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A Revision of the Tasmanian Hydroida

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With 92 Text Figures

The present paper gives an account of sixty-four species of Calyptoblastic Hydroids occurring in Tasmanian waters. This number includes sixteen forms not previously recorded from this region. Of these one is a new species, namely, *Halecium fragile*.

The specimens examined are from the east and south-east coasts, from the Derwent Estuary, and from the D'Entrecasteaux Channel. They were obtained partly by dredging and partly by shore-collecting.

Some of the Hydroids previously recorded from Tasmania were from deep water. Specimens of these have not been seen, and the descriptions given are based on those of previous authors. However, in other cases, existing descriptions have been carefully checked against new specimens, and, where necessary, measurements have been incorporated in the revised accounts.

PREVIOUS WORK

Investigations on the Calyptoblastic Hydroids from Tasmania are incomplete and few in number. With but one or two exceptions present knowledge is based on material obtained as part of larger collections of marine fauna, instead of on a specialized collection of Hydroida.

The first record of Hydroida from these regions concerns material obtained during the voyage of H.M.S. *Rattlesnake*, and described by Busk (1852).

In 1874 H.M.S. *Challenger* made some dredgings in Bass Strait, and the Hydroids obtained were described by Allman (1883, 1888).

D'Arcy Thompson (1879) wrote a paper on Hydroids from Australia and New Zealand. Included in this were descriptions of some specimens from Bass Strait and George Town.

Hydroids dredged off the Tasmanian coast by the F.I.S. *Endeavour* from 1909-1914, have been described by W. M. Bale (1914b, 1914c; 1915). In addition, E. A. Briggs (1914, 1915) has written two papers dealing with Hydroida from Tasmania.

The Hydroids collected by the Australasian Antarctic Expedition 1911-1914 were described by Briggs (1939). These included a few species dredged off Maria Island.

There are no records of any specimens having been found, or collections having been made, on the west and south-west coasts of Tasmania.

KEY TO FAMILIES AND GENERA

1.	No true hydrothecae or gonothecae	Gymnoblastea
2.	Hydrothecae and gonothecae present	Calyptoblastea 3
3.	Sarcothecae absent (except in *Phylactotheca and Perisiphonia*)	4
	Sarcothecae always present; hydrothecae sessile, on one side only of the stem or pinna	Plumulariidae 16
4.	Hydrothecae with a definite diaphragm	5
	Hydrothecae without a definite diaphragm, tubular with a smooth margin	Lafoëidae 10
5.	Hydrothecae tubular, wider than deep, biserial	Haleciidae 7
	Hydrothecae campanulate, generally deeper than wide, never adnate, operculum absent	Campanulariidae 8
	Hydrothecae ovato-conic, never adnate, operculum present	Campanulinidae 12
	Hydrothecae sessile, adnate or immersed	6
6.	Hydrotheca margin smooth	Syntheciidae 13
	Hydrotheca margin toothed	Sertularidae 14
7.	Sarcothecae present on hydrocaulus	*Phylactotheca*
	Sarcothecae never present	*Halecium*
8.	Gonothecae on hydrocaulus, free medusae	*Obelia*
	Gonothecae on hydrocaulus, fixed medusoid gonophores	*Gonothyraea*
	Hydrothecae terminal on short peduncles	9
9.	Medusae without manubrium	*Silicularia*
	Medusae without tentacles or digestive cavity	*Orthopyxis*
10.	Hydrocaulus monosiphonic	*Hebella*
	Hydrocaulus polysiphonic	11
11.	Peripheral tubes without sarcothecae	*Cryptolaria*
	Peripheral tubes bearing tubular sarcothecae	*Perisiphonia*
12.	Hydrocaulus internodes each bearing a pedunculate hydrotheca	*Thyroscyphus*
13.	Hydrocaulus internodes with paired, opposite hydrothecae; gonothecae arise from within certain hydrothecae	*Synthecium*
14.	Hydrothecae biserial, not in pairs, opposite to alternate	*Thuiaria*
	Hydrothecae always paired, opposite to alternate, internal operculum	15
	Hydrothecae alternate, one on an internode	*Sertularella*
	Hydrothecae spirally arranged in several longitudinal series	*Selaginopsis*
15.	Gonothecae differ in the sexes	*Diphasia*
	Gonothecae similar in the sexes	*Sertularia*
16.	Lateral sarcothecae moveable, wine glass shaped, bases narrow	17
	Lateral sarcothecae, when present, always fixed	18
17.	Branchlets pinnate	*Plumularia*
	Branchlets verticillate	*Nemertesia*
18.	Lateral sarcothecae present	19
	Lateral sarcothecae absent	20
19.	Gonothecae borne on the stem	*Halicornaria*
	Gonothecae borne in corbulae, or on modified pinnae	*Aglaophenia*
20.	Hydrothecae with a large anterior rostrum	*Halicornopsis*
	Hydrothecae without a rostrum	*Kirchenpaueria*

Sub-Order CALYPTOBLASTEA

Family *CAMPANULARIIDAE*

'Hydrothecae terminal, pedicellate, campanulate. Polypites with a large trumpet-shaped proboscis'. Hincks.

Genus **Obelia** Péron and Lesueur, 1809

'Stem branching, plant-like, rooted by a creeping stolon; hydrothecae campanulate, without operculum; gonothecae borne on the stem and branches; reproduction by free medusiform zooids.

Gonozooid: Umbrella (at the time of liberation), depressed and disk-like; manubrium short and quadrate; radiating canals 4; marginal tentacles numerous (increasing in number with age), prolonged at the base and projecting inwards; lithocysts 8 2 in each interradial space, borne on the inner side of 8 of the tentacles near the base'. Hincks.

Obelia geniculata (Linnaeus, 1758)

(Figs 1-4)

Sertularia geniculata Linnaeus, 1758.
Loamedea geniculata Lamouroux, 1816.
Campanularia geniculata Fleming.
Monopyxis geniculata Ehrenburg, 1834.
Eucope diaphana Agassiz, 1862.
Obelia geniculata Allman, 1864.
Eucope alternata A. Agassiz, 1865.

Trophosome: Hydrocaulus simple, monosiphonic, up to 2 cm. in height; stem markedly flexuous, or zig-zag, jointed at each flexure; immediately below each joint the perisarc is expanded to form a support for the annulated (4-6 rings) pedicel of the hydrotheca; one to three rings present on each stem internode distal to the joint. Hydrothecae obconical, rather short, with an entire margin; the supporting pedicel is almost erect, and tapers slightly from the base.

Gonosome: Gonothecae elongated and urn-shaped; aperture terminal in position and surrounded by a prominent collar of characteristic construction. The gonotheca arises in a position axillary to the pedicel of a hydrotheca and is supported by a short annulated stalk.

Dimensions:

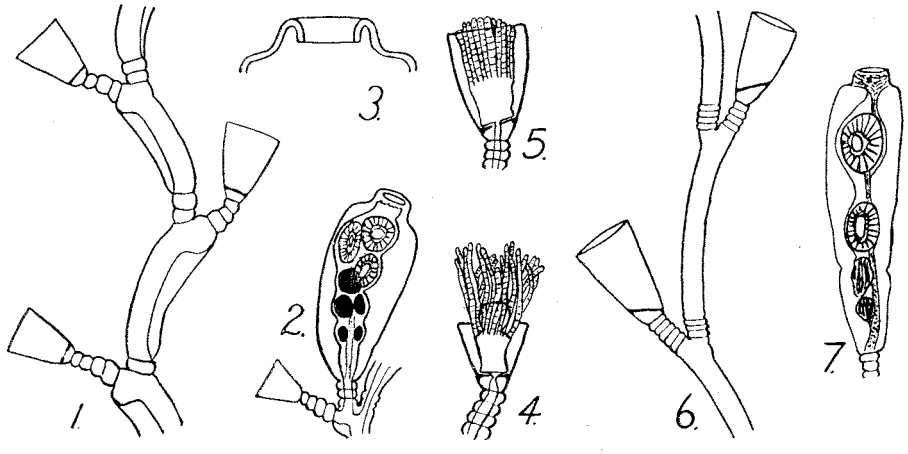
Hydrocaulus internode, length	0·72-0·75 mm.
Hydrocaulus internode, diameter (at joint)	0·13-0·16 mm.
Hydrotheca, depth	0·25-0·28 mm.
Hydrotheca, diameter (at aperture)	0·30-0·32 mm.
Gonotheca, length	0·75-0·80 mm.
Gonotheca, diameter	0·28-0·33 mm.

Locality: Garden Island Creek (December, 1948); Bellerive, Derwent Estuary (June, 1949).

Distribution: Recorded from Australia; New Zealand; Labrador; Massachusetts; European Seas.

The specimens from Garden Island Creek, which form the basis of this description, were found growing on the laminae of *Macrocystis* near the surface of the water. The hydrorhiza of the colonies formed a very extensive network covering the entire lamina.

The specimen differs from that described by Bale (1884, p. 59) in the possession of annuli on the hydrocaulus internodes, and also in the shape of the internodes, which are not as stout. In the possession of annuli the specimen agrees with the form described by Mulder & Trebilcock (1914, p. 44).



FIGS 1-7.

Obelia geniculata (Linnaeus). Fig. 1: Portion of colony. Fig. 2: Gonotheca showing medusae. Fig. 3: Longitudinal section through top of mature gonotheca. Fig. 4: Hydrotheca with partially expanded polyp. *Obelia australis* von Lendenfeld. Fig. 5: Hydrotheca with retracted polyp. Fig. 6: Portion of colony. Fig. 7: Gonotheca with two nearly mature medusae.

Obelia australis von Lendenfeld, 1884

(Figs 5-7)

Obelia australis von Lendenfeld, 1884.

Trophosome: Hydrocaulus monosiphonic, sparingly branched, attaining a height of about 3-4 cm.; stem flexuous, annulated (3-5 rings) distal to the origin of hydrothecae pedicels, also (8-10 rings) at the base of each branch, and the stem; pedicels annulated, those at the distal end of colony with 4-10 rings, those proximally placed with 10-20 rings, these later often having the central part smooth. Hydrothecae alternate, campanulate, not constricted at the level of the floor, which is very oblique and placed a little above the base; margin of aperture is entire and may be sinuous.

Gonosome: The gonothecae are urn-shaped and elongated, arising axillary to a branch hydrotheca, or both; the aperture is terminal with a collar surrounding.

Dimensions:

Hydrocaulus internode, length	up to 0·80 mm.
Hydrocaulus internode, diameter	0·10-0·11 mm.
Hydrotheca, length	up to 0·50 mm.
Hydrotheca, diameter at aperture	0·33-0·40 mm.
Gonotheca, length	up to 1·25 mm.
Gonotheca, diameter	0·43-0·44 mm.

Locality: Hobart (March, June, 1949); Maria Island, 65 fathoms (Briggs, December, 1912).

Distribution: Recorded from New South Wales; New Zealand; Gulf of Manaar, Ceylon.

The specimens were found growing on the piles of a jetty below low-tide level. The gonotheca resembles that of *Obelia geniculata*, but in some cases there is a transverse constriction, about half-way between base and apex. The specimen from Maria Island (Briggs, 1939, p. 14) was found growing epizoically on *Aglaophenia tasmanica* Bale.

Genus **Gonothyraea** Allman, 1864

'Stem erect and branched, rooted by a thread-like stolon; hydrothecae campanulate and hyaline; polypites with a prominent contractile proboscis; reproduction by fixed medusiform sporosacs which are furnished with a circlet of filiform tentacles, and, when mature, become extra-capsular, and are borne on the summit of the gonotheca'. Hincks.

Gonothyraea hyalina Hincks, 1868

(Figs 8-11)

Gonothyraea hyalina Hincks, 1868.
?Calycella parkeri Hilgendorf, 1897.
?Gonothyraea parkeri Bale, 1924.

Trophosome: Hydrocaulus monosiphonic, branched, attaining a height of about 3 cm.; stem flexuous, jointed, giving rise to a branch, hydrotheca, or both, at each joint; stem annulated at the base, and distal to each joint, as are the branches. Hydrothecae alternate, elongate, campanulate, hyaline; aperture circular, margin castellated, the denticles being indented at the top; hydrothecae are borne on annulated (up to 20 rings), slightly tapering pedicels.

Gonosome: Sexes are separate, the colony being either male or female. Gonothecae are large, axillary to a branch of hydrothecae, urn-shaped with a flattened top, supported by a ringed pedicel; gonophores become extra-capsular at maturity, but are not liberated.

Dimensions:

Hydrocaulus internode, length	up to 0·75 mm.
Hydrocaulus internode, diameter	0·08-0·10 mm.
Hydrotheca, length	0·43-0·47 mm.
Hydrotheca, diameter	0·20-0·25 mm.
Gonotheca, length	up to 0·80 mm.
Gonotheca, maximum diameter	0·40 mm.

Locality: Hobart, Derwent Estuary (March, 1947, 1949).

Distribution: England; New Zealand (?).

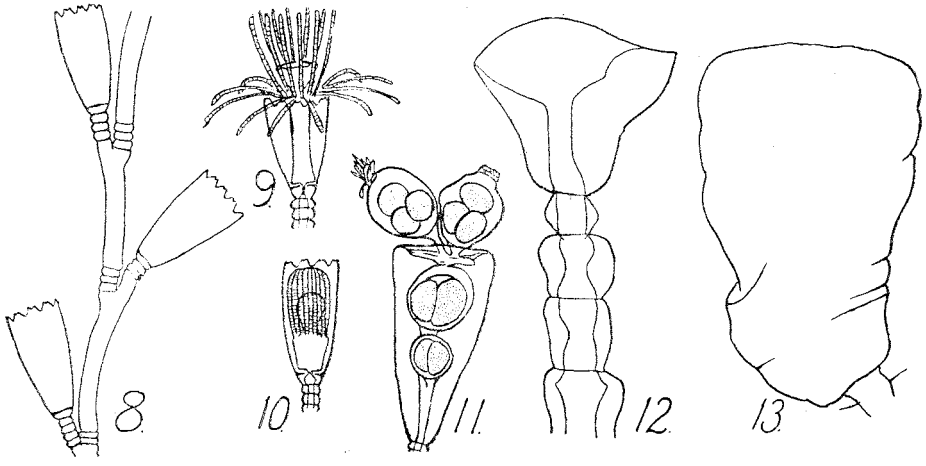
The hydranth when expanded is long and thin, with a large extensible trumpet-shaped proboscis; the single ring of twenty-four extremely long tentacles has the appearance of two rings (fig. 9). The appearance of the polyp in the retracted state is very characteristic, the tentacles being drawn just within the margin of the hydrotheca (fig. 10).

The trophosome of this genus closely resembles that of some species of *Obelia*, except in the structure of the reproductive organs. The female gonophores on becoming extra-capsular at maturity contain three to five large ova which are not liberated. Fertilisation and development to the motile planular stage

takes place within the sporosac. The male gonophores become extra-capsular in a similar way, but here the spermatozoa are discharged shortly after emergence.

The present specimen is the first record of *Gonothyraea hyalina* from the Southern Hemisphere. However, Bale (1924, p. 231) discusses a *Gonothyraea parkeri*, originally described from Dunedin by Hilgendorf under the name of *Calycella parkeri*, which he considers is probably identical with *Gonothyraea hyalina* Hincks.

This species lives in a position so as to become exposed at very low tides, a feature also noted by Hilgendorf in the case of *Gonothyraea parkeri*.



FIGS 8-13.

Gonothyraea hyaline Hincks. Fig. 8: Portion of colony. Fig. 9: Hydrotheca with expanded polyp. Fig. 10: Hydrotheca with contracted polyp. Fig. 11: Female gonotheca with two emergent medusoid gonophores containing mature ova. *Silicularia campanularia* (von Lendenfeld). Fig. 12: Distal portion of peduncle with terminal hydrotheca. Fig. 13: Gonotheca.

Genus **Silicularia** Meyen, 1834

'Trophosome similar to that of Campanularia; gonophores consisting of free medusoids which are destitute of a manubrium'. Bale.

Silicularia campanularia (von Lendenfeld, 1884)

(Figs 12, 13)

Eucopella campanularia, in part, von Lendenfeld, 1884.

Eucopella campanularia Bale, 1888.

?Eucopella reticulata Hartlaub, 1905.

Silicularia campanularia Bale, 1914a.

Trophosome: Hydrorhiza broad and flat; hydrothecae terminal on short unbranched peduncles which arise at right angles to the hydrorhiza. The length of the peduncles is very variable as is the number of joints (1-3) which may occur immediately below the spherule; spherule single lying between the hydrotheca and the peduncle. Perisarc of spherule and peduncle may be thickened, not necessarily corresponding to the external outline. Hydrotheca has no cavity corresponding to the external outline, a considerable portion being filled with

solid perisarc; the cavity is shallow and eccentrically placed towards the lower side of the hydrotheca; from the base of this cavity a tube leads to the spherule.

Gonosome: Gonothecae ovate, broad and flattened, attached to the hydrorhiza by a short stalk; at maturity a single medusoid is liberated.

Dimensions:

Peduncle, length	up to 2.5 mm.
Peduncle, diameter	0·13-0·16 mm.
Hydrotheca, length	0·48-0·55 mm.
Hydrotheca, diameter at aperture	0·47-0·58 mm.
Spherule, diameter	0·10-0·11 mm.
Spherule, length	0·13 mm.
Gonotheca, length	up to 1·50 mm.
Gonotheca, breadth	up to 1·00 mm.

Locality: South Arm, Derwent Estuary (April, 1947, 1949); Oyster Bay (May, 1949).

Distribution: Recorded from Victoria; New South Wales.

In life the polyp leans towards one side of the hydrotheca, into which it is not fully retractile; successive joints of the peduncle differ in length, but corresponding joints on different peduncles, are, as a general rule, equal and constant.

The specimens were found growing on various algae, the growth of the colonies often being very extensive. The specimen from South Arm (April, 1949) was found near low-tide mark, and that from Oyster Bay on storm drifted *Macrocystis*.

Genus **Orthopyxis** L. Agassiz, 1862

'Trophosome consisting of smooth or undulated peduncles of varying lengths, springing from a creeping hydrorhiza, and supporting each a single hydrotheca; hydrothecae campanulate with the lower part compressed but usually circular above the perisarc varying much in thickness but always greatly thickened inwards near the base so as to form a floor on which the hydranth is supported; hydranth radially symmetrical, with about 24-32 tentacles and a large trumpet-shaped hypostome. Gonothecae variable in form within the limits of a species; gonozooid a modified medusa, having neither tentacles nor digestive cavity but provided with four branched radial canals, and sometimes with marginal sense organs'. Bale.

Orthopyxis caliculata (Hincks, 1853)

(Figs 14-16)

Campanularia caliculata Hincks, 1853.
Campanularia breviscyphia Sars, 1857.
Laomedea caliculata Allman, 1864.
Clytia (Orthopyxis) poterium Agassiz, 1862.
Orthopyxis poterium A. Agassiz, 1865.
Campanularia poterium Nutting, 1901.
Clytia caliculata Nutting, 1901.
Eucopella caliculata Fraser, 1911.
Campanularia integra Levinsen, 1892.

Trophosome: Hydrorhiza a flattened, ribbon-like stolon bearing short upright shoots, or peduncles, of varying lengths; peduncles distinctly undulated and may be jointed distally; terminally on each peduncle is borne a single hydrotheca and immediately below, between the hydrotheca and the end of the peduncle,

is a single spherule. Hydrothecae campanulate, with the lower part exhibiting bilateral development in being distinctly compressed; the perisarc of hydrotheca walls is thickened towards the base to form a support for the hydranth.

Gonosome: Gonothecae elongate, ovate or oblong, smooth, somewhat compressed; at maturity they are rounded at the top. However, as with trophosome, wide variations are possible.

Dimensions:

Peduncle, length	up to 1·25 mm.
Peduncle, diameter	0·08-0·11 mm.
Spherule, length	0·41-0·44 mm.
Spherule, diameter	0·48-0·51 mm.
Hydrotheca, length	0·14-0·33 mm.
Hydrotheca, depth	0·11-0·26 mm.
Gonotheca, length	1·00 mm.
Gonotheca, diameter	0·50 mm.

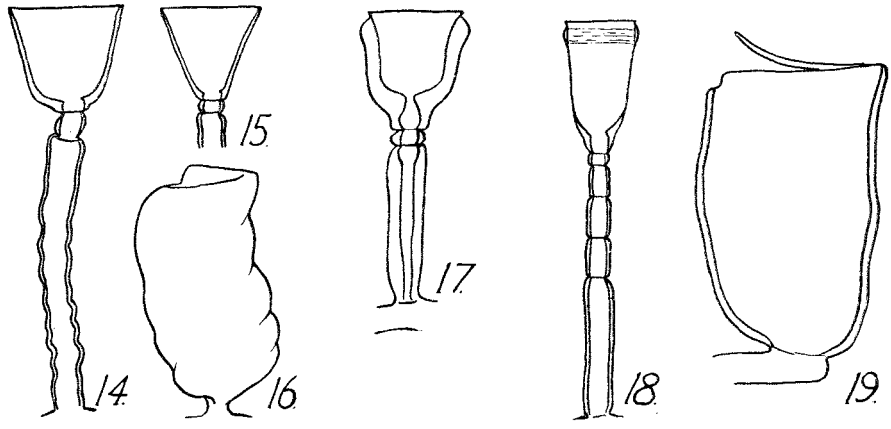
Locality: Eaglehawk Neck (February, 1948); Bicheno; Oyster Bay; Rheban (May, 1949).

Distribution: Cosmopolitan.

The specimens in this collection agree with the description by Bale (1914a, p. 74). As can be seen from the measurements above, there is a very wide variation in the trophosome measurements even in the one colony.

The bilateral symmetry of the hydrotheca is illustrated in figs 14, 15; in 'front' view the hydrotheca remains wide as far as the platform on which the hydranth is supported, with the walls more or less thickened, whilst in 'side' view the appearance is markedly conical with thin walls.

The specimen from Eaglehawk Neck was growing epizoically on *Plumularia setacea* (Ellis) just below low-tide level. The other specimens were taken from storm-drifted sea-weed.



FIGS 14-19.

Orthopyxis caliculata (Hincks). Fig. 14: Peduncle and terminal hydrotheca in broad aspect. Fig. 15: Hydrotheca in narrow aspect. Fig. 16: Gonotheca. *Orthopyxis angulata* Bale. Fig. 17: Peduncle and hydrotheca of the thickened type. Fig. 18: Peduncle and hydrotheca of the unthickened type. Fig. 19: Gonotheca.

Orthopyxis angulata Bale, 1914

(Figs 17-19)

Orthopyxis angulata Bale, 1914a.

Trophosome: Hydrorhiza a broad thickened ribbon, bearing stout upright shoots or peduncles of varying lengths; peduncles thickened, smooth, narrowed at point of origin, sometimes with one or more joints or constrictions towards the distal end; a single spherule between the distal end of peduncle and the terminal hydrotheca. Hydrothecae single and terminal on a shoot; bilaterally developed, in broad view being wide at base with the floor markedly flattened due to a thickening of perisarc; walls thickened, either for whole length, or in the form of a convex band running round the hydrotheca just below the margin; in narrow view hydrotheca appears almost conical, with thin walls, except for the continuation of sub-marginal band; aperture elliptical, margin entire, slightly everted.

Gonosome: Gonothecae broad, flattened; in broad view they appear ovate, truncate, with undulated edges, a little contracted towards the top, then widening to form two angular projections; top flat or slightly concave between the projections.

Dimensions:

Peduncle, length	up to 3·17 mm.
Peduncle, diameter	0·08-0·17 mm.
Spherule, length	0·05-0·07 mm.
Spherule, diameter	0·05-0·10 mm.
Hydrotheca, length	up to 0·54 mm.
Hydrotheca, diameter at aperture	up to 0·25 mm.
Gonotheca, length	1·08 mm.
Gonotheca, breadth	0·83 mm.

Locality: D'Entrecasteaux Channel, 10-12 fathoms (July, 1949); Blackman's Bay, Derwent Estuary, 3-4 fathoms (July, 1949).

Distribution: Recorded from Pt. Phillip (Wilson).

The specimens from the two localities show a marked contrast in the shape of the hydrotheca. However, Bale (1914a, p. 82) states that this wide variation in size and shape is not inconsistent with the allocation of the two forms to the one species.

The specimen from D'Entrecasteaux Channel has the peduncle jointed for some distance below the spherule; the internodes are unequal in length, the proximal the longest, with the others in a decreasing series. Hydrothecae have thin walls except for a convex band round the theca just below the margin, which is entire, slightly everted, with a rim that is smooth or very slightly undulated. Specimen was growing on *Macrocystis* lamina.

The specimen from Blackman's Bay differs in several points. Peduncle is not jointed. Hydrothecae are thickened bilaterally, giving the effect of strong compression; aperture is circular or nearly so; margin entire, smooth or slightly undulated, everted. This specimen was also found growing on *Macrocystis* lamina, with the hydrorhiza of the colony very wide-spread.

Family CAMPANULINIDAE

'Hydrothecae ovato-conic, pedicellate; polypites cylindrical, with a small conical proboscis'. — Hincks.

Genus **Thyroscyphus** Allman, 1877

'Hydrocaulus composed of consecutive internodes each supporting a pedunculate hydrotheca. Hydrothecae with the cavity divided from that of peduncle by a perforated diaphragm, and having the orifice surmounted by a roof which is composed of four triangular membranous valves'. — Allman.

Thyroscyphus simplex (Lamouroux, 1816)

(Fig. 22)

Laomedea simplex Lamouroux, 1816.
Campanularia tridentata Bale, 1894.
Sertularella tridentata Hartlaub, 1900.
Thyroscyphus tridentatus Hartlaub, 1901.
Thyroscyphus simplex Billard, 1909.
Parascyphus simplex Ritchie, 1911.

Trophosome: Hydrocaulus simple, monosiphonic, attaining a height of about 2-3 cm.; stem divided into internodes each bearing a short process from which springs a hydrotheca. Hydrothecae alternate, tubular above, curving inwards towards the base on the upper side only; the lower, outer wall is straight or concave, the upper strongly convex; the aperture has three pointed teeth (emarginations), and an operculum of three pieces.

Gonosome: Gonothecae up to four in number, borne proximally on hydrocaulus; ovate, elongate, smooth, with a rounded top and a small circular aperture; margin thickened but not elevated.

Dimensions:

Hydrocaulus internode, length	0·66-0·75 mm.
Hydrocaulus internode, diameter	0·15-0·20 mm.
Hydrotheca, length	0·66-0·70 mm.
Hydrotheca, diameter at aperture	0·20-0·22 mm.
Hydrotheca, diameter at base	0·08-0·10 mm.
Gonotheca, length	up to 1·40 mm.
Gonotheca, diameter	up to 0·60 mm.

Locality: D'Entrecasteaux Channel; Seven miles east of Cape Pillar, 100 fathoms (Briggs).

Distribution: Recorded from Australia (Lamouroux); Port Phillip, Victoria (Bale); French Pass, New Zealand (Hartlaub); Gough Island, South Atlantic (Ritchie); Clyde Sea Area, Barrier Plateau, between Sanda Island and Ailsa Craig, 24 fathoms (Ritchie); Forty miles west of Kingston, S.A., 30 fathoms (Bale); Fifty miles south of C. Wiles, S.A., 75 fathoms (Bale).

The discrepancy in the number of opercular teeth given in Allman's generic description, compared with the number in Bale's description of *Campanularia tridentata* is considered by the latter to be of little importance.

The specimen was growing on the shell of the scallop *Notovola fumatus*.

Gonothecae are lacking in this specimen, the measurements being those given by Briggs (1914, p. 288).

Family LAFOËIDAE

'Hydrothecae tubular; polypites cylindrical, with a conical proboscis'. Hincks.

Genus **Lafoea** Lamouroux, 1821

'Stem a simple, creeping, tubular fibre, or erect and composed of many tubes aggregated together, rooted by a filiform stolon; hydrothecae tubular, sessile or with a short pedicel, without an operculum, more or less regularly disposed on the stem and branches; polypites cylindrical, with a conical proboscis'. — Hincks.

Lafoëa fruticosa (Sars, 1850)

Campanularia fruticosa Sars, 1850.
Campanularia gracillima Alder, 1857.
Calicella fruticosa Hincks, 1861b.
Lafoëa gracillima G. O. Sars, 1874.
Lafoëa fruticosa Sars, 1862.

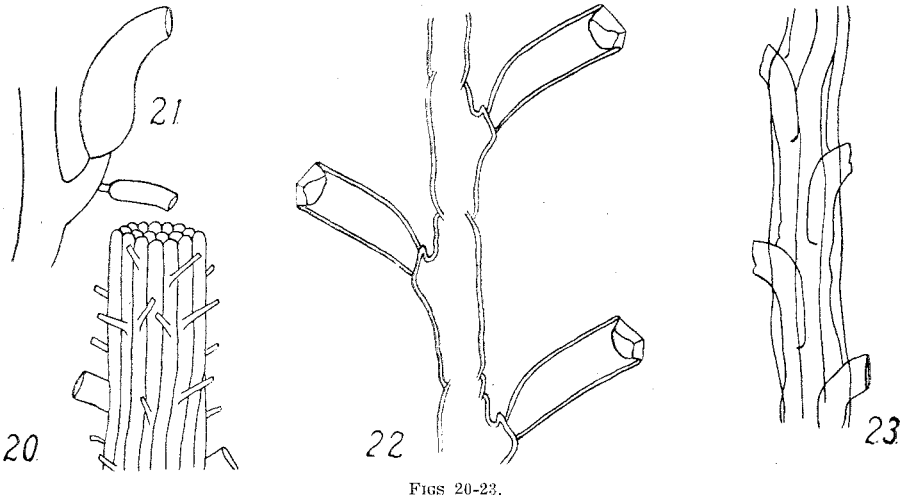
Trophosome: Hydrocaulus erect, polysiphonic, irregularly and often subunilaterally branched, attaining a height of about 7-8 cms. Hydrothecae long, slender, slightly curved with thin walls, borne on short pedicels which are either annulated (3-4 rings) or loosely twisted; aperture entire, margin smooth.

Locality: Bass Strait (Busk).

Distribution: Recorded from Great Britain; Bergen; North Cape; Iceland.

The specimen from Bass Strait, in Busk's collection, has been examined by Hincks who states he has 'little doubt that it is identical with the present species'.

Dimensions are not given. There is no specimen in this collection.



FIGS 20-23.

Perisiphonia exserta (Busk). Fig. 20: Distal end of pinna (after Allman). Fig. 21: Outline of hydrotheca showing a sarcotheca springing from its peduncle (after Allman). *Thyroscyphus simplex* (Lamouroux). Fig. 22: Portion of colony with hydrotheca. *Cryptolaria arboriformis* Ritchie. Fig. 23: Portion of fascicled branch with hydrothecae (after Ritchie).

Genus **Perisiphonia** Allman, 1888

'Hydrocaulus composed of two constituents, an axial and a peripheral; the axial formed by a continuous tube which carries at intervals along its length numerous tubes which completely surround the axial in its entire length, are

destitute of hydrothecae, but allow the hydrothecae of the axial tube to protrude through interstices between them into the surrounding water; the superficial tubes of the peripheral fascicle set with tubular sarcothecae'. Allman.

Perisiphonia exserta (Busk, 1858)

(Figs 20, 21)

Cryptolaria exserta Busk, 1858.
Perisiphonia filicula Allman, 1888.
Perisiphonia exserta Ritchie, 1911.

Trophosome: Hydrocaulus slender, polysiphonic, attaining a height of about 6 cm.; from the stem hydrocladia (pinnae), which may be slightly fascicled, arise in sub-opposite pairs lying in the same plane. Hydrothecae borne in two opposite series on axial tubes, regularly alternate, lying in one plane; hydrothecae cylindrical, adpressed to the axial tube for two-thirds of length, distal portion projecting through the fascicle of peripheral tubes; aperture round, margin smooth, slightly everted, little tendency to regeneration, not more than two reduplicated margins. Base of hydrotheca passes into an expanded portion of axial tube which represents a pedicel, this is marked by a strong oblique diaphragm. Sarcothecae occur on the stem and pinnae; more or less regularly placed on the external peripheral tubes; short, cylindrical, each placed on a forward projecting process which tapers towards distal end where the diameter is less than that of free portion of the sarcotheca.

Gonosome: Unknown.

Dimensions:

Peripheral tube, diameter	0·05-0·06 mm.
Hydrotheca, length adnate to axial tube	0·33-0·34 mm.
Hydrotheca, length free from axial tube	·012-0·15 mm.
Hydrotheca, diameter at mouth	0·12 mm.
Sarcotheca, length	0·05-0·06 mm.
Sarcotheca, diameter	0·035 mm.
Distance between adjacent hydrothecae on hydroclades	0·47-0·51 mm.

Locality: Seven miles east of C. Pillar, 100 fathoms (Briggs); Oyster Bay, 60 fathoms (Bale); Thirty-five miles south-east of Bruni Island, 150-230 fathoms (Bale).

Distribution: Recorded from Madeira, North Atlantic (Johnson); Station 75, near the Azores, Lat. 38° 38′ N., Long. 28° 28′ 30″ W., 450 fathoms (Allman); Station 163a, off Twofold Bay, N.S.W., 150 fathoms (Allman); Station 57, off Wata Mooli, N.S.W., 54-59 fathoms (Ritchie); Great Australian Bight, Long. 130° 40′ E., 160 fathoms (Bale).

The measurements quoted above are those given by Briggs (1914, p. 290), there being no specimen in this collection.

Genus **Cryptolaria** Busk, 1858

'Hydrocaulus consisting of two parts, an axial and a peripheral, the peripheral consisting of a fascicle of simple tubes, the axial of a single tube, simple or branched, whose proximal portion lies under cover of the peripheral, and whose distal portion is free. Hydrothecae borne both by the covered and free portions of the axial tube, tubiform, destitute of peduncles, with the cavity directly continuous with that of the axial tube, and with their walls never adnate to the axial tube, where this is covered

by the peripheral fascicle, but more or less adnate to the tube in the free portion of its course. Gonangia consisting of sac-like receptacles which spring at intervals from the axial tube and protrude externally through interstices between the peripheral fascicle'. Allman.

Cryptolaria arboriformis Ritchie, 1911

(Fig. 23)

Cryptolaria arboriformis Ritchie, 1911.

Trophosome: Hydrocaulus branched, polysiphonic, attaining a height of about 15 cm.; branches fascicled and very irregular; ultimate branchlets fascicled, lying in one plane and arising pinnately; the axial tube not jointed, but bearing alternate hydrothecae at regular intervals. Hydrothecae in one plane, close-set, small, elongate, adnate for most of length, narrow at base but widening upwards, concealed by peripheral fascicle except for a short free portion which curves outwards at an angle of about 50° to the axis; aperture round, slightly contracted, margin not reduplicated; no diaphragm at base of theca, but lower end of adcauline wall bends outwards towards abcauline wall to form a small ledge.

Gonosome: Unknown.

Dimensions:

Fascicle tube, diameter	0·07 mm.
Axial tube, diameter	up to 0·45 mm.
Hydrotheca, length of adnate portion	0·28-0·31 mm.
Hydrotheca, length of free portion	0·08-0·10 mm.
Hydrotheca, greatest diameter	0·10-0·12 mm.

Locality: Seven miles east of Cape Pillar, 100 fathoms (Briggs); Twenty-one miles N. 62° E. of Babel Island, Bass Strait (Bale).

Distribution: Recorded from Station 44, off Coogee, New South Wales, 49-50 fathoms (Ritchie).

The measurements recorded above are those given by Briggs (1914, p. 289), there being no specimen in this collection.

Genus **Hebella** Allman, 1888

'Hydrocaulus a creeping monosiphonic stolon. Hydrothecae cylindrical, with entire margin, destitute of operculum, and with the cavity distinctly differentiated from that of the peduncle'. — Allman.

Hebella calcarata (L. Agassiz, 1862) var. contorta Marktanner-Turneretscher, 1890

(Fig. 24)

Hebella contorta Marktanner-Turneretscher, 1890.

Hebella cylindrica, in part, Pictet, 1893.

Hebella scandens, in part, Bale, 1913.

Not *Lafoëa cylindrica* von Lendenfeld, 1884.

Hebella calcarata, in part, Billard, 1907b.

Trophosome: Hydrocaulus slender, monosiphonic, branching, bearing hydrothecae on very short pedicels. Hydrothecae straight, slightly curved or twisted; rounded near the level of the diaphragm which separates the cavity from that of the pedicel; basal portion below the diaphragm short; aperture simple, margin smooth, slightly everted.

Dimensions:

Hydrotheca, length (Marktanner-Turneretscher)	0·46 mm.
Hydrotheca, length (Bale)	0·37-0·40 mm.
Hydrotheca, diameter	0·15 mm.

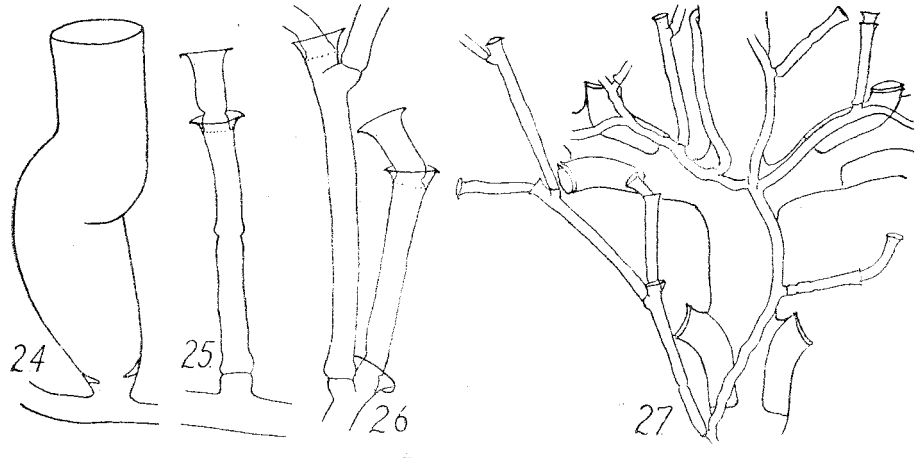
Locality: Ten miles north of Circular Head, on *Sertularia unguiculata* Busk (Bale).

Distribution: Recorded from New South Wales (Ritchie); Singapore (Marktanner-Turneretscher).

Bale (1915, p. 254) says; 'There is room for a difference of opinion as to whether *H. contorta*, which is distinguished from *H. calcarata* by the smaller size and somewhat twisted form of the hydrothecae, should be regarded as a distinct species'. He goes on to state that his specimens, compared with those of Marktanner-Turneretscher, had the hydrotheca rather less twisted, and in some cases not at all.

The dimensions above are the only ones given, there not being a specimen in this collection.

This species, in common with *Hebella calcarata*, is only found in association with another hydroid.



Figs 24-27.

Hebella calcarata var. *contorta* Marktanner-Turneretscher. Fig. 24: Hydrotheca arising from creeping hydrocaulus (after Marktanner-Turneretscher). *Halecium fragile* n.sp. Fig. 25: Shoot composed of a single internode with terminal hydrophores. Fig. 26: Portion of a shoot. Fig. 27: Portion of colony growing on *Synthecium patulum* (Busk).

Family HALECIIDAE

'Hydrothecae biserial, subsessile, jointed to a lateral process from the stem; polypites partially retractile'. Hincks.

Genus **Halecium** Oken, 1815

'Zoophyte plant-like, more or less branched, rooted by a creeping stolon; hydrothecae biserial, tubular or deeply campanulate, subsessile, jointed to a short lateral process from the stem; polypites partially retractile, large and fusiform; gonothecae scattered, dissimilar in the two sexes; reproduction by means of fixed sporosacs'. — Hincks.

Halecium fragile n. sp.

(Figs 25-27)

Trophosome: Hydrorhiza a creeping, filiform stolon, smooth or irregularly undulated. Hydrocaulus monosiphonic, sparingly branched or simple, consisting of shoots which attain a length of about 4-5 mm.; shoots flexuous, composed of long cylindrical internodes which are smooth or marked with irregularly placed transverse constrictions; internodes alternate, variable in length, each arising from a small lateral process immediately below the terminal hydrophore of the preceding one. Hydrophores tubular, shallow, expanded from diaphragm to margin which is smooth, and strongly everted; hydrophores may be regenerated up to four times each successive one arising at the level of the diaphragm of the former.

Gonosome: Gonothecae not present.

Dimensions:

Hydrorhiza, diameter	0·05-0·07 mm.
Hydrocaulus, internode, length	0·70-1·66 mm.
Hydrocaulus internode, diameter	0·05-0·08 mm.
Hydrophore, diameter at aperture	0·12-0·15 mm.
Hydrophore, diameter at diaphragm	0·07-0·08 mm.
Hydrophore, depth (margin to diaphragm)	0·036-0·042 mm.

Locality: D'Entrecasteaux Channel.

The specimen was growing epizoically upon a colony of *Synthecium patulum* (Busk), which was attached to the shell of the Commercial Scallop, *Notovola fumatus*.

The hydrorhiza of the specimen is a simple unjointed tube which, similar to the habit of *Hebella*, grows up the main stem of the host, giving off branches to the pinnae.

Shoots are very short, delicate, not exceeding 5 mm. in length, borne on small processes of the hydrorhiza; the form varies from single internodes with terminal hydrophores to shoots composed of a number of internodes, but usually not more than five or six.

The method of growth is cymose, typical of the Haleciidae. Each successive internode arises on a small lateral process beneath the terminal hydrophore of the preceding one. Shoots are normally unbranched, but in one case an internode bears no terminal hydrophore, but gives rise to two internodes (branches); and in two cases, two internodes (branches) arise beneath the terminal hydrophore.

The internodes may be marked by transverse constrictions which are not laid down in any regular or systematic plan.

The hydrophores each have a circlet of refractile puncta at the level of the diaphragm. The regenerated (secondary) hydrophores may be short, but in some cases the basal portion is nearly as long as one of the stem internodes.

The type specimen is in the Australian Museum.

Halecium flexile Allman, 1888

(Figs 25-27)

Halecium flexile Allman, 1888.
Halecium gracile Bale, 1888.
Halecium parvulum Bale, 1888.
Halecium balei Fraser, 1911.
No. 16, *Halecium* sp. Inaba, 1890.

Trophosome: Hydrocaulus branching, polysiphonic, attaining a height of about 2 cm.; branching irregular, with stem and branches flexuous, divided into long internodes by twisted oblique joints. Hydrophores alternate, borne at the distal end of the internode, tubular, with an everted margin, and often with secondary calycles arising within the old ones.

Gonosome: 'The male is pyriform, or club-shaped, laterally compressed, attached to the hydrocaulus by a short peduncle, and not terminal on a branch.

The female large, ovate, compressed, sporosac decidedly narrower than the capsule, with a space at the upper part not occupied by ova'. Bale, 1888.

Dimensions:

Hydrocaulus internode, length	0·57-0·66 mm.
Hydrocaulus internode, diameter	0·13-0·16 mm.
Hydrotheca, depth	0·06-0·08 mm.
Hydrotheca, diameter at aperture	0·15-0·16 mm.
Hydrotheca, diameter at base	0·08-0·10 mm.
Gonotheca, length	up to 0·60 mm.
Gonotheca, breadth	up to 0·50 mm.

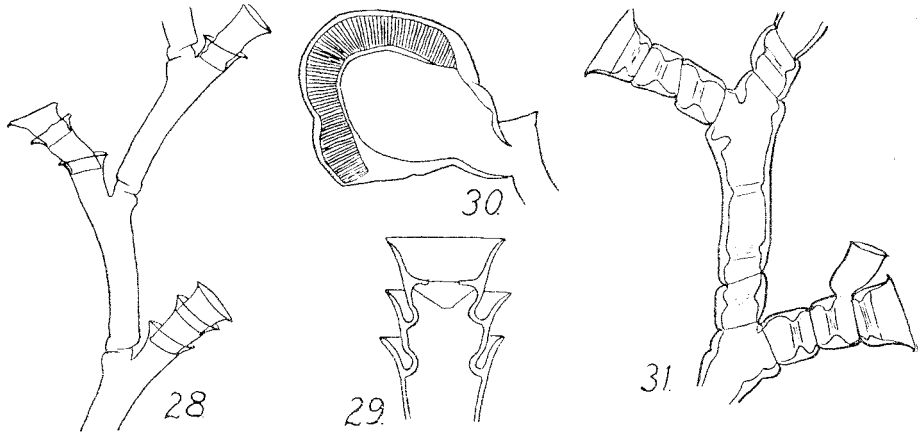
Locality: Eaglehawk Neck (February, 1948); Seven miles east of C. Pillar, 100 fathoms (Briggs); Ten miles north of Circular Head (Bale).

Distribution: Recorded from Station 145, off Marion Island, 50 fathoms (Allman); Station 312, Port Famine, Patagonia, Lat. 53° 37′ 30″ S., Long. 70° 65′ W., 9 fathoms (Allman); Port Stephens; Port Jackson; Bondi, N.S.W. (Bale); Gulf of Manaar, Ceylon (Thornely); Station 44, off Coogee, N.S.W., 49-50 fathoms (Ritchie).

The specimen agrees with that described by Bale (1888, p. 759) in its small size and monosiphonic habit. Allman's original description of the species was of a large form 10 cm. high, and polysiphonic at the base of the stem. The species described in present paper was originally named *Halecium gracile* by Bale, but was subsequently shown to be identical with *Halecium flexile* Allman.

A single hydrophore arises primarily from each internode, but with increasing age it may be regenerated three or four times, the point of origin being on or near the diaphragm of the preceding one.

The refractile puncta near the rim of the hydrophore, noted by Bale (1888, p. 760), have not been observed in any of the specimens in this collection. The polypite is connected with the coenosarc by a narrow neck, or strand, a characteristic feature of the Campanulariidae.



FIGS 28-31.

Halecium flexile Allman. Fig. 28: Portion of colony. Fig. 29: Longitudinal section through three hydrophores showing method of regeneration. Fig. 30: Gonotheca. *Phylactotheca armata* Stechow. Fig. 31: Portion of colony.

Genus **Phylactotheca** Stechow, 1913

Stem, when present regularly jointed, hyaline, monosiphonic; hydrotheca completely free, strictly alternate, bell-like. Hydranth large, similar to Halecium. Hypostome conical. Nematophores monothalamic, unmoveable, bell-shaped.

This generic description is modified from that of Stechow (1913, p. 155) by the omission of the words 'without basal-chamber' in the description of the hydrotheca. *Phylactotheca pacifica*, the species for which Stechow erected the genus, lacked a diaphragm in the hydrophore. However, *P. armata* Stechow possesses a diaphragm, and Stechow failed to alter his generic description to accommodate this feature.

Phylactotheca armata Stechow, 1924

(Fig. 31)

Phylactotheca armata Stechow, 1924.
Ophiodissa fragilis Blackburn, 1937a, b.

Trophosome: Hydrocaulus monosiphonic, occasionally branched, attaining a height of about 2 cm.; stem consists of alternate long and short internodes with oblique joints, and with the perisarc thickened into annuli which form partial cross-septa; the long internodes bear pedicellate hydrophores near their distal ends, the arrangement being alternate; pedicels consist of one to three segments and appears to be formed by differentiation during growth of hydrophores. Hydrophores borne terminally, one on a pedicel, free, bell-shaped, as deep as wide, margin entire and everted; a delicate septum is present about one-third of length from base, and on this the hydranth rests. Sarcothecae, single-chambered, large,

fixed, with an everted margin. They occur one or two on the stem, but more often in association with a hydrophore, in which case a single one arises from a segment of the pericel. Not all Hydrophores have these accosiated sarcothecae, there often being only one or two on the whole colony.

Gonosome: Gonothecae sub-spherical, arising at the junction of stem and hydrorhiza, or stem and pedicel.

Dimensions:

Hydrocaulus internode (long), length	0·33-0·47 mm.
Hydrocaulus internode (short), length	0·08-0·10 mm.
Hydrocaulus internode, diameter	0·12-0·13 mm.
Hydrophore, depth	0·12-0·13 mm.
Hydrophore, breadth at aperture	0·18-0·25 mm.
Sarcotheca, length	0·13-0·15 mm.
Sarcotheca, diameter at aperture	0·10 mm.

Locality: Bicheno (May, 1949).

Distribution: Champion Bay, W.A. (Stechow); Lady Julia Percy Island (Blackburn).

The specimen in this collection, on which the above description is based, was taken from storm-drifted sea-weed. It consists of a number of upright shoots, not more than 1·5 cms. high; only one of the shoots bearing a short lateral branch. The gonosome was not present.

Stechow (1924, p. 59) states that sarcothecae occur on the stem as well as in association with the hydrophores. In none of the present specimens, however, are there cauline sarcothecae. This may be due to injury.

Family SYNTHECIDAE

Genus **Synthecium** Allman, 1876

'Hydrocaulus divided into definite internodes, each internode carrying a pair of opposite hydrothecae, or a single hydrotheca which alternates with those of the internodes on each side of it. Hydrothecae adnate to a greater or less extent to the internode.

Gonangia borne on peduncles which spring from within the cavity of certain hydrothecae, where they take the place of the hydranths'. — Allman.

Synthecium patulum (Busk, 1852)

(Figs 32, 33)

Sertularia patula Busk, 1852.
Sertularia orthogonia Busk, 1852.
Synthecium patulum Bale, 1888.

Trophosome: Hydrocaulus monosiphonic, pinnately or bipinnately branched, attaining a height of about 4 cm.; stem jointed; internodes long, each bearing a single pair of hydrothecae near the middle, and a pair of opposite pinnae near the distal end; pinnae distant, at an angle of about 70° to stem axis, internodes each bearing one pair of hydrothecae. Hydrothecae opposite, not in contact with each other, tubular, adnate about three-quarters of length; free portion divergent, ascending; aperture circular, with margin entire, sinuated, slightly everted and regenerated one or twice.

Dimensions:

Hydrocaulus internode, length	2·00-2·33 mm.
Hydrocaulus internode, diameter	0·30-0·33 mm.
Pinna internode, length	0·66-0·71 mm.
Hydrotheca, length	0·50-0·58 mm.
Hydrotheca, length (free portion)	0·17-0·20 mm.
Hydrotheca, diameter at aperture	0·17-0·18 mm.

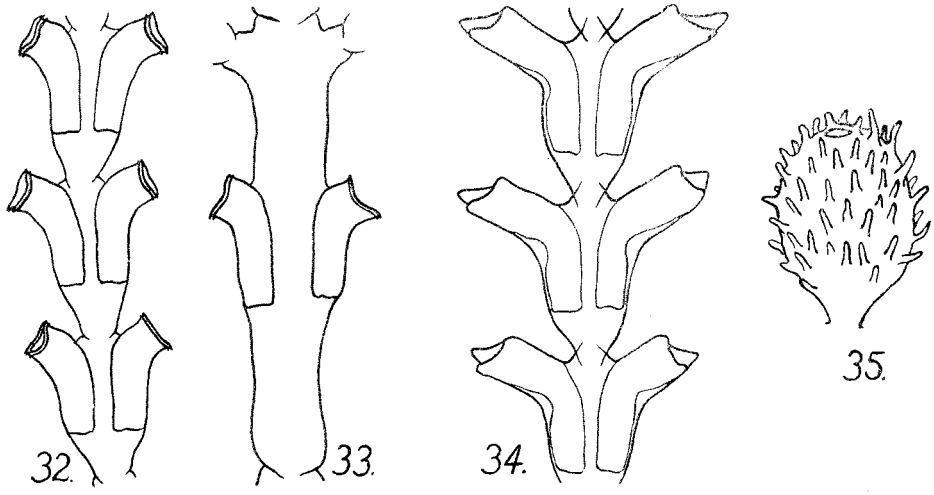
Locality: D'Entrecasteaux Channel; Bass Strait (Busk).

Distribution: Recorded from Williamstown, Victoria; Queenscliff, Victoria (Bale); Mouth of Snowy River (MacGillivray).

The example, from D'Entrecasteaux Channel, was found growing in association with *Halecium fragile* n.sp. attached to the shell of the Commercial Scallop *Notovola fumatus*.

In common with most other species of *Synthecium* the two hydrothecae forming the proximal pair on any pinna, are dissimilar. The base of the upper one is closer to the stem axis, and the free portion of the adcauline wall is markedly shorter than that of the others on the pinna.

In the absence of the gonosome it is not known whether the specimen is male or female. Totton (1930, p. 68) states: 'There is reason to believe that the dimensions of the male and female specimens of any species are different, the female being sometimes the larger and somtimes the smaller'.



FIGS 32-35.

Synthecium patulum (Busk). Fig. 32: Portion of pinna. Fig. 33: Stem internode, with single pair of hydrothecae, and single pair of pinnae. *Diphasia sub-carinata* (Busk). Fig. 34: Portion of colony, with paired hydrothecae. Fig. 35: Gonotheca.

Family SERTULARIIDAE

'Hydrothecae perfectly sessile, more or less inserted in the stem and branches; polypites wholly retractile, with a single wreath of filiform tentacles around a conical proboscis; gonozooids always fixed'. — Hincks.

The classification of this family is still under review, there being disagreement among taxonomists as to generic characters.

Prior to 1893 there was general agreement that the basis for separation of genera was the method of arrangement of hydrothecae. However, Levinsen, in 1892, put forward the view that generic separation should depend on the opercular structure, associated with the condition of the hydrotheca margin.

Genus **Selaginopsis** Allman, 1877

'Hydrophyton consisting of a single axile tube, to which the hydrothecae are adnate, and on which they are disposed in several longitudinal rows'. — Allman.

Selaginopsis dichotoma (Allman, 1888)

Dictyocladium dichotomum Allman, 1888.
Selaginopsis dichtoma Billard, 1910.

Trophosome: Hydrocaulus branching, monosiphonic, attaining a height of about 10-12 cm.; jointing distinct at branch origins, but obscure elsewhere; branching dichotomous, in one plane, with branches anastomosing to form a net. Hydrothecae tubular, stout, divergent, adnate for most of length; margin of aperture with three deep emarginations, often regenerated (five or six times); operculum of three valves; hydrothecae arranged spirally in four longitudinal series.

Gonosome: Gonothecae erect, large, ellipsoid, axially placed and arising from the inner side of a branch just above origin; 'encircled by a very wide spiral wing the perisarc of which is double'. Bale (1915, p. 265); aperture tubular, slightly expanding.

Locality: Off South Cape, 75 fathoms (Bale); Thirty-five miles south-east of Bruni Island, 150-230 fathoms (Bale); Station 162, off East Moncoeur Island, Bass Strait, 38-40 fathoms (Allman).

Dimensions are not given. There is no specimen in this collection.

Genus **Diphasia** L. Agassiz, 1862

'Zoophyte plant-like, stem more or less branching, jointed, rooted by a creeping stolon; hydrothecae opposite, a pair on each internode, occasionally sub-alternate, with an internal valve-like operculum; gonothecae scattered, differently shaped in the two sexes—the female ample, more or less cleft or divided into segments above, containing a marsupial chamber; the male smaller, with a central tubulous aperture'. — Hincks.

Diphasia sub-carinata (Busk, 1852)

(Figs 34, 35)

Sertularia sub-carinata Busk, 1852.
Diphasia sub-carinata Bale, 1884.

Trophosome: Hydrocaulus monosiphonic, attaining a height of about 5 cm.; stem simple, or with irregular, pinnately disposed branchlets; a single pair of hydrothecae on each internode. Hydrothecae opposite, long, tubular, somewhat expanded upwards, upper half widely divergent, not in contact with each other; aperture large, with an internal operculum, and with three large, blunt marginal lobes, two laterals, and one external and inferior.

Gonosome: Gonothecae borne on the lower part of the hydrocaulus in one or two rows; ovate, with a narrow tubular orifice; the surface is covered with small curved spines, except for an area near the stalk, and for most of the side which is adpressed to the hydrocaulus.

Dimensions:

Hydrocaulus internode, length	0·80-0·83 mm.
Hydrotheca, length adnate	0·49-0·55 mm.
Hydrotheca, length free	0·49-0·51 mm.
Hydrotheca, diameter of free portion	0·20-0·25 mm.
Gonotheca, length	up to 1·00 mm.
Gonotheca, diameter	0·60 mm.

Locality: Bicheno (May, 1949); Bass Strait (Busk); Off Devonport and Launceston (Bale); Twenty miles east of King Island, Bass Strait (Bale).

Distribution: Recorded from Port Stephens (Haswell); Griffiths' Point (Goldstein); Portland (Maplestone); Queenscliff; Williamstown; Great Australian Bight, 40-100 fathoms (Bale); Forty miles west of Kingston, S.A., 30 fathoms (Bale).

The specimen consists of a number of reddish-brown shoots arising from a colourless hydrorhiza, growing on the holdfast of storm-drifted *Macrocystis*.

Bale (1884, p. 103) mentions the presence of a keel, or ridge, running down the front of the hydrotheca. This however, is not present on any of the specimens in this collection.

Genus **Sertularia** Linné, 1758 (in part)

'Zoophyte plant-like; stems simple or branching, jointed, rooted by a creeping stolon; hydrothecae biserial, opposite to alternate, without external operculum, mostly arranged in pairs; gonothecae scattered, with a simple orifice, and without an internal marsupium'. — Bale.

Key to the Genus Sertularia

1.	Hydrothecal margin with two teeth	4
	Hydrothecal margin with more than two teeth	2
2.	Hydrotheca with three teeth	*S. tridentata* Busk
	Hydrotheca with more than three teeth	3
3.	Pinnae alternate; hydrothecal margin with six teeth	*S. elongata* Lamouroux
	Pinnae opposite; hydrothecal margin with about six teeth	*S. insignis* Thompson
4.	Hydrocaulus short (1-2 cm.), simple	5
	Hydrocaulus branched (not pinnately)	6
	Hydrocaulus pinnately branched; pinnae alternate, one on an internode; hydrothecae opposite to alternate	7
5.	Hydrothecae adnate to margin or nearly so	*S. minima* Thompson
	Hydrothecae adnate about one-half of length, short and squat	*S. loculosa* Bale
6.	Branching dichotomous; hydrothecae opposite, adnate to margin, not in contact	*S. operculata* Linné
	Branching rare; hydrothecae opposite, tubular, adnate about two-thirds length, in contact in front but not behind	*S. pusilla* Bale
7.	Hydrothecae ovato-conic	*S. penna* Kirchenpauer
	Hydrothecae sub-tubular (flask-shaped)	8
	Hydrothecae tubular	9
8.	Hydrothecae with a strong tooth projecting inwards from abaxial marginal wall	*S. macrocarpa* Bale
	Hydrothecal marginal teeth laterally placed, equal	*S. australis* Kirchei
	Hydrothecal marginal teeth unequal, one small in front, other larger in outer angle	*S. pulchella* Thompson
9.	Hydrothecae with an internal process arising from middle of abaxial wall	*S. maplestonei* Bale
	Hydrothecae (pinnate) adnate for half-length, projecting forward; hydrothecae in contact for two-thirds length	*S. geminata* Bale
	Hydrothecae (pinnate) adnate or immersed, teeth large, lobate, outer recurved	*S. unguiculata* Busk

Sertularia operculata Linné, 1758

(Figs 36, 37)

Sertularia operculata Linné, 1758.
Sertularia usneoides Pallas, 1766.
Nigellastrum usneoides Oken, 1815.
Sertularia serra Lamarck, 1816.
Dynamena serra Blainville, 1834.
Dynamena brevicella Lamouroux, 1824b.
Sertularia brevicella Milne-Edwards, 1836.
Dynamena operculata Lamouroux, 1816.
Amphisbetia operculata L. Agassiz, 1862.
Dynamena fasciculata Kirchenpauer, 1864.
Odontotheca operculum Levinsen, 1913.
?Dynamena pulchella D'Orbigny, 1839-1846.
?Sertularia pulchella Nutting, 1904.
?Sertularia crinis Allman, 1886.

Trophosome: Hydrocaulus slender, monosiphonic, attaining a height of about 20 cm., much branched dichotomously, bearing a pair of opposite hydrothecae on each internode. Hydrothecae tubular, adnate to the margin or nearly so, not in contact with each other; aperture with a small spine-like tooth in front, and a larger tooth on the posterior, outer side, the latter usually slightly incurved.

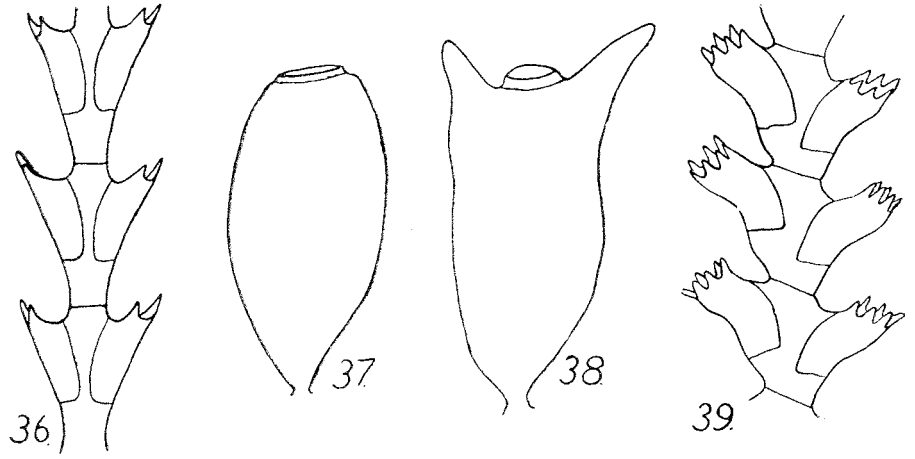
Gonosome: Gonothecae obovate, smooth, large, with an elevated collar around the aperture which is operculate.

Dimensions:

Hydrocaulus internode, length	0·50-0·55 mm.
Hydrotheca, length	0·30-0·32 mm.
Hydrotheca, diameter	0·13-0·15 mm.
Gonotheca, length	up to 1·50 mm.
Gonotheca, diameter	up to 0·75 mm.

Locality: D'Entrecasteaux Channel (August, 1949); Seven miles east of Cape Pillar, 100 fathoms (Briggs); Devonport; near Circular Head (Bale).

Distribution: Cosmopolitan.



FIGS 36-39.

Sertularia operculata Linnaeus. Fig. 36: Portion of colony. Fig. 37: Gonotheca. *Sertularia elongata* Lamouroux. Fig. 38: Gonotheca. Fig. 39: Portion of colony.

In the specimens in this collection the joints of the hydrocaulus are not visible other than as constrictions below the hydrothecae.

This species is very abundant in the D'Entrecasteaux Channel, being constantly taken in the form of large tangled masses, in scallop dredges.

Sertularia elongata Lamouroux, 1816

(Figs 38, 39)

Sertularia elongata Lamouroux, 1816.
Sertularia scandens Lamouroux, 1816.
Sertularia lycopodium Lamarck, 1816.
Sertularia millefolium Lamarck, 1816.
Dynamene abietinoides Gray, 1843.
Sertularia abietinoides Hutton, 1872.

Trophosome: Hydrocaulus monosiphonic, flexuous, pinnately or bipinnately branched, attaining a height of about 7-8 cm.; each stem internode bears a pinna, an axillary hydrotheca, and a pair of hydrothecae above; pinnae alternate, internodes bearing one or more pairs of hydrothecae. Hydrothecae sub-alternate, not in contact, tubular, divergent, adnate about half length, margin of aperture with six spine-like teeth.

Gonosome: Gonothecae on the stem or pinnae, large, pyriform, sides produced into two erect spine-like processes extending above aperture; aperture with tubular neck, and an operculum.

Dimensions:

Hydrocaulus internode, length	up to 0·80 mm.
Pinna internode, length	0·44-0·50 mm.
Hydrotheca, length	0·30-0·33 mm.
Hydrotheca, diameter	0·16-0·20 mm.
Gonotheca, length	2·32 mm.
Gonotheca, length excluding spines	2·00 mm.
Gonotheca, breadth	0·83 mm.

Locality: D'Entrecasteaux Channel; Oyster Bay (May, 1949); Devonport; Bass Strait.

Distribution: Recorded from South Australia; Victoria; New Zealand.

The specimen from Oyster Bay, the basis of the above description consists of a number of dark brown colonies which were taken from storm-drifted seaweed. All the specimens were incomplete due to injury.

Sertularia minima Thompson, 1879

(Figs 41, 42)

Synthecium gracilis Coughtrey, 1874.
Sertularia pumila Coughtrey, 1875.
Sertularia minima D'A. W. Thompson, 1879.
Sertularia pumiloides Bale, 1881.
?Sertularia crinoidea Allman, 1886.
Odontotheca minima Levinsen, 1913.

Trophosome: Hydrocaulus simple, monosiphonic, attaining a height of about 1·5 cm., divided into regular internodes by oblique joints, each internode with a pair of hydrothecae. Hydrothecae opposite, tubular, in contact or approximate in front, but separate behind, adnate for most of length, upper half divergent; aperture looking upwards and outwards, margin with two lateral teeth, the outer the larger.

Gonosome: Gonothecae obovate, elongate, with margin of aperture elevated into a collar; aperture operculate.

Dimensions:

Hydrocaulus internode, length	0·42-0·43 mm.
Hydrocaulus internode, diameter	0·22-0·25 mm.
Hydrotheca, length	0·22-0·23 mm.
Hydrotheca, diameter	0·13-0·15 mm.
Gonotheca, length	up to 1·25 mm.
Gonotheca, diameter	up to 0·66 mm.
Gonotheca, diameter of aperture	0·30 mm.

Locality: South Arm, Derwent Estuary (July, 1947); Eaglehawk Neck (February, 1948); Rheban (May, 1949); Oyster Bay (May, 1949).

Distribution: Recorded from New Zealand (Coughtrey); Gulf of St. Vincent (Thompson); Portland (Maplestone); Williamstown; Queenscliff; Great Australian Bight (Bale).

The specimens in this collection were taken from storm-drifted seaweed, and from *Macrocystis* growing near low-tide level. The majority of specimens do not exceed 1 cm. in height.

Bale (1915, p. 270-272) discusses the presence, in both this species and *Sertularia pusilla*, of minute tubular appendages near the base of some of the internodes; the presence of these tubular 'sarcothecae' has also been noted by Mulder and Trebilcock (1914b, p. 39). However, in none of the numerous specimens in this collection is there any structure comparable to the 'sarcothecae' described or figured by the above authors.

There is a considerable range of size and shape, the dimensions quoted being for one of the most typical forms.

Sertularia pusilla Bale, 1915

(Fig. 40)

Sertularia minima Thompson, var. *tubatheca* Mulder and Trebilcock, 1914b.
Sertularia pusilla Bale, 1915.
Not *Sertularia tubitheca* Allman, 1877.

Trophosome: Hydrocaulus sparingly branched or simple, monosiphonic, attaining a height of about 1 cm., usually divided into internodes, each of which bear a pair of hydrothecae, but in some cases the joints may be lacking on part or all of the stem. Hydrothecae opposite, tubular, in contact or approximate in front, but separate behind, adnate for about two-thirds of length, upper half moderately divergent; aperture margin with two lateral lobes, or teeth, the outer the larger.

Gonosome: Gonothecae borne singly on the proximal internode of the shoot; ovate, somewhat compressed, the margin elevated to form a low collar with minute internal denticles.

Dimensions:

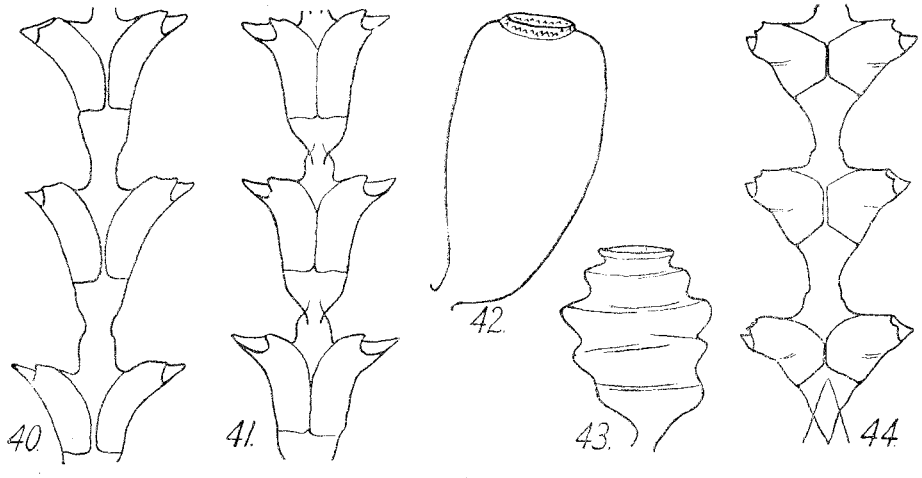
Hydrocaulus internode, length	0·33-0·45 mm.
Hydrocaulus internode, diameter	0·05-0·07 mm.
Hydrotheca, length	0·23-0·25 mm.
Hydrotheca, diameter at aperture	0·07-00·8 mm.

Locality: South Arm, Derwent Estuary (April, 1947); Bicheno (May, 1949); Devonport and Launceston (Bale); Bass Strait (August, 1949).

Distribution: Recorded from Queenscliff (Mulder and Trebilcock); Victoria.

The specimens in this collection were taken from *Macrocystis* stipe, near low-tide level (South Arm); and from storm-drifted material (Bicheno). The specimen from Bass Strait, growing epizoically on a pleopod of *Jasus lalandii*, consisted of a single colony bearing shoots about 5 mm. high.

The minute tubular 'sarcothecae' described by Bale (1915, p. 270), have not been observed.



FIGS 40-44.

Sertularia pusilla Bale. Fig. 40: Portion of colony. *Sertularia minima* Thompson. Fig. 41: Portion of colony. Fig. 42: Gonotheca. *Sertularia loculosa* Bale. Fig. 43: Gonotheca. Fig. 44: Portion of colony.

Sertularia loculosa Bale, 1884

(Figs 43, 44)

Sertularia loculosa Bale, 1884.
Sertularia turbinata Billard, 1910.
?Sertularia turbinata Ritchie, 1910.
Not *Sertularia loculosa* Busk, 1852.
Not *Dynamena turbinata* Lamouroux, 1816.

Trophosome: Hydrocaulus simple, monosiphonic, attaining a height of about 1-2 cm., divided into internodes; joints either single and horizontal, or double, the lower being horizontal, the upper very slender and oblique. Hydrothecae in pairs, short and squat, opposite, in contact in front but not behind, adnate about one-half length; upper half markedly divergent, with angle of flexure appearing as a nearly horizontal fold; base very oblique; aperture contracted, directed outwards and upwards, margin with two lateral teeth.

Gonosome: Gonothecae borne on the proximal internodes of the hydrocaulus; ovate, truncate, with strong transverse rugae; aperture large, operculate.

Dimensions:

Hydrocaulus interdode, length	0·55-0·58 mm.
Hydrotheca, length	0·28-0·30 mm.
Hydrotheca, diameter	0·20-0·22 mm.
Hydrotheca, diameter at aperture	0·12-0·13 mm.

Locality: Bicheno (May, 1949); Bass Strait, 45 fathoms (Busk).

Distribution: Recorded from Portland (Maplestone); Queenscliff.

The specimen, which is the basis of this description, lacks gonothecae. The oblique joints between the internodes are marked, but the single, horizontal joints are rather obscure, the appearance being of long internodes bearing several pairs of hydrothecae.

The specimen was found growing on storm-drifted *Macrocystis*.

Sertularia unguiculata Busk, 1852

(Figs 45, 46)

Sertularia unguiculata Busk, 1852.
Sertularia sp.? Coughtrey, 1876.
Thuiaria ambigua Thompson, 1879.
Desmoscyphus unguiculata Allman, 1886.
Dynamena australis Kirchenpauer, 1864.
Sertularia australis Thompson, 1879.
Desmoscyphus pectinatus Allman, 1888.
Sertularia Challengeri Nutting, 1904.
?Thuiaria heteromorpha Allman, 1886.
Not *Sertularia australis* Bale, 1886.

Trophosome: Hydrocaulus monosiphonic, pinnately branched, attaining a height of about 15 cm.; stem divided into long and short internodes; long internodes bear a pinna with two hydrothecae above and one below on one side. and a pinna with three hydrothecae above on the other; short internodes bear a pinna, an axillary hydrotheca, and a pair of hydrothecae above. Pinnae alternate, proximal internodes may be long bearing several pairs of hydrothecae, the distal internodes usually short with one or two pairs. Hydrothecae tubular, subalternate on the stem, opposite on the pinnae, upper portion free, divergent, directed towards the front, lower portion adnate, often immersed; hydrothecae on pinnae in contact or approximate in front, separate behind; aperture oval, small, margin with two large lateral teeth, the outer recurved.

Gonosome: Gonothecae borne on the hydrocaulus, large, obovate, aperture operculate, with a low collar.

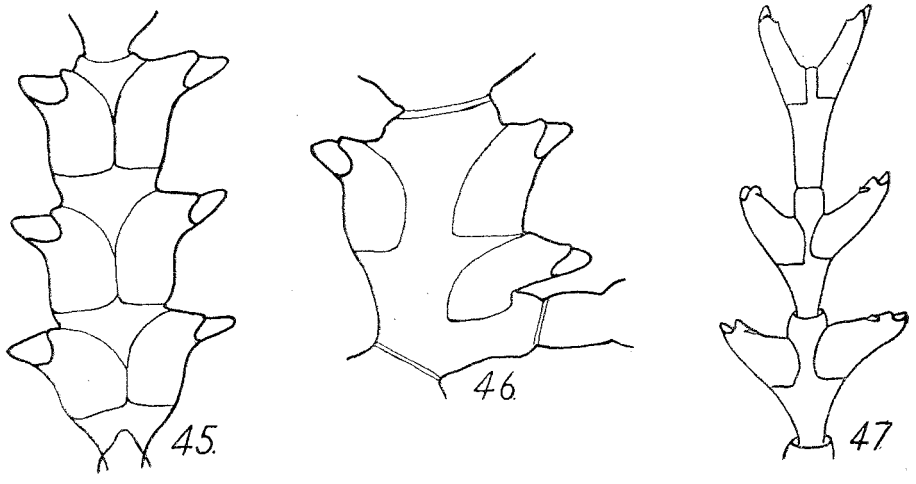
Dimensions:

Hydrocaulus internode (long), length	1·08 mm.
Hydrocaulus internode (short), length	0·58-0·65 mm.
Pinna internode, length (4 pairs thecae)	1·16-1·22 mm.
Pinna internode, length (3 pairs thecae)	0·96-1·00 mm.
Pinna internode, length (2 pairs thecae)	0·73-0·78 mm.
Pinna internode, length (1 pair thecae)	0·38-0·41 mm.
Hydrotheca, length	0·22-0·25 mm.
Hydrotheca, breadth (frontal aspect)	0·10-0·12 mm.
Hydrotheca, breadth (lateral aspect)	0·16-0·18 mm.

Locality: Oyster Bay (May, 1949); Ten miles north of Circular Head (Bale); Bass Strait (Bale).

Distribution: Recorded from Portland (Maplestone); Griffiths' Point (Goldstein); Queenscliff; New Zealand; Robe, S.A. (Smeaton); Sydney (Maplestone).

According to Bale (1914b, p. 16-19) this species is very variable, both in size (from 2 cm. to 15 cm.) and in form. The specimens in this collection, from Oyster Bay, are all under 3 cm. in length, and were taken from storm-drifted kelp.



FIGS 45-47.

Sertularia unguiculata Busk. Fig. 45: Portion of branch. Fig. 46: Stem internode. *Sertularia macrocarpa* Bale. Fig. 47: Portion of colony (after Bale).

Sertularia macrocarpa Bale, 1884

(Fig. 47)

Sertularia macrocarpa Bale, 1884.
Odontotheca macrocarpa Levinsen, 1913.

Trophosome: Hydrocaulus slender, flexuous, monosiphonic, pinnately branched, attaining a height of about 12-15 cm.; stem jointed, each internode bearing a branch, an axillary hydrotheca, and a pair of hydrothecae above; branches alternate, internodes with one or two pairs of hydrothecae. Hydrothecae flask-shaped or sub-tubular, opposite to sub-alternate, in contact in front but not behind, adnate for about one-half length, upper side of free part nearly horizontal except towards distal end of branch where free part is elongated and produced upwards; aperture small, facing upwards, margin with two rounded lateral teeth, and a tooth projecting inwards from the adaxial wall.

Gonosome: Gonothecae large, obovate, borne in rows on the stem; aperture operculate with a low collar.

Locality: Bass Strait (Bale).

Distribution: Recorded from Queenscliff; Williamstown; Portland (Maplestone).

Dimensions are not given. There is no specimen in this collection.

Sertularia pulchella Thompson, 1879

(Fig. 48)

Sertularia pulchella D'A. W. Thompson, 1879.
?Sertularia bicuspidata Lamarck, 1816.

Trophosome: Hydrocaulus slender, flexuous, monosiphonic, pinnately branched, attaining a height of about 1-2 cm.; stem internodes each bearing a pinna, an axillary hydrotheca, and a pair of hydrothecae above; pinnae alternate, internodes with one to three pairs of hydrothecae. Hydrothecae flask-shaped, with upper wall horizontal, opposite to alternate, approximate or in contact in front, adnate about one-half length; a small process projects into cell from abaxial wall, a little above the base; aperture small, looking upwards, margin with two spine-like teeth, one anterior, and one on posterior outer angle.

Gonosome: Gonothecae pyriform, large, with sides produced into two large, erect, conical proceses extending above aperture which is operculate and has a low collar. Gonothecae borne singly near base of shoot.

Locality: George Town (Thompson).

Distribution: Recorded from South Australia (Smeaton).

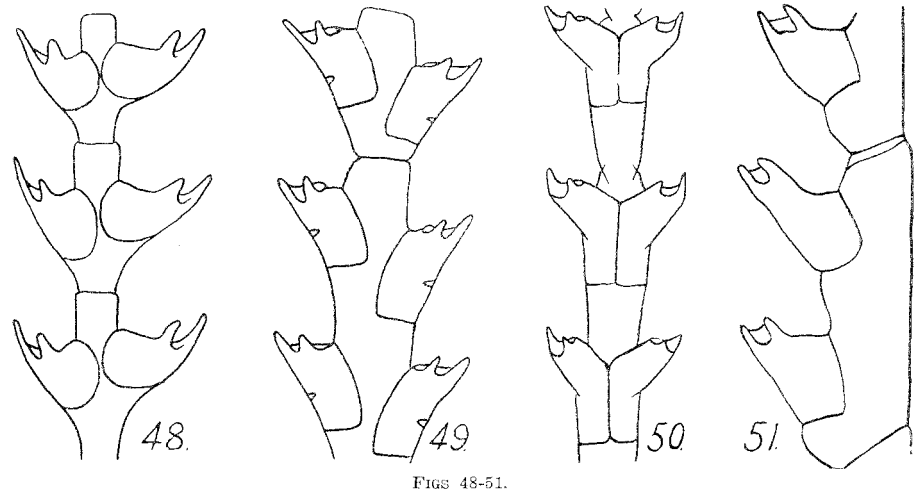
Dimensions are not given. There is no specimen in this collection.

Sertularia maplestonei Bale, 1884

(Fig. 49)

Sertularia maplestonei Bale, 1884.
Odontotheca maplestonei Levinsen, 1913.
Not *Thuiaria maplestonei* Billiard, 1907.

Trophosome: Hydrocaulus monosiphonic, slender, pinnately branched, attaining a height of about 6-8 cm.; stem divided into internodes each bearing a pinna, an axillary hydrotheca, and a pair of hydrothecae above; pinnae alternate, internodes diminishing in length from the proximal, each internode with from one to



FIGS 48-51.

Sertularia pulchella Thompson. Fig. 48: Portion of colony. *Sertularia maplestonei* Bale. Fig. 49: Portion of colony. *Sertularia geminata* Bale. Fig. 50: Portion of stem in frontal aspect (after Bale). Fig. 51: Portion of stem in lateral aspect (after Bale).

five pairs of hydrothecae. Hydrothecae tubular, divergent, sub-alternate, not in contact with one another, adnate nearly to margin, free portion short; a small process projects into cell from middle of the abaxial wall; aperture facing upwards, margin with two teeth, one anterior, the other at the posterior outer angle.

Gonosome: Gonothecae elongate, sub-tubular, produced into two angular processes at the sides of the aperture; aperture operculate, margin elevated into a low collar.

Locality: Hunter Group, Bass Strait, 15 fathoms (Bale).

Distribution: Recorded from Portland (Maplestone); Victoria (Marktanner-Turneretscher).

Dimensions are not given. There is no specimen in this collection.

Sertularia geminata Bale, 1884

(Figs 50, 51)

Sertularia geminata Bale, 1884.
Desmascyphus orifissus Allman, 1886.

Trophosome: Hydrocaulus monosiphonic, branched, slender, attaining a height of about 10-12 cm.; stem internodes each with a pinna, an axillary hydrotheca, and a pair of hydrothecae above; pinnae alternate, attached to the stem by an oblique joint, internodes variable in length, the proximal ones longest, bearing three to four pairs of hydrothecae. Hydrothecae tubular, divergent in the upper half; sub-alternate on the stem, opposite on the pinnae; those on pinnae in contact with one another for about two-thirds of length, and adnate for about one-half length to pinna from which they project forwards; aperture oval, small, facing upwards and outwards, margin with two incurved, lateral teeth.

Gonosome: Gonothecae ovate, borne on the stem and pinnae; aperture operculate with a low collar.

Locality: Twenty miles east of King Island, Bass Strait (Bale).

Distribution: Recorded from Portland (Maplestone); Queenscliff; South coast of South Australia (Bale).

Dimensions are not given. There is no specimen in this collection.

Sertularia insignis Thompson, 1879

(Fig. 52)

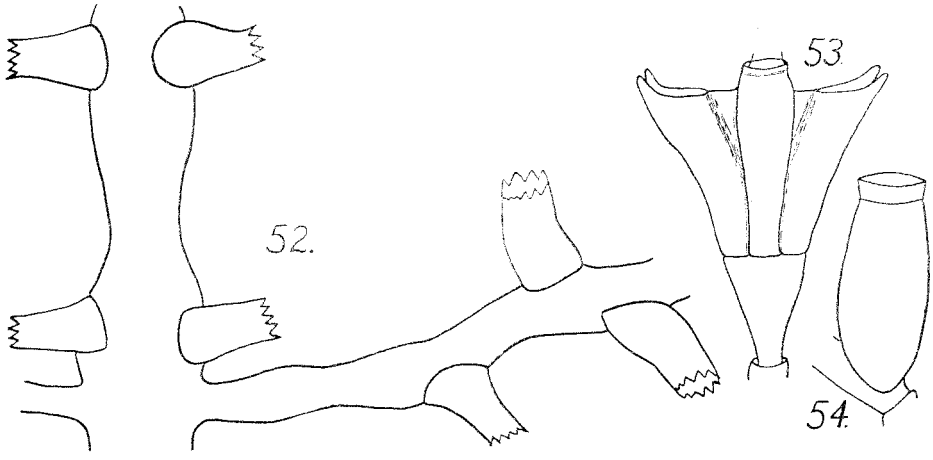
Sertularia insignis D'A. W. Thompson, 1879.

Trophosome: Hydrocaulus monosiphonic, pinnately branched, attaining a height of about 16-18 cm.; pinnae opposite; jointing obscure on both stem and pinnae. Hydrothecae tubular, elongate, tapering slightly towards aperture the margin of which is furnished with about six small, rounded teeth; hydrothecae opposite on stem, at 90° to axis, alternate to sub-alternate on pinnae, at about 80° to axis.

Gonosome: Gonothecae large, elongate, oblong, with two blunt divergent spines at the upper angles; aperture small; gonothecae arise from pinnae close to their origin.

Locality: George Town (Harvey).

Dimensions are not given. There is no specimen in this collection.



FIGS 52-54.

Sertularia insignis Thompson. Fig. 52: Portion of colony (after Bale). *Sertularia penna* (Kirchenpauer). Fig. 53: Internode of stem (after Bale). Fig. 54: Gonotheca (after Bale).

Sertularia penna (Kirchenpauer, 1864)

(Figs 53, 54)

Dynamena penna Kirchenpauer, 1864.
Sertularia penna Bale, 1884.

Trophosome: Hydrocaulus monosiphonic, pinnately branched, attaining a height of about 6-8 cm.; stem internodes each bearing a pinna, an axillary hydrotheca, and a pair of hydrothecae above; pinnae alternate. Hydrothecae opposite, obconical, adnate to the margin or nearly so; aperture large, facing upwards and outwards, margin with two lateral spine-like teeth.

Gonosome: Gonothecae small, cylindrico-tubular, slightly contracted towards aperture which is expanding with a broad collar.

Locality: Bass Strait (Kirchenpauer).

Dimensions are not given. There is no specimen in this collection.

Sertularia australis (Kirchenpauer, 1864)

Dynamena australis Kirchenpauer, 1864.
Sertularia australis Thompson, 1879.

Trophosome: Hydrocaulus short, slender, monosiphonic, pinnately branched; stem internodes each bearing a pinna, an axillary hydrotheca, and a pair of hydrothecae above; pinnae alternate, internodes bearing one or two pairs of hydrothecae. Hydrothecae sub-alternate, those on pinnae in contact, adnate about one-half length, divergent, tapering slightly towards aperture which faces upwards and outwards; margin of aperture with two lateral teeth.

Gonosome: Gonothecae large, urceolate; aperture operculate with a low collar.

Locality: George Town (Thompson).

Distribution: Recorded from Port Phillip (Kirchenpauer, Thompson); Scaler's Cove; Cape Lefebvre.

Dimensions are not given. There is no specimen in this collection.

Sertularia tridentata Busk, 1852

Sertularia tridentata Busk, 1852.

Trophosome: Hydrocaulus monosiphonic, pinnately branched, attaining a height of about 5-6 cm.; branches borne on the middle 2 cm. of the stem, with those in the centre longer than those above and below. Hydrothecae urn-shaped, paired, opposite, divergent in the upper half, in contact in front, contracted towards the aperture; aperture entire, circular, looking upwards and outwards, margin with two long, slightly everted, lateral teeth, and one short, sharp superior tooth.

Locality: Bass Strait (Busk).

Dimensions are not given. There is no specimen in this collection.

Genus **Sertularella** Gray, 1843

'Zoophyte plant-like; stem simple or branching, jointed, rooted by a creeping stolon; hydrothecae biserial, decidedly alternate, one usually borne on each internode, with an operculum composed of several pieces, the orifice generally toothed; gonothecae usually ringed transversely'. — Bale.

Key to the Genus Sertularella

1.	Hydrothecae with three marginal teeth	2
	Hydrothecae with four marginal teeth	5
2.	Hydrothecae contracted towards aperture	*S. indivisa* Bale
	Hydrothecae not contracted towards aperture	3
3.	Hydrocaulus monosiphonic	4
	Hydrocaulus polysiphonic, hydrotheca adnate up to margin which may be regenerated	*S. adpressa* Ritchie
4.	Hydrocaulus simple, short (about 1 cm.)	*S. pygmaea* Bale
	Hydrocaulus pinnately, bipinnately, or irregularly branched	*S. divaricata* (Busk)
5.	Hydrocaulus simple, monosiphonic	6
	Hydrocaulus pinnately branched, polysiphonic	*S. tasmanica* Bale
6.	Hydrocaulus internodes undulated; hydrothecae squat, marginal teeth small, with shallow emarginations between	*S. undulata* Bale
	Hydrocaulus internodes smooth, twisted at joints; hydrothecae elongate, transversely rugose, contracted towards aperture	*S. robusta* Coughtrey

Sertularella indivisa Bale, 1881

(Figs 55, 56)

Sertularella indivisa Bale, 1881.
Sertularella solidula Bale, 1881.
Sertularella variabilis Bale, 1888.
Sertularella sieboldi Kirchenpauer, 1884.
*Sertularella müller*i Kirchenpauer, 1884.
Not *Sertularella indivisa* Stechow, 1913.

Trophosome: Hydrocaulus simple or pinnately branched, attaining a height of about 5 cm., divided into internodes by twisted joints, each internode bearing a hydrotheca, or a hydrotheca and a branch. Hydrothecae adnate for one-third to one-half length, divergent, transversely rugose (two or three ridges), becoming narrowed and contracted towards the aperture which is furnished with three marginal teeth, one superior and two laterals; operculum of three internal, compressed, vertical teeth, which alternate with the marginal ones.

Gonosome: Gonothecae three or four times the length of a hydrotheca, borne on hydrocaulus or hydrorhiza; ovate, with distinct transverse rugae, and with a tubular neck bearing on the summit three to six lobes or teeth.

Dimensions:

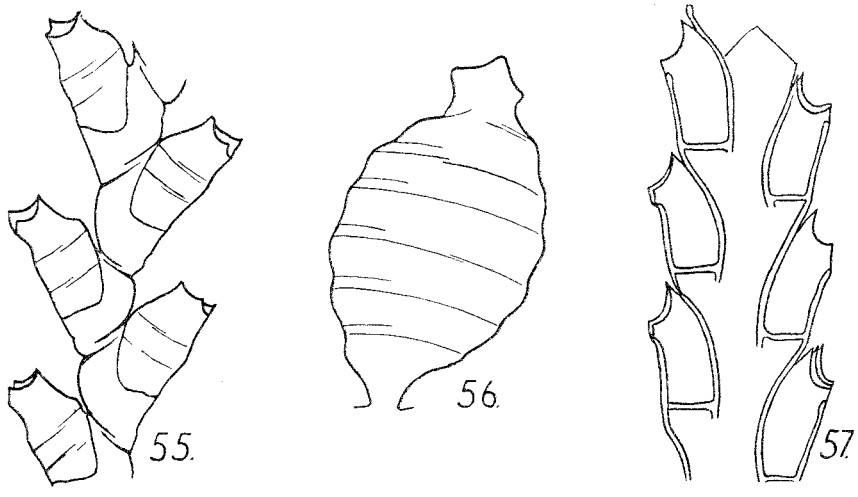
Hydrocaulus internode, length	very variable.
Hydrotheca, length	0·42-0·47 mm.
Hydrotheca, diameter	0·28-0·32 mm.
Hydrotheca, diameter at aperture	0·17-0·18 mm.
Gonotheca, length	up to 1·10 mm.
Gonotheca, diameter	up to 0·66 mm.

Locality: Adventure Bay (September, 1949); Blackman's Bay, Derwent Estuary (March, 1938); South Arm, Derwent Estuary (April, 1949); Eaglehawk Neck (February, 1948); Oyster Bay (May, 1949); Bass Strait (Bale).

Distribution: Recorded from South East Australia.

There is a wide range of variation among the specimens in this collection, some being profusely branched, others simple, some with rugose hydrothecae, others smooth. However, in nearly all cases the measurements agree over a narrow range.

The variations in this species have been discussed at length by Bale (1915, p. 285), and Hartlaub (1890, 1900, 1901), and in consequence *Sertularella indivisa*, *Sertularella solidula*, and *Sertularella variabilis* have been united in the one species.



FIGS 55-57.

Sertularella indivisa Bale. Fig. 55: Portion of colony. Fig. 56: Gonotheca. *Sertularella adpressa* Ritchie. Fig. 57: Part of branch with hydrothecae (after Ritchie).

Sertularella adpressa Ritchie, 1911

(Fig. 57)

Sertularella adpressa Ritchie, 1911.

Trophosome: Hydrocaulus polysiphonic, profusely branched, attaining a height of about 10 cm.; main branches fascicled; stem and branches bear pinnae which are alternate, and in one plane; stem divided into regular internodes, joints oblique,

successively sloping in opposite directions; in pinnae the jointing becomes obscure. Hydrothecae tubular, adnate to the margin or nearly so; margin of aperture with three equal teeth, a superior and two laterals; margin often regenerated; an internal operculum of three pieces.

Gonosome: Gonothecae elongate, club shaped, sessile, smooth or weakly rugose; aperture small, margin elevated; borne immediately below a hydrotheca on stem, branches or pinnae, and lying closely pressed against the member.

Dimensions:

Hydrocaulus internode, length	up to 1·36 mm.
Pinna, diameter	0·42 mm.
Hydrotheca, length	0·42-0·43 mm.
Hydrotheca, diameter	0·19-0·21 mm.
Gonotheca, length	up to 2·00 mm.
Gonotheca, greatest breadth (frontal aspect)	0·64-0·71 mm.
Gonotheca, greatest breadth (lateral aspect)	0·52-0·64 mm.

Locality: Seven miles east of Cape Pillar, 100 fathoms (Briggs); Oyster Bay, 60 fathoms (Bale).

Distribution: Recorded from Station 36, of Botany Bay, N.S.W., 20-23 fathoms (Ritchie); Station 54, within Jervis Bay, N.S.W., 10-11 fathoms (Ritchie); Shoalhaven Bight, N.S.W., 15-45 fathoms (Bale).

The measurements quoted above are taken from Briggs (1914, p. 291), there being no specimen in this collection.

Sertularella robusta (Coughtrey, 1874)

(Fig. 58)

Sertularia simplex Coughtrey, 1874.
Sertularella robusta Coughtrey, 1875.
?Sertularella sp. Thompson, 1879.
?Sertularella microgona von Lendenfeld, 1884.
Sertularella angulosa Bale, 1894.
Not *Sertularella tenella* Alder, Hartlaub, 1901.

Trophosome: Hydrocaulus monosiphonic, simple, flexuous, attaining a height of about 1·5 cm.; stem divided by oblique joints into long internodes each bearing a hydrotheca near its distal end. Hydrothecae large, divergent, transversely rugose, adnate for about one-third of length, contracted towards the aperture, the margin of which is furnished with four teeth; operculum consists of three internal, vertical, compressed teeth.

Gonosome: Gonothecae ovate, transversely rugose, aperture with a toothed margin.

Dimensions:

Hydrocaulus internode, length	up to 1·00 mm.
Hydrocaulus internode, diameter at joint	0·08-0·10 mm.
Hydrotheca, length	0·43-0·47 mm.
Hydrotheca, length free	0·28-0·30 mm.
Hydrotheca, diameter at aperture	0·13-0·15 mm.
Hydrotheca, maximum diameter	0·22-0·23 mm.

Locality: D'Entrecasteaux Channel (April, 1947); Rheban (May, 1949).

Distribution: Recorded from Lyall Bay, New Zealand (Hutton); Otago (Coughtrey); Brown's River (Thompson); Port Phillip, Victoria (von Lendenfeld).

The specimens in this collection, the basis of the above description, consist of simple upright shoots not more than 1·5 cm. in height. The example from Rheban was taken from a piece of storm-drifted seaweed.

Sertularella undulata Bale, 1915

(Fig. 59)

Sertularella undulata Bale, 1915.

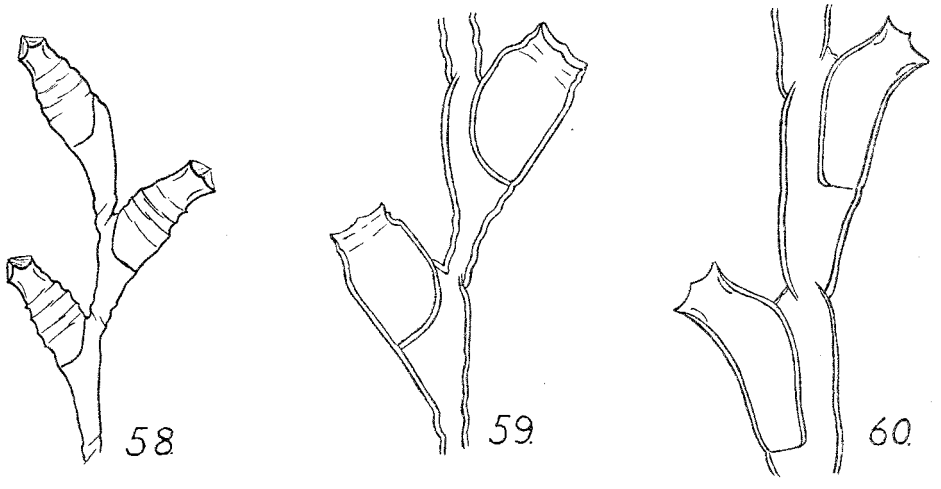
Trophosome: Hydrocaulus simple, monosiphonic, attaining a height of about 1 cm.; stem divided into internodes of variable length by twisted oblique joints; each internode bears a hydrotheca distally, the portion of internode below the hydrotheca being undulated. Hydrothecae short, squat, adnate about one-half length, proximal portion smooth, distal portion with a strong annular shoulder beyond which hydrotheca narrows and bears another smaller annulation close to the margin; aperture wide, square in outline, margin with four small teeth having between them shallow emarginations; no operculum.

Gonosome: Unknown.

Locality: Off South Cape, 75 fathoms (Bale).

The specimen, consisting of a single colony, was found growing epizoically on *Sertularella tasmanica* Bale.

Dimensions are not give. There is no specimen in this collection.



FIGS 58-60.

Sertularella robusta (Coughtrey). Fig. 58. Portion of colony. *Sertularella undulata* Bale. Fig. 59: Portion of colony (after Bale). *Sertularella tasmanica* Bale. Fig. 60: Portion of colony (after Bale).

Sertularella tasmanica Bale, 1915

(Fig. 60)

Sertularella tasmanica Bale, 1915.

Trophosome: Hydrocaulus polysiphonic, branched, attaining a height of about 3 cm.; branching irregularly pinnate, stem and branches divided into long internodes by twisted oblique joints; hydrothecae borne at distal end of internodes,

with branches arising below them; proximal branch internodes very long and may be slightly undulated at origin. Hydrothecae large, divergent, lying in one plane, adnate more than one-half length; expanded slightly towards aperture, margin with four teeth; operculum of three strong internal teeth.

Dimensions:

Stem internode, length below hydrotheca	about 0·45 mm.
Branch proximal internode, length below hydrotheca	up to 1·80 mm.
Hydrotheca, length	about 0·82 mm.

Locality: Off South Cape, 75 fathoms (Bale).

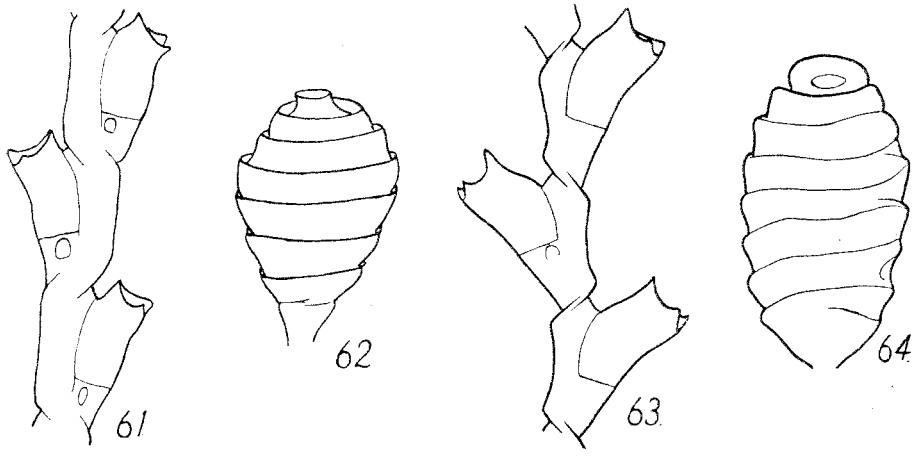
The dimensions given above are from the original specific description by Bale (1915, p. 283). There is no specimen in this collection.

Sertularella divaricata (Busk, 1852)

(Figs 61, 62)

Sertularia divaricata Busk, 1852.
Sertularella divaricata Bale, 1894.
Sertularella subdichotoma Kirchenpauer, 1884
Sertularella johnstoni Bale, 1884.
Not *Sertularella johnstoni* Gray, 1843.

Trophosome: Hydrocaulus monosiphonic, pinnate, bipinnate, or irregularly branched, attaining a height of about 10 cm.; pinnae alternate on regular forms; stem internodes with one to three hydrothecae, pinna internodes with one only. Hydrothecae tubular, distant, adnate more than one-half length, free portion divergent; margin of aperture with three teeth, the superior slightly recurved.



FIGS 61-64.

Sertularella divaricata (Busk). Fig. 61: Portion of colony. Fig. 62: Gonotheca. *Sertularella pygmaea* Bale. Fig. 63: Portion of colony. Fig. 64: Gonotheca.

Gonosome: Gonothecae obovate, annulate, borne on the pinnae; aperture eccentrically placed, wide and tubuliform.

Dimensions:

Hydrocaulus internode, length	up to 2·00 mm.
Hydrotheca, length adnate	0·25-0·33 mm.
Hydrotheca, length free	0·08-0·13 mm.
Hydrotheca, diameter at aperture	0·15-0·17 mm.
Hydrotheca, diameter at base	0·12-0·15 mm.

Locality: Seven miles east of Cape Pillar, 100 fathoms (Briggs); Oyster Bay (May, 1949); Bicheno (May, 1949); Bass Strait (Bale).

Distribution: Recorded from Victoria; South Australia; Queensland; New Zealand, South America, Antarctica.

There is a considerable variation of form in the specimens in this collection. The internodes, particularly, are very variable in length, with the accompanying effect on both microscopic and macroscopic appearance. This variability is discussed at length by Bale (1914b, p. 20).

The specimens in this collection are mostly small, not exceeding 3 cm. in height; they were taken from storm-drifted seaweed.

Sertularella pygmaea Bale, 1881

(Figs 63, 64)

Sertularella pygmaea Bale, 1881.

Trophosome: Hydrocaulus simple, monosiphonic, attaining a height of about 1 cm., divided into internodes by twisted joints; each internode bears a hydrotheca distally. Hydrothecae tubular, divergent, smooth, adnate about half length; no floor to hydrotheca, but hydranth supported by a small ledge formed from the adcauline wall; margin of aperture with three teeth, one superior and two laterals.

Gonosome: Gonothecae borne on the lower part of the stem; large, transversely rugose, aperture on the end of a short tubular neck which arises within the most distal of the rugae; margin entire.

Dimensions:

Hydrocaulus internode, length	0·31-0·33 mm.
Hydrotheca, length	0·23-0·25 mm.
Hydrotheca, diameter	0·13-0·15 mm.
Gonotheca, length	0·75-0·80 mm.
Gonotheca, diameter	0·46 mm.

Locality: Oyster Bay (May, 1949); Bicheno (May, 1949).

Distribution: Recorded from Griffiths' Point (Goldstein); Portland (Maplestone); Queenscliff; New Zealand; Robe, S.A.

This species is not very abundant, only a few scattered colonies being found on storm-drifted kelp. The colonies were all under 1 cm. in height.

This species bears a marked resemblance in form to *Sertularella divaricata* Busk, but the simple unbranched habit, and the small size, provide a ready method of distinction.

Genus **Symplectoscyphus** Marktanner-Turneretscher, 1890

'Hydrocladia projecting in short hydrotheca-free processes which generally are attached to other hydrocladia or branches. Arrangement and shape of hydrothecae similar to that of *Sertularella*. Margin of aperture of hydrotheca toothed. One or more very delicate membranous valves, operculum-shaped, are present.

Gonothecae elongate, pyriform, annulate, a short tubuliform aperture at the distal end'. — Marktanner-Turneretscher.

Symplectoscyphus columnarius (Briggs, 1914)

(Fig. 65)

Sertularella columnaria Briggs, 1914.

Symplectoscyphus columnarius Totton, 1930.

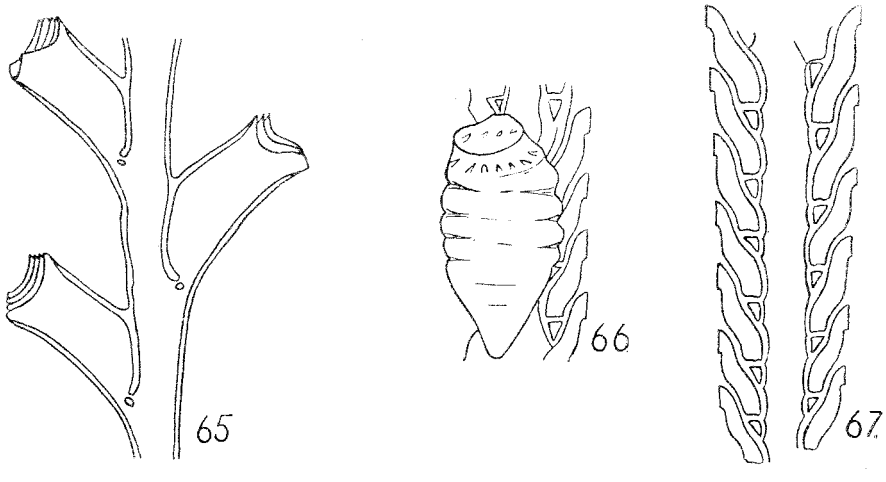
Trophosome: Hydrocaulus polysiphonic, branched, attaining a height of about 7 cm.; stem divided into regular internodes by oblique joints which slope successively in opposite directions; each internode bears a hydrotheca or a hydrotheca and a branch; branches regular, monosiphonic, alternate, in one plane, arising below a hydrotheca, slightly constricted at origin, nodes becoming obscure. Hydrothecae borne at the distal end of internodes, adnate about half length, distant, tubular, smooth, curved outwards; margin of aperture with three teeth, one superior and two laterals; some tendency to regeneration, margin may be duplicated or triplicated.

Gonosome: Gonothecae ovate, three distinct rugae on distal half, proximal half smooth, aperture tubuliform and expanding.

Dimensions:

Hydrocaulus internode, length	1·04-1·16 mm.
Hydrocaulus internode, diameter	0·40-0·43 mm.
Branch internode, length	0·73-0·87 mm.
Branch internode, diameter	0·35-0·38 mm.
Hydrotheca, length adnate	0·64-0·70 mm.
Hydrotheca, length free	0·70-0·76 mm.
Hydrotheca, diameter at mouth	0·50-0·53 mm.
Gonotheca, length	3·19 mm.
Gonotheca, greatest diameter	1·30-1·68 mm.
Gonotheca, diameter of aperture	0·45 mm.

Locality: Seven miles east of Cape Pillar, 100 fathoms (Briggs); Off Maria Island, 65 fathoms (Briggs).



FIGS 65-67.

Symplectoscyphus columnarius (Briggs). Fig. 65: Portion of colony (after Briggs). *Thuiaria sinuosa* Bale. Fig. 66: Gonotheca (after Bale). Fig. 67: Portion of pinna (after Bale).

Distribution: Recorded from New Zealand (Bale); Off Three Kings Islands, New Zealand, 100 fathoms (Totton).

The measurements given above are taken from the descriptions by Briggs (1914, p. 293) and by Totton (1930, p. 180). There is no specimen in this collection.

Genus **Thuiaria** Fleming

'Zoophyte plant-like, stem branching, jointed, rooted by a filiform stolon; hydrothecae biserial, not in pairs, usually more or less immersed; gonothecae similar to those of *Sertularia*'. — Bale.

The adnate condition of the hydrotheca was originally taken to be the essential character of the genus *Thuiaria*, but this was shown by Allman to be quite inadequate. Allman went on to point out that a better distinguishing feature was the manner of jointing of the hydrocaulus, and stated that in the true Sertularians the jointing occurs between every two, or two pairs of hydrothecae. This, however, is definitely not a constant character in the Australian species.

The true distinction between *Thuiaria* and *Sertularia* is that in the former the hydrothecae are biserial, whereas in the latter they are in pairs; that is, in *Sertularia* there is always an even number of hydrothecae on an internode, while in *Thuiaria* odd or even numbers are equally likely to occur.

Thuiaria sinuosa Bale, 1888

(Figs 66, 67)

Thuiaria sinuosa Bale, 1888.

Trophosome: Hydrocaulus polysiphonic, pinnately branched, attaining a height of about 19 cm.; stem irregularly and indistinctly jointed; pinnae alternate, jointing also obscure; three hydrothecae between each two pinnae on the same side. Hydrothecae elongate, sub-conical, alternate on the stem, opposite to alternate on the pinnae; markedly biserial, adnate in lower half to the stem, and in the upper half to the hydrotheca above; a conspicuous triangular area below the base of each hydrotheca; aperture semi-circular, small, directed outwards.

Gonosome: Gonothecae borne on anterior of pinnae in rows; obovate, transversely rugose; aperture large, with elevated margin which possesses a few long internal spines.

Dimensions:

Stem, diameter of cladate tube	0·54 mm.
Pinna, length	up to 48·0 mm.
Pinna, diameter, including hydrotheca	0·47-0.50 mm.
Hydrotheca, length	0·61-0·64 mm.
Hydrotheca, greatest diameter	0·12-0·15 mm.
Gonangium, length	1·41-1·53 mm.
Gonangium, greatest diameter	0·68-0·75 mm.

Locality: Seven miles east of Cape Pillar, 100 fathoms (Briggs).

Distribution: Recorded from Station 54, within Jervis Bay, N.S.W., 10-11 fathoms (Ritchie); Port Molle, Queensland (Bale).

The measurements quoted above are taken from Briggs (1914, p. 294). There is no specimen in this collection.

Family PLUMULARIIDAE

'Hydrothecae sessile and unilateral. Zoophyte furnished with nematophores (minute calycles containing an extensile offshoot of the coenosarc, and frequently bearing thread-cells). Polypites with a single wreath of filiform tentacles around a conical proboscis; gonozooids always fixed'. — Hincks.

Genus **Plumularia** Lamarck, 1816 (in part)

'Zoophyte consisting of pinnate (or rarely undivided) shoots, often branched, jointed, rooted by a creeping stolon; hydrothecae generally more or less distant, margin not toothed; sarcothecae distributed along the hydrocaulus, not attached to the calycles; gonothecae never enclosed in corbulae nor protected by gonangial ramules'. — Bale.

The genus *Plumularia* includes species which possess a delicate hydrophyton, with the hydrothecae, and the pinnae, separated somewhat so as to give a slender and graceful appearance. Margins of the hydrothecae are always smooth. Sarcothecae are arranged on a definite plan, some regularly about the hydrothecae, others along the hydrocaulus; they are generally wine-glass shaped, narrow at the base ,and moveable; in some of the species those median in position are curved, fixed, with the adcauline wall cut away, and also with a stout attachment to the hydrocaulus.

KEY TO THE GENUS PLUMULARIA

1.	Median sarcothecae fixed	2
	Median sarcothecae never fixed	5
2.	Pinnae internodes each with a hydrotheca set at about 45° to axis	3
	Pinnae with alternate long and short internodes, hydrothecae borne only on the former	4
3.	Hydrocaulus simple, monosiphonic	*P. buskii* Bale
	Hydrocaulus bipinnately branched, polysiphonic	*P. sulcata* Lamarck
4.	Hydrocaulus simple, monosiphonic; hydrothecae at 70° to pinna axis, wall markedly thickened	*P. filicaulis* Poeppig
	Hydrocaulus branched, polysiphonic; hydrotheca at 40° to pinna axis, borne proximally on internode	*P. campanula* Busk
5.	Hydrocaulus, polysiphonic	6
	Hydrocaulus monosiphonic	7
6.	Hydrocaulus branched, colony procumbent; hydrothecae adnate up to margin, aperture at 90° to pinna	*P. procumbens* Spencer
7.	Hydrocaulus simple; hydrothecae single, terminal on a pinna, abaxial wall convex	*P. obliqua* Saunders
	Hydrocaulus branched	8
8.	Hydrothecae single, terminal on a pinna, abaxial wall concave	*P. pulchella* Bale
	Pinnae with alternate long and short internodes, hydrothecae borne only on the former	9
9.	Hydrothecae adnate up to margin, aperture at 90° to pinna	*P. setacea* (Ellis)
	Hydrothecae at 40° to pinna axis, margin of aperture entire	*P. setaceoides* Bale

Plumularia obliqua (Saunders)

(Fig. 68)

Laomedea obliqua Saunders, in litt.

Campanularia sp. Lister, 1834.

Plumularia obliqua Hincks, 1861.

Trophosome: Hydrorhiza with marginal markings; hydrocaulus simple, monosiphonic, attaining a height of about 1·5 cm.; stem flexuous, slender; pinnae alternate, arising near distal end of internode, each supporting a single hydrotheca. Hydrothecae campanulate, rounded at base, laterally compressed, aperture at 90° to pinna axis, margin sinuous; from summit of pinna a vestigial intrathecal ridge

projects into the calycle. Sarcothecae canaliculate, bithalamic; one median below calycle, one lateral on each side on end of pinna, one axillary, and one near middle of stem internode. The two lateral sarcothecae above calycle have the upper chamber compressed.

Gonosome: Gonothecae large, ovate, truncate above.

Distribution: Recorded from Williamstown, Victoria; Tasmania; England.

I can find no record of the Tasmanian locality from which this specimen was recorded. There is no specimen in this collection and dimensions are not given.

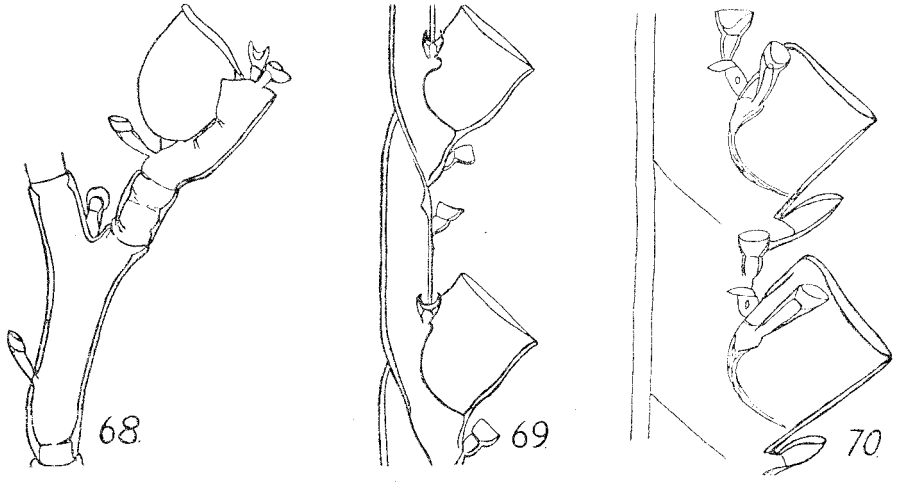
Plumularia campanula Busk, 1852

(Fig. 69)

Plumularia campanula Busk, 1852.
Plumularia indivisa Bale, 1881.
Plumularia laxa Allman, 1883.
Plumularia torresia von Lendenfeld, 1884.
Plumularia rubra von Lendenfeld, 1884.

Trophosome: Hydrocaulus branched, polysiphonic, erect, attaining a height of about 12 cm.; branches slender, pinnate, bearing both hydrothecae and pinnae; pinnae distant, alternate, arising from each or every second branch internode; pinna internodes long, with oblique joints, a hydrotheca borne on each, except the proximal of each pinna. Hydrothecae borne at the proximal end of internodes, large, campanulate, set at an angle of about 40° to pinna axis, margin entire, free at back. Sarcothecae canaliculate, bithalamic, median ones fixed with stout bases; one lateral, pedunculate, at each side of the hydrotheca, one median below, one between each two hydrothecae on the same internode as the lower, and one on the proximal internode of pinna.

Gonosome: Gonothecae ovate, tapering below, or short and broad; a sarcotheca on each side near peduncle.



FIGS 68-70.

Plumularia obliqua (Saunders). Fig. 68: Portion of colony (after Bale). *Plumularia campanula* Busk. Fig. 69: Portion of colony (after Bale). *Plumularia sulcata* Lamarck. Fig. 70: Portion of colony (after Bale).

Locality: Twenty miles east of King Island, Bass Strait (Bale); Oyster Bay, 60 fathoms (Bale).

Distribution: Recorded from Holborn Island, 20 fathoms; Port Stephens (Haswell); Portland (Maplestone); Williamstown (Bale).

Dimensions are not given. There is no specimen in this collection.

The species is separated into two varieties, one being the large polysiphonic form as described above; the other, originally described as *Plumularia indivisa* (Bale, 1881, pp. 39, 36), consisting of short, slender shoots which bear hydrothecae only. Both varieties have been taken from Bass Strait.

Plumularia sulcata Lamarck, 1816

(Fig. 70)

Plumularia sulcata Lamarck, 1816.
Plumularia aglaophenoides Bale, 1884.

Trophosome: Hydrocaulus polysiphonic, bipinnately branched, attaining a height of 45 cm., or more; stem and branches thick, flexuous, giving rise to monosiphonic branchlets; branchlets alternate and pinnate, arising one from each flexure; from the branchlets arise pinnae which are alternate, approximate, with a hydrotheca on each internode, joints oblique becoming more or less obscure distally. Hydrothecae large, campanulate, set at an angle of 45° to pinna axis, margin with a broad sinuation adaxially. Sarcothecae canaliculate, bithalamic; one median, fixed, below hydrotheca to which it is almost adpressed, adaxial margin deeply cut away; two large, pedunculate, wine-glass shaped at the sides; two small, at the back of the hydrotheca with two larger just above; one or two on proximal internode of the pinna; generally a double series on proximal portion of the branchlet. Only the lateral sarcothecae are freely moveable.

Gonosome: Gonothecae urceolate, large, with an oblique, circular aperture, the margin of which is not thickened; a large internal operculum rests on an internal ridge just below the margin; base surrounded by several large sarcothecae (5-6).

Dimensions:

Gonosome, length	up to 1·6 mm.
Gonosome, maximum diameter	0·70-0·71 mm.

Locality: Off Wineglass Bay, Freycinet Peninsula, 80 fathoms (Briggs); Bass Strait, 40 fathoms (Bale).

Distribution: Recorded from Mers australes (Lamarck); Broughton Island, N.S.W., 25 fathoms (Bale); Station 48, off Wollongong, N.S.W., 55-56 fathoms (Ritchie); Fifty miles south of Cape Wiles, S.A., 75 fathoms (Bale).

The dimensions given above are from Briggs (1915, p. 306). There is no specimen in this collection.

Plumularia pulchella Bale, 1881

(Fig. 71)

Plumularia pulchella Bale, 1881.

Trophosome: Hydrocaulus branched, monosiphonic, attaining a height of about 2·5 cm., slender and flexuous; pinnae alternate, arising near distal end of internode, bearing a single hydrotheca, the distal part curving from beneath hydrotheca, widening upwards. Hydrothecae campanulate, with an entire, slightly everted margin which rises above distal end of pinna; aperture at 90° to pinna

axis. Sarcothecae canaliculate, bithalamic, with slender bases; one median below calycle, two laterals on end of pinna, two axillaries, and one near middle of stem internode.

Gonosome: Gonothecae very large, ovate, obliquely truncate, aperture with large internal teeth.

Dimensions:

Hydrocaulus internode, length	0·33-0·40 mm.
Hydrocaulus internode, diameter	0·04-0·05 mm.
Pedicel, length	0·10-0·11 mm.
Pedicel, diameter	0·026-0·03 mm.
Hydrotheca, depth	0·11-0·13 mm.
Hydrotheca, diameter at aperture	0·10-0·11 mm.

Locality: D'Entrecasteaux Channel; Rheban (May, 1949).

Distribution: Recorded from Williamstown, Victoria.

The specimens which form the basis of this description were found growing epizoically on a Bryozoan (D'Entrecasteaux Channel), and on *Macrocystis* (Rheban).

Bale (1884, p. 140) states that the hydrocaulus is unbranched; while this appears to be the usual condition, one specimen in this collection reaches a height of 2·5 cm., and is irregularly branched, the branches arising in or near the pinna axils. The hydrorhizae in all the specimens are filiform stolons and not in the form of a mat (Bale, 1884, p. 140). Also the constrictions of the pinnae behind the hydrothecae are obscure in these specimens. They are not visible in lateral view, and are seen only faintly in a frontal view. Gonothecae are absent.

Plumularia filicaulus Poeppig, 1876

(Fig. 72)

Plumularia filicaulus Poeppig, 1876.
Plumularia lucerna Mulder & Trebilcock, 1911.
Antennella filicaulus Bedot, 1917.

Trophosome: Hydrorhiza ribbon-like, edges indented in a castellate pattern. Hydrocaulus simple, monosiphonic, attaining a height of about 1 cm.; stem jointed, each internode bearing a pinna; pinnae alternate, consisting normally of successive long and short internodes, with hydrothecae borne only on the former. Hydrothecae cup-shaped, walls greatly thickened, the thickening on the adcauline side forming a short, broad intrathecal ridge; margin of aperture entire, sinuous. Median sarcothecae bithalamic, canaliculate, stout, fixed; one below the hydrotheca, and one on the short internode. Lateral sarcothecae wine-glass shaped, moveable, monothalamic (?), with slender bases, and very thin delicate walls; one on each side above hydrotheca, and somewhat protected by it. Cauline sarcothecae, resemble medians; one in the axil, and one on lower part of stem internode.

Gonosome: Gonothecae irregularly ovate, arising from the hydrorhiza and closely adnate by the flat underside to the supporting material; upper surface transversely rugose, convex; aperture sub-terminal, facing upwards.

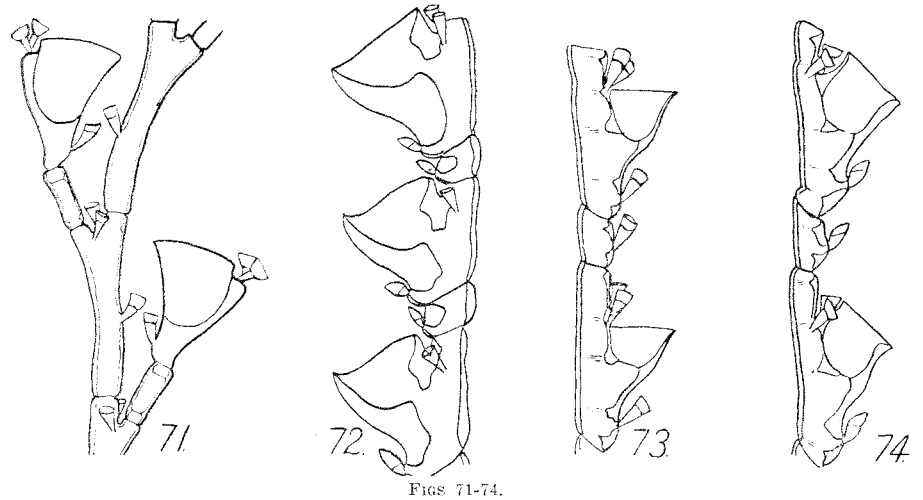
Dimensions:

Hydrocaulus internode, length	0·30-0·33 mm.
Hydrocaulus internode, diameter	0·07-0·10 mm.
Pinna internode (long), length	0·30-0·33 mm.
Pinna internode (short), length	0·10-0·12 mm.
Pinna internode, diameter	0·08-0·10 mm.
Hydrotheca, depth	0·12-0·13 mm.
Hydrotheca, breadth at aperture	0·25-0·28 mm.

Locality: Blackman's Bay, Derwent Estuary, 3-4 fathoms (July, 1949).

Distribution: Bay of Talcahuano, Chili (Poeppig); Portland (Maplestone); Point Lonsdale (Mulder & Trebilcock).

The specimen described above consists of a number of pinnate shoots. There are no simple shoots which, according to Mulder & Trebilcock (1916, p. 80), often arise from the same hydrorhiza as the pinnate shoots. The colony was growing on a divided *Macrocystis* lamina.



FIGS 71-74.

Plumularia pulchella Bale. Fig. 71: Portion of colony. *Plumularia filicaulus* Poeppig. Fig. 72: Portion of colony. *Plumularia setacea* (Ellis). Fig. 73: Portion of colony. *Plumularia setaceoides* Bale. Fig. 74: Portion of colony.

Plumularia setacea (Ellis, 1755)

(Fig. 73)

Corallina setacea Ellis, 1755.
Sertularia pinnata Linnaeus, 1758.
Sertularia setacea Pallas, 1766.
Aglaophenia setacea Lamouroux, 1816.
Aglaophenia gaymardi Lamouroux, 1824.
Plumularia setacea Lamarck, 1816.
Pennaria setacea Oken, 1815.
Plumularia multinoda Allman, 1886.
Plumularia tripartita von Lendenfeld, 1884.
Plumularia turgida Bale, 1888.
Plumularia palmeri Nutting, 1900.
Plumularia corrugata Nutting, 1900.

Trophosome: Hydrocaulus monosiphonic, sparingly branched, regularly jointed, attaining a height of about 5 cm.; pinnae alternate, arising at the distal end of stem internodes, with up to six hydrothecae. Alternate short and long internodes, former with a single sarcotheca only, the latter bearing both hydrothecae and sarcothecae. Hydrothecae campanulate, small, expanded upwards, back adnate up to the margin which is entire; aperture at 90° to pinna axis, or nearly so; borne near the middle of internodes, hydranths small, completely retractile, with a ring of 18 tentacles. Sarcothecae wine-glass shaped, bithalamic, canaliculate, with slender bases; one median below the hydrotheca, one lateral on each side above, one median on short internode, one or two in pinna axil, and one near proximal end of stem internode.

Gonosome: Gonothecae differ in the sexes; female smooth, ampullate, with a tubular neck and large orifice; male more slender and elongate, with a very narrow neck and a small terminal aperture.

Dimensions:

Hydrocaulus internode, length	0·30-0·33 mm.
Hydrocaulus internode, diameter	0·11-0·13 mm.
Pinna internode (long), length	0·30-0·33 mm.
Pinna internode (short), length	0·10-0·13 mm.
Pinna internode, diameter	0·05-0·07 mm.
Hydrotheca, depth	0·08-0·10 mm.
Hydrotheca, diameter at aperture	0·10-0·12 mm.
Gonotheca (male), length	up to 0·90 mm.
diameter	up to 0·20 mm.
Gonotheca (female), length	up to 0·90 mm.
diameter	up to 0·33 mm.

Locality: South Arm, Derwent Estuary (April, 1947); Eaglehawk Neck (February, 1948); Oyster Bay (May, 1949).

Distribution: Recorded from S.E. Australia; New Zealand; Europe.

The living specimen has a very delicate and graceful appearance. Being quite colourless and transparent, it is often very difficult to see.

The present specimens were found growing on *Macrocystis* and other algae in shallow water.

There are two forms represented in this collection, one corresponding to the type as described by Hincks (1868, p. 296), the other to that originally described by Bale (1888, p. 779) as *Plumularia turgida*. The latter is more often branched and has two sarcothecae at the base of the pinna, one in front of the axil, and one behind. This type has been taken only from Eaglehawk Neck, where it occurs in association with *Halecium flexile* Allman.

Plumularia setaceoides Bale, 1881

(Fig. 74)

Plumularia setaceoides Bale, 1881.

Trophosome: Hydrorhiza ribbon-like, with undulated edges. Hydrocaulus monosiphonic, rarely branched, attaining a height of about 7-8 cm., divided into internodes by oblique joints; pinnae alternate, distant, borne near the distal ends of internodes, consisting of alternate long and short internodes, with hydrothecae borne only on the former. Hydrothecae at an angle of about 40° to pinna axis, campanulate; aperture round, with an entire margin. Sarcothecae wine-glass

shaped, canaliculate, bithalamic, base slender, cup shallow; median sarcothecae (on both long and short internodes) have the margin cut away on the ad-axial side; sarcothecae one below each hydrotheca, one lateral on each side above, one median on the short internode, one in the pinna axil, and one near the proximal end of the stem internode.

Gonosome: Gonothecae large, obliquately truncate above the broadest part, transversely rugose; borne at the bases of pinnae, often in two rows on the stem.

Dimensions:

Hydrocaulus internode, length	0·30-0·33 mm.
Hydrocaulus internode, diameter	0·12-0·13 mm.
Pinna internode (long), length	0·30-0·35 mm.
Pinna internode (short), length	0·08-0·10 mm.
Pinna internode, diameter	0·05-0·08 mm.
Hydrotheca, depth	0·12-0·13 mm.
Hydrotheca. diameter at aperture	0·13-0·15 mm.

Locality: South Arm, Derwent Estuary (April, 1948); Nubeena, Tasman Peninsula (April, 1949); Bicheno (May, 1949).

Distribution: Recorded from Victoria; New South Wales.

In the present specimens there is a considerable variation in the thickening of the hydrothecal walls. The specimen from Nubeena has markedly thickened walls, as opposed to the condition found in all the remaining specimens. Apparently, however, this is not sufficient grounds for the formation of a new variety, for Bale (1888, p. 781) also records the same characteristic.

An interesting feature is that the specimen from Nubeena was growing epizoically on a pleopod of *Jasus lalandii* (Tasmanian Marine Crayfish). The specimens from South Arm were taken from algae below low-tide level, and those from Bicheno, were found on storm-drifted seaweed.

Plumularia buskii Bale, 1884

(Fig. 75)

Plumularia buskii Bale, 1884.
Plumularia nuttingi Billard, 1911.
Plumularia buski Billard, 1913.

Trophosome: Hydrocaulus simple, monosiphonic, attaining a height of about 5-6 cm., bearing hydrothecae as well as pinnae; pinnae arise towards the front, and are approximate, alternate, joints oblique, a hydrotheca on each internode except the proximal. Hydrothecae large, set at an angle of about 45° to the pinna axis, margin entire and free at the back. Sarcothecae canaliculate, bithalamic, the median ones fixed with stout bases; one, pedunculate, on each side above the hydrotheca, one median sub-calycine, fixed, curved, almost appressed to the hydrotheca, one median supra-calycine behind hydrotheca, one on distal part of internode near joint, one on proximal internode of pinna, and two abreast on the distal end of stem internode.

Gonosome: Gonothecae (female) large, borne on the stem, 'having a turgid dorsum and a more flattened ventral surface', Bale (1914, p. 28); two series of 5-6 large, moveable, irregularly arranged sarcothecae on the dorsal surface, also a single one near apex in central line.

The male gonothecae are small, borne on the pinnae, ovate, with a pair of sarcothecae near peduncle.

Dimensions:

Hydrocaulus internode, length	0·70-0·73 mm.
Hydrocaulus internode, diameter	0·29-0·33 mm.
Pinna, length	up to 9·00 mm.
Pinna (hydrothecate) internode, length	0·57-0·61 mm.
Hydrotheca, depth	0·29-0·31 mm.
Hydrotheca, diameter at aperture	0·26-0·28 mm.

Locality: D'Entrecasteaux Channel, 2-11 fathoms (Briggs).

Distribution: Recorded from Griffiths' Point, Victoria (Bale); Laysan Island, Hawaiian Archipelago (Hartlaub); Gulf of Manaar (Thornely); Christmas Island (Ritchie); Great Australian Bight (Bale).

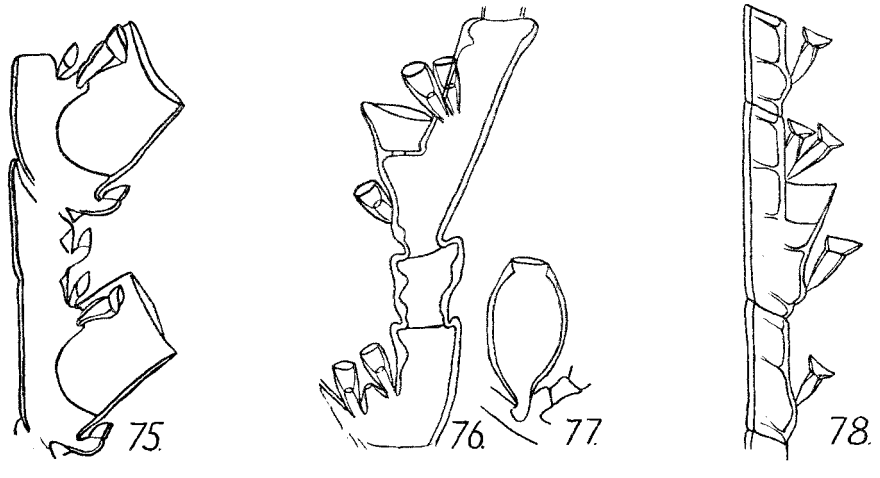
The measurements given above are taken from Briggs (1915, p. 304). There is no specimen in this collection.

Plumularia procumbens Spencer, 1891

(Figs 76, 77)

Plumularia procumbens Spencer, 1891.
Plumularia setaceaformis Mulder & Trebilcock, 1915.

Trophosome: Hydrocaulus branched, polysiphonic, attaining a height of about 15 cm., the whole colony procumbent; branching is in one plane, with pinnae arising from both stem and branches; pinnae alternate, composed of successive long and short internodes, former bearing hydrothecae and sarcothecae, the latter bearing sarcothecae only, and then not constantly. Hydrothecae small, adnate up to margin which is smooth; aperture at about 90° to pinna axis. Sarcothecae large, bithalamic, canaliculate; one median below the hydrotheca, one lateral on each side above, two in the pinna axil, and numerous others scattered over the branches and stem.



FIGS 75-78.

Plumularia buskii Bale. Fig. 75: Portion of colony (after Bale). *Plumularia procumbens* Spencer. Fig. 76: Portion of colony (after Spencer). Fig. 77: Gonotheca (after Spencer). *Nemertesia ceciliata* Bale. Fig. 78: Portion of colony (after Bale).

Gonosome: Gonothecae (male) ovate, borne on a short stalk, in a position axillary to a pinna; aperture large, terminal. One sporosac.

Dimensions:

Hydrocaulus (pinnate) internode, length	0·61-0·64 mm.
Hydrocaulus (pinnate) internode, diameter	0·12-0·14 mm.
Pinna internode (long), length	0·20-0·31 mm.
Pinna internode (short), length	0·10-0·12 mm.
Pinna internode, diameter	0·03-0·04 mm.
Hydrotheca, depth	0·05-0·06 mm.
Hydrotheca, diameter at aperture	0·08 mm.
Supra-calycine sarcotheca, length	0·07-0·08 mm.

Locality: Off Wineglass Bay, Freycinet Peninsula, 80 fathoms (Briggs).

Distribution: Recorded from Port Phillip, Victoria (Spencer); Great Australian Bight, 40-100 fathoms (Bale).

The measurements quoted above are those given by Briggs (1915, p. 305). There is no specimen in this collection.

Genus **Nemertesia** Lamouroux, 1812

'Zoophyte plant-like; stems simple or branching. jointed, clothed with verticillate branchlets, and rooted by a mass of fibres; hydrothecae cup-shaped; nematophores bithalamic, distributed along the stem (and branchlets); gonothecae axillary, unilateral'. — Hincks.

Nemertesia ciliata Bale, 1914

(Fig. 78)

Nemertesia ciliata Bale, 1914c.

Trophosome: Hydrocaulus in one plane, polysiphonic, profusely branched, attaining a height of about 30 cm.; main branches bear branchlets which are monosiphonic, biserial, opposite to alternate, divided into internodes, each of which, except the first, bears one to eight whorls of pinnae; each whorl consists of three to four pinnae which are divided into alternate long and short internodes, the former hydrothecate, the latter bearing sarcothecae only. Hydrothecae very small, cup-shaped, adnate to the margin which is smooth. Sarcothecae bithalamic, canaliculate, large, moveable; one median in front of hydrotheca, two laterals above, one on short internodes, and two in each pinna axil.

Gonosome: Gonothecae small, delicate, campanulate, with very thin walls; gonothecae expand from base to apex; aperture wide, open, transverse; no operculum.

Dimensions:

Pinna internode (thecate), length	0·26-0·29 mm.
Pinna internode (intermediate), length	0·15-0·17 mm.
Pinna internode, diameter	0·05-0·06 mm.
Hydrotheca, depth	0·05 mm.
Hydrotheca, diameter at aperture	0·05-0·06 mm.
Gonotheca, length	0·037-0·044 mm.

Locality: Thirty-five miles south-east of Bruni Island, 150-230 fathoms (Bale); Oyster Bay, 60 fathoms (Bale); Off Wineglass Bay, Freycinet Peninsula, 80 fathoms (Briggs).

Measurements quoted above are from Briggs (1915, p. 307) and Bale (1915, p. 300), there being no specimen in this collection.

Nemertesia ciliata Bale, var. **cruciata** Bale, 1915

Trophosome: Hydrocaulus similar to that of *Nemertesia ciliata* Bale, except that the pinnae are usually paired, each pair alternating with those above and below. Bale (1915, p. 300) states that: 'Excepting on the proximal portions of the branches the arrangement of the hydrocladia in alternate pairs is very general, though occasionally a branch bears them in sets of three, in which case there is often more or less irregularity among them. The branches seem to begin, more frequently than in the type, with two or three internodes devoid of hydrocladia, and, as in the type, the first few hydrocladia on a branch are irregular in position. A frequent arrangement is for two hydrocladia, nearly opposite, to begin the series, followed by three, all different heights, the rest being in alternate pairs; many other variations, however, occur. No gonangia were seen'.

Locality: Off South Cape, 75 fathoms (Bale); Twenty-five miles north-east of Babel Island, Bass Strait, 70-100 fathoms (Bale).

Genus **Halicornopsis** Bale, 1881

'Hydrocaulus pinnate; hydrothecae with a fixed anterior sarcotheca, lateral sarcothecae absent; median sarcostyles present, naked or protected by a rudimentary sarcotheca. Gonothecae not borne in corbulae, nor on modified pinnae'. — Bale.

The absence of lateral sarcothecae is a characteristic which immediately separates this genus, together with *Kirchenpaueria*, from the other *Aglaophenia*-type members of the Plumulariidae.

The median sarcostyle, the presence of which remained unnoticed for a long while, increases the affinity of the relationship between this genus and *Kirchenpaueria*.

Halicornopsis elegans (Lamarck, 1816)

(Fig. 79)

Plumularia elegans Lamarck, 1816.
Aglaophenia elegans Lamouroux, 1816.
Aglaophenia avicularis Kirchenpauer, 1872.
Halicornopsis avicularis Bale, 1881.
Azygoplon rostratum Allman, 1883.
Halicornopsis elegans Billard, 1907b.

Trophosome: Hydrocaulus branched, monosiphonic, becoming polysiphonic in the older parts, attaining a height of about 15 cm.; branching irregular; pinnae close, alternate, one or two on an internode. Hydrothecae set at an angle of about 45° to pinna axis; shallow, with two lateral teeth on margin, and a large anterior rostrum. Rostrum hollow, the inner side produced downwards to form an intrathecal ridge within the hydrotheca. Median sarcothecae short, scoop-shaped, open on the inner side, situate on the front of the hydrotheca opposite the base of the rostrum; cauline sarcothecae small, one on the branch above origin of pinna,

one on base of pinna, and one axillary. A median sarcostyle is present, situated between the pinna and the back of the hydrotheca, naked, or protected by a rudimentary sarcotheca in the form of a delicate flap of perisarc; sarcopore a simple aperture communicating with the interior of the pinna.

Gonosome: Gonothecae irregularly ovate, thick-walled, borne at the bases of the pinnae; no visible orifice or operculum.

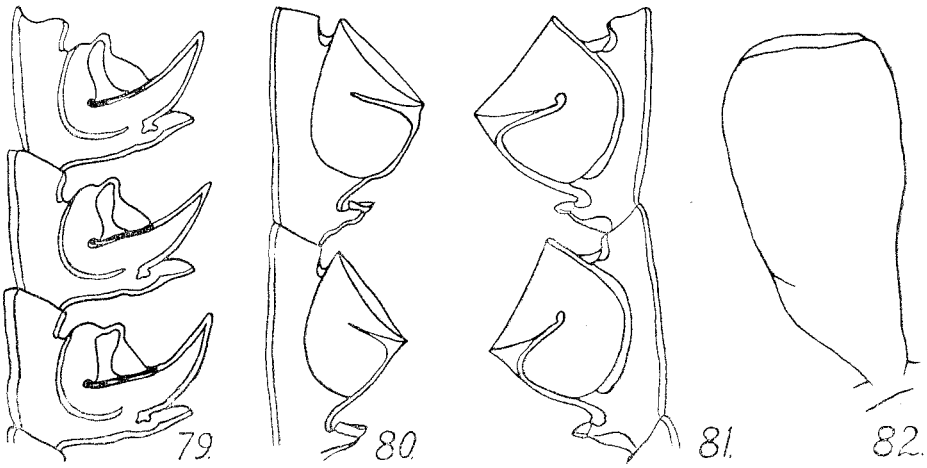
Dimensions:

Hydrocaulus internode (single pinna), length	0·61-0·73 mm.
Hydrocaulus internode (double pinna), length	0·97-1·38 mm.
Hydrocaulus internode (pinnate), diameter	0·28-0·36 mm.
Pinna internode, length	0·42-0·45 mm.
Pinna internode, diameter	0·12-0·17 mm.
Hydrotheca, depth	0·29-0·31 mm.
Hydrotheca, diameter at aperture (lateral aspect)	0·26-0·28 mm.
Hydrotheca, diameter at aperture (frontal aspect)	0·36-0·40 mm.
Gonotheca, length	1·31 mm.
Gonotheca, greatest diameter	0·73-0·80 mm.

Locality: Off South Cape, 75 fathoms (Bale); D'Entrecasteaux Channel, 2-11 fathoms (Briggs); Hobart, Derwent Estuary; Seven miles east of Cape Pillar, 100 fathoms (Briggs); Wineglass Bay, 11 fathoms (Briggs); Bass Strait (Kirchenpauer); Bass Strait (Bale).

Distribution: Recorded from Indian Ocean (Lamouroux); Great Australian Bight, 40-100 fathoms (Bale); Victoria; New South Wales.

The measurements quoted above are those given by Briggs (1915, p. 309). There is no specimen in this collection.



FIGS 79-82.

Halicornopsis elegans (Lamarck). Fig. 79: Portion of pinna. *Kirchenpaueria producta* (Bale). Fig. 80: Portion of pinna (after Bale). *Kirchenpaueria mirabilis* (Allman). Fig. 81: Portion of pinna. Fig. 82: Gonotheca.

Genus **Kirchenpaueria** Jickeli, 1883

'Hydrocaulus pinnate, hydrocladia furnished with median sarcothecae, but none at the sides of the hydrothecae; median sarcostyles present which are not provided with sarcothecae, but communicate with the interior of the hydrocladia by simple apertures in the perisarc.

Gonangia without phylactocarps of any kind, sometimes adnate by one side to a foreign substance'. — Bale.

Kirchenpaueria mirabilis (Allman, 1883)

(Fig. 81, 82)

Diplocheilus mirabilis Allman, 1883.
Kirchenpaueria mirabilis Bale, 1894.
Plumularia mirabilis Billard, 1910.
Diplocheilus allmani Torrey, 1904.

Trophosome: Hydrocaulus monosiphonic or slightly fascicled, sparingly branched, attaining a height of about 8 cm.; stem internodes long; pinnae alternate, arising near the distal end of stem internode. joints oblique. Hydrothecae, one on each pinna internode; proximal portion nearly parallel with pinna, distal portion curved away; aperture circular, margin free and everted; anterior wall of hydrotheca inflected immediately below margin forming a deep intrathecal ridge which extends more than half way across the cell, external sinus filled with perisarc. A median sarcotheca below each hydrotheca, fixed erect, aperture facing the hydrotheca, terminal chamber wide, shallow, with adaxial wall deeply cut away. No lateral sarcothecae, but a median sarcostyle between back of hydrotheca and the pinna; sarcostyle a simple aperture partially protected by a web of perisarc connecting hydrotheca and pinna. A single sarcotheca at the base of each pinna, and one or two others near; one, conical, in the axil.

Gonosome: Gonothecae borne, one on an internode, on the lower part of the stem; large, free, with rounded summit, and irregular, wide, transverse undulations; no distinct marginal ring or operculum. Sporosacs two.

Dimensions:

Hydrocaulus internode, length	0·49-0·75 mm.
Hydrocaulus internode, diameter	0·16-0·25 mm.
Pinna internode, length	0·50-0·61 mm.
Hydrotheca, depth	0·28-0·33 mm.
Hydrotheca, diameter at aperture	0·30-0·33 mm.
Gonotheca, length	up to 1·60 mm.
Gonotheca, maximum breadth	0·85 mm.

Locality: D'Entrecasteaux Channel, 2-11 fathoms (Briggs); South Arm, Derwent Estuary (April, 1949); Storm Bay (Briggs); Station 162, off Moncoeur Island, Bass Strait (Allman).

Distribution: Recorded from Port Phillip and Griffiths' Point, Victoria (Bale); Scottburgh, Natal (Warren); Station 44, off Coogee, N.S.W., 49-50 fathoms (Ritchie); Misaki, Japan (Stechow); Pt. Loma, California, U.S.A. (Torrey).

A number of colonies were found on the hold-fast of *Macrocystis* which had been washed up on a beach at South Arm. Some of the colonies bore the characteristic gonothecae which have a reddish-brown colour, the remainder of the colony being colourless. Measurements differ somewhat from those given by Briggs (1915, p. 308), the stem internodes never attaining the minimum length quoted (0·87 mm.).

Kirchenpaueria producta (Bale, 1881)

(Fig. 80)

Plumularia producta Bale, 1881.
Azygoplon productum Bale, 1888.
Kirchenpaueria producta Bale, 1894.
Halicornaria producta Torrey, 1902.
Not *Diplocheilus allmani* Torrey, 1904.

Trophosome: Hydrocaulus monosiphonic, unbranched, attaining a height of about 1 cm.; pinnae alternate, either one or two borne on each internode. Hydrothecae borne one on each pinna internode, proximal portion nearly parallel to the pinna, the distal portion curving upwards; aperture with an entire margin; anterior wall of hydrotheca inflected below the margin so as to form an intrathecal ridge which extends more than half way across the cell. A median sarcotheca below each hydrotheca, fixed, erect, the distal chamber shallow or saucer-shaped, with the adaxial wall cut away. A single median sarcostyle in the angle between the hydrotheca and the pinna, protected by a delicate extension of perisarc between the hydrotheca and the pinna. Cauline sarcothecae, two at the base of the pinna, one of which is axillary and larger than the other, both just conical projections.

Gonosome: Gonothecae large, irregularly ovate, attached to the hydrorhiza by the flat ventral surface; dorsal surface is convex, with indistinct transverse undulations.

Locality: Bass Strait (Bale).

Distribution: Recorded from Coogee, N.S.W.; Port Jackson, N.S.W. (Bale); Queenscliff; Williamstown; Portland.

No dimensions are given. There is no specimen in this collection.

Genus **Halicornaria** Busk, 1852

'Shoots plumose, pinnate, often branched, rooted by a filiform stolon; hydrothecae generally toothed or lobed at the margin; a median anterior and two lateral sarcothecae connected with each hydrotheca, no others along the polypiferous ramules; gonothecae naked, on the main stem or the unaltered pinnae'. Bale.

A number of the species which have been placed in this genus have lacked the gonosome, so that the assignation must be provisional. However, such is the character of the remainder of the polypidom that there is little doubt that, in most cases, there will be agreement in the structure of the gonosome.

Halicornaria longirostris (Kirchenpauer, 1872)

(Fig. 83)

Aglaophenia longirostris Kirchenpauer, 1872.
Aglaophenia thompsoni Bale, 1881.
Halicornaria longirostris Bale, 1884.

Trophosome: Hydrocaulus monosiphonic, branched, attaining a height of about 9 cm.; branches in one plane; pinnae close, one or two on an internode, alternate to sub-alternate. Hydrothecae cup-shaped, set at an angle of about 45° to pinna axis, one on each pinna internode; margin of aperture with an incurved, spine-like tooth in front, a broad, shallow, rounded lobe behind, and three teeth on each side; thecate internodes not constricted. Median sarcotheca more than double the length of the hydrotheca, to which it is adnate as far as the margin; upper part tubular,

curved and produced forwards parallel to the pinna; lateral and terminal orifices distinct. Lateral sarcothecae small, oval, adnate to pinna; orifice tubular, lateral and terminal apertures may be confluent. Cauline sarcothecae similar to the laterals, one behind each pinna, and two on the front of stem internode.

Gonosome: Gonothecae small, delicate, truncate, borne at the bases of the pinnae.

Dimensions:

Hydrocaulus internode, length	0·55-0·58 mm.
Hydrocaulus internode, diameter	0·30-0·33 mm.
Pinna internode, length	0·23-0·27 mm.
Pinna internode, diameter	0·12-0·14 mm.
Hydrotheca, depth	0·18-0·21 mm.
Hydrotheca, breadth	0·17-0·19 mm.
Gonotheca, length	up to 0·60 mm.
Gonotheca, breadth	up to 0·40 mm.

Locality: Blackman's Bay, Derwent Estuary (March, 1938); Taroona, Derwent Estuary (August, 1949); Storm Bay (Briggs); Bicheno (May, 1949).

Distribution: Recorded from Victoria; South Australia; New South Wales.

The specimens in this collection consist of simple, pinnate colonies, none exceeding 7 cm. in height. The gonothecae, present on the specimen from Blackman's Bay, are borne in a single row up the stem, for the greater part of the length.

Halicornaria comes (Bale, 1914)

(Fig. 84)

Halicornaria intermedia Bale, 1914b.
Halicornaria furcata var. *intermedia* Bale, 1914b.
Halicornaria comes Briggs, 1939.

Trophosome: Hydrocaulus branched, monosiphonic, attaining a height of about 30 cm.; branching in one plane, dichotomous; pinnae arise two on an internode, alternate or sub-alternate; internodes with oblique joints. Hydrothecae set at an angle of about 60° to the pinna axis, facing towards the front; base wider than aperture; an intrathecal ridge runs obliquely from the abaxial wall to about the centre of the cell; margin of aperture entire or with an indistinct median tooth in front, a broad rounded lobe behind, and three teeth on each side, the centre one everted, the others degenerate; aperture between hydrothecae and pinna with minute marginal denticles; internode non-septate. Median sarcotheca adnate up to hydrotheca margin, the free part short, slender, with lateral and terminal orifices distinct. Lateral sarcothecae adnate, saccate, the two terminal orifices, one of which faces forwards, the other upwards, often more or less confluent with the large lateral aperture. Cauline sarcothecae similar to the laterals, two at the base of each pinna, and one at the back of axil.

Dimensions:

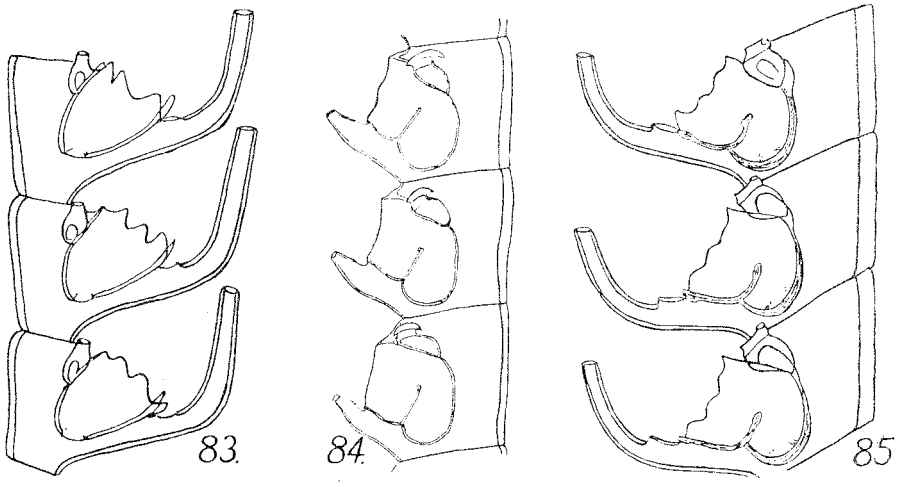
Hydroclade, length	up to 18·00 mm.
Hydroclade internode, length	0·39-0·42 mm.
Hydroclade internode, diameter	0·26-0·31 mm.
Hydrotheca, depth	0·29-0·31 mm.
Hydrotheca, breadth	0·18-020 mm.
Hydrotheca, length of free portion of mesial sarcotheca	0·09-0.21 mm.

Locality: Seven miles east of Cape Pillar, 100 fathoms (Briggs); Off Maria Island, 65 fathoms (Briggs); Oyster Bay, 20 fathoms (Bale); Off Wineglass Bay, 80 fathoms (Briggs); Bass Strait (Bale); Thirty-six miles S. 58° W. of Cape Wickham Lighthouse, 72 fathoms (Bale); Off Green Cape, 470 fathoms (Bale).

The lengths of the free parts of the median sarcothecae show a marked variation, presenting, in general, a series which decreases from the proximal portion of the pinna to the end.

This species has, so far, only been taken in Tasmanian waters in association with *Aglaophenia tasmanica* Bale, on which it occurs as an epizöon.

The measurements quoted above are those given by Briggs (1915, p. 311). There is no specimen in this collection.



FIGS 83-85.

Halicornaria longirostris (Kirchenpauer). Fig. 83: Portion of pinna. *Halicornaria comes* (Bale). Fig. 84: Portion of pinna (after Bale). *Halcornaria superba* (Bale). Fig. 85: Portion of pinna (after Bale).

Halicornaria superba (Bale, 1881)

(Fig. 85)

Aglaophenia superba Bale, 1881.
Halicornaria superba Bale, 1884.

Trophosome: Hydrocaulus monosiphonic, sparingly branched, attaining a height of about 20cm.; pinnae two on each internode, close, alternate to sub-alternate. Hydrothecae set an an angle of about 60° to pinna axis, cup-shaped, with distal part somewhat bent upwards from pinna; a distinct intrathecal ridge projects from the middle of the abaxial wall to near the centre of the hydrotheca; margin of aperture entire, with a rudimentary anterior tooth in front, a free, broad, rounded lobe behind, and three everted teeth on each side, the most posterior often being reduced or absent; thecate internodes not constricted. Mesial sarcotheca about double the length of the hydrotheca to which it is adnate as far as the margin, distal portion curved and produced forwards nearly parallel to the pinna; lateral and terminal apertures separate. Lateral sarcothecae saccate, adnate, two

circular, sub-tubular apertures, one directed forwards, the other upwards; both apertures often confluent with the large lateral aperture. Cauline sarcothecae resemble the laterals, one behind pinna, and two on the front of the stem.

Gonosome: Unknown.

Dimensions:

Hydrocaulus internode, length	0·56-0·77 mm.
Hydrocaulus internode, diameter	up to 0·87 mm.
Pinna internode, length	0·28-0·31 mm.
Pinna internode, diameter	0·24-0·26 mm.
Hydrotheca, depth	0·24-0·26 mm.
Hydrotheca, breadth	0·17-0·19 mm.

Locality: Storm Bay (Briggs); Twenty miles east of King Island, Bass Strait (Bale).

Distribution: Recorded from Griffiths' Point (Goldstein); Queenscliff, Victoria; Port Phillip Heads, Victoria; Forty miles west of Kingston, S.A., 30 fathoms (Bale); Dongarra Beach, W.A. (Bale).

The measurements quoted above are those given by Briggs (1915, p. 312). There is no specimen in this collection.

Genus **Aglaophenia** Lamouroux, 1812 (in part)

'Shoots plumose, pinnate, often branched, rooted by a filiform stolon; hydrothecae generally toothed or lobed at the margin; a median anterior and two lateral sarcothecae connected with each hydrotheca, no others along the polypiferous ramules; gonothecae enclosed in corbulae or borne on specially modified pinnae'. — Bale.

The members of this genus have a characteristic feather-like appearance contrasting with the more delicate structure of the species of *Plumularia*.

Macroscopically this genus closely resembles *Halicornaria*, the character and position of the reproductive organs being the main distinguishing features. Here the gonothecae are never borne naked on the stem, but always on a pinna which is modified in some way to form a protective structure.

The mesial sarcotheca shows a range from forms with distinct lateral and terminal apertures, to forms in which these apertures are confluent. There are no sarcothecae on the pinnae other than those associated with the hydrothecae, but there are usually two or more on the stem at the base of each pinna. Sarcothecae are fixed, tubular or saccate, but not wine-glass shaped, attached partly to the hydrotheca and partly to the pinna.

The Australian members of the genus may be separated into several well-defined groups, the separation depending on characteristics of the trophosome and gonosome. This is discussed at length by Bale (1884, pp. 147-153).

KEY TO THE GENUS AGLAOPHENIA

1.	Hydrocaulus simple, monosiphonic	2
	Hydrocaulus branched, polysiphonic	3
2.	Hydrothecae elongate; margin of aperture with an everted angular lobe on each side	*A. plumosa* Bale
	Hydrothecae urn-shaped; margin with four teeth on each side, the second from front more or less bilobed	*A. parvula* Bale
3.	Mesial sarcothecae extending beyond hydrotheca rim; hydrotheca margin with four teeth on each side	5
	Mesial sarcothecae not extending beyond hydrotheca rim	4
4.	Hydrothecal margin having one small triangular tooth on each side	*A. tasmanica* Bale
	Hydrothecal margin having three teeth on each side	*A. armata* Bale
	Hydrothecal margin having four teeth on each side	*A. tenuissima* Bale
5.	Hydrothecae with marginal anterior median tooth long, incurved	*A. divaricata* (Busk)
	Hydrothecae with marginal anterior median tooth everted	*A. decumbens* Bale

Aglaophenia tenuissima Bale, 1914

(Fig. 86)

Aglaophenia tenuissima Bale, 1914c.

Trophosome: Hydrocaulus very slender, flexuous, polysiphonic, branching, attaining a height of about 40 cm.; branches arise at flexures, monosiphonic, alternate, delicate, bearing only sarcothecae on proximal portions, jointing obscure; pinnae short, alternate, one on an internode. Hydrothecae almost cylindrical, nearly parallel with pinna axis, a minute intrathecal ridge on adcauline side near the base; aperture oblique, margin furnished with a short, pointed, anterior tooth, and on each side four equal triangular teeth which are similar to the anterior tooth but shorter; back adnate, Septal ridges opposite base of lateral sarcothecae and intrathecal ridge, with often a third between. Mesial sarcotheca less than one half length of hydrotheca, adnate, free portion very short, single terminal aperture. Lateral sarcothecae small, adnate up to margin, beyond which there is only a small projection; single terminal aperture. Cauline sarcothecae resemble the laterals, but are larger; one in axil of pinna, and one lower down behind axil.

Gonosome: Pinna replaced by a gonangial branch, the first three or four internodes bearing modified hydrothecae. Female: Corbula consisting of about fifteen pairs of pinnules; pinnules narrow proximally, but widened distally into broad leaflets, which meet to form the closed corbula. From base of each pinnule, on distal side, projects forwards a lateral spur which supports, proximally, a modified hydrotheca with its attendant lateral sarcothecae, and is continued distally into a leaf-like process, which may be very large, and armed with a few sarcothecae. The distal edges of the pinnules are free, wing-like, directed outwards, and continued above corbula, the edges with infrequent, scattered sarcothecae; often one or two free pinnules at distal or both ends of corbula.

Dimensions:

Hydrocaulus internode (pinnate), length	0·54-0·78 mm.
Hydrocaulus internode (pinnate), diameter	0·14-0·17 mm.
Pinna internode, length	0·45-0·47 mm.
Pinna internode, diameter	0·07-0·08 mm.
Hydrotheca, depth	0·33-0·35 mm.
Hydrotheca, breadth at mouth	0·18-0·19 mm.

Locality: Off Wineglass Bay, Freycinet Peninsula, 80 fathoms (Briggs).

Distribution: Previously recorded only from the Great Australian Bight, Long. 126° 45¼′ E., 190-320 fathoms; Long. 130° 40′ E., 160 fathoms (Bale).

The measurements recorded here are those given by Briggs (1915, p. 318). There is no specimen in this collection.

Aglaophenia plumosa Bale, 1881

(Fig. 87)

Aglaophenia plumosa Bale, 1881.

Trophosome: Hydrocaulus monosiphonic, unbranched, attaining a height of about 3-4 cm.; pinnae close, alternate, arising one on each internode, both series borne towards the front of stem. Hydrothecae elongate, nearly parallel with pinna axis, two small intrathecal ridges, one short, stout, on abcauline side at base of median anterior tooth, the other rudimentary, on adcauline side near base of hydrotheca; aperture at about 45° to pinna axis; margin of aperture with a long pointed, slightly incurved tooth in front, sides each forming an everted angular lobe, cut-away down to pinna. Septal ridges two, one at base of lateral sarcotheca, running obliquely forward, the other transverse, opposite the adcauline intrathecal ridge; occasionally a third between. Mesial sarcotheca long, divergent, with distinct terminal and lateral apertures, also an opening leading into the hydrotheca. Lateral sarcothecae tubular, adnate to the hydrotheca as far as the margin, with a free part above directed forwards and outwards, distinct lateral and terminal apertures. Cauline sarcothecae two on stem at base of pinna, apertures confluent.

Gonosome: Normal pinna replaced by a gonangial pinna which bears 15-20 pairs of alternate pinnules; each pinnule furnished with two series of tubular sarcothecae; sarcothecae opposite or sub-alternate, the two proximal ones on the distal edge of pinnule without corresponding ones on the proximal edge; the two series of pinnules are arched, meeting at the top and forming an open corbula; a single hydrotheca on pinna below corbula.

Dimensions:

Hydrocaulus internode (pinnate), length	0·25-0·32 mm.
Hydrocaulus internode (pinnate), diameter	0·17-0·23 mm.
Pinna internode, length	0·29-0·33 mm.
Pinna internode, diameter	0·10-0·13 mm.
Hydrotheca, depth	0·24-0·27 mm.
Hydrotheca, breadth at aperture	0·12-0·15 mm.

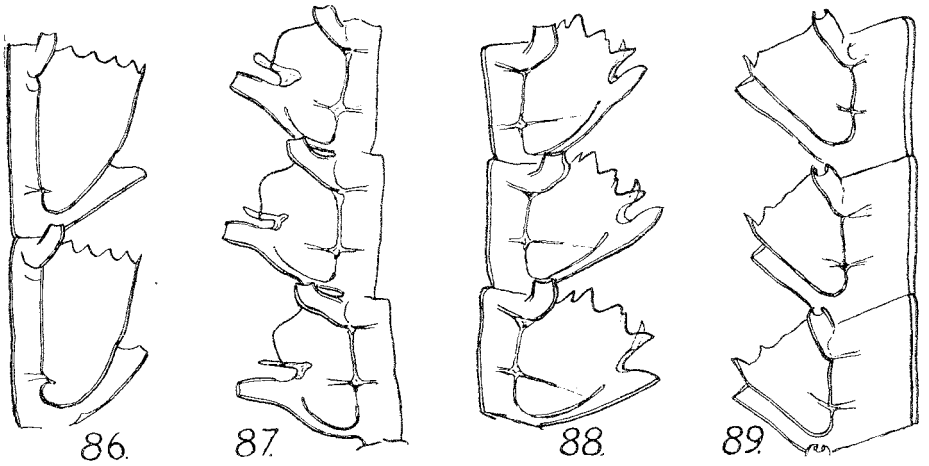
Locality: Snug, North-West Bay (September, 1949); South Arm, Derwent Estuary (April, 1947); Taroona, Derwent Estuary (August, 1949); Bicheno (May, 1949).

Distribution: Recorded from Aldinga, S.A. (Smeaton); Portland (Maplestone); Williamstown; Queenscliff.

The specimens, collected in widely separated localities, show a large range of variation in their microscopic measurements and macroscopic appearance. However, this is not inconsistent with specific characters.

The material from South Arm was growing on *Macrocystis* stipe near low-tide level; it is simple, pinnate, about 1·5 cm. high, arising from a reticulate, filiform stolon. That from Bicheno was obtained from storm-drifted seaweed.

The specimen from Snug was larger than that from South Arm, shoots being about 4 cm. long. It was found growing on *Zostera* below low-tide level.



FIGS 86-89.

Aglaophenia tenuissima Bale. Fig. 86: Portion of pinna (after Bale). *Aglaophenia plumosa* Bale. Fig. 87: Portion of pinna. *Aglaophenia parvula* Bale. Fig. 88: Portion of pinna. *Aglaophenia tasmanica* Bale. Fig. 89: Portion of pinna (after Bale).

Aglaophenia parvula Bale, 1881

(Fig. 88)

Aglaophenia parvula Bale, 1881.

Trophosome: Hydrocaulus monosiphonic, unbranched, attaining a height of about 4-5 cm.; pinnae are alternate, approximate, arising one on an internode towards the front of the stem. Hydrothecae urn-shaped, widening from base upwards, at an angle of about 40° to the pinna axis; a fold or constriction runs around cell, perpendicular to pinna axis and a little above base; margin of aperture with a single incurved, median tooth in front, four teeth on each side, the second tooth from the front may, or may not, be divided into two lobes, the back is entire and adnate to pinna. Septal ridges two, one opposite the base of lateral sarcotheca running obliquely forward, and one transverse, opposite the intrathecal fold. Mesial sarcotheca not extending beyond rim of hydrotheca, divergent, terminal and lateral apertures confluent, also an opening leading into the hydrotheca. Lateral sarcothecae short, not reaching beyond hydrotheca margin, partially adnate, free portion tapering, apertures confluent. Cauline sarcothecae resemble laterals, two on stem near base of pinna, and one on each side of axil.

Gonosome: Normal pinna replaced by a modified gonangial pinna bearing a single hydrotheca below the corbula; a joint above and below the hydrotheca, but no others on pinna are distinct. Corbulae of two kinds: (1) Six or seven pairs of broad leaflets united to form a closed sac, the distal edge of each leaflet bearing short, stout sarcothecae; from the distal side of the base of the proximal pinnule

arises a lateral spur which runs forwards parallel to pinna and bears sarcothecae on each edge. (2) Having leaflets free, both edges bordered with sarcothecae, forming an open corbula.

Dimensions:

Hydrocaulus internode (pinnate), length	0·18-0·23 mm.
Hydrocaulus internode (pinnate), diameter	0·20-0·23 mm.
Pinna internode, length	0·23-0·27 mm.
Pinna internode, diameter	0·08-0·10 mm.
Hydrotheca, depth	0·25-0·27 mm.
Hydrotheca, breadth at aperture	0·15-0·17 mm.
Corbula. length	up to 1·80 mm.
Corbula, breadth	up to 0·80 mm.

Locality: Kingston, Derwent Estuary; South Arm, Derwent Estuary (19/4/47).

Distribution: Portland (Maplestone); Queenscliff (Bale).

Referring to the mode of arrangement of the hydrothecal marginal teeth, Bale (1884, p. 166) says: 'having five teeth on each side, the second of which however is often folded behind the third, so that under a low-power they appear like one tooth'. After an examination of the specimens in this collection I am convinced that there are but four teeth on each side, the second being bi-lobed to a greater or less extent, an appearance of overlapping being due to the peculiar method of construction.

The specimen from Kingston consists of a large number of colonies growing epizoically on the elongated stalk of the ascidian *Boltenia pachydermatina*. The specimen from South Arm was growing on the stipe of *Macrocystis* near low-tide level.

Aglaophenia tasmanica Bale, 1914

(Fig. 89)

Aglaophenia tasmanica Bale, 1914b.

Trophosome: Hydrocaulus polysiphonic, sparingly branched, attaining a height of about 30 cm.; branches arise mostly in opposite pairs, with both series in one plane, originating from a primary hydrocaulus internode, replacing a pinna; pinnae alternate, arising one on an internode, at an angle of about 40° to branch, both series placed towards the front, joints somewhat oblique. Hydrothecae borne at an angle of about 30° to pinna, tapered proximally, distal part nearly cylindrical, a small fold near base on adcauline side; some hydrothecae with a small rounded tooth projecting into cavity from abcauline side a little above base; margin of aperture with a median, pointed, anterior tooth, a single triangular tooth on each side, near front, remainder sinuous but not lobed; back cut-away, adnate. Septal ridges at base of lateral sarcothecae, and at intrathecal fold. Mesial sarcothecae not reaching theca margin, adnate for whole length, with a single aperture perpendicular, or nearly so, to hydrotheca. Lateral sarcothecae tubular, projecting just above theca margin, pointing forwards and outwards; aperture round, small. Cauline sarcothecae broad, open above, two on a branch near base of pinna.

Gonosome: Gonangial pinnae usually in pairs, with first four or five internodes bearing sarcothecae only. Female: Corbula long, consisting of fifteen (or more) pairs of alternate pinnules, arising from separate pinna internodes; proximally the pinnules are narrow, but distally they expand into broad leaflets, corbula is

closed. Distal end of each pinnule extended beyond line of union giving a free edged expansion bordered with sarcothecae, and continued upwards forming a large crest above corbula having both edges free and bordered with sarcothecae. Just above origin of each pinnule, on distal side, arises a lateral projection or spur bearing two series of sarcothecae (up to seven on each side) but no hydrothecae. Male: Corbula long, with up to twenty-four pairs of alternate pinnules, which are narrow proximally, but expanded into broad leaflets distally; corbula closed for most of length but distally the pinnules become shortened and separated, until at the end they are abbreviated almost down to lateral spur. Lateral spurs similar to those of female, but bear only four or five pairs of sarcothecae.

Dimensions:

Hydrocaulus internode (pinnate), length	0·42-0·43 mm.
Hydrocaulus internode (pinnate), diameter	0·40-0·42 mm.
Pinna internode, length	0·38-0·43 mm.
Pinna internode, diameter	0·19-0·22 mm.
Hydrotheca, depth	0·36-0·38 mm.
Hydrotheca, breadth at mouth	0·21-0·22 mm.
Corbula (female), length	up to 12·5 mm.
Corbula (female), diameter	up to 2·00 mm.

Locality: Seven miles east of Cape Pillar, 100 fathoms (Briggs); Oyster Bay, 20 fathoms (Bale); Off Wineglass Bay, 80 fathoms (Briggs); Bass Strait, 70-470 fathoms (Bale).

This species has been found only in Tasmanian waters.

The dimensions are those given by Briggs (1915, p. 317). There is no specimen in this collection.

Aglaophenia armata Bale, 1914

(Fig. 90)

Aglaophenia armata Bale, 1914c.

Trophosome: Hydrocaulus polysiphonic, irregularly branched, attaining a height of about 30 cm.; a single pinna arises from each branch internode, the jointing of which may be obscure; pinnae close, alternate, divergent, joints transverse or slightly oblique. Hydrothecae borne towards the front, at about 60° to pinna axis, elongate, tubular, a strong intrathecal ridge arises near the base of the lateral sarcothecae and extends downwards about half-way across cell, nearly parallel with pinna axis; margin of aperture with large, median, anterior tooth, three lateral teeth on each side; back deeply cut-away. Two septal ridges on hydrothecate internode, one beneath hydrotheca, one beneath lateral sarcotheca, and occasionally one between. Mesial sarcotheca tubular, not extending much beyond the theca margin, straight or slightly curved, somewhat divergent, free for distal third of length, terminal and lateral apertures often confluent. Lateral sarcothecae long, tubular, parallel to axis of theca to which they are adnate for whole length, apertures may be confluent. Cauline sarcothecae two on anterior side of branch, and one behind, near origin of pinna.

Gonosome: Pinna replaced by a gonangial branch. Female: on branch, proximally, about eight to ten internodes bear modified hydrothecae, beyond is a closed corbula formed by about fifteen pairs of alternate pinnules; proximally the pinnules bear 'a projecting sarcotheca and above it a minute irregular hydrotheca (?) with two or three sarcothecae above' (Bale, 1914), this on distal side;

the distal portions of pinnules are expanded into large lobes fringed with sarcothecae. Male: bearing only about four hydrothecae proximally on the gonangial branch, corbula with much smaller foliaceous lobes.

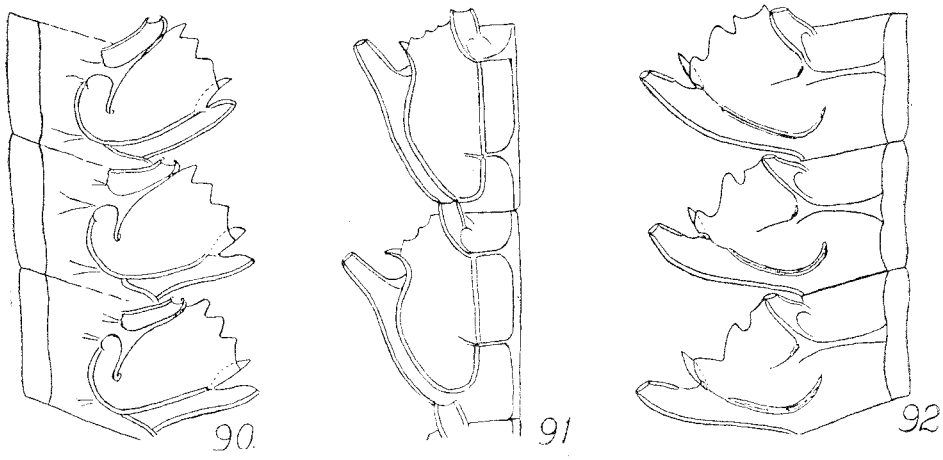
Dimensions:

Hydrocaulus internode (pinnate), length	0·26-0·28 mm.
Hydrocaulus internode (pinnate), diameter	0·22-0·24 mm.
Pinna internode, length	0·28-0·31 mm.
Pinna internode, diameter	0·24-0·26 mm.
Hydrotheca, depth	0·38-0·40 mm.
Hydrotheca, breadth at mouth	0·17-0·19 mm.

Locality: Off Wineglass Bay, Freycinet Peninsula, 80 fathoms (Briggs).

Distribution: Recorded from thirteen miles north-east of North Reef, 70-74 fathoms; Thirty-eight miles north-east of North Reef Lighthouse, Capricorn Group, off Port Curtis, Queensland, 74 fathoms (Bale).

The measurements quoted above are those given by Briggs (1915, p. 314). There is no specimen in this collection.



FIGS 90-92.

Aglaophenia armata Bale. Fig. 90: Portion of pinna (after Bale). *Aglaophenia decumbens* Bale. Fig. 91: Portion of pinna (after Bale). *Aglaophenia divaricata* (Busk). Fig. 92: Portion of pinna (after Bale).

Aglaophenia decumbens Bale, 1914

(Fig. 91)

Aglaophenia decumbens Bale, 1914b.

Trophosome: Hydrocaulus slender, polysiphonic, sparingly branched, attaining a height of about 12 cm.; branches arise from peripheral fascicle, mostly on distal portion of hydrophyton; pinnae slender, alternate, one on an internode, both series borne towards the front, joints transverse. Hydrothecae elongate, axis nearly parallel with that of pinna, a small fold present on adcauline side near base; margin of aperture with an everted median anterior tooth, four equal triangular teeth on each side, the last pair obscured by the lateral sarcothecae, back adnate. Septal ridges on thecate internodes at intrathecal fold, and at base of lateral

sarcothecae. Mesial sarcothecae extending beyond hydrotheca, somewhat divergent, adnate for two-thirds of length; free part tubular with distinct lateral and terminal apertures. Lateral sarcothecae sub-tubular, adnate, reaching to theca margin, directed forwards and outwards, terminal and lateral apertures distinct or confluent. Cauline sarcothecae large, two on branch near base of pinna.

Dimensions:

Hydrocaulus internode (pinnate), length	0·42-0·45 mm.
Hydocaulus internode (pinnate), diameter	0·19-0·21 mm.
Pinna internode, length	0·43-0·45 mm.
Pinna internode, diameter	0·08-0·10 mm.
Hydrotheca, depth	0·35-0·38 mm.
Hydrotheca, breadth at mouth	0·15-0·17 mm.

Locality: Seven miles east of C. Pillar, 100 fathoms (Briggs); Off Wineglass Bay, Freycinet Peninsula, 80 fathoms (Briggs); Bass Strait (Bale).

Bale originally erected this species for a single specimen from Bass Strait, pointing out at the time that: 'There is some doubt as to whether this species is identical with *A. brevicaulus*, Kirchenpauer'.

The measurements recorded are those given by Briggs (1915, p. 315). There is no specimen in this collection.

Aglaophenia divaricata (Busk, 1852)

(Fig. 92)

Plumularia divaricata Busk, 1852.
Plumularia ramosa Busk, 1852.
Aglaophenia ramosa Kirchenpauer, 1872.
Aglaophenia McCoyi Bale, 1881.
Lytocarpus ramosus Allman, 1886.
Aglaophenia divaricata Kirchenpauer, 1872.
?Aglaophenia brevicaulus Kirchenpauer, 1872.
Not *Aglaophenia ramosa* Allman, 1877.

Trophosome: Hydrocaulus slender, branched, polysiphonic, attaining a height of about 12-15 cm.; branches widely divergent, rarely in one plane, arising from peripheral fascicle; pinnae arise one on each internode, close, alternate, joints slightly oblique, both series borne towards the front of the stem. Hydrothecae set at an angle of about 45° to pinna axis, cup-shaped, with a small intrathecal ridge projecting into cell from middle of adcauline side; from ridge arises a thin fold partially dividing the hydrotheca into two; aperture large, with a long median, incurved tooth in front, four teeth on each side, back adnate. A transverse septal ridge, continuous with intrathecal ridge, crosses the internode. Mesial sarcotheca variable in length, at an angle of about 60° to pinna axis, adnate up to hydrotheca margin, with free part tapering in lateral view; lateral and terminal apertures distinct, and an opening leading into the hydrotheca. Lateral sarcothecae conical, adnate up to hydrotheca margin, with a free tubular neck directed forwards and upwards, lateral and terminal apertures distinct. Cauline sarcothecae resemble laterals, two on branch at base of each pinna.

Gonosome: Normal pinna replaced by a gonangial branch. Modified pinnae bear from 15-20 pairs of alternate pinnules; pinnules each borne on a short internode, and each with two lateral series of sarcothecae similar to hydrothecal laterals, but larger; sarcothecae opposite, except proximally where the first two

on the distal side of pinnule lack corresponding ones on the proximal side; jointing of pinnules obscure; two sarcothecae present on pinna at base of each pinnule. The two series of pinnules are arched, meeting at top, forming an open corbula. A single hydrotheca borne proximally on the pinna below the corbula.

Dimensions:

Hydrocaulus internode (pinnate), length	0·29-0·33 mm.
Hydrocaulus internode (pinnate), diameter	0·28-0·29 mm.
Pinna internode, length	0·26-0·28 mm.
Pinna internode, diameter	0·17-0·19 mm.
Hydrotheca, depth	0·24-0·26 mm.
Hydrotheca, breadth at aperture	0·17-0·19 mm.

Locality: Storm Bay (Briggs); Oyster Bay, 60 fathoms (Bale); Off Wineglass Bay, 80 fathoms (Briggs); Bass Strait (Busk); George Town (Kirchenpauer).

Distribution: Recorded from Swan Island, Banks Strait (Busk); Wilson's Promontory, Victoria (Kirchenpauer); Portland; Griffiths' Point; Queenscliff; Williamstown, Victoria; Brighton, South Australia; Port Jackson, N.S.W. (Bale); Victoria (Marktanner-Turneretscher); Station 54, within Jervis Bay, N.S.W., 10-11 fathoms (Ritchie).

The measurements are those given by Briggs (1913, p. 316). There is no specimen in this collection.

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