular ridges, the upper ridges having 4 large, bluntly triangular projecting outwards and upwards; operculum pyramidal and 4 valved; resembles hydrotheca in general shape, presence of annular ridges, marginal teeth and operculum, but differs in having a bulged shape, shorter peduncles and the annular ridges remaining perfectly circular; gonophores arise as globular structures around an axial blastostyle.

Length of hydrotheca	..	..	0.70-0.75 mm.
Breadth of hydrothecal mouth	..	..	0.30-0.35 mm.
Maximum breadth of hydrotheca	..	..	0.35-0.40 mm.
Length of hydrothecal peduncle	..	..	0.14-0.19 mm.
Breadth of hydrothecal peduncle	..	..	0.05-0.06 mm.
Height of gonotheca	..	..	0.63-0.73 mm.
Breadth of gonothecal mouth	..	..	0.38-0.42 mm.
Maximum breadth of gonotheca	..	..	0.45-0.60 mm.
Length of gonothecal peduncle	..	..	0.05-0.08 mm.
Breadth of gonothecal peduncle	..	..	0.04-0.05 mm.

Locality—This hydroid was collected from Kovilam and Thankassery. It seems to have a decided preference to calcareous weeds and coarser *Sargassum*. In the Indian region it has been previously recorded from the Gulf of Manaar (Gravely 1927). The gonotheca of this species is here recorded for the first time.

Remarks—Stechow (1925) doubtfully refers *C. solitaria* (Nutting) as synonymous with *C. campanulata* (Warren). This is not correct as *C. solitaria* (Nutting) has narrower hydrothecae and longer peduncles, the length of the peduncles being nearly equal to that of the hydrothecae.

Sertularella Gray *Emend* Stechow*Sertularella* Gray 1847.*Sertularella* Stechow 1924a.

Hydrocaulus is erect, branching, hydrotheca usually alternate, four valved with four toothed hydrothecal margin; hydranth with a 'blind-sac' in preserved material; nematophores absent; and gonotheca usually ornamented.

Sertularella may be identified as follows :

- I. Hydrotheca with transverse annulations. *S. tenella* (Alder)
- II. Hydrotheca without transverse annulations.
1. Each internode with a single hydrotheca. *S. parvula* n. sp.
 2. Each internode with more than one hydrotheca.

Hydrotheca provided with a thickening at the base of the adcauline side, gonotheca *Calamphora*-like

- (i) Gonotheca with four feebly projecting corners. *S. quadridens* (Bale)
- (ii) Gonotheca with four well developed corners directed upwards.
S. quadridens (Bale) var. *cornuta* (Ritchie)

Sertularella tenella (Alder)

(Fig. 68)

'*Sertularia rugosa* var.' Johnston 1847 (1) 64, fig. 8c.

Sertularia tenella Alder 1857, p. 23.

Sertularia tenella Hincks 1868, p. 242, Pl. XLVII, fig. 3.

Sertularia rigosa Armstrong 1879, p. 102, Pl. X.

Sertularella tenella Nutting 1904, p. 83, Pl. XVIII, figs. 1-2.

Sertularella tenella Jäderholm 1909, p. 102, Pl. X, fig. 5.

Sertularella tenella Stechow 1924a, p. 185, fig. A' b.

Sertularella tenella Fraser 1937, p. 158, Pl. XXXVI, fig. 190.

Sertularella tenella Yamuda 1950, p. 12, Pl. I, fig. 11.

The hydrocaulus is thin and short, arising from a creeping hydrorhiza ; perisarc without internal ridges, uniformly thick ; hydrotheca relatively large, alternating and arising from the distal half of the internode, adnate for one-quarter or one-third of the adcauline side, basally narrow, gradually widening to the level where it becomes free and further up gradually narrowing again forming a relatively narrow neck with a slightly flared margin, with four to six annulations on the middle half, the distal and proximal quarters being free from annulations ; mouth closed by a four valved operculum ; gonosome not observed.

Height of colony (3 thecae only)	..	..	upto 2.0 mm.
Length of internode	..	..	0.55-0.66 mm.
Breadth of internode	..	..	0.13-0.14 mm.
Length of theca	..	..	0.44-0.52 mm.
Breadth of thecal mouth	..	..	0.15-0.17 mm.
Length of adnate part of hydrotheca	..	..	0.15-0.17 mm.

Locality—Immature colonies with a maximum of three hydrothecae were obtained from Kovilam on a piece of floating sea-weed. Previously this species was recorded from off Cape Comorin and off Arakkan coast (Armstrong 1879) and 'the west coast of India' (Jaderholm 1903).

Remarks—It is interesting to note that the Indian and Japanese specimens have comparatively sharp annulations on the hydrothecae. Whether this represents an immature condition or a distinct variety is difficult to say, especially in view of the fact that the gonosome is absent.

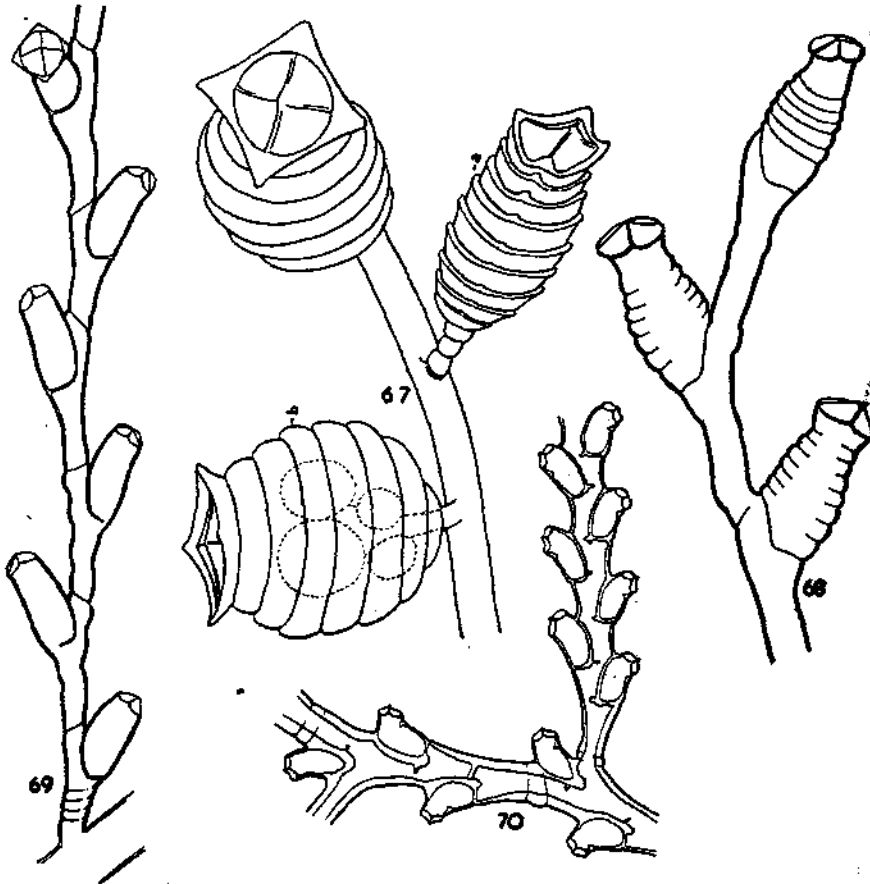


FIG. 67. *Campanularia campanulata* (a) hydrotheca (b) gonotheca; 68. *Sertularia tenella*; 69. *Sertularia parvula*; 70. *Sertularia quadridens*.

***Sertularia parvula* n. sp.**

(Fig. 69)

Colonies are dimorphic, large forms carrying upto 9 hydrothecae and growing upto 3 mm. and small forms with a single hydrotheca and reaching hardly 1 mm., both arising from the same hydrorhiza; hydrocaulus erect, unbranched, monosiphonic,

nodes distinct and oblique; basal part of the internode usually with a small constriction running parallel to the node, margins usually straight, though occasionally wavy, bearing hydrotheca at the distal half; hydrothecae alternate, without annulations, elongate, nearly tubular, slightly bulged at the middle, gradually narrowing towards the mouth, adcauline side adnate to the hydrocaulus to one-third its length, mouth with four triangular teeth and a four valved operculum, perisarcal thickening and internal teeth absent; gonosome not obtained.

Height of colony	..	..	upto 3.0 mm.
Length of internode	..	..	0.32-0.35 mm.
Breadth of internode	..	..	0.08-0.09 mm.
Length of hydrotheca	..	..	0.26-0.29 mm.
Breadth of hydrothecal mouth	..	..	0.10-0.11 mm.
Maximum breadth of hydrotheca	..	..	0.12-0.14 mm.
Length of adnate part of hydrotheca	..	..	0.10-0.11 mm.
Length of free part of adcauline side of hydrotheca	..	..	0.15-0.21 mm.

Locality—This species was collected at Kovilam along with *Sertularella tenella* (Alder) on a piece of floating seaweed, the larger form is represented by 3 colonies and the smaller by about 20.

Remarks—The specimens described by Leloup (1932) as *Sertularella minuscula* agree in all characters with the present specimens and their similarity is further enhanced by the dimorphic condition and the identity of the place of collection.

Sertularella quadridens (Bale)

(Fig. 70)

Thiaria quadridens Bale 1884, p. 119, Pl. VII, figs. 5 & 7.

Thiaria quadridens Von Lendenfeld 1884, p. 915, Pl. XL, fig. 9.

Thiaria quadridens Bale 1888, p. 772.

Sertularia quadridens Billard 1910, p. 11.

Sertularia quadridens Ritchie 1910a, p. 818, fig. 79, Pl. LXXVII, figs. 12, 12a.

Sertularella quadridens Stechow & Müller 1923, p. 471.

Sertularella quadridens Billard 1925, p. 150.

Sertularella quadridens Vervoort 1941, p. 214, fig. 5.

Presence of a perisarcal prolongation from the base of the adcauline side of the hydrotheca, extending half way across the cavity of the hydrocaulus is the distinctive character of the species. Bale (1884) and Ritchie (1910a) have given detailed descriptions of this species. A gonosome was absent in the present collection.

Height of colony	..	..	upto 100 mm.
Length of cauline internode	..	..	1.90-2.15 mm.
Breadth of hydrocaulus at node	..	..	0.25-0.30 mm.
Length of hydroclade	..	..	0.40-0.43 mm.

Breadth of hydroclade at node	0.16-0.18 mm.
Length of adnate portion of the adcauline side of cauline hydrotheca	0.30-0.44 mm.
Length of free portion of the adcauline side of cauline hydrotheca	0.15-0.22 mm.
Length of adnate portion of cladial hydrotheca	0.40-0.44 mm.
Length of free part of adcauline side of cladial hydrotheca	0.10-0.18 mm.

Locality—Abundant material of this species was dredged from the shipping channel between Pamban and Shingle island in the Gulf of Manaar at a depth of 10-12 fathoms. They grow on dead corals (species of *Madrepora* and *Favia*). This is the first record of this species from the Indian coast, although Ritchie (1910a) has recorded *S. quadridens* var. *cornuta* from Andamans.

Remarks—A careful study of a very large quantity of material of the present species has shown that the arrangement of hydrothecae are subject to considerable variations even in the same colony. Therefore the validity of the varieties created on the strength of these characters is open to doubt. The differences in the size of the gonotheca is perhaps the only valid distinguishing character between *S. quadridens* and *S. quadridens* var. *cornuta* (Ritchie), which if not a sexual dimorphism can be taken as sufficient for varietal difference. The presence of perisarcal thickening which Billard (1925) gave as specific character of *S. decipiens* is found to some extent in the present material also. The trophosomal characters do not amply justify the separate status of *S. decipiens* and as the gonosome of this species is not known, it is impossible to be definite about its true identity. However, Stechow and Müller (1923) consider it as a variety of *S. quadridens* (Bale).

Sertularia Linnaeus

Sertularia Linnaeus 1748

Hydrocaulus is branched or unbranched; hydrotheca biserial, opposite, sub-opposite or alternate, hydrothecal mouth with two large teeth, and occasionally a third low median tooth; operculum with a small adcauline valve, almost firmly attached to the thecal mouth and a large adcauline membraneous valve with its distal part free; hydranth with an 'adcauline blind-sac' in preserved material; gonosome simple.

The various species of *Sertularia* recorded from the Indian region can be identified as follows:

- I. Hydrothecae annulated. *S. rugosissima* Thornely
- II. Hydrothecae not annulated.
 1. Hydrothecae without internal abcauline septum.
 - (i) Colony unbranched

- (A) Nodes present between all pairs of hydrothecae.
- (a) Hydrocaulus with basal athecate internodes, theca swollen at the base, rapidly narrowing towards the orifice, basal pair of hydrothecae separated, but distally approximated.
S. west-indica (Stechow)
- (b) Hydrocaulus without a distinct basal athecate internode, hydrotheca simple, adnate for half the adcauline side.
S. densa (Stechow)
- (B) Nodes entirely absent, except for one immediately below the basal pair of hydrothecae.
S. maldivens (Borradaile)
(=*Thuiaria maldivens* Borradaile)
- (ii) Colony usually unbranched.
Nodes at regular intervals, certain internodes having two pairs of hydrothecae. The floor of the hydrotheca with a pair of backwardly directed perisarcal thickenings; gonotheca ovate.
S. distans Lamouroux var. *gracilis* (Hassall)
- (iii) Colony usually branched.
Cauline hydrotheca elongate, laterally arranged, cladial hydrotheca adnate to 2/3 adcauline side, remaining on the front side. Gonotheca oval with a short neck and 4-5 transverse annulations.
S. palkensis (Thornely)
2. Hydrotheca with an abcauline intrathecal septum.
- (i) Colony branched.
Gonotheca with distinct marginal horns and 5 to 6 deep annulations.
S. marginata (Kirchenpauer)
- (ii) Colony unbranched.
Gonotheca barrel-shaped with 7-9 transverse annulations.
S. turbinata Lamouroux

***Sertularia west-indica* (Stechow)**

(Fig. 71)

Fridentata west-indica Stechow 1919a, p. 38, fig. 5.

Tridentata west-indica Stechow 1924a, p. 210, fig. H.

Sertularia borneensis Billard 1925, p. 171.

Sertularia borneensis Billard 1925b, p. 649, fig. 10.

The trophosome consists of an erect unbranched hydrocaulus, basal internodes athecate, highly variable in length; nodes oblique, united with the hydrocaulus upto the middle of the adcauline side, distal pair mesially separate and diverging at about

160°; proximal pairs less diverging and mesially separated; the adcauline side proximally bulged and distally narrowing; abcauline side straight; median tooth absent, but with internal annulations a little below the hydrothecal mouth; gonotheca cup-shaped, laterally compressed, with 5 prominent annulations arising from the base of a basal hydrotheca.

Height of colony	upto 7.5 mm.
Length of basal internode	0.40-1.88 mm.
Length of typical internode	0.40-0.50 mm.
Length of adnate part of hydrotheca	0.10-0.17 mm.
Length of adcauline free part of hydrotheca	0.12-0.24 mm.
Breadth of hydrocaulus at node	0.08-0.09 mm.
Distance between thecal mouth of a pair of hydrotheca	0.28-0.37 mm.
Height of gonotheca	0.85-0.95 mm.
Breadth of gonotheca	0.69-0.93 mm.

Locality—A large collection of *S. west-indica* was collected from sand-stones at the intertidal region at Kovilam. This species has not so far been recorded from the Indian region.

Remarks—The characters and measurements of the present specimens agree in general with those of *Tridentata west-indica* Stechow and *Sertularia borneensis* Billard. Billard's (1925 & 1925b) contention that *S. borneensis* is distinct from *T. west-indica* is far from convincing. According to Billard, *S. borneensis* is characterised by the absence of a median tooth, oblique hydrothecal base and the presence of marginal internal annulations of the hydrothecae. Regarding the first objection, Billard himself in an earlier part of the same paper (p. 172, p. 2) pointed out how the presence of the median tooth can be an illusion. With regard to the next point, there is hardly any difference in the obliquity of the hydrothecal base in the illustrations given by the two authors or in the present specimens. The only valid difference is the presence of marginal thickenings on the hydrothecae, which has not been pointed out for *T. west-indica* Stechow. But from a review of Stechow's papers it is quite clear that he has not attributed much significance to the hydrothecal ridges. It therefore becomes clear that there is sufficient justification in combining the two species under the older name *T. west-indica*, but as the genus *Tridentata* has not been recognised this species is here described as *Sertularia west-indica* (Stechow).

S. west-indica (Stechow) resembles *S. distans* Lamouroux var. *gracilis* (Hassall), *S. turbinata* Lamouroux and *S. minutus* Hargitt. It can, however, be distinguished from *S. distans* var. *gracilis* by the absence of double cone joint above the basal internode, the more or less straight abcauline side of the hydrotheca and the presence of internal annulations of the hydrotheca. It can also be distinguished from *S. turbinata* by the presence of intrathecal septum and by the presence of internal annulations of the hydrotheca. The similarity of the present species to *S. minutus* is very close and probably a re-examination of the specimens of Hargitt might show that it is the same as *S. west-indica* (Stechow).

Sertularia densa Stechow

(Figs. 72-74)

Sertularia densa Stechow 1919, p. 93.

The hydrocaulus is simple, unbranched and divided into internodes, all internodes, except the basal ones, carrying hydrothecae, basal internode long and articulating with the rest of the hydrocaulus through a double cone joint; hydrothecae opposite and adnate to about half their length and then diverging at an angle of 90°, the diverging part may be straight or arched; hydrothecal mouth with two moderately large lateral teeth alternating with the adcauline and abcauline valves; hydrothecal base with a pair of backwardly directed perisarcal thickenings; gonosome not observed.

Height of colony	.. ..	upto 92 mm.
Length of basal internode	.. ..	upto 1.56 mm.
Length of typical internode	.. ..	0.40-0.58 mm.
Breadth of a pair of theca at the base	.. ..	0.09-0.11 mm.
Distance between thecal mouth of a pair of hydrotheca		0.38-0.45 mm.
Length of adnate side of hydrotheca	.. ..	0.20-0.29 mm.
Length of free adcauline side of hydrotheca	.. ..	0.28-0.35 mm.

Locality—This is fairly common at Kovilam, Thankassery and Pamban, although this species appears to have been recorded only once from Villefranche near Nizza.

Remarks—Stechow (1919) has discussed the affinity of this species in detail. It is surprising that Billard (1925) and Broch (1933) treated this as synonymous with *Dynamena cornicina* (McCrady), though it is smaller in the total height and measurements of the individual parts. Even though the present collection is rich, not a single specimen showed even a trace of branching. This clearly distinguishes *S. densa* Stechow from *D. cornicina* (McCrady). However, *S. densa* shows some local variations. In the specimens from Pamban the distal part of the hydrocaulus is drawn out into long tendril-like processes, which curl around foreign objects for support. This structure is absent in the specimens from other stations. Another striking feature is the occurrence of tall and stunted forms. As a rule the specimens from protected localities, where the physical and biological conditions are more or less constant, possess very long basal internode with less flared theca, the free part of which is almost at right angles to the hydrocaulus. On the other hand those living under less favourable conditions have short basal and thecate internodes, closely arranged theca the distal end of which are more diverging. In some colonies both types of structures are found representing the growths of favourable and unfavourable seasons.

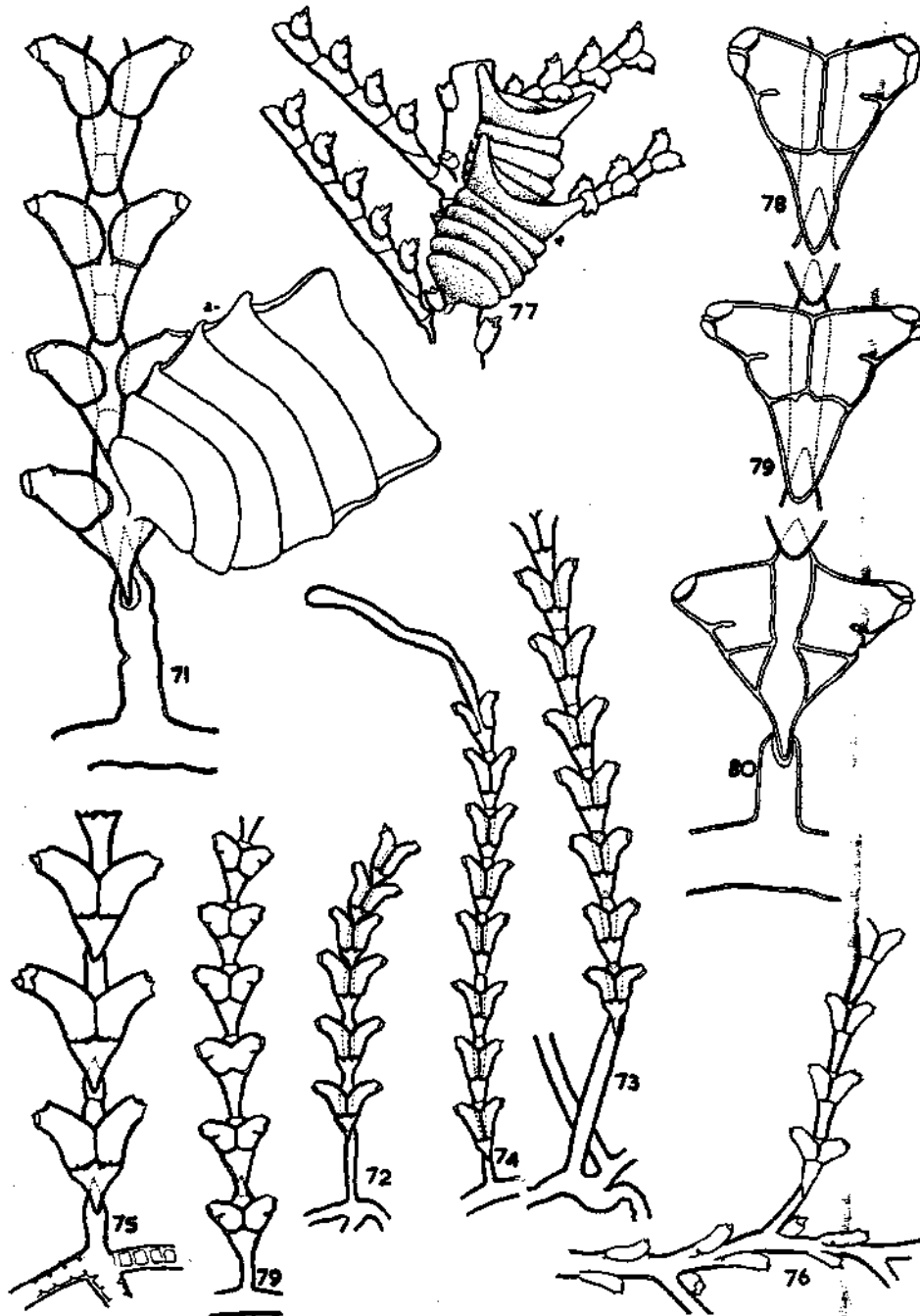


FIG. 71. *Sertularia west-indica* (a) gonotheca; 72. *Sertularia densa*. Colony with the distal hydrothecae closely packed; 73. *Sertularia densa*. Colony with very long basal internode and regularly arranged hydrotheca; 74. *Sertularia densa*. Colony with a terminal tendril; 75. *Sertularia distans* var. *gracilis*; 76. *Sertularia palkensis*; 77. *Sertularia marginata* (a) gonotheca; 78. *Sertularia turbinata*. A pair of distal hydrothecae; 79. *Sertularia turbinata*. A pair of middle hydrothecae; 80. *Sertularia turbinata*. A pair of proximal hydrothecae; 81. *Sertularia turbinata*.

***Sertularia distans* Lamouroux var. *gracilis* (Hassall)**

(Fig. 75)

- Sertularia gracilis* Hassall 1848, p. 2223.
Sertularia gracillis Hincks 1868, p. 262, Pl. XVI, figs. 9-10.
Sertularia gracilis Pictet 1893, p. 48, Pl. II, fig. 41.
 ? *Sertularia gracilis* Thornely 1904, p. 116, Pl. II, figs. 1, 1b.
Thuriaria tenuis Borradaile 1905, p. 841.
Sertularia distans Billard 1909, p. 322 (in part).
Sertularia tenuis Thornely 1916, p. 149.
Sertularia distans var. *gracilis* Billard 1925, p. 175, text-fig. 33.
Sertularia lamourouxi Bedot 1925, p. 399 (in part).
Sertularia distans var. *gracilis* Billard 1925a, p. 200, fig. 1.
Sertularia distans var. *gracilis* Leloup 1935b, p. 47.
Sertularia distans var. *gracilis* Leloup 1937, p. 105, fig. 8.
Sertularia distans var. *gracilis* Millard 1957, p. 221, fig. 12.
Sertularia distans var. *gracilis* Millard 1958, p. 193.

The colony is usually branched arising from a creeping hydrorhiza ; hydrorhiza has regular internal ridges ; hydrocaulus divided into internodes, certain internodes carrying two pairs of hydrotheca while the majority have only one pair ; hydrothecae opposite, united mesially for less than half the adcauline side ; hydrothecal floor straight, horizontal with two backwardly directed perisarcial thickenings ; hydrothecal margin occasionally reduplicated. Gonosome was not present in the present collection.

Height of colony	.. ..	upto 2.5 mm.
Length of typical internode	.. ..	0.43-0.48 mm.
Breadth of typical internode	.. ..	0.09-0.11 mm.
Length of adnate part of theca	.. ..	0.11-0.12 mm.
Distance between thecal mouth of a pair of hydrothecae		0.30-0.35 mm.

Locality—This variety is represented in the present collection by a few specimens collected from sea weeds at Kovilam and Thankassery. In the Indian region it has been previously recorded from the Gulf of Manaar (Thornely 1904), Moradu, Addu and North Atoll of Maldives (Borradaile 1905), Kiu, off Beyt on Kathiawar coast (Thornely 1916) and ' west of India ' (Leloup 1932).

Remarks—Thornely's (1904) record of *S. gracilis* (Hassall) from the Gulf of Manaar is highly doubtful, because of the elongated and attenuated condition of the hydrothecae. The present specimens agree with the descriptions of Billard (1925a) except that in the present material a transverse internode is absent, being represented by a slight constriction.

Sertularia palkensis (Thornely)

(Fig. 76)

Desmoscyphus palkensis Thornely 1904, p. 108, Pl. II, figs. 7a & b.*Sertularia palkensis* Bedot 1925, p. 403.

The hydrocaulus is branched, divided into internodes carrying a hydroclade, two alternating hydrothecae and an axial hydrotheca in the axil of the hydroclade, all hydrocladia having a basal double-cone joint; hydrotheca typical, slightly curved outwards, margin with two lateral obtuse teeth and abcauline and adcauline valves, intrathecal septum absent, those on the hydrocaulus alternate and mesially separated by a distance equal to the width of the hydrotheca, those on the hydroclade opposite and mesially adnate; gonosome is not observed.

Height of colony	..	..	upto 3.6 cm.
Breadth of hydrocaulus	..	..	0.25-0.30 mm.
Length of cauline internode	..	..	1.00-1.45 mm.
Length of hydroclade	..	..	upto 0.30 mm.
Length of hydrotheca	..	..	0.17-0.19 mm.
Distance between thecal mouth of a pair of cladial hydrothecae	..	..	0.25-0.27 mm.

Locality—A large number of colonies of this species were dredged from off Neendakara at a depth of 8 fathoms. The only other record of this species is from Palk bay in the Gulf of Manaar (Thornely 1904).

Sertularia marginata (Kirchenpauer)

(Fig. 77)

Dynamena marginata Kirchenpauer 1864, p. 13, fig. 8.*Desmoscyphus gracilis* Allman 1888, p. 71.*Sertularia versluysi* Nutting 1904, p. 53, Pl. L, fig. 4.*Sertularia versluysi* Ritchie 1907a, p. 505, p. 144.*Sertularia marginata* Bale 1913, p. 125, Pl. II, fig. 9, Pl. XIV, figs. 1-6.*Amphisbetia marginata* Stechow 1921, p. 258.*Amphisbetia marginata* Stechow 1924a, p. 201.*Sertularia marginata* Totton 1930, p. 204, fig. 48.*Sertularia marginata* Millard 1957, p. 224, fig. 13.

The hydrocaulus is moderately thick, monosiphonic, pinnately branched; cauline internode typically with non-parallel nodes, one hydroclade, two alternating hydrothecae and an axial hydrotheca; larger internodes often carrying more than one hydroclade, the internodes being parallel or not; hydrotheca and hydrocladia placed at regular intervals irrespective of the disposition of the nodes; cladial internodes identical, with transverse nodes appearing oblique in profile, each bearing

a pair of mesially adnate hydrothecae, occupying a fronto-lateral position on the hydroclade, all hydrothecae similar, with an abcauline intrathecal septum, a large lateral tooth on the off side of the lateral margin, and a medium sized tooth on the adcauline margin. The gonotheca arises immediately above the base of the hydroclade, close to the median side of the axial hydrotheca, bases of successive gonotheca alternating, distal part lying in a straight line and overlapping the preceding; gonotheca flat, sides parallel, base triangular, with 5-6 transverse annulations, distal end produced into two lateral horns with a slit-like opening between the horns.

Height of colony	.. ..	upto 5.0 cm.
Length of cauline internode	.. ..	0.68-1.76 mm.
Breadth of cauline internode	.. ..	0.40-0.44 mm.
Length of hydroclade	.. ..	upto 6.20 mm.
Length of adnate part of cladial hydrothecae	.. ..	0.18-0.20 mm.
Height of gonotheca	.. ..	0.55-1.85 mm.
Breadth of gonotheca	.. ..	0.80-0.96 mm.

Locality—This species is represented by a rich collection dredged from a depth of 10 fathoms off Trivandrum. A large number of specimens bear gonothecae. This is the first record of this species from the Indian region.

Sertularia turbinata Lamouroux

(Figs. 78-81)

- Sertularia turbinata* Lamouroux 1816, p. 180.
Sertularia loculosa Busk 1852, p. 393.
Sertularia turbinata Bale 1884, p. 96.
Sertularia loculosa Bale 1884, p. 91, Pl. IX, fig. 12, Pl. XIX, fig. 9.
Desmoscyphus brevicyathus Versluys 1899, p. 40, figs. 9-10.
Sertularia loculosa Jaderholm 1903, p. 285.
Sertularia loculosa Thornely 1904, p. 118.
Thuiaria gracilis Borradaile 1905, p. 841.
Sertularia turbinata Billard 1907a, p. 274.
Sertularia loculosa Warren 1908, p. 306, fig. 8.
Sertularia turbinata Bale 1913, p. 124, Pl. XII, fig. 6.
 Non *Sertularia turbinata* Stechow 1913a, p. 145.
Tridentata turbinata Stechow 1925, p. 233, fig. L.
Sertularia turbinata Billard 1925, p. 177, fig. xxxiv.
Sertularia turbinata Leloup 1935b, p. 50.
Sertularia turbinata Millard 1958, p. 197, fig. 8.

The hydrocaulus is unbranched, divided into a small athecate internode and a number of more or less identical thecate internodes with double cone joint between the basal and the first athecate internode, each internode with a pair of hydrothecae. Hydrothecae are opposite, adnate to each other for nearly half its adcauline side,

sharply diverging beyond at an angle of 200° for the basal pair, distally the angle progressively diminishing; the base of the hydrotheca with backwardly directed perisarcular thickenings; the abcauline side nearly straight, with a large intrathecal septum extending from the middle of the abcauline side to nearly one half the width across the cavity of the hydrotheca; the hydrothecal mouth with two lateral obtuse teeth alternating with the two valves; gonosome arising from the hydrotheca or rarely from the hydrocaulus; gonotheca barrel-shaped with 6-8 transverse annulations.

Height of the colony	.. ..	upto 8 mm.
Length of hydrothecal interode	.. ..	0.58-0.70 mm.
Length of basal internode	.. ..	0.08-0.15 mm.
Length of adnate part of hydrotheca	.. ..	0.18-0.25 mm.
Length of free adcauline side of hydrotheca	.. ..	0.22-0.30 mm.
Breadth of hydroclade at node	.. ..	0.08-0.12 mm.
Distance between the hydrothecal mouth of a pair	.. ..	0.44-0.57 mm.
Height of gonotheca	.. ..	1.35-1.50 mm.
Breadth of gonotheca	.. ..	0.70-0.80 mm.

Locality—Abundant material of this species was collected from Pamban in the Gulf of Manaar. It was also collected from Thankassery, where the growth was poor. This species has been previously recorded in the Indian region at Pamban (Jaderholm 1903), Gulf of Manaar (Thornely 1904) and Maldives (Borradaile 1905).

Remarks—The original description of *S. turbinata* by Lamouroux was quite inadequate and so Billard (1907) redescribed the type specimens, but it was only in 1925 that he clearly defined the species, pointing out its difference from the closely allied forms. However, Billard's inclusion of *S. brevicyathus* of Jarvis as synonym of *S. turbinata* does not seem to be justified, since the former possesses a branched hydrocaulus. Billard has also eliminated '*S. turbinata* Bale' (1913) from the synonymy. Bale's species differs only in the smaller size and fewer annulations of the gonotheca. So also Jaderholm's *S. turbinata* (1903) collected from Pamban differs from the type only in the lesser number of annulations of the gonotheca. It is quite probable that these annulations vary according to the age of the colony, as has been observed in the gonotheca of *Clytia johnstoni* (Alder) of the present collection. According to Stechow (1925) *S. loculosa* of Thornely (1904) is synonymous with *S. turbinata*. Judging from the meagre descriptions of Thornely it is impossible to advance such a claim, though the occurrence of *S. turbinata* in the same locality renders it highly probable. Thornely's *S. ligulata* collected from the Palk bay in the Gulf of Manaar is characterised by a 'ligula' arising from the adcauline side of the mouth of the hydrotheca. A similar structure found on the hydrotheca of some of the specimens of the present collection was found to be algal growth. It is very likely that the 'ligula' of *S. ligulata* Thornely is also a similar object. But for the presence of 'ligula' *S. ligulata* Thornely seems to be synonymous either with the present species or *S. marginata* (Kirchenpauer). The 'ligula' described by Billard (1925) arises from the adcauline side and appears to be only a valve folded inwards. But even if the significance of the 'ligula' is eliminated, Billard's *S. ligulata* should be regarded as a valid species, because of the branched nature of the colony, the characters of the gonotheca, hydrothecal mouth and basal prolongations of the intrathecal septum.

Dynamena Lamouroux*Dynamena* Lamouroux 1812.*Pasythea* Lamouroux 1812.*Tuluparia* Blainville 1830.*Pasya* Stechow 1922.

Hydrothecae are arranged biserially, singly, in pairs or in groups; hydrothecal margin with two lateral teeth and occasionally a median tooth; operculum consisting of a small, firm, adcauline membrane and a distally free adcauline membrane; hydranth devoid of an 'abcauline blind-sac' in preserved material; gonosome simple.

Dynamena as used in the present day literature differs from *Sertularia* (s. str.) only in the absence of a 'blind-sac'. The Indian species of *Dynamena* may be identified as follows:*

- I. Hydrotheca paired, grouped and mesially adnate.
 1. Hydrothecae usually in groups of two pairs, floor of the basal pair of the hydrothecae arched upwards, basal segment small, perisarc uniformly thick. *D. thankasseriensis* n. sp.
 2. Hydrothecae usually in groups of three pairs, floor of the basal pair of hydrotheca nearly straight, perisarc thin, with internal annulations near the mouth. Basal segment large. *D. quadridentata* (Ell. et Sol.)
- II. Hydrothecae on hydrocaulus usually subalternate when in pairs not adnate to each other.
 1. Hydrotheca short, cylindrical, opposite and placed wide apart. *D. eissa* (Thornely)
 2. Hydrotheca long and tubular. Gonotheca tubular with a bulged middle. *D. crisioides* Lamouroux

***Dynamena thankasseriensis* n. sp.**

(Fig. 82)

The hydrocaulus is divided into internodes, basal part of the hydrocaulus with one or two pairs of ungrouped opposite and mesially adnate hydrothecae, further up the hydrocaulus, the hydrothecae are arranged in groups consisting of two or occasionally three pairs. Of the two pairs usually constituting a group, the distal pair is shorter, squarish and adnate to each other for a distance of two-thirds to three-fourths the adcauline side and then sharply diverging from one another at an angle of 140° to 160°; proximal pair also short, stout, adnate to two-fifth the adcauline length and then diverging at the same angle as the distal pair, a considerable part of the

* The description of *Pasythea hexadon* of Thornely (1904) is inadequate. A re-examination of her material might show that her species is *D. quaridentata*. If on the other hand her identification is correct it should be *Salacia hexadon* (Bale 1915, p. 257 and Billard 1925, p. 137).

adcauline side of the proximal pair again adnate with the base of the distal pair leaving only one-fifth the adcauline side free; the floor of the basal pair arched upwards, mouth of the theca guarded by two lateral and a short median tooth; thecal margin not reduplicated, intrathecal annulations absent; triangular segment below the proximal pair forming a double-cone joint with a short intermediate internode having a straight basal node; perisarc uniformly thick. Gonosome is not obtained.

Height of colony	..	..	upto 5.5 mm.
Length of typical thecate internode	..	..	0.65-0.70 mm.
Length of basal thecate internode	..	..	0.40-0.46 mm.
Breadth of proximal hydrotheca	..	..	0.28-0.31 mm.
Length of mesially adnate portion of proximal pair of hydrothecae	..	..	0.25-0.27 mm.
Height of typical triangular segment	..	..	0.20-0.23 mm.
Thickness of perisarc of hydrotheca	..	..	0.02 mm.

Locality—This species was collected from Sargassam at Thankassery beach.

Remarks—*Dynamena* with grouped hydrothecae (*Pasya* Stechow) is often difficult to identify because of the wide range of variations. However, the present species shows the following distinctive characters which clearly distinguishes it from all the known species. Internodes are comparatively short, periderm uniformly thick, hydrothecal mouth without perisarc plates and internal annulations; hydrotheca short and mesially adnate, both pairs in each group diverge identically at the same angle; the floor of the basal pair of hydrothecae is arched and the triangular segment is small; the hydrothecal margin not reduplicated and intermediate internodes are short. This species is therefore described as new and the specific name *thankas-seriensis* refers to the place of collection.

Dynamena quadridentata (Ell. et Sol.)

(Fig. 83)

- Sertularia quadridentata* Ellis et Solander 1786, p. 57.
Pasythea quadridentata Lamouroux 1816, p. 156.
Pasythea quadridentata Bale 1884, p. 112, Pl. VII, fig. 3.
Pasythea quadridentata Bale 1888, p. 770, Pl. XIV, figs. 6-7.
Pasythea quadridentata Nutting 1904, p. 75, Pl. XIII, figs. 4-7.
Pasythea quadridentata Warren 1908, p. 372, fig. 11.
Pasythea quadridentata Thornely 1916, p. 150.
Pasya quadridentata Stechow 1924a, p. 165.
Pasythea quadridentata Gravely 1927, p. 14, Pl. II, fig. 6.
Pasythea quadridentata Nutting 1927, p. 220.
Dynamena quadridens Blackburn 1938, p. 390.

Hydrocaulus is unbranched, divided into thecate internodes, the length of the internode depending on the number of hydrothecal pairs in each group, the basal part of the hydrocaulus with fewer pairs of hydrothecae than those on the succeeding internodes, a typical group having three or four pairs and occasionally five pairs of

hydrothecae. In each group the distal pair remains adnate for three-fourths their adcauline side and diverges at nearly 90° , the pairs below this having a shorter adnate portion, with the angle of divergence progressively increasing towards the proximal pair of each group, which is about 160° , the basal pair of hydrotheca in each group with two pairs of backwardly directed perisarcal processes; hydrothecal mouth with two large lateral teeth, a small median adcauline tooth and an internal annulation a little below the thecal mouth. Hydranths show clear differentiation into digestive and non-digestive regions and one or two thin protractors. Gonosome was not observed.

Height of colony	..	..	upto 7 mm.
Length of typical internode	..	..	1.05-1.50 mm.
Length of distal hydrotheca of a group	..	..	0.35-0.40 mm.
Length of second hydrotheca of a group	..	..	0.33-0.40 mm.
Length of basal hydrotheca of a group	..	..	0.28-0.38 mm.
Length of basal triangular segment	..	..	0.40-0.47 mm.

Locality—This hydroid was particularly abundant under the Pamban bridge in the Gulf of Mannar. It has also been collected from Thankassery, Cape Comorin and Kovilam.

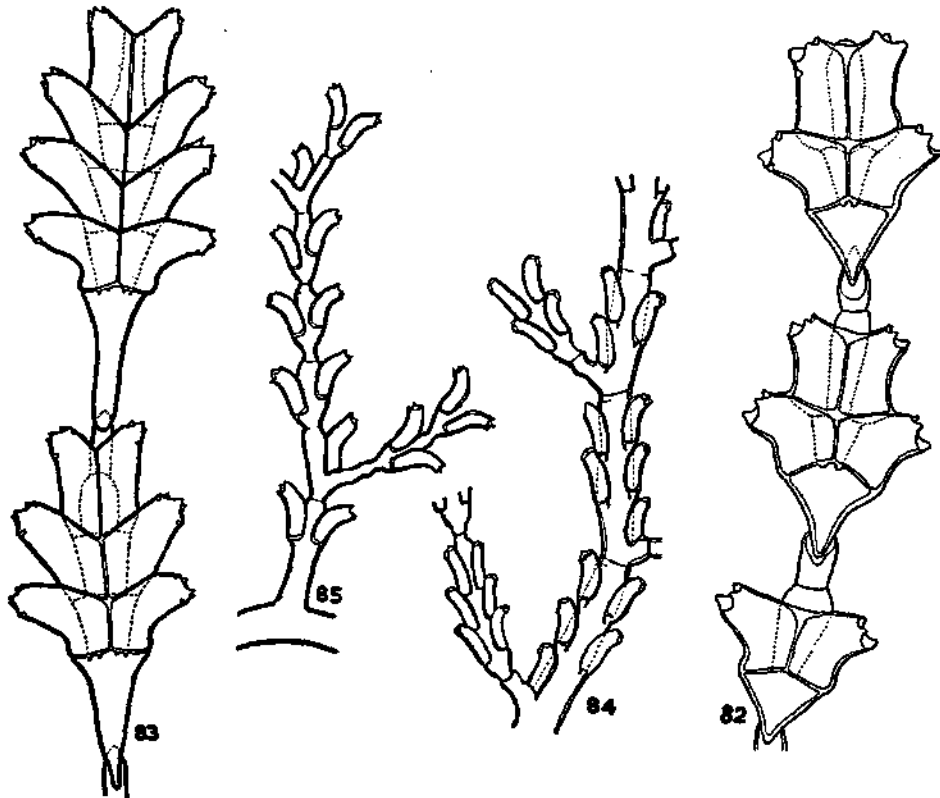


FIG. 82. *Dynamena thankasseriensis*; 83. *Dynamena quadridentata*; 84. *Dynamena cristioides* Type A. 85. *Dynamena cristioides* Type B.

Dynamena crisioides Lamouroux

(Figs. 84-85)

- Dynamena crisioides* Lamouroux 1824, p. 613, Pl. Xc, figs. 11-12.
Dynamena tubuliformis Marktanner 1890, p. 238.
Sertularia vegae Pictet 1893, p. 44, Pl. II, figs. 37-38.
Thuiaria palans Thornely 1904, p. 119, Pl. III, figs. 5, 5a.
Thuiaria tubuliformis Thornely 1908, p. 83.
Thuiaria crisioides Billard 1909, p. 320, fig. 7.
Thuiaria tubuliformis Ritchie 1910b, p. 832.
Sertularia tubuliformis Broch 1918, p. 132.
Dynamena tubuliformis Stechow 1919, p. 23.
Thuiaria interrupta Jarvis 1922, p. 342, Pl. XXV, fig. 13.
Thuiaria tubuliformis Hargitt 1924, p. 493, Pl. IV, fig. 16.
Dynamena crisioides var. *gigantea* Billard 1924a, p. 651.
Dynamena crisioides Billard 1925, p. 181, fig. xxvi.
Dynamena crisioides var. *peculiaris* Billard 1925, p. 185, fig. xxxviii.
Dynamena crisioides var. *gigantea* Billard 1925, p. 186, Pl. VIII, fig. 24.
Dynamena crisioides var. *alternata* Billard 1925, p. 187, fig. xxxix, H.J.
Thuiaria interrupta Gravely 1927, p. 13, Pl. II, fig. 7.
Dynamena crisioides Briggs et Gardiner 1931, p. 190.
Dynamena crisioides Vervoort 1941, p. 210, figs. 4 a-g.
Dynamena crisioides var. *gigantea* Vervoort 1941, p. 210, fig. a-g.
Dynamena crisioides var. *alternata* Vervoort 1941, p. 213.
Dynamena crisioides Millard 1958, p. 183.
Dynamena crisioides var. *gigantea* Millard 1958, p. 183.

The present collection includes two distinct types. Type A (Fig. 84) perfectly agrees with *Thuiaria interrupta* of Jarvis (1922). Hydrocaulus is divided into internodes having 1-3 hydrothecae on the cladiate side and one less on the opposite side; cladia more or less regular, with usually 4-5 pairs of subopposite hydrothecae, fourth the hydrotheca adnate to the hydrocladia and the margin often reduplicated. In type B (Fig. 85) the cauline nodes are indicated by constrictions only; hydrocladia few, set at irregular intervals, with 4-7 intervening internodes; typical cauline internodes with a pair of sub-opposite hydrothecae, but those bearing hydroclade with an axial hydrotheca; hydrotheca shorter than type A, adnate to the stem for a little over half the adcauline length, the free part bent outwards at an angle of 45°, margin not reduplicated.

	Type A	Type B
Height of hydrocaulus ..	upto 5.6 cm.	upto 1.5 cm.
Length of cauline internode ..	upto 1.88 mm.	0.62-0.74 mm.
Breadth of hydroclade ..	0.13-0.14 mm.	0.11-0.12 mm.
Length of hydrotheca ..	0.40-0.48 mm.	0.37-0.42 mm.
Breadth of hydrotheca ..	0.14-0.21 mm.	0.15-0.17 mm.

Locality—Type A was obtained from stones and pieces of dead corals around Krusadai island and Type B was collected from stones around the beacon at the Porites Bay near Krusadai island.

Remarks—This is a highly variable species. The large number of forms recorded from the tropical and subtropical regions and those from the Indo-Pacific region in particular clearly shows the extent of variation of *D. crisioides*. Even from specimens collected from a limited area, several authors have described many varieties. In the present collection also two distinct types have been noticed. Billard (1925) identified three varieties and even his type species showed a large number of variations. *D. crisioides* var. *gigantea* to which Billard referred six older records as synonyms does not show the majority of characters which Billard attributed to that variety and not less than 4 independent forms can be distinguished from this variety alone. Gravely (1927) has pointed out as many as four distinct forms from the specimens which he collected from around the Krusadai island in the Gulf of Mannar. Thus every author has been able to discover some valid difference deserving special attention. If all these variations are taken as sufficient ground for creating varieties, it will lead to an almost impossible position. The only alternative therefore is to define the range of variation met with. The height of colony varies from 1-20 cms., hydrocaulus thick or thin, nodes distinct or ill defined, internodes with 0-13 pairs of hydrothecae; hydrothecae longitudinally or transversely approximated, opposite, subopposite or alternate, lengths varying from 0.35-0.55 mm., the extent of fusion varying from one-third to the entire adcauline side, walls thick or thin, margin reduplicated or plain, adcauline tooth developed to a varying extent; gonosome arising from the hydrorhiza, hydrocaulus, hydrocladia or even emerging through the mouth of a hydrotheca. In spite of all these variations, there is a remarkable uniformity in the shape and structure of the gonosome, the latter being decisive character in the determination of species.

Idiella Stechow

Idia Lamouroux 1816.

Idiella Stechow 1919.

Hydrocaulus branching, cauline hydrothecae alternating and mesially separate, cladiate hydrothecae alternate and contiguous to one another; hydrothecal mouth with a large lateral tooth and a lateral opercular membrane; gonotheca bottle-shaped.

Idiella pristis (Lamouroux)

(Fig. 86)

Idia pristis Lamouroux 1816, p. 200, Pl. V, fig. 5.

Thuimaria compressa Armstrong 1979, p. 102, Pl. XII.

Idia pristis Bale 1884, p. 113, Pl. VII, figs. 1-2.

Idia pristis Allman 1888, p. 85, Pl. XXXIX, fig. 10.

Idia pristis Jaderholm 1903, p. 288.

Idia pristis Thornely 1904, p. 108.

Idia pristis Borradaile 1905, p. 842.

Idia pristis Hartlaub 1905, p. 617.

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- Idia pristis* Billard 1907b, p. 351.
Idia pristis Billard 1909, p. 321.
Idia pristis Billard 1910, p. 16.
Idia pristis Ritchie 1910, p. 11.
Idia pristis Thornely 1916, p. 150.
Idia pristis Jaderholm 1920, p. 4.
Idiella pristis Stechow 1923, p. 12.
Idiella pristis Stechow et Muller 1923, p. 469.
Idiella pristis Stechow 1924a, p. 69.
Idia pristis Bale 1924, p. 240.
Idia pristis Billard 1925, p. 219, Pl. VIII, fig. 33.
Idiella pristis Stechow 1925, p. 221.
Idia pristis Briggs et Gardiner 1931, p. 191.
Idia pristis Leloup 1935, p. 37.
Idiella pristis Vervoort 1941, p. 205.

This species is characterised by the alternate arrangement of hydrothecae on the hydrocladia with a zigzag line of fusion. The arrangement of hydrothecae on either side suggests a remote resemblance to the 'saw of *Pristis*' to which the specific name alludes.

Height of colony	..	..	upto 86 mm.
Length of cauline internode	..	..	0.85-0.88 mm.
Breadth of cauline internode	..	..	0.31-0.40 mm.
Length of hydroclade	..	..	upto 28 mm.
Length of adnate part of hydrotheca	..	..	0.35-0.45 mm.
Length of free part of hydrotheca	..	..	0.15-0.24 mm.
Breadth of hydrothecal mouth	..	..	0.06-0.10 mm.
Length of gonotheca	..	..	0.75-0.90 mm.
Breadth of gonothecal mouth	..	..	0.32-0.35 mm.

Locality—The present material was dredged at a depth of 10 fathoms from the shipping channel between Pamban and Shingle island in the Gulf of Mannar. This hydroid has a wide distribution in the warmer waters. In the Indian region, it has been previously recorded from the Kathiawar coast (Thornely 1916), Maldives (Borradi 1905) off Cape Comorin and Konkan coast (Armstrong 1879), Lower Burma (Ritchie 1910), Gulf of Mannar (Jaderholm 1920, Gravely 1927) and from an unspecified locality in the Indian Ocean (Jaderholm 1920).

Remarks—Allman (1888) has given a detailed account of this species. However, Allman's account of the ornamentation of the gonotheca is somewhat misleading. He has illustrated the gonotheca as a very symmetrical and stream-lined structure. This, however, does not represent the natural condition. He has shown double the actual number of ridges. The error in the description has been pointed out by some of the later workers, but strangely enough, Gravely (1927) also gives a similar diagram for the gonotheca of his species from the Gulf of Mannar.

Salacia Lamouroux

Salacia Lamouroux 1816.

Hydrocaulus and hydrocladia with long internodes bearing two linear rows of entate hydrothecae each with a single abcauline valve; hydranth without a 'blind-s'; gonosome typical.

Along the Indian coast this genus is represented by a single species viz. *Salacia racythara* Lamouroux.

Salacia tetracythara Lamouroux

(Fig. 87)

Salacia tetracythara Lamouroux 1816, p. 212, Pl. VI, fig. 3, fig. 3 A.B.C.

Salacia tetracythara Lamouroux 1821, p. 15, Pl. LXVII, fig. 7, Pl. IX, fig. 14.

?*Calyptothuiaria opposita* Campenhausen 1896, p. 312, Pl. XV, fig. 7.

Thuiaria tetracythara Billard 1909, p. 319.

Thuiaria fenestra Thornely 1916, p. 146.

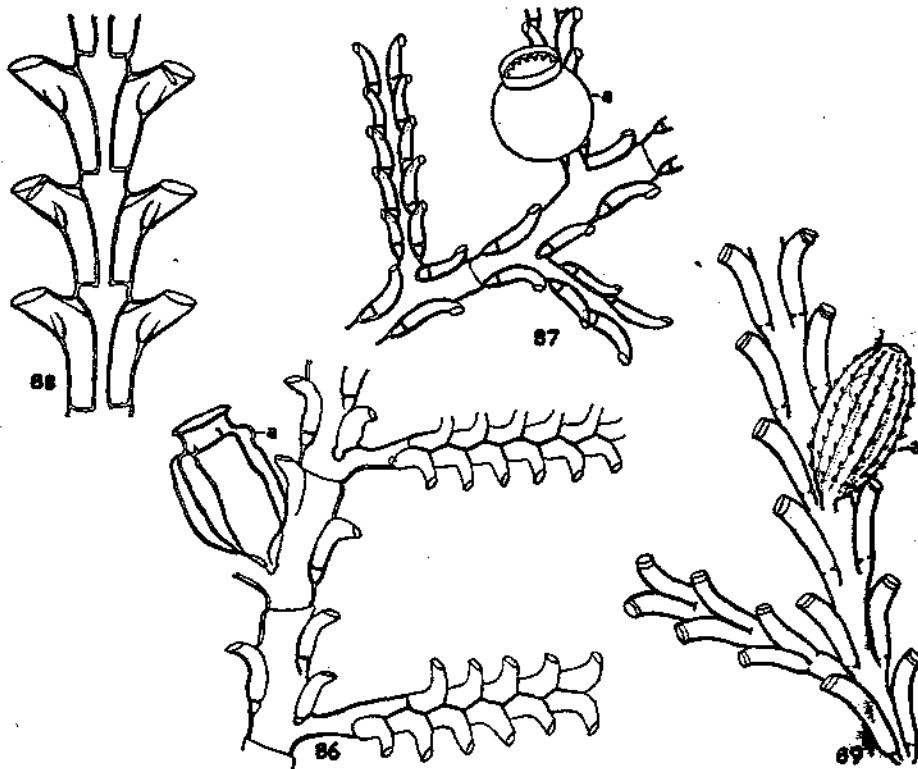
Salacia tetracythara Billard 1924, p. 84.

Salacia tetracythara Billard 1925, p. 202, Pl. VIII, figs. 27, 28, text-fig. XLVII.

Colony is large, hydrocaulus divided into more or less regular internodes carrying hydrotheca arranged on either side in a sub-opposite to alternate fashion; hydrocladia alternating, carrying biserial hydrotheca, the free-end of each hydrotheca slightly overlapping the base of the preceding. Gonotheca is spherical with a short collar with 16 tongue-like in-growths from the base of the collar giving the typical fenestrated appearance.

Height of colony	..	..	upto 80 mm.
Length of cauline internode	..	..	2.00-2.54 mm.
Breadth of cauline internode	..	..	0.30-0.43 mm.
Length of cladial hydrotheca	..	..	0.50-0.53 mm.
Breadth of cladial hydrotheca	..	..	0.11-0.15 mm.
Breadth of hydrothecal mouth	..	..	0.52-0.55 mm.
Length of gonotheca	..	..	0.95-1.13 mm.
Maximum breadth of gonotheca	..	..	0.80-0.85 mm.

Locality—This species was dredged from a depth of 12 fathoms, off Trivandrum. This has been previously reported from Kathiawar in the Indian region (Thornely 1916).



FIGS. 86. *Idiella pristis* (a) gonotheca ; 87. *Salacia tetracythara* (a) gonotheca ; 88. *Nigellastrum mutulatum* ; 89. *Nigellastrum digitale*.

Nigellastrum Oken

Nigellastrum Oken 1815.

Diphasia Agassiz 1862.

Hydrocaulus is branching, hydrotheca biserial, opposite or sub-opposite rarely alternate; mouth oblique, without teeth with a single adcauline valve; hydranth without a 'blind-sac'; gonotheca usually dimorphic, often highly ornamented, female gonotheca generally provided with an internal marsupium.

The Indian species of *Nigellastrum* can be identified as follows :

- I. Hydrothecae alternate. *N. thornelyi* (Ritchie)
- II. Hydrothecae opposite or subopposite.
 1. An abcauline intrathecal ridge present, hydrothecae bent outwards at an angle, with the mouth facing outwards. *N. mutulatum* (Busk)

2. An abcauline intrathecal ridge absent, hydrotheca curved with mouth facing outwards.
- (i) Gonotheca oval, with a large number of evenly distributed spines.
N. digitale (Busk)
- (ii) Gonotheca without spines, irregularly oval, with a tubular or somewhat funnel-shaped mouth.
N. maldivens (Borradaile)

Nigellastrum mutulatum (Busk)

(Fig. 88)

Sertularia mutulata Busk 1852, p. 391.

Sertularia mutulata Bale 1884, p. 101, Pl. IX, figs. 6-9.

Diphasia mutulata Thornely 1904, p. 118 (in part) pl. II, fig. 6.

Diphasia mutulata Ritchie 1910, p. 12, Pl. IV, figs. 6-9.

Nigellastrum mutulatum Stechow et Müller 1923, p. 468.

Hydrocaulus is unbranched and not demarcated into internodes. Hydrotheca is tubular, mesially separated, opposite and lateral, set at regular intervals, adnate to the hydrocaulus for three quarters of their length, free adcauline side and the corresponding abcauline side slightly concave, with a lateral longitudinal ridge running parallel to the abcauline side of the hydrotheca, a small intrathecal septum appear as semicircular ridges a little below the middle of the abcauline side. The hydrothecal mouth faces upwards; teeth absent, with a single adcauline operculum, often folded inwards. Gonosome was not observed.

Height of colony	..	..	upto 18 mm.
Breadth of the hydrocaulus	..	..	0.20-0.25 mm.
Length of adnate portion of hydrotheca	..	..	0.45-0.50 mm.
Length of free adcauline side of hydrotheca	..	..	0.15-0.17 mm.
Breadth of hydrotheca	..	..	0.15-0.18 mm.

Locality—Few tufts of this colony were obtained from Eunucid tubes dredged from a depth of 8 fathoms off Neendakara. In the Indian region this species has been previously reported from the Gulf of Mannar (Thornely 1904) and Andamans (Ritchie 1910).

Remarks—The present material agrees with the descriptions and illustrations of Ritchie (1910). However, Ritchie did not notice the longitudinal ridges of the hydrothecae. This character is quite clear in Thornely's illustrations. It appears that Thornely's record of '*Diphasia mutulata*' includes besides *N. mutulatum*, *N. thornelyi* (Ritchie) also. The colonies with opposite or subopposite hydrothecae and spinous gonothecae are referable to *N. mutulatum*, while the colonies with alternate hydrotheca and spines restricted to the distal extremity of the gonotheca represent a different species, probably *N. thornelyi* (Ritchie).

Nigellastrum digitale (Busk)

(Fig. 89)

- Sertularia digitalis* Busk 1852, p. 383.
Desmoscyphus longithecus Allman 1877, p. 26.
Desmoscyphus acanthocarpa Allman 1888, p. 73.
Diphasia longithecus Jaderholm 1903, p. 288.
Sertularia digitalis Borradaile 1905, p. 843.
Sertularia digitalis Borradaile 1905, p. 843.
Nigellastrum digitale Stechow 1922, p. 147.
Nigellastrum digitale Stechow 1924a, p. 161.
Diphasia digitalis Hargitt 1924, p. 501.
Diphasia digitalis Stechow 1925, p. 209.
Diphasia digitalis Gravely 1927, p. 14, Pl. III, fig. 15.
Diphasia digitalis Nutting 1927, p. 218.
Diphasia digitalis Leloup 1932, p. 161.

Hydrocaulus is thick, rigid, monosiphonic and branched; hydrotheca long, tubular and adnate to the hydrocaulus and hydroclade for two-thirds the adcauline side; cauline hydrothecae subopposite and members of each pair separated by a gap; cladial hydrothecae dorsal, strictly opposite and mesially adnate; hydrothecal mouth with a narrow marginal band and an adcauline operculum sometimes remaining folded inside forming an 'internal valve-like operculum.' Gonotheca oval and slightly inclined towards one side, with spines regularly arranged in 14-16 longitudinal rows and can be resolved into 12-14 transverse rows also; each spine conical, sharp and curved forwards, blastostyle stout, with a terminal knob; internal marsupium not observed.

Height of hydrocaulus	..	..	upto 50 mm.
Breadth of basal part of hydrocaulus	..	..	0.55-0.66 mm.
Length of hydroclade	..	..	upto 1.25 mm.
Breadth of hydroclade	..	..	0.41-0.45 mm.
Length of adnate part of cladial hydrotheca	..	..	0.62-0.66 mm.
Length of free part of cladial hydrotheca	..	..	0.38-0.42 mm.
Distance between thecal mouth of a pair of cladial hydrothecae	..	..	0.38-0.42 mm.
Length of gonotheca	..	..	1.63-1.76 mm.
Breadth of gonotheca	..	..	0.70-0.78 mm.

Locality—The material was dredged off Trivandrum at a depth of 12-15 fathoms. In the Indian region this species has been previously recorded from Maldives (Borradaile 1905), Mergui Archipelago (Ritchie, 1910a) and Pamban (Gravely 1927, Leloup 1932).

Remarks—The highly elongate and biserially arranged hydrothecae and spiny gonothecae render the identification of this species easy. However, none of the earlier workers seem to have observed the exact nature of the gonothecae.

(To be concluded)