Report on some Hydroids from the New Zealand Coast, with Notes on New Zealand Hydroida generally, supplementing Farquhar's List.

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Communicated by Dr. Chas. Chilton.

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1. INTRODUCTION.

THE Hydroida dealt with in the present paper are, for the most part, included in a collection forwarded by Professor Chilton from the Canterbury College, Christchurch, to Mr. E. A. Briggs, of the Australian Museum, Sydney, for examination and report.* Mr. Briggs commenced the work, but, finding that stress of official duties was likely to prolong it unduly, he suggested that I should undertake the task, which I have accordingly done. I have also included descriptions of several other New Zealand species hitherto imperfectly known, or not identifiable from the original accounts.

I have to thank Professor W. B. Benham, of the University Museum, Dunedin, for valuable assistance in sending me portions of type specimens of some of Hutton's and Coughtrey's species, preserved in the Museum, which enable me to identify some of those species previously unrecognized.

My thanks are also due to the Trustees of the British Museum for examples of some of Allman's New Zealand species, as well as for one of Gray's not hitherto identified since its description in 1843. This species, as well as several of Allman's which have been wrongly associated with other forms, will now, I trust, be rendered identifiable. I have specially to thank Captain Totton, of the British Museum, for much trouble taken by him in furnishing me with information regarding the New Zealand species in the Museum, and forwarding specimens.

2. LITERATURE OF THE NEW ZEALAND HYDROIDA.

The first published list of New Zealand Hydroida was that by Dr. J. E. Gray, in Dieffenbach's *New Zealand*, 1843, in which were described four species collected by Dr. Sinclair and one by Sir Joseph Banks.

Captain Hutton's paper in *Trans. N.Z. Inst.* for 1872 included several new species, with a number of those previously known; in some of the latter, however, the identifications have proved mistaken.

Dr. Millen Coughtrey, in his papers in *Trans. N.Z. Inst.* for 1874 and 1875, and one in the *Annals and Magazine of Natural History* for 1876, added considerably to what was already known regarding the New Zealand species, and included some new ones, also furnishing, for the first time, figures of the forms described. Of the few Plumularians mentioned,

* The collection has been deposited in the Canterbury Museum, Christchurch, New Zealand.—C. C.

however, the figures and descriptions have not proved sufficient to enable observers to discriminate between nearly allied forms.

For the next twenty years no special account of New Zealand species appeared, either in the colony or elsewhere, but a number of new species were included in Allman's papers in the *Journal of the Linnean Society* of 1876 and 1885, and in the "Challenger" Reports; also in the works of Kirchenpauer, Thompson, von Lendenfeld, Marktanner-Turneretscher, and others.

All these are enumerated in Farquhar's "List of New Zealand Hydroida," which was published in *Trans. N.Z. Inst.*, vol. 28, p. 459, 1896, and which is the only complete list of New Zealand species up to that date. More recent publications are Hilgendorf's "On the Hydroids of the Neighbourhood of Dunedin," in *Trans. N.Z. Inst.*, 1897, and a report on a collection of New Zealand hydroids in the *Zoologischen Jahrbuchern*, 1901, by Dr. Cl. Hartlaub.

3. Nomenclature.

Since the publication of Farquhar's list there have been many changes of nomenclature, especially as a result of Levinsen's researches among the Sertularians. For example, species which were formerly regarded as typical *Thuiariae* are now referred to *Sertularella*, others which were ranked under *Sertularia* have been relegated to *Thuiaria*, and so on. Species which for these and other reasons have had their names changed are comprised in the following list, in which Farquhar's names appear in the first column, and the names to which the various species are assigned in the present paper in the second.

Names in Farquhar's List.	Names in this Paper.
Tubularia attennoides Coughtrey ..	*Tubularia attenuoides* Coughtrey.
Coryne tenella Farquhar	*Syncoryne tenella* (Farquhar).
Campanularia caliculata Hincks ..	*Orthopyxis caliculata* (Hincks).
Campanularia caliculata var. *makrogona* v. Lendenfeld	*Orthopyxis macrogona* (v. Lend.).
Campanularia bilabiata Coughtrey ..	*Silicularia bilabiata* (Coughtrey).
Hebella scandens (Bale)	*Hebella calcarata* (L. Agassiz).
Halecium delicatula Coughtrey	*Halecium delicatulum* Coughtrey.
Halecium parvulum Bale	*Halecium flexile* Allman.
Sertularia elongata Lamouroux	*Stereotheca elongata* (Lamouroux).
Sertularia crinis Allman	*Sertularia fasciculata* (Kirchenpauer).
Sertularia ramulosa Coughtrey	*Sertularia fasciculata* (Kirchenpauer).
Sertularia huttoni Marktanner-Turneretscher	*Stereotheca huttoni* (Marktanner-Turneretscher).
Sertularella capillaris Allman	*Sertularella johnstoni* (Gray).
Sertularella polyzonias (Linné)	*Sertularella simplex* (Hutton).
Sertularella episcopus Allman	*Sertularia episcopus* (Allman).
Thuiaria zelandica Gray	*Stereotheca zelandica* (Gray).
Thuiaria monilifera Hutton	*Selaginopsis monilifera* (Hutton).
Thuiaria subarticulata Coughtrey ..	*Sertularella subarticulata* (Coughtrey).
Thuiaria quadridens Bale	*Sertularella quadridens* (Bale).
Desmoscyphus buskii Allman	*Thuiaria buski* (Allman).
Hydrallmania bicalycula Coughtrey ..	*Thuiaria bicalycula* (Coughtrey).
Synthecium ramosum Allman	*Synthecium elegans* Allman.
Synthecium campylocarpum Allman ..	*Synthecium orthogonium* (Busk).
Plumularia campanula Busk	*Schizotricha campanula* (Busk).
Plumularia turgida Bale	*Plumularia setacea* (Ellis).
Plumularia multinoda Allman	*Plumularia setacea* (Ellis).
Aglaophenia banksii (Gray)	*Hemicarpus banksi* (Gray).
Aglaophenia formosa (Busk)	*Thecocarpus formosus* (Busk).
Aglaophenia pennatula ? Coughtrey ..	*Aglaophenia huttoni* Kirchenpauer.

4. ADDITIONS TO THE SPECIES SINCE FARQUHAR'S LIST.

In Hilgendorf's paper of 1897 are included six species said to be new to New Zealand. They are as follows :—

Tubiclava fruticosa Allman. (The identification with Allman's species is doubtful, and the form does not appear different from *T. rubra* Farquhar.)

Hemitheca intermedia n. sp.

Obelia nigrocaulus n. sp.

Calycella parkeri n. sp. (This is not at all like a *Calycella*, but is a typical *Gonothyraea*, very probably *G. hyalina* Hincks.—*Vide G. Parkeri.*)

Hypanthea asymmetrica n. sp. (The same as *Eucopella campanularia* v. Lendenfeld, now referred to *Silicularia.*)

Aglaophenia filicula Allman. (Identification very doubtful.)

Hartlaub, in his paper of 1901, adds the following :—

Syncoryne sp.

Perigonimus sp.

Clytia johnstoni (Alder).

Eucopella crenata n. sp. (Previously figured, but not named, by Coughtrey. See *Orthopyxis crenata.*)

Thyroscyphus tridentatus (Bale). (= *T. simplex* (Lamouroux).)

Sertularella tenella (Alder). (One of the forms included by Coughtrey under *S. simplex*, but afterwards named by him *S. robusta*, q.v. Not *S. tenella ?*)

Sertularella solidula Bale. (Not *S. solidula;* see *S. crassiuscula.*)

Sertularella fusiformis Hincks var. *nana.* (Is *S. simplex* Hutton.)

In a paper in *Trans. N.Z. Inst.*, vol. 47, p. 146, 1915, Professor H. B. Kirk describes a new genus and species, *Ascidioclava parasitica.*

The hydroids which in the present paper are recorded as new to the New Zealand region are the following :—

Syncoryne sp. Bale.
Syncoryne eximia Allman.
Obelia nodosa n. sp.
Obelia coughtreyi n. sp.
Campanulina humilis n. sp.
Thuiaria farquhari n. sp.
Sertularella columnaria Briggs.
Sertularella crassiuscula n. sp.
Sertularella edentula n. sp.
Plumularia setacea (Ellis) var. *opima* n. var.
Plumularia wattsi Bale.
Thecocaulus heterogona n. sp.
Aglaophenia plumosa Bale.
Thecocarpus chiltoni n. sp.
Halicornaria rostrata n. sp.

The references prefixed to the various descriptions are not exhaustive. In a number of cases, where no change has occurred in the nomenclature, I have commenced with a reference to Farquhar's list, where the earlier synonymy will be found. In other cases I have referred for the synonymy to more recent publications, where they are easily procurable, like the "Endeavour" Reports, &c.

5. DESCRIPTIONS OF THE SPECIES.

Fam. ATRACTYLIDAE.

Perigonimus sp. Hartlaub.

Hartlaub, 1901, p. 363.

Hartlaub mentions a fragment of a *Perigonimus* from French Pass, but the material was insufficient for a complete diagnosis.

Fam. BOUGAINVILLIDAE.

Hemitheca intermedia Hilgendorf.

Hilgendorf, 1897, p. 202.

Fam. CLAVIDAE.

Tubiclava rubra Farquhar.

Farquhar, 1895, p. 209; 1896, p. 459.

A fragment from Sumner, containing two hydranths, much shrunken and blackened, may belong to the above species. I think it probable that the form referred by Hilgendorf to *T. fruticosa* Allman (1897, p. 201) may be the same as Farquhar's species.

Ascidioclava parasitica Kirk.

Kirk, 1915, p. 146.

Fam. TUBULARIIDAE.

Tubularia attenuoides Coughtrey.

Tubularia attennoides Coughtrey, 1875, p. 302: Farquhar, 1896, p. 459: Hilgendorf, 1897, p. 202.

Types of this species are in the Dunedin Museum. Professor Benham points out that the correct spelling of the name is "*attenuoides*," not "*attennoides*" as hitherto printed.

Fam. CORYNIDAE.

Syncoryne tenella (Farquhar).

Coryne tenella Farquhar, 1895, p. 208; 1896, p. 459.

A cotype of this species, among Professor Chilton's material, consists of three shoots, very slender, and not more than 8 mm. in height. The hydranths, which are badly preserved, are smaller than Farquhar's figure, the largest not being more than 1 mm. in length, with about 27 tentacles. The gonosome is not present.

Specimens from Taylor's Mistake are more robust, reaching nearly 1 in. in height, and more freely branched. Stems very dark at base, becoming gradually paler upwards, and, while proximal portions are very slender, diameter increases slightly above. Stem and branches strongly but irregularly annulated at base; there are often a few annulations on stem just above origin of branches. Terminal portions of hydrocaulus smooth, occasionally with a few faint corrugations. They do not form basal cups for hydranths.

Hydranths reach up to about 1·6 mm. in length, as figured by Farquhar, and are cylindrical, with very little tendency towards clavate form. I saw none with more than 23 tentacles, and only a few with so many. First verticil, with 4 or 5, is distinct, but there is not much regularity about the arrangement of the others. Capitula packed with numerous nematocysts, mostly from about 0·005 mm. to 0·0075 mm. in length, a few still larger.

Medusae borne on short peduncles, difficult to see when crowded among tentacles. At first oval, they become more cylindrical at maturity, with a perfectly semiglobular base, and sometimes a little expanding at mouth. Margin raised into four broad convex lobes, each with a distinct ocellus

in middle, but these are not produced into tentacles. The structure thus corresponds with that of several of the species described by Allman, and it is probable that, as in those species, the medusa does not become free. Manubrium shorter than umbrella, but very stout, occupying great part of cavity. Medusae, apparently mature, averaged about 0·35 mm. in length by about 0·25 mm. in width.

Though not more than 23 tentacles were present on any of these specimens, while *C. tenella* is said to have from 25 to 30, I do not think the difference sufficient to invalidate their reference to Farquhar's species.

Loc.—Wellington (Farquhar): Taylor's Mistake (Chilton).

Syncoryne sp.

A small *Syncoryne*, represented only by four or five specimens not exceeding 6 mm. in height, agrees pretty closely with *S. tenella* in habit, and in the character of the hydranths and the medusae, but differs in the peculiar nature of the armature. Capitula of tentacles furnished with numerous small nematocysts, very delicate, and so faintly outlined that they may be overlooked on casual examination. But besides these there are present larger ones (about 0·008 mm. in length), elliptic, and so highly refractive as to be strikingly conspicuous. Their number varies from 1 to about 15, and a few capitula may be without them.

In the stream of coenosarc are found a few of these nematocysts, with a great number of others about half their length, and still more numerous smaller oblong bodies which may possibly be yet another form of nematocyst. All these bodies have the same highly refractive character as the large nematocysts. Perhaps this may be only a peculiar condition of *S. tenella*.

Syncoryne sp. Hartlaub.

Hartlaub, 1901, p. 363.

Hartlaub mentions a species of *Syncoryne* from French Pass, but the description is incomplete, and the species cannot be identified with certainty.

Syncoryne eximia Allman.

Hincks, 1868, p. 50: Allman, 1871, p. 282.

The form which I refer, with little doubt, to the above species is represented in Professor Chilton's collection by a single mounted fragment, and I possess a similar mount, evidently the same gathering, for which I have to thank Mr. C. B. Morris, of Oamaru, the original collector.

Stems strongly annulated at base, as well as at points where branches originate, and the latter exhibit the characteristic tendency to a unilateral arrangement, while the polypiferous ramuli are mostly more or less loosely ringed throughout, and are prolonged into membranous cups of extreme tenuity (sometimes indistinct), surrounding bases of hydranths. The latter are somewhat clavate, with about 20 tentacles, the first 4 forming a regular verticil, the others scattered. Medusae ovate and pedunculate, becoming more nearly globular at maturity and assuming the typical *Sarsia* form: they are numerous and often crowded on the lower half or two-thirds of body. Hydranths reach about 1·4 mm. in length.

Loc.—Oamaru rocks (Mr. C. B. Morris).

Fam. CAMPANULARIDAE.

Obelia geniculata (Lin.).

Farquhar, 1896, p. 460: Hilgendorf, 1897, p. 204: Hartlaub, 1901, p. 362.

This cosmopolitan species has received numerous synonyms, which may be found in Nutting's work on the American Campanularidae, where the references to it occupy two and a half folio pages. Hartlaub records it from Rangitoto Island. Professor Chilton's specimen is from Oamaru rocks (Mr. C. B. Morris).

Obelia nigrocaulus Hilgendorf.

Hilgendorf, 1897, p. 203. (Dunedin.)

Obelia nodosa n. sp. (Fig. 1.)

Shoots nearly 1 in. in height, monosiphonic or slightly fascicled at base, nearly straight below, flexuous above; internodes with a few distinct rings at lower end, at top supporting a hydrotheca with ringed peduncle; a branch or gonangium, or both, springing from axil.

Hydrothecae campanulate, distal portion generally less expanding than lower, extreme margin usually everted, undulated, sometimes subregularly, often simply ragged; diaphragm usually oblique.

Gonothecae on short annulated peduncles, with about three inflations more or less distinct; mouth tubular, not very wide.

Loc.—Waitakerei, Auckland (Chilton).

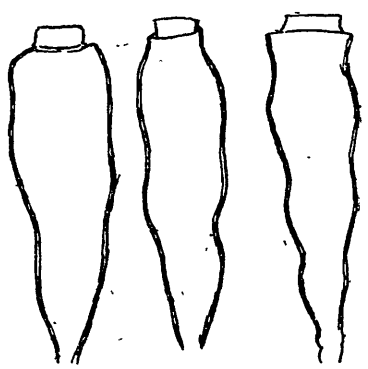


FIG. 1.—*Obelia nodosa* n. sp. × 40.

Many of the shoots are monosiphonic, but some become fascicled by the formation of stolons which originate from apertures formed at the sides of the apophyses near base, from which hydrothecae have fallen. Generally only one or two of the lowest apophyses give rise to these stolons, which run down to the hydrorhiza and are continued over it. Most of the hydrothecae have margins irregular, showing very slight traces of undulations, which are very shallow, but some show them more distinctly.

The most characteristic feature is the form of the gonangia, which have three inflations increasing in size upwards. These vary in degree, being more pronounced in some cases than in others. The tubular neck is well developed.

Obelia coughtreyi n. sp. (Fig. 2.)

Shoots about 1 in. in height, monosiphonic (?), slightly flexuous below, very strongly above; internodes with a few distinct rings at lower end, at the top supporting a hydrotheca with ringed peduncle; a branch or gonotheca, or both, springing from axil.

Hydrothecae campanulate, margin regularly undulated, but in older hydrothecae with undulations obscure, margin appearing simply ragged; diaphragm often appearing somewhat oblique.

Gonothecae on short annulated peduncles, large, wide, mouth only very little elevated.

Loc.—Taylor's Mistake (Chilton).

A more robust species than the last, the gonangia especially being much larger. They are widest at the top, and noticeable for the shallow scarcely tubular lip. There is a series of numerous annular undulations, so slight that they might easily pass unnoticed but for the fact that the minute diatoms which invest the gonangia in great numbers have in parts followed their course.

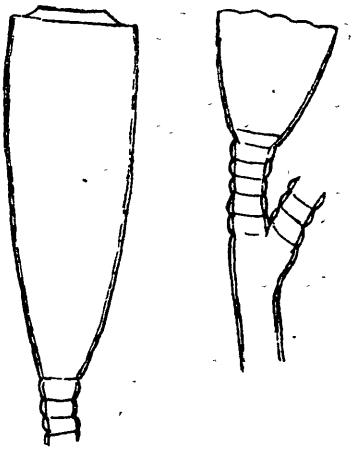


Fig. 2.—Obelia coughtreyi n. sp. ×40.

The hydrothecae are larger on the average than in *O. nodosa*, and usually more widened upwards; there is no doubt as to the marginal structure, which exhibits about 10–14 undulations, or shallow rounded lobes, best seen in the newer hydrothecae, as, apparently owing to their extreme delicacy, they soon become irregular and ragged.

Obelia australis v. Lendenfeld.

Farquhar, 1896, p. 460: Hartlaub, 1901, p. 367.

Hartlaub records this species from French Pass.

Gonothyraea parkeri (Hilgendorf).

Calycella parkeri Hilgendorf, 1897, p. 205 (= *G. hyalina* Hincks, 1868, p. 184 ?).

Among the specimens received from Professor Benham is a slide labelled "Type *Calycella parkeri* Hilgendorf." The species does not resemble a *Calycella*, but is a *Gonothyraea*, possibly *G. hyalina* Hincks. But the specimen is not in good condition; all the hydrothecae are more or less crumpled and collapsed, especially towards the aperture, so that it is impossible to say with certainty what the form of the margin has been. Hilgendorf says that the thecostome may be either "entire, wavy, or regularly serrated with small even teeth." The hydranths are similar to those of *Obelia*, but seem more slender than we are accustomed to find them in that genus. They are all retracted into the hydrothecae, with the tentacles straight up, surrounding the proboscis: in this state the tentacles just about reach the margin of the hydrotheca, or a little above it, while the proboscis is considerably shorter. This is not in accordance with Hilgendorf's statement that "when in a state of retraction it projects above the retracted tentacles."

The gonangia mostly contain three or four gonophores, or have them borne outside the capsule and attached to the blastostyle in a cluster. The gonophores themselves are too shrunken and too deeply stained to allow their structure to be seen clearly, but the characteristic tentacles can be traced on some of them.

In *G. hyalina* Hincks says that the hydrothecae have "the rim cut out into numerous shallow denticles of castellated form, slightly indented at the top," and in one or two of the hydrothecae of *G. parkeri* I find fragments of the rim which seem to present a similar aspect; I think, therefore, that the two forms are probably identical. The gonosome also appears to agree with that of *G. hyalina.*

Clytia johnstoni (Alder).

Hincks, 1868, p. 143: Hartlaub, 1901, p. 364.

Some specimens from French Pass, which Hartlaub examined, are said by him to be undoubtedly a *Clytia*, and are, with somewhat less certainty, referred to this well-known and widely distributed species.

Orthopyxis caliculata (Hincks).

Campanularia caliculata Hincks, 1868, p. 164: Farquhar, 1896, p. 459 (as var. *makrogona*).
Orthopyxis caliculata Bale, 1914*a*, p. 74 (synomymy).

The species which Coughtrey first described as *C. integra* and afterwards as *C. caliculata* is placed by Farquhar under *C. caliculata* var. *makrogona* v. Lendenfeld (*Orthopyxis macrogona* Bale, 1914*a*, p. 77). The reason for this is not apparent: it seems equally probable, or more so, that it may have been a true *O. caliculata;* indeed, Coughtrey's description of the gonangium does not apply very well to either form. Hartlaub thinks the species is probably the same as his *Eucopella crenata* (*Orthopyxis crenata*).

Orthopyxis crenata (Hartlaub). (Fig. 3.)

Campanularia allied to *C. caliculata* Coughtrey, 1876, p. 25, note.
Eucopella crenata Hartlaub, 1901, p. 364: Billard, 1905, p. 332; 1906, p. 71.
Not *Eucopella crenata?* Hartlaub, 1905, p. 568: Billard, 1907*b*, p. 170.
Not *Orthopyxis crenata* Nutting, 1915, p. 67.

Hydrorhiza broad, flattened, forming an irregular network; pedicels very variable in length, more or less undulated, often with one or more constrictions; a single spherule below each hydrotheca.

Hydrothecae large, obconic, wall smooth or with 2–4 strong undulations; in the wider aspect very thick, the thickening mostly extending from base up to just below rim, in the narrow aspect not much thickened except at base; border rising just above top of thickening, very thin, everted horizontally, furnished with shallow teeth, about 15 (or according to Hartlaub 12–14), often difficult to see.

Gonothecae large, strongly compressed, broadly truncate above, thick-walled with undulated surface, with short smooth stalk, enclosing two medusae (Hartlaub).

Loc.—French Pass (Hartlaub): Sumner (Chilton): west coast of Africa; Gambier Islands (Billard).

Hartlaub refers to thick-walled and thin-walled hydrothecae growing on the same hydrorhiza: these are similar hydrothecae seen in different aspects, as is usual in the genus. *O. macrogona* (v. Lendenfeld) is not, as Hartlaub suggests, the same species, as it has a perfectly smooth border, and differs otherwise. Whether Hartlaub is right in referring to *O. crenata* the hydroid which Coughtrey considered allied to *Campanularia integra* is impossible to determine.

The hydrothecae of *O. crenata* vary greatly in form. Some are smooth and with the wall about equally thick from base up to just below margin; others have the outline wavy, and in such cases the undulations of outside and inside surfaces do not always correspond. The thickening of perisarc (as seen in the broad aspect) is more pronounced than in most species, recalling *O. compressa.* This thickening ends abruptly just below rim, which, being very thin and usually turned out horizontally, causes the teeth to be very commonly indistinguishable in the ordinary side view. Hydrothecae larger than those of any other species I have seen.

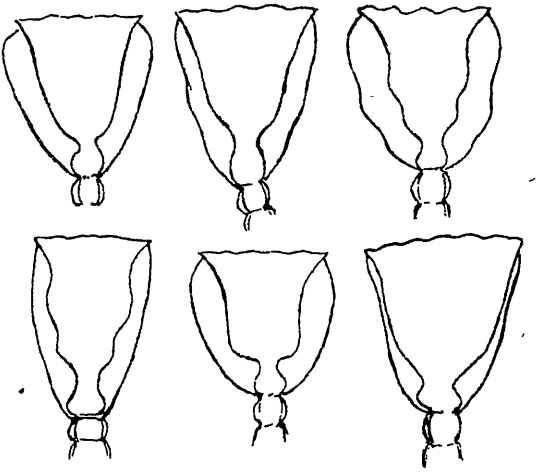


FIG. 3.—*Orthopyxis crenata* (Hartlaub). × 40.

Pedicels may be scarcely longer than hydrothecae, or many times as long; their undulations may be very pronounced or only slightly indicated, and thickness of perisarc varies considerably.

I saw no gonangia, and quote Hartlaub's description.

(The form figured by Nutting is that which Hartlaub referred doubtfully to *E. crenata*, but which he afterwards recognized as distinct, and which Jäderholm calls *Campanularia lennoxensis.*)

Silicularia bilabiata (Coughtrey). (Fig. 4.)

Campanularia bilabiata Coughtrey, 1874, p. 291; 1875, p. 299; 1876, p. 25: Farquhar, 1896, p. 460

Hypanthea bilabiata Hilgendorf, 1897. p. 213: Bale, 1914*a*, p. 89.

This species may readily be identified by Coughtrey's figure of the hydrotheca, which is much larger and of longer proportions than that of *S. campanularia;* among them, however, are a few with much shorter hydrothecae, these being mostly such as have very short pedicels. The ordinary pedicels attain the height of about 6 mm. or 7 mm., and are very thick, with much-thickened walls, which are narrowed in at base so that diameter at point of attachment is little more than that of interior of tube; in this respect they resemble those of *S. campanularia.* Hilgendorf specially mentions this character, but his figure represents a very thin-walled pedicel. Both Coughtrey and Hilgendorf note that hydrothecae are set on pedicels at an angle of 45°; this character is not constant, but I find it in most of the hydrothecae, and when it occurs it is always the

lower lip which is bent downward. The condition, however, is equally common in *S. campanularia.*

The gonangia are large and pear-shaped, but apt to be very irregular in outline; the largest which I saw were simply rounded at top; shorter ones were more or less truncate, which is presumably a matter of development. They taper down to a very narrow base, smaller than that of the hydrotheca-stalks, and those which I saw were mostly erect, while those of *S. campanularia* are more often decumbent.

Specimens from Professor Chilton were very perfectly preserved, the perisarc not having suffered the slightest contraction; one of Coughtrey's specimens, from the Dunedin Museum, had been dried, and, as always happens in such circumstances, the thick perisarc of the hydrothecae was much shrivelled and distorted. The hydrothecae were somewhat shorter than in Professor Chilton's specimens, but this may be more or less

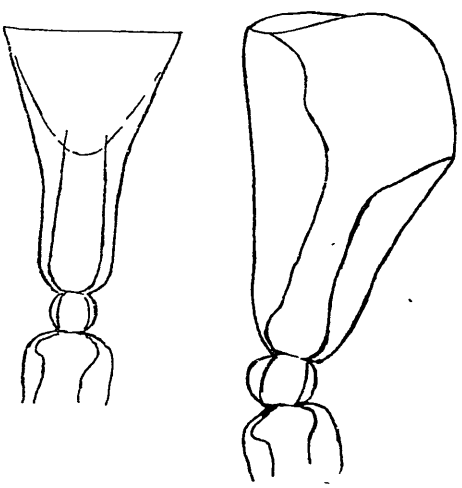


FIG. 4.—*Silicularia bilabiata* (Coughtrey). × 40.

the effect of the general shrinkage. The gonangia were on Coughtrey's specimen, and probably some of the irregularity which characterizes them is due to their having been dried, though they appear to have suffered less than the hydrothecae and their pedicels. The latter seem to have been originally thin-walled, a condition accentuated no doubt by shrinkage due to drying.

Hilgendorf has classed *Eucopella campanularia* as a synomym of *C. bilabiata*, but this is erroneous, and there is scarcely a doubt that his *Hypanthea asymmetrica* is really the same as *E. campanularia.*

Loc.—Timaru (Coughtrey): Tomahawk, Dunedin (Hilgendorf): Sumner (Chilton): Oamaru rocks (Morris).

Silicularia campanularia (v. Lendenfeld).

Eucopella campanularia v. Lendenfeld, 1883, p. 497 (in part): Bale, 1884, p. 60; 1888, p. 751: Mulder and Trebilcock, 1914, p. 9.
Hypanthea asymmetrica Hilgendorf, 1897, p. 212: Hartlaub, 1901, p. 366.
Silicularia campanularia Bale, 1914*a*, p. 84.
? *Eucopella reticulata* Hartlaub, 1905, p. 569.

Hilgendorf's account of *Hypanthea asymmetrica* and *H. bilabiata* is unsatisfactory; so far as features of specific importance are concerned

there is nothing in the account of either species which would not apply to the other, except the description of the pedicels, which are said to be smooth in *H. bilabiata*, but to have occasional sharp constrictions in *H. asymmetrica*. In reality *H. bilabiata* is equally subject to these irregularities, which simply indicate the points at which regeneration has occurred. The distinction between these two species, at least so far as the trophosome is concerned, seems to depend almost entirely on size of hydrothecae and hydranths. The former, in *H. bilabiata*, often attain 1 mm. in length; in *S. campanularia*, which I consider identical with *H. asymmetrica*, I do not find the largest to exceed about 0·67 mm., either in Australian specimens or in Professor Chilton's. The hydrothecae of *S. bilabiata* are, as a rule, longer in proportion to their width than those of the other species, and the gonangia are longer and more erect.

Hartlaub mentions that he found his specimens intermixed with his *Eucopella crenata*, so that at first it appeared that the two forms of hydrothecae belonged to the same hydroid; on further examination, however, he traced them to two different hydrorhizas growing together. No doubt it was a similar association which led von Lendenfeld to describe the hydrothecae of *S. campanularia* and an *Orthopyxis* (perhaps *O. compressa*) as forms of one species. In the present collection *O. crenata* and *S. campanularia* are found, but not in company.

Loc.—Kuri Beach (Hilgendorf): French Pass (Hartlaub): Lyttelton Harbour (Chilton): Port Phillip; Port Jackson; ? Falkland Islands (Hartlaub).

Fam. LAFOEIDAE.

Hebella calcarata (L. Agassiz).

Lafoea scandens Bale, 1888, p. 758.
Hebella scandens Farquhar, 1896, p. 460: Bale, 1913, p. 117.
Hebella calcarata Bale, 1915, p. 251 (synonymy).

Fam. HALECIIDAE.

Halecium delicatulum Coughtrey.

Halecium delicatula Coughtrey, 1875, p. 299; 1876, p. 26: Farquhar, 1896, p. 461.
Halecium delicatulum Ridley, 1881, p. 103: Hartlaub, 1901, p. 368; 1905, p. 613: Stechow, 1913, p. 79.

Recorded by Hartlaub from French Pass, and by Ridley from Punta Arenas. Ridley describes the gonangia.

Halecium parvulum Bale.

H. parvulum and *H. gracile* are now commonly regarded as synonyms of *H. flexile* Allman. (See Bale, 1915, p. 246.)

Fam. CAMPANULINIDAE.

Campanulina humilis n. sp. (Fig. 5.)

Hydrorhiza filiform, delicate, giving rise to numerous slender closely-undulated pedicels, each supporting a single hydrotheca; pedicel expanding gradually to base of hydrotheca.

Hydrothecae slender, upper one-third with several folds or irregular converging segments; a distinct diaphragm at base.

Gonosome ?

Loc.—" Hull of 'Terra Nova'" (D. G. Lillie).

In this delicate species pedicels average about 0·27–0·30 mm. in length, and hydrothecae range from about 0·20 mm. to 0·30 mm. There is much variation in undulation of pedicels, some being smoother than others; generally undulations are fainter in distal portions. Abrupt divisions may

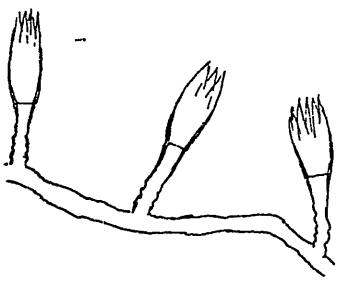


Fig. 5.—*Campanulina humilis* n. sp. × 40.

be seen occasionally, indicating where regenerations have occurred. No constriction between hydrothecae and pedicels, which slightly enlarge and join hydrothecae without interruption, so it would be impossible to say where hydrothecae begin if it were not for diaphragm. The latter is extremely thin, and the perisarc throughout is of the thinnest.

In the only specimen all the hydranths were retracted, so I could not ascertain whether the tentacles were webbed, as is usual in the genus.

Thyroscyphus simplex (Lamouroux).

Laomedea simplex Lamouroux, 1816, p. 206.
Campanularia tridentata Bale, 1893, p. 98.
Sertularella tridentata Hartlaub, 1900, p. 46.
Thyroscyphus tridentatus Hartlaub, 1901, p. 369.
Parascyphus simplex Ritchie, 1911, p. 160.
Thyroscyphus simplex Bale, 1915, p. 245 (synonymy).

Recorded by Hartlaub from French Pass, and by Ritchie from the British coast and the South Atlantic.

Fam. Sertulariidae.

Of the genera here included in the Sertulariidae, *Thuiaria* and *Sertularella* are taken according to Levinsen's definitions. I do not, however, adopt his genus *Odontotheca*, as its characters appear to me insufficient to warrant its separation from *Sertularia*. Levinsen himself, though classing *S. minima* as an *Odontotheca* (1913, p. 308), states on p. 264 of the same work that it is a true *Sertularia*. All the other *Sertulariae* mentioned in the present paper would come under the *Odontotheca* of Levinsen.

The species with six or more teeth on thecostome, and, so far as is known, without operculum, are referred to the genus *Stereotheca*, under Synthecidae.

Thuiaria buski (Allman).

Desmoscyphus buskii Allman, 1876, p. 265: Farquhar, 1896, p. 465.

The untenable genus *Desmoscyphus* embraced Sertularians in which the opposite hydrothecae are in contact with each other in front, and it included forms some of which belong to the genus *Sertularia*, and others to *Thuiaria*, as now understood. *D. buski*, as Captain Totton informs me, is extremely closely allied to the *Thuiaria bicalycula* of Coughtrey, and it is undoubtedly to be referred to the same genus.

Selaginopsis monilifera (Hutton).

Sertularia monilifera Hutton, 1872, p. 257: Coughtrey, 1874, p. 282; 1875, p. 301; 1876, p. 30.
Thuiaria cerastium Allman, 1876, p. 271.
Thuiaria monilifera Thompson, 1879, p. 111: Farquhar, 1896, p. 465.
Dictyocladium dichotomum Allman, 1888, p. 77: Levinsen, 1913, p. 277.
Selaginopsis dichotoma Billard, 1910, p. 16: Bale, 1915, p. 266.

I have a fragment of *S. monilifera* from the collection of Hutton's types in Dunedin Museum, and specimens of Allman's types of *T. cerastium* and *D. dichotomum* from British Museum. The *Dictyocladium* is more robust, with hydrothecae more distant; otherwise it does not differ essentially from the other specimens. Hydrothecae very variable in the extent to which distal portion is prolonged. It is singular that Allman, when describing *Dictyocladium*, should have overlooked his earlier account of *T. cerastium*. As I have elsewhere remarked, the "Challenger" figure is very inexact—that of *T. cerastium* is more like the specimens; and this is notably the case with the gonangia, which are figured correctly as springing from one of the branches just above the axil, instead of from the axil itself as in the "Challenger" figure.

I have to thank Captain Totton for pointing out to me the identity of these forms.

Sertularella edentula n. sp. (Fig. 6.)

Hydrocaulus branched, fascicled in older portions, each internode of rachis bearing a single hydrotheca on one side, and a pinna between two hydrothecae on the other; pinnae alternate, not close, long, straight, narrow at origin, with nodes few or absent.

Hydrothecae alternate, the two series sometimes more widely separated behind than in front, very stout, tubular, slightly narrowed upward, adnate in their whole length, somewhat contracted at aperture, which is at an angle of about 45° with axis of pinna, border circular, quite smooth, operculum of three valves.

Gonangia springing from rachis, very large and stout, in back or front view obovate, in side view with back more convex than front, a wide shallow longitudinal depression running whole length of dorsum and over summit; aperture on ventral side, nearly reaching top, circular, margin not thickened.

Loc.—Cape Maria van Diemen, ten miles north-west, 50 fathoms (Chilton).

This is one of that group of species which, from the immersed hydrothecae, as well as from their biserial and unpaired arrangement, were formerly regarded as typical *Thuiariae*. It somewhat resembles *S. lata*, but is a more robust species, with the hydrothecae larger and more fully divided off from the hydrocaulus. The pinnae, which may reach over 1 in. in length, may be wholly unjointed, or there may be

a node near the end. The hydrothecae are less close in the distal than in the proximal portions of the pinnae, and where a node occurs the highest hydrotheca on the lower internode has its border nearly horizontal.

The form of the hydrotheca-margin is characteristic, having no trace of the three or four emarginations usual in the genus, but being perfectly round and smooth, and in general showing no indication of the operculum. In this group the operculum is readily detached, yet in such species as *S. lata*, for example, one generally finds its remains attached to the hydrotheca-margin (though it is only in well-preserved specimens that the four valves are distinct), but in the species before us the operculum generally comes clean away, leaving no trace. Only

FIG. 6.—*a, Sertularella edentula* n. sp.; × 25. *b, Sertularella edentula*: gonangium; × about 10.

here and there can a remnant be found, and then usually insufficient to indicate its original form; however, after careful search I succeeded in finding a few specimens intact, all of which were trivalvate, though the margin showed no corresponding divisions.

In many of the hydrothecae is found a membranous diaphragm (or its remains) situated at a small but variable distance within the margin and continuous with a membrane lining the hydrotheca; it is pierced by a circular central orifice of very variable size (in some cases, however, I could not find this opening). It is evidently a temporary structure, as even where the orifice is distinct it is frequently so small that the hydranth could not possibly pass through it. Hartlaub (1900, p. 11) mentions finding a similar structure, which he calls the "velum," in an American species.

The gonangia are very large (about 4·3 mm. in length and 1·8 mm. in diameter), and their form is very distinctive. Looking at them from the back or the front the longitudinal depression is not noticeable, except perhaps on the top, but seen sidewise it gives the impression of two longitudinal ridges. The aperture, before opening, can only be distinguished by an extremely fine suture.

The only specimen was about 8 in. high, with two lateral branches near the base, where the stem was about 2 mm. in thickness.

Sertularella johnstoni (Gray).

Sertularia johnstoni Gray, 1843, p. 294: Hutton, 1872, p. 256: Coughtrey, 1874, p. 281: Hilgendorf, 1897, p. 207.
Sertularia subpinnata Hutton, 1872, p. 256.
Sertularia delicatula Hutton, 1872, p. 256.
Sertularella johnstoni Coughtrey, 1875, p. 299; 1876, p. 26: Allman, 1876, p. 261: Thompson, 1879, p. 101: Bale, 1886, p. 21: Farquhar, 1896, p. 463: Hartlaub, 1900, pp. 22, 30, &c.; 1905, p. 628: Billard, 1910, p. 13 (in part): Bale, 1914*b*, p. 25: Jäderholm, 1916–17, p. 10.
Sertularella capillaris Allman, 1885, p. 133.
Sertularella purpurea Kirchenpauer, 1884, p. 49: Bale, 1886, p. 36.
Symplectoscyphus australis Marktanner-Turneretscher, 1890, p. 226.
Not *S. johnstoni* Bale, 1884, p. 109; 1893, p. 102; which I have later referred to *S. divaricata*.

Hartlaub (1900) considered *S. capillaris*, *S. purpurea*, *S. australis*, along with *S. pygmaea* Bale, as synonyms of *S. johnstoni*. I had in 1886 referred *S. purpurea* to that species, but I think that *S. pygmaea* is nearer to *S. divaricata*. Billard agrees with Hartlaub, after examining Allman's specimens of *S. johnstoni* and *S. capillaris*, the latter of which he says has three teeth on the hydrotheca, not four as Allman states. Billard also considered *S. divaricata* as synonymous, but I have given reasons for dissenting from this view (1914*a*), with which opinion Jäderholm concurs (1916–17).

Type specimens of Hutton's *S. subpinnata* were received from the Dunedin Museum, and Professor Chilton sends typical specimens of *S. johnstoni* from Island Bay.

Sertularella columnaria Briggs.

Briggs, 1914, p. 293.

Hitherto this species is only recorded from near Cape Pillar, Tasmania. A single fragment occurs in Professor Chilton's collection, but the part of New Zealand from which it came is uncertain.

The species seems to bear the same relationship to the *johnstoni* group that *S. gigantea* does to the *rugosa* group; its gonosome, however, is unknown.

Sertularella pygmaea Bale.

Bale, 1881, p. 25; 1884, p. 108; 1914*b*, p. 25: Farquhar, 1896, p. 464: Hartlaub, 1900, pp. 30–32 (under *S. johnstoni*).

Considered by Hartlaub to be a form of *S. johnstoni*. (*Vide* Bale, 1914*b*.)

Sertularella simplex (Hutton). (Fig. 7.)

Sertularia simplex Hutton, 1872, p. 257 : Coughtrey, 1874, p. 283 (in part).
Sertularella simplex Coughtrey, 1875, p. 300 (in part) ; 1876, p. 27.
Sertularella fusiformis Hincks var. *nana* Hartlaub, 1901, p. 372.

Hydrocaulus simple (or rarely branched—Hutton), twisted at base, about 8 mm. in height, divided by narrow twisted joints into internodes, each bearing a hydrotheca on upper part.

Hydrothecae adnate a little less than half their height, divergent and directed somewhat forward, smooth, narrowed upwards and contracted near aperture, margin slightly everted, with four teeth ; three internal compressed vertical teeth, two of which are within the two upper emarginations of border, and the third below inferior marginal tooth.

Gonangia about 3½–4 times length of hydrothecae, borne on lower portion of hydrocaulus, ovate, with a few distinct coarse rugae on upper part, and tubular neck ; summit with about four conical teeth.

Loc.—Lyall Bay (Hutton) : Sumner (Hartlaub).

I have formerly ranked *S. simplex* as a synonym of *S. polyzonias*, as also has Farquhar, but examination of one of Hutton's specimens from the Dunedin Museum shows this to be erroneous. They agree with Coughtrey's figure of the type (1874, fig. 8) ; the internal teeth, however, are not shown. Fig. 10 is no doubt a different species, and probably fig. 9 also. though Hartlaub includes it with the type.

The species is analogous to the Australian *S. indivisa*, but the hydrothecae are smooth and have four emarginations of the border instead of three ; they are also larger, and have the lip rather more everted. The gonangia are of the same type, but larger, with neck more pronounced and the circular rugae fewer and less sharp.

Hartlaub's reference of this form to *S. fusiformis* Hincks seems to me doubtful.

Sertularella robusta Coughtrey.

Sertularia simplex Coughtrey (in part), 1874, p. 283.
Sertularella simplex Coughtrey (in part), 1875, p. 300 ; 1876, p. 27.
Sertularella robusta Coughtrey, 1875, p. 300 ; 1876, p. 27 : Farquhar, 1896, p. 464.
? *Sertularella* sp. Thompson, 1879, p. 101.
Sertularella tenella Hartlaub, 1901, p. 370.

This form, originally described by Coughtrey as one of the varieties of *S. simplex* Hutton, was figured by him in 1874 (pl. xx, fig. 10), but afterwards described as a distinct species. Hartlaub refers it, along with several other species, to the *S. tenella* of Alder (Hincks, 1868, p. 242). He only cites Coughtrey's original description, and seems to have overlooked the later references (1875 and 1876), in which Coughtrey named the form *S. robusta.*

I cannot agree with Hartlaub's reference of the present species, with *S. microgona* von Lendenfeld and *S. angulosa* Bale, to *S. tenella*, as these forms all possess three distinct internal teeth in the hydrothecae, which in *S. tenella* are wanting.

Hartlaub's specimens were from French Pass.

Sertularella crassiuscula n. sp. (Fig. 8.)

Sertularella solidula Hartlaub, 1900, p. 71 ; 1901, p. 371.
Not *S. solidula* Bale, 1881, p. 24 ; 1884, p. 106.

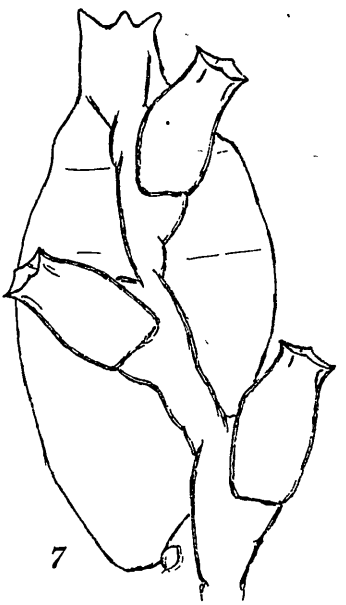
Hydrocaulus simple, twisted at base, about 10–12 mm. in height, divided by twisted joints into internodes, each bearing a hydrotheca on upper part.

Hydrothecae adnate about half their height, divergent, very stout, mostly thick-walled, smooth, usually with extreme distal part bent outward; border with four marginal teeth or shallow emarginations; three internal compressed vertical teeth, two of which are within the two upper emarginations of border, and the third below inferior marginal tooth.

Gonangia large, about 3–3½ times the length of hydrothecae, obovate, with a few transverse rugae and no distinct neck, flattened at top, without distinct teeth.

Loc.—French Pass (Hartlaub): Akaroa (Chilton): "New Zealand" (Hincks collection, British Museum).

Notwithstanding that this species has the mouth of the hydrotheca distinctly four-sided, Hartlaub has referred it to *S. solidula*, which has the aperture three-sided, on the ground that several species of *Sertularella* vary in this respect. I have not met with such; in any case, among the



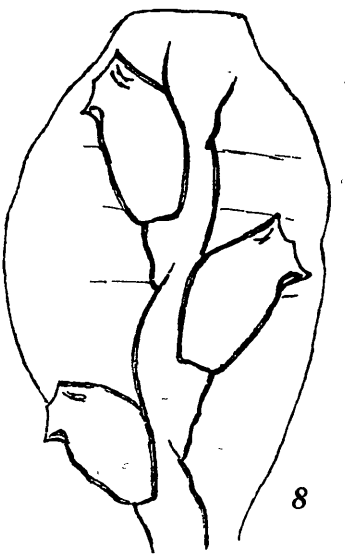


FIG. 7.—*Sertularella simplex* (Hutton). × 40.
FIG. 8.—*Sertularella crassiuscula* n. sp. × 40.

many forms of *S. indivisa* (of which species *S. solidula* is a variety) I have never seen a four-sided specimen, and, on the other hand, in the *polyzonias* group the four-sided condition seems invariable. It is even proposed by Stechow, in a recent paper, to establish distinct genera for the three-sided and the four-sided species.

Undoubtedly, however, a strong similarity exists between the present species and the form described as *S. solidula* by me, a similarity which depends mainly on the very stout hydrothecae, the thick solid-looking perisarc, and the relative shortness of the internodes, which are swollen, and abbreviated below. In all these points the species differs from *S. simplex*.

The hydrothecae are larger than those of *S. solidula*, and have always four emarginations of the border, which are very shallow, especially in

those near summit of shoot, where border often appears almost flat and very thin. The hydrotheca is commonly somewhat constricted on outer side, just below border, and the internal teeth are strongly developed.

Gonangia considerably larger than those of *S. solidula*, but otherwise much resemble them. They differ from those of *S. simplex* in absence of conical teeth on summit.

Specimens from the Hincks collection in the British Museum have somewhat shorter hydrothecae than those received from Professor Chilton.

Sertularella polyzonias (Lin.).

Farquhar, 1896, p. 463.

S. polyzonias was included in Farquhar's list in the belief that it was the same as *S. simplex* (Hutton), which is not the case. I do not think that the true *S. polyzonias* has been recorded either from New Zealand or from Australia, the form from Bass Strait which I formerly assigned to that species being more nearly allied to *S. mediterranea* Hartlaub.

Sertularella integra Allman.

Sertularella integra Allman, 1876, p. 262: Farquhar, 1896, p. 464: Hartlaub, 1900, p. 65.

I have received a fragment of the type specimen from British Museum. The species is readily identifiable by Allman's figure—the rugose condition of the upper sides of the hydrothecae is even more pronounced than in the figure; the outline at this part is quite deeply crenate.

The mouth portions of the hydrothecae are much broken, but I am convinced that Allman's statement, "The perfectly even rim of the hydrotheca, destitute of all trace of teeth, is an obvious feature," is incorrect. There seem to have been three or four (probably four) shallow emarginations of the border, as usual in the genus. The internal "conical process" referred to by Allman is one of the internal teeth now known to exist in so many species. All three are present, one being on the apocauline side, the other two, as usual, equidistant from it and from each other. They are here very large, but being thin and hyaline they are inconspicuous, especially in Canada balsam.

Sertularella subarticulata (Coughtrey).

Thuiaria subarticulata Farquhar, 1896, p. 465: Hilgendorf, 1897, p. 210.
Sertularella subarticulata Briggs, 1918, p. 36.

Type specimens were received from the Dunedin Museum. Former accounts, which described the hydrothecae as having two or four teeth, are erroneous; the species is undoubtedly tridentate, but the superior tooth, seen laterally, often appears split. The hydrothecae are extremely brittle.

Sertularella quadridens (Bale).

Thuiaria quadridens Bale, 1884, p. 119; 1914*b*, p. 12: v. Lendenfeld, 1884, p. 915: Weltner, 1900, pp. 585–86: Farquhar, 1896, p. 465.
Sertularella quadridens Ritchie, 1910*c*, p. 818: Billard, 1910, p. 11: Levinsen, 1913, p. 279: Jädenholm, 1916, p. 6.
Thuiaria vincta Allman, 1888, p. 68.

Billard states (1910) that observation of the type of *T. vincta* Allman shows its complete identity with *S. quadridens*.

Thuiaria bicalycula (Coughtrey). (Fig. 9.)

Hydrallmania (?) *bicalycula* Coughtrey, 1875, p. 301; 1876, p. 29.
Hydrallmania bicalycula Farquhar, 1896, p. 465.

Hydrocaulus monosiphonic, rarely branched, pinnate. Stem thick, fistulous, divided into internodes of variable length, each bearing from 1 to 6 pairs of hydrothecae. Pinnae rather irregular, alternate to subalternate, rarely opposite, stout, divergent nearly at right angles, borne on rather short thick apophyses; proximal internodes very long, bearing up to 16–18 pairs of hydrothecae, one or two distal internodes with few pairs sometimes present; pinnae in some cases without nodes.

Hydrothecae in pairs, opposite, adnate in front, most of their length vertical, upper portion turned outward and narrowed; aperture vertical, widened laterally, with two lateral lobes, facing outward and forward; a large smooth wide tooth inside lower margin.

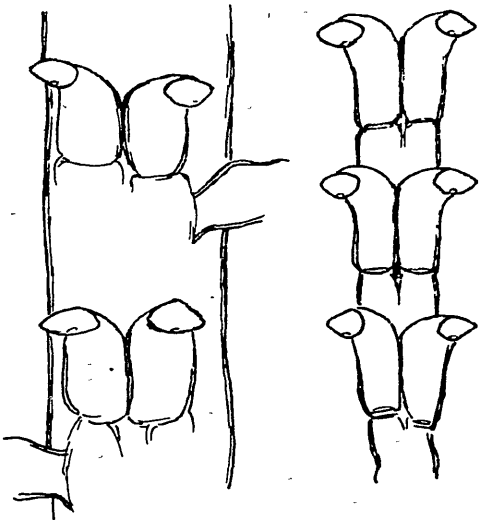


FIG. 9.—*Thuiaria bicalycula* (Coughtrey): stem and pinna. × 40.

Gonothecae abundant on the pinnae, large, length 0·13 in., width 0·8 in., urceolate, mouth small, round, entire, on a short simple neck; on the widest part of the capsule, about one-fourth of its length from mouth, is a faint rim; capsule subpedicellate. (Coughtrey.)

There is little doubt that this is the same as Coughtrey's species, though the original specimen seems to have been more robust. Coughtrey says that the stem, close to its origin, gives off from 8 to 20 shoots, which, within an inch, bifurcate into long flexuous branchlets 7 in. long. In our specimen several shoots rise from a common point of the hydrorhiza, and are unbranched; in one instance only I observed a secondary branch. The pinnae are mostly alternate, and in parts they are regularly arranged, one being given off below every pair of hydrothecae on the rachis; but, while this arrangement preponderates to such an extent as to be fairly considered typical, irregularities are frequent, and in a few cases the pinnae are opposite.

The species is nearly allied to *T. tuba* (Bale), but the stems and pinnae are very much stouter, hydrothecae are much larger and generally face

more forward, and the internal tooth is characteristic. The stems and pinnae are so thick that the tips of hydrothecae often project only slightly, or not at all, beyond them, and they are mostly not constricted between the pairs of hydrothecae. The pinnae do not generally run out into tendrils and anastomose, as in *T. tuba*, but I have seen instances.

Still closer to the present species is *T. buski*, which was the type of Allman's proposed genus *Desmoscyphus*. In this group the *Desmoscyphus* character is found in its most pronounced form, hydrothecae being seated more on the front of hydrocaulus than on its sides. As noted by Allman in regard to *D. buski*, the greatest diameter of the hydrothecae is in view when they are seen in a position midway between the front and the side aspects. The main difference between these two species is that in *T. buski* the pairs of hydrothecae on the pinnae are almost in contact with those above and below them, while in *T. bicalycula* they are widely separated.

I have not seen the gonangia; if Coughtrey's figure is correct they are more pyriform than those of the allied forms, in all of which the widest part is near the middle.

I noticed in one shoot an interesting abnormality in the arrangement of the hydrothecae on the stem: a gradual transition occurred from the opposite to a perfectly regular alternate condition, which after a short space returned gradually to the normal arrangement. Where the alternate order prevailed the hydrocaulus was somewhat narrower than elsewhere.

The species does not seem to have been observed hitherto since Coughtrey described it.

Loc.—Wickliff Bay, Bluff Harbour (Coughtrey): Cape Maria van Diemen, ten miles north, 50 fathoms (Chilton).

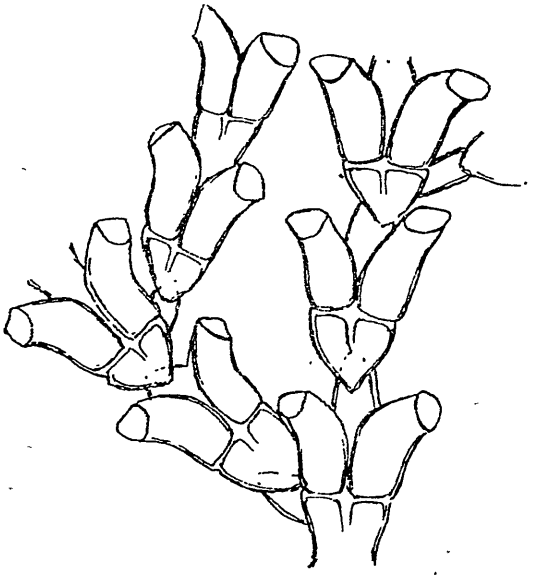


FIG. 10.—*Thuiaria farquhari* n. sp. × 40.

Thuiaria farquhari n. sp. (Fig. 10.)

Hydrocaulus short, monosiphonic, pinnate, divided into short internodes, bearing 1–3 (mostly 2) pairs of hydrothecae. Pinnae quite irregular, on

extremely short apophyses, internodes bearing usually 1–2 pairs of hydrothecae, and occasionally a secondary ramule.

Hydrothecae in pairs, opposite, adnate in front, upper half curving outward and forward and becoming narrower; aperture vertical, facing outward and forward, with two large angular lateral lobes, thinned away to margin.

Gonangia ovate, widest near the middle, with faint annular undulations, most distinct in upper half; aperture circular, margin not thickened, a circlet of thick perisarcal processes projecting into the neck.

Loc.—Lyttelton (Chilton).

The largest specimen is about $\frac{3}{4}$ in. long; it has one pinna on right side, then two on left, then five on right, so that no definite order can be traced. Stem and branches do not appreciably differ, either in size or form, and hydrothecae have the same arrangement throughout. In striking contrast to the last species, hydrocaulus is much constricted between pairs of hydrothecae, and especially between internodes, where joints are of oblique type, sloping backward and upward, so that internode, which is very wide at base of hydrothecae, narrows rapidly downward to a point in front, while part above hydrothecae is narrower throughout. Between the pairs on an internode, though the joint is wanting, the constriction is still marked. Upper part of hydrothecae is turned so much forward that in front view anterior lateral tooth is scarcely noticeable, being so much foreshortened.

The gonangia are similar to those of the allied species, *T. tuba* and *T. buski*.

Sertularia episcopus (Allman).

Sertularia fusiformis Hutton, 1872, p. 257: Coughtrey, 1874, p. 285: Ridley, 1881, p. 105 ?: Pfeffer, 1892, p. 568.
Sertularia longicosta Coughtrey, 1875, p. 300; 1876, p. 28.
Sertularella episcopus Allman, 1876, p. 263: Farquhar, 1896, p. 464: Hartlaub, 1905, p. 658.

This species, having the character formerly considered typical of *Sertularella*, and the name *fusiformis* having been preoccupied in that genus, Allman named it *S. episcopus* and Coughtrey *S. longicosta*. The species described in Allman's paper of 1876 were mentioned in a preliminary note in *Nature* in 1874, with short descriptions to ensure priority; hence the adoption of the name *S. episcopus* in preference to to *S. longicosta*.

It is not easy to ascertain the true form of the gonangia, as they vary so much, and have the appearance of having shrunk considerably in drying. Those which appear the best preserved are of an elongated somewhat fusiform shape, with a deep narrow dorsal channel running from end to end, formed by an inflection of the perisarc: this channel being narrow and abrupt, its edges form two longitudinal ridges, which are approximated, or sometimes quite close together, perhaps by shrinkage. At the summit are generally two blunt angles, terminating these ridges, and the aperture, which is subterminal, is just in front; it has no definite border, and looks as if simply broken through.

The hydrotheca-apertures are, in the form of their two lateral lobes, similar to those of *S. macrocarpa* Bale (*Odontotheca macrocarpa* Levinsen). *S. mccallumi* (M. & T.) has the same type of aperture, and also agrees with the present species in the very unusual character of having each hydrotheca on a separate internode. No opercula could be distinguished

on the dried specimen, which was one of Hutton's types, from the Dunedin Museum. The lateral lobes are very large and deep, and have the border thickened.

Ridley (1881) mentions some specimens from south-west Chile under the name of "*Sertularia fusiformis* Hutton ? (*non* Hincks)," and says, "This is certainly not the species assigned to Hutton's species by Allman under the name of *S. episcopus*." Hartlaub (1905) says that he has no doubt of the identity of *S. fusiformis* with *S. episcopus*, neither does he doubt that Ridley had the same species before him. Ridley says, "The growth is very strong, and the calicles large (·425 mm. in diameter at their middle), but they should be described as quadridentate, though the interior and exterior teeth are very short. The crest, described by Coughtrey on the upper side of the gonangium, is here, at any rate, a tube which opens in the side of the gonangium." In Hutton's specimens I find no trace of the two small teeth referred to by Ridley. The middle diameter of the hydrothecae ranges from about 0·33 mm. to 0·4 mm.

Pfeffer records the species from the Straits of Magellan.

Sertularia operculata Lin.

Sertularia operculata Farquhar, 1896, p. 462: Bale, 1915, p. 274 (synonymy).
Odontotheca operculata Levinsen, 1913, pp. 309, 317.

Of the numerous synonyms mentioned by me in the above-cited paper, *Dynamena fasciculata* Kirchenpauer and *Sertularia crinis* Allman are now associated, along with *S. ramulosa* Coughtrey, as a separate species, under Kirchenpauer's specific name. *Dynamena pulchella* D'Orbigny may be the same form.

Sertularia fasciculata (Kirchenpauer).

Dynamena fasciculata Kirchenpauer, 1864, p. 12.
Sertularia ramulosa Coughtrey, 1874, p. 283; 1875, p. 300; 1876, p. 28: Farquhar, 1896, p. 462.
Sertularia operculata (?) Thompson, 1879, p. 106 (in part).
Sertularia crinis Allman, 1885, p. 139: Farquhar, 1896, p. 462: Bale. 1915, p. 276.
? *Dynamena pulchella* D'Orbigny, 1839–46, p. 26: Hartlaub, 1905, p. 667: Nutting, 1904, p. 55 (in part).

Among Coughtrey's types from the Dunedin Museum is a specimen of his *S. ramulosa*, which I find to be identical with *S. crinis* Allman, and I have now no doubt that Kirchenpauer's *D. fasciculata* is also the same. Hitherto the latter has usually been ranked as a synonym of *S. operculata*, to which species Billard has also referred *S. crinis*.

The difference between *S. operculata* and the present form (whether it be admitted as specific or not) is very obvious. In *S. operculata* all the ramules resulting from the innumerable dichotomous divisions are alike, so that there is no distinction of stem and branches. In *S. fasciculata* the main stem and its principal branches, extending right to the distal extremities of the polypidom, are very conspicuous, differing from the smaller branches in their greater thickness, far longer internodes, and much more distant hydrothecae. These internodes commonly reach about 3 mm. in length, often more, but support only a single pair of hydrothecae, which are close to top. Many of them also give off lateral branchlets, which divide dichotomously into somewhat flabelliform fascicles. The first two or three internodes are long (though still much shorter than

those of stem), and where bifurcations occur in fascicles one of the divisions has its first pair of hydrothecae opposite as usual, while in the other they are generally subalternate.

Hydrothecae much like those of *S. operculata*, but teeth generally more nearly equal; in many cases quite equal, as figured by Allman; while Coughtrey describes one as much larger than the other—a description not borne out by his specimens. No doubt considerable variation occurs.

The mode of branching is, as in allied species, strictly dichotomous, though, where the fascicles branch off, one division (that which continues the rachis) is much thicker than the other. There is, as usual, a hydrotheca at each side of every axil.

Stem-internodes much stouter than hydrothecae situated upon them, and the latter often inconspicuous; it is probably partly on this account, and partly from their being frequently broken off from older portions, that Kirchenpauer has described stem as being without cells.

The gonangia, which are not present in specimens before me, are described as similar to those of *S. operculata*, not to those of *S. bispinosa*.

Thompson, under the name "*S. operculata* (?)" includes *D. fasciculata* K. and *D. bispinosa* Gray, and, though not having seen specimens exactly corresponding to *S. trispinosa* Coughtrey, has "little doubt that it is in reality a mere variety of the present species." He says, "*Sertularia operculata* (?) is of very common occurrence in New Zealand and Australia. There are two very distinct varieties, as indeed is, I think, the case with our British specimens. The first is brown in colour, and forms dense short tufts, 2 or 3 inches in height. The second variety is of a yellowish hue, and occurs in long, trailing, dichotomously-branching shoots, often 2 (according to Kircheupauer 3 or 4) feet in height. This is not merely a difference in age." Coughtrey says of *S. ramulosa* that there are two varieties, coarse and delicate.

Kirchenpauer says that the thread-like stems are densely crowded on a Laminaria, forming clusters 3 ft. or 4 ft. long, and that the individual stems reach 2 ft. in length. His specimens were from Sydney and New Zealand.

Thompson's statement that the species is of very common occurrence in Australia and New Zealand can, I think, only be accounted for by his having mixed up several species. I have specimens of *S. operculata*, *S. bispinosa*, and *S. trispinosa* from both countries, but I have never seen a specimen of *S. fasciculata* other than that from the Dunedin Museum.

Thompson remarks that *S. furcata* Trask is indistinguishable from the present species, so far as the form of gonangia and hydrothecae is concerned. On the Pacific coast of United States *S. furcata* is still regarded by some observers as identical with *D. pulchella* D'Orbigny, a species allied to *S. operculata* and the species before us, and very possibly identical with one of them. I have referred to this subject in another place (1915, p. 276) but I may here summarize the distinctions between the two forms. *S. furcata* is a dwarf form, under 1 in. in height, usually unbranched, and with one or two gonangia borne at base of shoot; it is of the *Desmoscyphus* type—that is to say, hydrothecae forming a pair are in contact or closely approximate in front of hydrocaulus, at least in upper portion. *D. pulchella* is a large species, 9 in. in height, abundantly branched, with numerous gonangia scattered over branches, and is not of the *Desmoscyphus* type, hydrothecae being wide apart, and quite similar to those of *S. operculata*.

Sertularia bispinosa (Gray).

Sertularia bispinosa Farquhar, 1896, p. 462: Hilgendorf, 1897, p. 206: Jäderholm, 1903, p. 284: Hartlaub, 1901, p. 373: Nutting, 1904, p. 56: Bartlett, 1907, p. 61: Billard, 1910, p. 18: Mulder and Trebilcock, 1914, p. 6: Briggs, 1918, p. 37: Jäderholm, 1916–17, p. 15.
Sertularia operculata Hartlaub, 1905, p. 664 (in part).
Odontotheca bispinosa Levinsen, 1913, p. 308.

A specimen from Sumner is in Professor Chilton's collection. Hydrothecae of this species differ from those of *S. operculata* in having upper portion free and abruptly contracted on inner side; gonangia are compressed, with a shoulder at each side often produced upwards into an erect process.

Sertularia unilateralis Allman.

Sertularia unilateralis Allman, 1885, p. 139: Farquhar, 1896, p. 463.
Sertularia bispinosa Billard, 1910, p. 18 (in part).

From the British Museum I have received a portion of one of Allman's specimens. The primary shoots give origin by repeated bifurcations to a number of secondary shoots, all on the same side, which are again subdivided, the primary shoot thus assuming to some extent the character of a stem; its structure, however, only differing from that of the smaller branches by the somewhat more robust internodes and hydrothecae. On the small branches also the two members of a bifurcation are sometimes slightly unequal. The average length of the internodes and hydrothecae is decidedly less than in the ordinary forms of *S. bispinosa*, of which species it may rank as a variety.

Sertularia trispinosa Coughtrey.

Sertularia trispinosa Coughtrey, 1874, p. 284; 1875, p. 300; 1876, p. 28: Ridley, 1881, p. 104: Bale, 1884, p. 69; 1886, p. 92: Farquhar, 1896, p. 462: Hilgendorf, 1897, p. 207: Hartlaub, 1905, p. 668: Bartlett, 1907, p. 62: Jäderholm, 1916–17, p. 16.
Odontotheca trispinosa Levinsen, 1913, pp. 309, 318.

Specimens from Coughtrey's material in Dunedin Museum are somewhat more lax and delicate than others I have seen. Though a member of the *operculata* group, the species is sharply distinguished from all the rest by third tooth on hydrotheca-margin. Levinsen's figure of hydrotheca is the best. Hilgendorf erroneously describes gonangia (which he calls "gonophores") as having *two* large teeth on each side of orifice.

Sertularia unguiculata Busk.

Sertularia unguiculata Farquhar, 1896, p. 463: Bale, 1914*b*, pp. 16, 11; 1915, p. 273.

I have given the full synonymy in 1914*b*, p. 16. *Thuiaria ambigua* Thompson is the large form of the species; *Sertularia australis* (Kirchenpauer), described by Thomson in the same paper, is the dwarf form. A specimen of the latter, from Lyttelton, is in Professor Chilton's collection.

Sertularia minima Thompson.

Sertularia minima Farquhar, 1896, p. 462: Hilgendorf, 1897, p. 209: Jäderholm, 1905, p. 24: Thornely, 1908, p. 83: Billard, 1909*a*, p. 194: 1910, p. 17: Jäderholm, 1910, p. 3: Hilgendorf, 1911, p. 541: Ritchie, 1911, p. 845: Mulder and Trebilcock, 1914, p. 39: Bale, 1915, p. 269 (synonymy): Briggs, 1918, p. 37.
Odontotheca minima Levinsen, 1913, p. 308.

From Dunedin Museum I have one of Coughtrey's specimens of this most variable species. If differs somewhat from his figures, having more compact internodes, with hydrothecae less divergent at base and more so above. Specimens from Port Phillip agree more perfectly with the figures. These forms have rarely more than 10 or 11 pairs of hydrothecae, and do not exceed about 3 mm. in height. The hydrorhiza forms a network running over fronds of algae; it is flat and ribbon-like, and at short intervals along each side are little perisarcal loops running inward from margin; these are wanting in some of the varieties. The nodes are oblique, but this feature is sometimes scarcely noticeable, especially in lower part of the colony. The shoots are borne on slender peduncles, mostly consisting of an apophysis and a very short fusiform internode. The nodes at this part are very oblique, and are sometimes referred to inaccurately as "twisted joints."

The variations depend on the respective sizes of the colonies and of their several parts, degree of distinctness and obliquity of nodes, compactness or otherwise of internodes, degree of divergence of hydrothecae, and especially the character of hydrorhiza. The largest variety which I have seen is the form which I originally described as *S. pumiloides*, from Port Phillip, reaching about 6 mm. in height, and consisting of about 12–16 internodes. Its hydrothecae are larger than those of typical forms, and its gonangia exceed in size those of any other variety, being about 1·5 mm. by 1·0 mm., while the joints are more markedly oblique. The hydrorhiza is reticulated, delicate, and in parts scalloped alternately on sides, so as to present a zigzag appearance; marginal loops of perisarc are not present. Another specimen from the same locality has nodes transverse, with hydrothecae more divergent; its hydrorhiza is stout, filiform, dark in colour and not reticulated, being the most conspicuous part of the colony; and it has no trace of marginal loops. The peduncles of shoots in this form are more robust, and have two, sometimes three, fusiform internodes following apophysis. A very similar form from Akaroa is from the Busk collection in British Museum, and another, with up to 20 internodes, is from "New Zealand." On one or two of these varieties I noticed instances where a joint was quite wanting, so that an internode of 4 hydrothecae was formed.

Mulder and Trebilcock also mention having observed several varietal forms, some with the characteristic markings of the hydrorhiza, and others without them. These observers have called attention to the existence in this species and its allies of minute apertures near the bases of some of the internodes, often surrounded by delicate tubular processes.

Hilgendorf has noticed that the shoots spring from points of the hydrorhiza at which branching occurs; this character is not, however, constant, as he supposed.

Idia pristis Lamouroux.

Idia pristis Farquhar, 1896, p. 467: Campenhausen, 1897, p. 311: Jäderholm, 1903, p. 288: Billard, 1907*a*, p. 351; 1910, p. 16: Ritchie, 1910*a*, p. 820; 1910*b*, p. 11: Stechow, 1913, p. 141: Levinsen, 1913, p. 315.
Idiella pristis Stechow, 1919*a*, p. 106; 1919*b*, p. 19.

Jäderholm and Campenhausen considered the form described by Allman was a distinct species; Billard, after examining Allman's types, does not concur.

Fam. SYNTHECIDAE.

Synthecium orthogonium (Busk).

Sertularia orthogonia Busk, 1852, p. 390 : Bale, 1884, p. 38.
Synthecium orthogonia Bale, 1888, p. 767.
Synthecium orthogonium Jäderholm, 1903, p. 289 ; 1916, p. 6 : Billard, 1910, p. 23 : Bale, 1914*b*, p. 6.
Synthecium campylocarpum Allman, 1888, p. 78 : Marktanner-Turneretscher, 1890, p. 248 : Campenhausen, 1897, p. 310 : Farquhar, 1897, p. 466 : Billard, 1910, p. 26 : Jäderholm, 1916, p. 6.
? *Synthecium campylocarpum* Inaba, 1890–92, figs. 52–54 : Stechow, 1913, p. 127 : Jaderholm, 1919, p. 14.

I unite Allman's *S. campylocarpum* with Busk's species, as I am quite unable to find any difference between them. Allman's species, of which I have received a specimen from British Museum, is identical with the form which I figured in 1888 (from the same locality, near Port Jackson) as *S. orthogonium*. I have pointed out in a former paper (1914*b*) that Campenhausen and Marktanner-Turneretscher both state that the forms which they referred to Allman's species resembled *S. orthogonium*, but neither of them gave any reason for not assigning them to that species. Jäderholm (1916) mentions the occurrence of both forms near Cape Jaubert, north-west Australia, and records them as distinct species, without any remarks as to their affinities Billard, again, in his revision of the British Museum Hydroida, refers to the types of the two species, and says nothing as to their relationship. He mentions, however, that Busk's type exhibits the right-angled outward prolongation of hydrotheca as shown in his sketch, copied in my *Catalogue*.

I conclude that these observers regard the abrupt curve outward of hydrotheca and its horizontal continuation as characteristic of *S. orthogonium*. The distinction fails, however, owing to the great variability of the hydrothecae in this particular. On the same branch one often finds hydrothecae bent out abruptly, as in Busk's figure, while in others the curvature is quite gradual. Even in the fragment of Allman's species sent to me one or two hydrothecae are quite similar in this respect to Busk's figure. I have not seen hydrothecae prolonged horizontally quite so far as Busk has shown them, but this prolongation is, in all cases where I have observed it, the result of repeated regenerations. The original aperture is slightly oblique, but when regeneration occurs the new thecostome is advanced slightly more above than below, so that the aperture soon becomes vertical, and the hydrotheca is then continued straight outward.

The " Challenger " figure is unlike type specimens in having aperture at right angles instead of more nearly vertical, and especially in showing hydrothecae as occupying little more than half the height of internode, whereas they really occupy nearly the whole of it (see Billard's figure).

I have mentioned in 1893 that, besides the large gonangia described by Allman, I found on one specimen (from the same gathering) small gonangia, something like those described by Allman as occurring in *S. elegans*, but with the markings more irregular. They are not more than one-third the length of the ordinary ones, and of about the same width. Whether these are the male form or are abnormal is at present doubtful.

The Japanese form figured by Inaba, Stechow, and Jäderholm does not seem to me to belong to this species, but rather to *S. patulum* or to *S. subventricosum*. Goto, in his account of Inaba's species, mentions the subalternate arrangement of the hydrothecae on the proximal portions of the pinnae, a very characteristic feature of the latter species, but also occurring to a much less extent in *S. patulum*.

Loc.—Torres Strait (Busk): near Port Jackson (Bale, Allman): Tahiti (Jäderholm): Auckland (Marktanner-Turneretscher): Ternate (Campenhausen): ? Japan (Inaba, Stechow, Jäderholm).

Synthecium elegans Allman.

Synthecium elegans Allman, 1872, p. 229; 1876, p. 266: Coughtrey, 1874, p. 285: Farquhar, 1896, p. 465: Hilgendorf, 1897, p. 211; 1911, p. 541: Hartlaub, 1901, p. 368: Billard, 1910, p. 25.
Sertularia elegans Coughtrey, 1875, p. 301; 1876, p. 29.
Synthecium ramosum Allman, 1885, p. 137: Billard, 1907*a*, p. 359.

A single specimen from Professor Chilton differs from Allman's figure in having at least the first pair of hydrothecae on the pinnae subalternate instead of exactly opposite; also in having apertures of hydrothecae not quite at right angles, but slightly approaching the vertical.

The locality is unknown; Hartlaub's specimens were from French Pass, Hilgendorf's from Dunedin.

Hilgendorf's remark anent "the close approximation of the opposite hydrothecae which gave the genus its name" is based on a misunderstanding, as the generic name applies solely to the fact that peduncles of gonangia spring from within the cavity of some of the hydrothecae; moreover, opposite hydrothecae in *Synthecium* are not closely approximate.

Allman considered that the peculiarity on which he founded the genus was without parallel in any other group of hydroids, but it is now known to occur as an occasional feature in various hydroids—*e.g.*, *Obelia geniculata*, *Sertularella polyzonias*, &c.

Stereotheca zelandica (Gray).

Thuiaria zelandica Farquhar, 1896, p. 464: Billard, 1910, p. 15 (synonymy).
Thuiaria dolichocarpa Allman, 1876, p. 270.
? *Thuiaria hippisleyana* Allman, 1885, p. 146.

Allman's magnified figure of *T. dolichocarpa* is quite sufficient for identification, but hydrothecae are shown too rounded; they are tubular, more square at base, with sinus on adcauline side shorter and more abrupt. Hydrotheca has seven teeth, one on apocauline margin and three on each side; in no case were more than seven present, and the only variation I observed was that the two teeth nearest hydrocaulus were in some cases very much reduced, so that there appeared to be only five. A very fine line surrounds hydrotheca a little below margin, and parallel with it.

The specimen sent to me from British Museum consists of a single pinna with a gonangium. So far as I can judge therefrom, the species seems to share with *S. acanthostoma* the very rare character of having both sides of polypidom exactly alike; hydrothecae being no nearer to those opposite them on one side than on the other, and teeth also being symmetrical on the two sides.

If there is an operculum I am unable to trace it in this specimen; probably, as in the other species with numerous teeth, it is inoperculate, and therefore to be referred to *Stereotheca*.

The pinnae are not, as stated, without nodes; in this instance there is one long internode and two or three short ones.

The addition of *T. hippisleyana* to synonyms recorded by Farquhar was made by Billard, who, however, did not see the type of that species. According to the figures, the two species are very different, and the specimen of *T. dolichocarpa* sent to me from British Museum shows none of the peculiar features said to characterize *T. hippisleyana*.

Stereotheca huttoni (Marktanner-Turneretscher).

Sertularia huttoni Marktanner-Turneretscher, 1890, p. 233: Farquhar, 1896, p. 463.
? = *Sertularia insignis* Thompson, 1879, p. 109.

Though I have little doubt that *S. huttoni* is only a synonym of the older *S. insignis*, yet as there are certain slight discrepancies in the accounts of the two species, and Thompson's figure does not agree very well with his description, while the gonosome of Marktanner's species is unknown, I content myself at present with noting the similarity of the two forms. *S. insignis* is recorded from George Town, Tasmania; *S. huttoni* from "New Zealand."

Stereotheca elongata (Lamouroux).

Sertularia elongata Farquhar, 1896, p. 461: Bale, 1915, pp. 277, 262 (synonymy).

I have given a pretty full list of references in the above-cited paper. Specimens from Lyttelton, in Professor Chilton's collection, do not differ in any respect from the small form abundant on the southern Australian coast.

Fam. PLUMULARIIDAE.

The genera of the Plumulariidae included in this paper are in accordance with Bedot's classification (*vide* "Notes systématiques sur les Plumularides," *Revue Suisse de Zoologie*, 1921).

Thecocaulus, proposed by me in 1915 as the name of a section of the genus *Plumularia*, comprising the species in which the rachis, as well as the hydrocladia, bears hydrothecae, is adopted by Bedot as a genus. He excludes from it, however, those species in which the hydrocladia produce secondary ramules, also bearing hydrothecae; these he refers to the genus *Schizotricha*, modified from Allman's genus of that name.

Plumularia setacea (Ellis). (Fig. 11.)

Sea-bristles, Ellis, 1755, p. 19.
Corallina setacea Ellis, 1755, pl. xxxviii, p. 19.
Sertularia setacea Linné, 1758, p. 813: Pallas, 1766, p. 148.
Aglaophenia setacea Lamouroux, 1816, p. 171.
Aglaophenia gaymardi Lamouroux, 1824, p. 611.
Plumularia setacea Lamarck, 1816, p. 129: Johnston, 1847, p. 97: Hincks, 1868, p. 296: Bale, 1888, pp. 747, 778; 1919, pp. 348, 349: Farquhar, 1896, p. 466: Hilgendorf, 1897, p. 214: Schneider, 1897, p. 486: Jäderholm, 1896, p. 16; 1909, p. 107; 1919, p. 20: Calkins, 1899, p. 362: Nutting, 1900, p. 56: Hartlaub, 1901, p. 374; 1905, p. 680: Torrey, 1902, p. 79: Billard, 1904, p. 206; 1907*b*, p. 209; 1909*b*, p. 325; 1913, p. 32: Ritchie, 1909, p. 89; 1910*b*, p. 834; 1911, p. 851: Fraser, 1911, p. 84; 1914, p. 209: Hilgendorf, 1911, p. 541: Stechow, 1912, p. 362; 1913, p. 89: Bedot, 1914, p. 86: Broch, 1918, p. 55.
Plumularia multinoda Allman, 1885, p. 157.
Plumularia tripartita v. Lendenfeld, 1884, p. 477.
Plumularia turgida Bale, 1888, p. 779.
Plumularia palmeri Nutting, 1900, p. 65: Fraser, 1911, p. 84.
Plumularia corrugata Nutting, 1900, p. 64: Fraser, 1911, p. 82; 1914, p. 205.

It would serve no useful purpose to cite all the numerous references and the many synonyms applied to this species by the early observers; I may point out, however, that while Bedot and other authors refer to the species as "*P. setacea* Linné," others, including Hincks, quote Ellis as the author of the specific name. Though Ellis, in his text, calls the hydroid "sea-bristles," he also names it "*Corallina setacea*," which seems to be the first use of the specific name.

Billard is the authority for ranking *Aglaophenia gaymardi* Lamouroux as a synonym. I pointed out in 1888 that *P. tripartita* v. Lendenfield was also a synonym. Torrey (1902) added *P. palmeri* Nutting, in which Stechow and Bedot concurred (Bedot 1914).

Bedot, in the above-cited paper, urges that *P. lagenifera* Allman (*P. californica* Marktanner-Turneretscher) and *P. corrugata* Nutting are in no way different from *P. setacea*, and supports this view by figures of several forms of that species observed by him at Roscoff, which, he claims, exhibit the characters which have been ascribed to *P. lagenifera*, &c., such as length, relative and absolute, of hydrocladial internodes, thickness of perisarc, and especially greater or less development of septal ridges. I fully agree that these characters are of little importance. But as regards *P. lagenifera* the specific status does not depend upon any of these points, but on the form

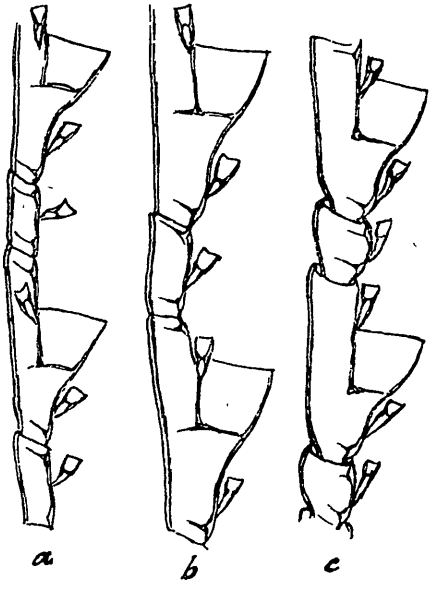


FIG. 11.—*a*, *Plumularia setacea* (Ellis); *b*, *P. setacea* var. = *P. turgida* Bale; *c*, *P. setacea* var. *opima* n. var. × 80.

of the hydrotheca and its internode. The hydrotheca, seen in side view, is almost or quite as wide at base as at rim—indeed, the front is often somewhat incurved so that the widest part is at middle. In *P. setacea*, on the other hand, the hydrotheca widens upward from base to margin. The distinction is well seen in Allman's two figures of *P. lagenifera* and *P. multinoda* (the latter being only *P. setacea* with septal ridges strongly developed).

I hesitate, therefore, to accept the association of *P. lagenifera* with *P. setacea*. *P. turgida*, however, which I have united with *P. lagenifera* (1919), though undoubtedly intermediate, seems to me now to be more fitly associated with *P. setacea*, judging from numerous specimens of the latter species which I have since obtained. *P. lagenifera* has the anterior mesial sarcotheca borne on a much more pronounced swelling of the internode than any which I have seen in *P. setacea*. None of the figures given by Bedot have hydrothecae at all like those of *P. lagenifera*.

Allman describes both *P. lagenifera* and *P. multinoda* as having hydrothecal internodes separated by several short ones instead of by a single one. I find this character to exist in *P. lagenifera* as an occasional variation only, and it occurs equally n *P. setacea* and *P. caliculata.* The description of *P. multinoda* as having usually five short internodes between two hydrothecal ones is obviously an error. The specimen is one with septal ridges strongly marked, and divisions shown in figure are the two actual nodes, the two ridges always found near ends of the short internode, and the two near ends of hydrothecal internodes. These ridges, encircling interior of internodes, have been mistaken for real nodes. *P. multinoda* is, therefore, only *P. setacea* with well-marked septal ridges.

Here and there, however, in all these species the intermediate internode may be divided by real nodes into two or more shorter ones, and in *P. setacea* I have seen as many as four of these together, only one of them bearing a sarcotheca.

Several examples of *P. setacea* are in this collection, mostly from Lyttelton; one from Sumner had hydrothecae slightly larger than the others. Also recorded from Timaru by Hilgendorf, from Sumner by Hartlaub, from Quail Island by Chilton, and from Tauranga by Allman. Professor Chilton's Sumner specimen, which is of somewhat larger proportions throughout than typical forms, corresponds exactly with that which I formerly described as *P. turgida*, and which was among von Lendenfeld's types in the Australian Museum, labelled "*P. aglaophenoides*"; it came from Lyttelton.

Plumularia setacea var. **opima** n. var. (Fig. 11, *c.*)

This form resembles *P. setacea* in its general characters, but is of larger proportions throughout than typical forms. Hydrothecal internodes are swollen out more abruptly below hydrothecae, as in *P. lagenifera*, but the latter are not, as in that species, as wide at base as at summit.

Internodes of hydrocladia are very stout in proportion to length, the intermediate ones especially being often nearly or quite as wide as long, but they are rounded off at ends to a small diameter, so that nodes are very deeply constricted, a feature which gives the variety a characteristic appearance.

Gonangia large, and borne profusely at bases of hydrocladia throughout greater part of the colony. The only complete specimen was about 40 mm. in length; it was collected at Tomahawk Beach, Dunedin, by Mr. C. B. Morris. Specimens, also from Dunedin, are in Professor Chilton's collection.

Plumularia wattsi Bale. (Fig. 12.)

Plumularia wattsii Bale, 1886, p. 95.

P. wattsi has not been recorded since I described it in 1886 from Port Phillip, and another specimen given to me by the late Dr. MacGillivray was probably from the same locality. In Professor Chilton's collection are fragments from Port Chalmers.

My original specimen was about 10 in. high, and was incomplete, the upper portion having been torn off, and replaced by irregular regeneration-growth. The slender monosiphonic stem is divided into internodes of from 0·7 mm. to 1·5 mm. in length, with an average thickness of about 0·25 mm., the longer and shorter ones interspersed irregularly, and each internode

supporting a small branch close to the top. These branches are arranged in an irregular spiral, are mostly under 1 in. in length, and sometimes give origin to one or two secondary branches. The structure of each individual branch corresponds closely with that of a complete shoot of *P. setacea*, the hydrothecae and sarcothecae, with the general arrangement of the hydrocladia, being quite similar in the two species. The gonangia also resembles those of *P. setacea*, though the few which I observed were rather smaller, and very thin and delicate. The perisarc of main stem is very thick, equalling about one-fourth of diameter. The branches mostly have the first long internode borne directly on the apophysis, but sometimes there is a short intervening internode without a hydrocladium. In older portions, however, the first two or three internodes of branches may be very irregular, the result apparently of repeated regenerations.

FIG. 12.
Plumularia wattsi Bale.
× 80.

Professor Chilton's specimens were very small pieces, not including more than ¼ in. of stem. The stem-internodes varied from 0·7 mm. to 1·0 mm. in length, and averaged about 0·2 mm. in diameter, with thinner perisarc than my original specimen. On each were four sarcothecae, one at each side of branch (these two converging towards each other in axil), and two in line, one about one-fifth and the other about three-fifths of the length of internode from base.

In the original specimen I had not observed these sarcothecae, but on a close search I found two or three remaining, also several scars indicating where others had fallen off. This, judging from the thick perisarc, was an old specimen, and it appears that when sarcothecae were lost they were not replaced (as were the branches), and that the channels communicating with them had been more or less filled up with perisarc.

Dr. MacGillivray's specimens closely resemble those from New Zealand, the only difference I noticed being that the stem-internodes in some cases supported three sarcothecae in line instead of two.

Thecocaulus heterogona n. sp. (Fig. 13.)

Shoots growing in clusters, reaching about 6 in. in height, stems stout, monosiphonic, unbranched, pinnate, joints very oblique, a hydrocladium and a hydrotheca on each internode. Hydrocladia alternate, both series springing from the front, joints oblique, internodes short, a hydrotheca on each except the first two.

Hydrothecae set at an angle of about 45°, large, campanulate, free at the back, free part somewhat concave, margin entire.

Sarcothecae bithalamic, canaliculate, more or less movable, one on each side of hydrotheca (except the cauline ones), one in front, curved forward, one on second internode of each hydrocladium, two abreast above each cauline hydrotheca.

Gonangia, female, very large, ovate, tapering below, membranous, borne on stem at side of hydrothecae, with a pedicel of about two short joints; several large sarcothecae around base: male, very small, ovate, borne on hydrocladia at sides of internodes just below hydrothecae, not provided with sarcothecae.

Loc.—Cape Maria van Diemen, ten miles north-west, 50 fathoms. (Chilton.)

From its general habit this species might at first sight be taken for *P. buski*, from which species, however, it differs widely in many of its structural details. The cauline hydrothecae are borne on very stout processes of stem, and from sides of these processes spring the hydrocladia, which commence by an extremely short internode, followed by a

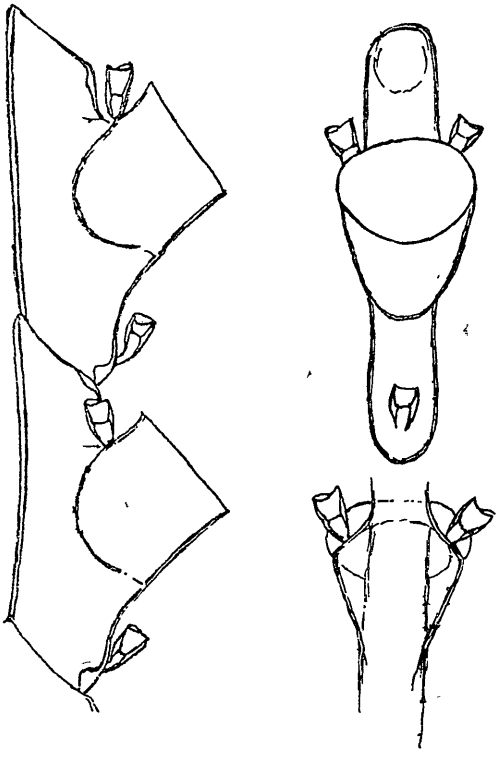


FIG. 13.—*Thecocaulus heterogona* n. sp. × 80.

rather longer one, bearing a sarcotheca; the rest are alike, no intermediate ones being normally present, and no sarcothecae except the usual three surrounding each hydrotheca. As in the allied species generally, however, the hydrothecal internode may have a faint transverse constriction just above hydrotheca. Hydrothecae like those of *P. buski*, but the free part of back is slightly concave, as in *P. concava* Billard. In the condition of the anterior sarcothecae the species is a marked exception to the general rule in *Thecocaulus*. Instead of the stout, rigid, curved process usually seen, we have here a narrow-based form, not very different from

laterals, though still apparently somewhat less freely movable. Internodes are considerably expanded laterally at back of hydrothecae, enlargements so formed taking the place of the more definite peduncles found supporting the paired sarcothecae in most species. The pairs of sarcothecae on rachis are not attached to hydrothecae, but situated a little distance above them, and the regular supracalycine pair are wanting.

Male and female gonangia may be found on same shoot. The former are remarkably small, being but little longer than hydrothecae, and only about half their diameter. They differ from those of most allied species in the total absence of sarcothecae. The female gonangia, on the other hand, are extremely large (about 2·5 mm. by 0·8 mm.), and excessively thin and delicate, shrivelling up at once if placed suddenly into a dense medium. In the two specimens which I observed I could just trace a faint circular suture at the tops, but no thickened border. One had four large sarcothecae round base; on the other I found only two, but possibly others had become detached.

Aglaophenia plumosa Bale.

Aglaophenia plumosa Bale, 1881, p. 37; 1884, p. 153: Bedot, 1921*a*, p. 337.
Not *A. plumosa* Pennington, 1885, p. 129.

Quail Island (Chilton). Not previously recorded from New Zealand.

Aglaophenia filicula Hilgendorf.

Aglaophenia filicula Hilgendorf, 1897, p. 215.

Hilgendorf refers this form to *A. filicula* Allman, which is classed by Bedot as a synonym of *A. tubulifera* Hincks. The species is indeterminable; Hilgendorf's description would apply equally to many other species, and the figures are not sufficient to serve for identification.

Aglaophenia incisa Coughtrey.

Plumularia incisa Coughtrey, 1874, p. 290.
Aglaophenia incisa Coughtrey, 1876, p. 31: Farquhar, 1896, p. 467.

This is an indeterminable species from Lyall Bay. It may possibly be the same as *Halicornaria rostrata* n. sp., as it has the front of hydrothecae produced into a pointed rostrum, as in that species.

Aglaophenia huttoni Coughtrey.

Plumularia banksii Hutton (not Gray), 1872, p. 259.
Plumularia huttoni Coughtrey, 1874, p. 290.
Aglaophenia huttoni Coughtrey, 1876, p. 31: Farquhar, 1896, p. 467.

Another indeterminable species from Lyall Bay. It is, according to Hutton, irregularly branched, polysiphonic, with alternate pinnae leaning to one side: its hydrothecae have a pointed rostrum, as in *A. incisa*. It is said to have the aperture "sinuous and wide, with an obtuse tooth on each side," but Coughtrey's figure shows several crenations on each side of hydrotheca. Evidently the "obtuse tooth" refers to lateral sarcotheca. From the inadequate figure it might be supposed the same as *Thecocarpus formosus;* its polysiphonic and branching habit, however, seem to forbid the association.

Aglaophenia huttoni Kirchenpauer.

Plumularia pennatula Hutton (not Ellis and Solander), 1872, p. 258: Coughtrey, 1874, p. 289.
Aglaophenia pennatula? Coughtrey, 1876, p. 31.
Aglaophenia huttoni Kirchenpauer, 1876, p. 24: Farquhar, 1896, p. 467 (note).

Another species from Lyall Bay, also indeterminable. The hydrothecae, with their long slender sarcothecae, resemble those of *Halicornaria*

longirostris Kirchenpauer, but the gonosome is said to include a corbula. I do not know any corbula-bearing species with hydrothecae of this type.

Investigation at Lyall Bay might probably result in the discovery of specimens of these insufficiently-described forms, especially the present species, which is said to be common. If identified with reasonable probability it should be renamed, as the specific name *huttoni* was first used by Coughtrey for the preceding species (unless the two species should prove to belong to different genera).*

Aglaophenia acanthocarpa Allman. (Fig. 14.)

Aglaophenia acanthocarpa Allman, 1876, p. 274 : Farquhar, 1896, p. 467.
Aglaophenia laxa Hilgendorf, 1911, p. 541.
? Aglaophenia divaricata var. *acanthocarpa ?* Jäderholm, 1916–17, p. 18.
Not *A. divaricata* var. *acanthocarpa ?* Bale, 1915, p. 313.
Not *A. laxa* Allman, 1876, p. 275.

Hydrophyton slender, polysiphonic, branched, branches springing from the supplementary tubes. Hydrocladia close, alternate, one on each internode, rising at an angle of 40–45°, and strongly directed forward ; nodes oblique.

Hydrothecae urceolate, deep, set at angle of about 40–45°, a rudimentary ridge a little below middle of adcauline side, with a fold from it nearly surrounding hydrotheca ; border with four teeth on each side, the first wide, second and third triangular, fourth minute or obsolete, only the second everted ; a median anterior tooth with erect crest ; back adnate. Hydrothecal internode with strong transverse septal ridge near middle, and oblique one near base of lateral sarcothecae. Hydropore very large.

Mesial sarcotheca a little longer than hydrotheca, adnate to it as far as margin, and then projecting outward, free part forming a tube nearly equal in diameter from lateral aperture to end, and bent forward, with distinct terminal and lateral apertures, and an orifice opening into hydrotheca. Lateral sarcothecae adnate up to hydrotheca-margin, with a short free part directed forward, usually becoming much larger towards ends of hydrocladia ; terminal and lateral apertures distinct. Cauline sarcothecae wider than laterals, two on rachis at base of each hydrocladium.

Gonangial pinna replacing a hydrocladium, the first internode bearing a hydrotheca. Corbula open, with about 15–20 strongly-arched pinnules on each side, each springing from a separate internode of rachis, and furnished with two lateral series of long slightly-curved tubular sarcothecae, the two proximal ones on distal side of each pinnule without corresponding ones on the other side, and the first one often bifid, and with a small secondary one ; nodes between pairs of sarcothecae usually indistinct. Two sarcothecae on rachis at base of each pinnule.

Specimens from British Museum enable me to identify this species with the form from Kermadec Islands collected by Mr. W. R. B. Oliver and described by Hilgendorf as *A. laxa* (specimens of which were given to me by Mr. Briggs). They also indicate that the form described by me as *A. divaricata* var. *acanthocarpa* is not the same as Allman's species.

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* Stechow in a recent paper in *Archiv für Naturgeschichte*, 1921, proposes the name *Aglaophenia zelandica*. But in the very possible event of the two species being identified as of different genera the specific name *huttoni* may stand for both species.

The following characters distinguish the species from *A. divaricata*. In the latter the base of hydrotheca is broadly rounded and deeply immersed, while the lower part of hydrotheca, from intrathecal ridge to base, is quite continuous with cavity of internode, the usual partition being absent. In *A. acanthocarpa* the base of hydrotheca is narrower, not so deeply immersed, and the partition between hydrotheca and internode is present, though in front view it can be seen to consist only of a quadrangular diaphragm, formed by a narrow shelf bordering the intrathecal ridge, the two sides, and base of hydrotheca. The mesial sarcotheca in *A. divaricata*, as seen in side view, tapers towards end (though in front view it becomes wider); in *A. acanthocarpa* that part of the sarcotheca in which the lateral aperture is situated stands off from the hydrotheca almost at a right angle, but above the aperture the sarcotheca is tubular, not compressed nor widened, bent forward, and nearly or quite uniform in diameter to end, exactly as in Allman's figure of *A. laxa*. The first pair of lateral teeth of hydrotheca are very broad and obtuse, and in profile they usually overlap anterior tooth, which has

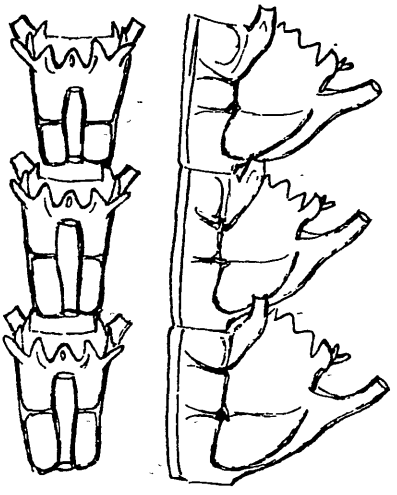

FIG. 14.—*Aglaophenia acanthocarpa* Allman (from a Kermadec Island specimen). × 80.

an erect keel or crest like that of *A. mc coyi*. Last pair of lateral teeth very small, and not generally apparent in profile view. The orifice between mesial sarcotheca and hydrotheca is rather large, easily seen in side view. Intrathecal ridge reduced to narrowest dimensions; two septal ridges are as shown by Allman. Lateral sarcothecae become much larger towards ends of hydrocladia (a character seen even more conspicuously in some forms of *A. divaricata*). Hydrothecae, like the whole polypary, are smaller and more delicate than those of *A. divaricata* and its varieties. This is especially the case with Kermadec specimens. Allman, like Jäderholm, gives no indication of erect crest on anterior tooth, which is well developed; and Jäderholm shows the first pair of lateral teeth as narrow and pointed in side view, and widely separated from median one—in other respects his figure agrees well with my specimens.

Allman's figure of corbula is rather misleading as to its general aspect. The ribs are very strongly curved, so that in a direct profile view only the middle part of them can be seen distinctly, not only on account of difference in focus, but of extreme foreshortening of upper and lower portions. The figure is more like what the corbula would be if it were compressed till the curvature of the ribs should be very nearly straightened out. This applies to Hilgendorf's figure also.

The only corbula seen by me in the Kermadec Island specimen was, like Hilgendorf's, very short, being probably incomplete. Sarcothecae on proximal portions of corbula-ribs are quite regularly arranged, the first two internodes having them on distal side only. In this, as in other respects, corbulae agree with those of *A. divaricata.*

Aglaophenia laxa Allman. (Fig. 15.)

Aglaophenia laxa Allman, 1876, p. 275 : Farquhar, 1896, p. 467.
Not *A. laxa* Hilgendorf, 1911, p. 541.
Not *A. laxa* Stechow, 1907, p. 199 ; 1909, p. 93.
Not *Thecocarpus laxus* Billard, 1913, p. 98.

Of this species, which is closely allied to *A. acanthocarpa,* I have also received specimens from British Museum. It is described as a smaller form than *A. acanthocarpa,* and of more open habit, the hydrocladia

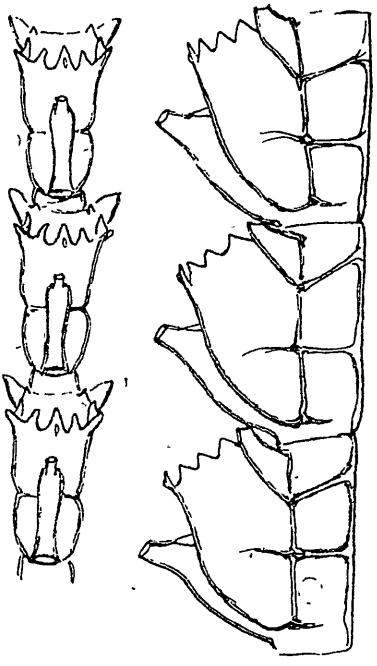

FIG. 15.—*Aglaophenia laxa* Allman (from one of Allman's specimens). × 80.

being somewhat less close. The internodes and hydrothecae are not shorter, as shown in Allman's figure; on the contrary, 6 complete internodes of *A. laxa* are about equal in length to $7\frac{3}{4}$ of those of

A. acanthocarpa. This is due partly to the actual length of hydrothecae, and partly to their forming a lower angle with internode. The first lateral tooth is not so wide as in *A. acanthocarpa,* and the anterior tooth has a small semicircular crest instead of the longer one of the other species. The mesial sarcothecae of both species are just as Allman has figured them in *A. laxa,* except that they are sometimes shorter; in many cases, especially in proximal portions of hydrocladia of *A. laxa,* they are cut down close to lateral aperture. The first two septal ridges are as in *A. acanthocarpa,* the forward one being usually more oblique than Allman shows it; the third one, opposite base of hydrothecae, is generally much less pronounced. The orifice between mesial sarcotheca and hydrotheca is very small, and not noticeable in side view. The opening between hydrotheca and internode is much as in *A. acanthocarpa,* but the shelf-like border is slightly narrower.

The *Thecocarpus laxus* of Billard is readily distinguishable from this species, even in the absence of corbula. In *T. laxus* intrathecal and septal ridges are much nearer base of hydrotheca, and therefore farther from ridge at base of lateral sarcothecae, and the extreme base of hydrotheca does not dip so deeply into internode as the part farther forward, the condition being the opposite in *A. laxa.* The third ridge is not present in *T. laxus.* In *A. laxa,* as in all the *divaricata* group, the second lateral tooth of hydrotheca is notably everted, and the others not at all; in Billard's species the third is widely everted, and the second but little everted, or even incurved.

Hilgendorf's "*A. laxa*" is, as mentioned elsewhere, *A. acanthocarpa.*

Specimens referred to *A. laxa* by Stechow, which had only two shallow triangular lobes on each side of hydrotheca, were afterwards regarded by him as *A. whiteleggei.*

The gonosome of *A. laxa* is not yet known, but the close affinity between the species and *A. acanthocarpa* and *A. divaricata* renders it highly probable that it will prove to be of the same character as in those species.

Thecocarpus formosus (Busk).

Plumularia formosa Busk, 1851, p. 118.
Aglaophenia formosa Allman, 1871, p. 157: Kirchenpauer, 1872, p. 26: Bale, 1884, p. 168: Marktanner-Turneretscher, 1890, p. 264: Farquhar, 1896, p. 467.
Thecocarpus formosus Billard, 1907*a*, pp. 378, 385: Stechow, 1912, p. 370; 1919*a*, p. 143: Bedot, 1921*a*, pp. 333, 322.
Not *Aglaophenia formosa* Bonnevie.

It is perhaps doubtful whether all the above-cited references are to the same species. That described by Billard has a closed corbula, but Kirchenpauer, as mentioned by Billard, has figured the corbula as open. Possibly, as in several cases now known, this may be a difference of sex, otherwise it would seem that these observers have seen two different species. Busk's reference to the corbulae as costate capsules seems most appropriate to the closed form.

Allman referred to the species as being known to him from Australia, New Zealand, and South Africa, and Billard adds Madagascar and Ceylon. I have never met with the species in collections from Australia or New Zealand.

Thecocarpus chiltoni n. sp. (Fig. 16.)

Hydrophyton polysiphonic, pinnately branched, branches in one plane, alternate, subregular, rising at an angle of about 45° from the primary

stem, each taking the place of a hydrocladium. Hydrocladia close, alternate, at about 45°, one on each internode, both series directed a little forward.

Hydrothecae at an angle of about 40°, deep, widened upward from base; a very narrow intrathecal ridge near base on adcauline side, with a fold from it crossing hydrotheca and curving slightly forward; aperture with short anterior tooth, above which the front is produced into a somewhat longer point; lateral teeth 4 on each side, the first and fourth very minute, often obsolete, second and third nearly triangular, shallow: back adnate. Internode with short septal ridges opposite the intrathecal ridge and the bases of the lateral sarcothecae.

Mesial sarcotheca a little shorter than calycle, and mainly rising from it, tapering, canaliculate. Lateral sarcothecae tubular, adnate to hydrotheca nearly to margin and then bent forward, canaliculate. Cauline sarcothecae canaliculate, two at base of each hydrocladium, the lower projecting forward, the other larger, projecting outward.

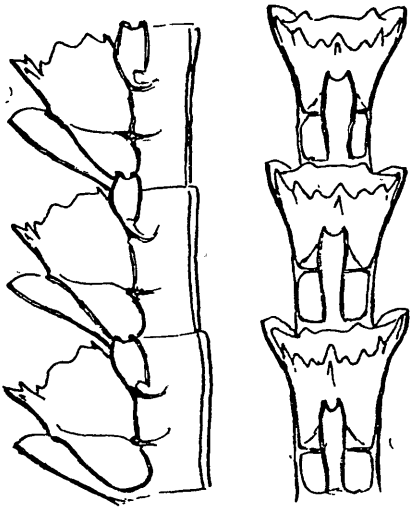

FIG. 16.—*Thecocarpus chiltoni* n. sp. × 80.

Gonangial pinna replacing a hydrocladium, with the first two internodes bearing hydrothecae. Corbula curved, rather short, consisting of about 8 pairs of alternate ribs, originating as narrow pinnules but expanding above into broad leaflets, which unite to form corbula; distal margin of each leaflet bordered with about 5–7 tubular, closely-set sarcothecae; a stout spur springing from distal side of each leaflet, just above base, bluntly pointed or with alternate sarcothecae, and bearing a small modified hydrotheca with lateral sarcothecae.

Loc.—Cape Maria van Diemen, ten miles north-west, 50 fathoms (Chilton).

The specimen has two main stems, reaching about 8 in. in length, and about 8 mm. in diameter at base, clothed almost down to base with branches, which reach about 3 in. in length, and are alternate, the average distance between successive branches on the same side being about $\frac{1}{4}$ in. Being all in one plane, the colony somewhat resembles that of

Lytocarpus phoeniceus, except that the branches are alternate instead of opposite. Secondary branches sometimes occur.

The two hydrothecae on gonocladium do not differ appreciably from the others, but those on corbula are smaller, more cylindrical, with intrathecal fold more oblique, marginal teeth smaller, and anterior one without superior point. Only male corbulae present.

Hemicarpus banksi (Gray). (Fig. 17, *a*.)

Plumularia banksii Gray, 1843, p. 294 : Coughtrey, 1874, p. 289.
Aglaophenia banksii Bale, 1886, p. 103 : Farquhar, 1896, p. 467.

Ever since Gray's time this has remained an unidentifiable species, Hutton's reference to it of a hydroid found by him at Lyall Bay being pronounced by Coughtrey to be erroneous. By the aid of a fragment of Gray's specimen received from British Museum I am enabled to give

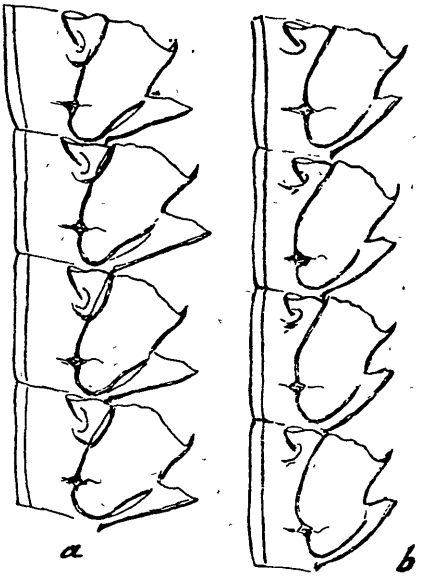

FIG. 17.—*a*, *Hemicarpus banksi* (Gray), from Sir Joseph Banks's specimen ; *b*, *Lytocarpus secundus* Allman, from one of Allman's specimens. × 80.

an account of it sufficient to render its identification possible. Though its gonosome is not present, its close similarity to *Hemicarpus secundus* (*Aglaophenia secunda* Kirchenpauer, *Lytocarpus secundus* Allman), which Bedot unites with the *Sertularia pennaria* of Linné, leaves no doubt as to the affinity of the two forms, and in fact it is not certain that they are even specifically distinct.

Gray mentions that the stem is compound and branched ; his description of branchlets as opposite is, however, not in accordance with the specimens, which, Captain Totton informs me, have the branches alternate, pinnately arranged, pinnae being at distances of from 5 mm. to 8 mm. apart, and both series directed strongly to front (Gray describes them as unilateral). The specimens, which are fragmentary, measure about 38 mm. and 35 mm. respectively.

The slide sent to me contained half a dozen hydrothecae, very well preserved. They are notably small for Statoplea, subconical, rather narrowed-in between mesial sarcotheca and margin, with a rudimentary ridge on adcauline side near base, from which originates a very small sharply-defined fold of hydrotheca-wall, curved or sigmoid; sides are more prominent than front and back, and margin has small undulations or crenations which are quite irregular, even those on the two sides not corresponding. So far as I can judge from the side view, the back appears adnate. In front is a strong thick conspicuous median tooth, somewhat incurved, which, as seen in strictly lateral view, projects quite abruptly. (The condition is the same in *H. secundus*, the sides not curving gradually into median tooth, as shown by Allman.)

Anterior sarcotheca a little shorter than hydrotheca, but more projecting, and adnate to hydrotheca rather more than half the length of the latter; the free part is widely open in front, and each side forms a wide angular lobe. There is a small orifice connecting cavity of hydrotheca with that of sarcotheca. Lateral sarcothecae short and very wide, with the whole front margin free. Opposite intrathecal ridge is a very narrow thickening in internode, which shows sufficient variability to warrant the surmise that it may be sometimes extended into an annular ridge.

In a slide of portions of the "Challenger" specimen of *H. secundus*, sent for comparison, are a considerable number of hydrothecae, which differ very little from those of *H. banksi*. The most noticeable points of difference are that in *H. banksi* there is a distinct bulging inward of the front of hydrotheca under mesial sarcotheca, which is not seen in *H. secundus*, and that mesial sarcotheca in the former species is more projecting.

Whether the differences are sufficiently constant to justify the retention of *H. banksi* as a separate species cannot be determined until further material is available.

Halicornaria rostrata n. sp. (Fig. 18.)

Hydrocaulus monosiphonic, unbranched; hydrocladia alternate, not close, one on each internode, at an angle of about 45°, both series directed forward; nodes oblique.

Hydrothecae at an angle of about 40°, very narrow at base and widening upward, a narrow rudimentary intrathecal ridge on adcauline side near base, hydropore on adcauline side at base, with several chitinous points on distal margin (over ridge); front of hydrotheca produced into a large hollow pointed rostrum with entire apex, extending much beyond aperture; margin with incurved anterior tooth, and three triangular teeth on each side, the first and third everted, the second incurved, and two minute angular lobes behind lateral sarcothecae; back entire, adnate. Internode with a thickened ridge opposite distal edge of hydropore, sometimes extending partly round.

Mesial sarcotheca about as long as body of hydrotheca, mainly rising from it and adnate more than half its length; free part canaliculate, slightly recurved towards end. Lateral sarcothecae stout, saccate, canaliculate, adnate up to margin of hydrotheca, and directed strongly outward. Cauline sarcothecae canaliculate, two at base of each hydrocladium in front and one behind each axil.

Gonosome ?

Loc.—Cape Maria van Diemen, ten miles north-west, 50 fathoms (Chilton).

This species is referred to *Halicornaria* on account of the monosiphonic habit, the presence of a cauline sarcotheca at back of each axil, and the little points bordering hydropore—all special characteristics which I have not found combined in any species known to belong to other genera.

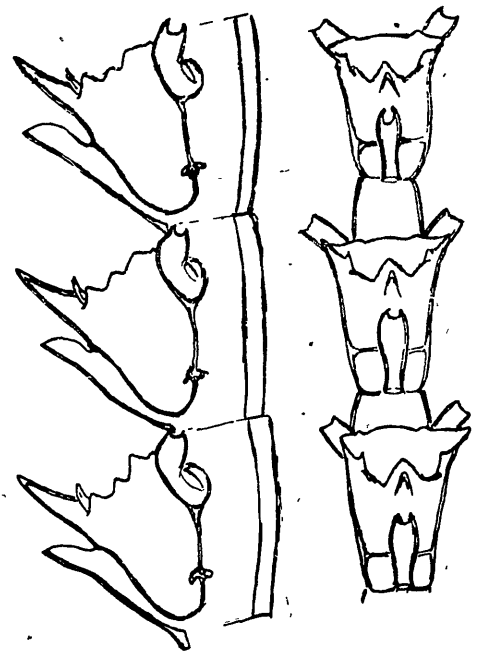

FIG. 18.—*Halicornaria rostrata* n. sp. × 80.

The peculiar character of the prolongation of front of hydrotheca into a rostrum much exceeding mesial sarcotheca in length is found both in *P. huttoni* and *P. incisa*, figured by Coughtrey. The former is a polysiphonic species, but *P. incisa* is monosiphonic, and may quite possibly be identical with the present species.

LITERATURE CITED.

ALLMAN, G. J., 1871. *A Monograph of the Gymnoblastic or Tubularian Hydroids.*
—— 1876. Diagnoses of New Genera and Species of Hydroida, *Jour. Linn. Soc., Zool.*, XII.
—— 1883. Report on the Hydroida, I, The Plumularidae, *Rep. Sci. Results "Challenger" Exped., Zool.*, vii.
—— 1885. Description of Australian, Cape, and other Hydroida, mostly new, from the Collection of Miss H. Gatty, *Jour. Linn. Soc., Zool.*, xix.
—— 1888. Report on the Hydroida, II, *Rep. Sci. Results "Challenger" Exped., Zool.*, xxii.
BALE, W. M., 1881. On the Hydroida of South-eastern Australia, with Descriptions of Supposed New Species, and Notes on the Genus *Aglaophenia, Jour. Micr. Soc. Vict.*, ii.
—— 1884. *Catalogue of the Australian Hydroid Zoophytes.*
—— 1886. The Genera of the Plumulariidae, with Observations on various Australian Hydroids, *Trans. and Proc. Roy. Soc. Vict.*, xxiii.

BALE, W. M., 1888. On some New and Rare Hydroida in the Australian Museum Collection, *Proc. Linn. Soc. N.S. Wales* (2), iii.
—— 1893. Further Notes on Australian Hydroids, with Descriptions of some New Species, *Proc. Roy. Soc. Vict.* (n.s.), vi.
—— 1913. Further Notes on Australian Hydroids, II, *Proc. Roy. Soc. Vict.* (n.s.), xxvi.
—— 1914*a*. Further Notes on Australian Hydroids, III, *Proc. Roy. Soc. Vict.* (n.s.), xxvii.
—— 1914*b*. Report on the Hydroida collected in the Great Australian Bight and other Localities, Part I, *Biological Results "Endeavour,"* ii.
—— 1914*c*. Report on the Hydroida collected in the Great Australian Bight and other Localities, Part II, *Biological Results "Endeavour,"* ii.
—— 1915. Report on the Hydroida collected in the Great Australian Bight and other Localities, Part III, *Biological Results "Endeavour,"* iii.
—— 1919. Further Notes on Australian Hydroids, IV, *Proc. Roy. Soc. Vict.* (n.s.), xxxi.
BARTLETT, G. C., 1907. Notes on Hydroid Zoophytes, *Geelong Naturalist* (2), iii.
BEDOT, M., 1914. Nouvelles Notes sur les Hydroïdes de Roscoff, *Arch. Zool. exp. et gén.*, liv.
—— 1921*a*. Notes systématiques sur les Plumularides, 1re partie, *Rev. Suisse de Zool.*, xxviii.
—— 1921*b*. Notes systématiques sur les Plumularides, 2me partie, *Rev. Suisse de Zool.*, xxix.
BILLARD, A., 1904. Contribution à l'étude des Hydroïdes, *Ann. Sci. nat., Zool.*, xx.
—— 1905. Hydroides récoltés par M. Seurat aux îles Gambier, *Bull. Mus. d'hist. nat.*, xi.
—— 1906. Mission des Pêcheries de la côte occidentale d'Afrique, III, Hydroïdes, *Actes Soc. linn. Bordeaux*, lxi.
—— 1907*a*. Hydroïdes de Madagascar et du Sud-Est de l'Afrique, *Arch. Zool. exp. et gén.* (4), vii.
—— 1907*b*. *Expéditions scientifiques du "Travailleur" et du "Talisman,"* VIII, Hydroïdes.
—— 1909*a*. Sur les Hydroïdes de la Collection Lamouroux ; Sur quelques Sertulariidae de la Collection du British Museum ; Sur quelques Plumulariidae de la Collection du British Museum : *Comptes rendus Acad. des Sciences*, cxlviii.
—— 1909*b*. Revision des Espèces types d'Hydroïdes de la Collection Lamouroux, *Ann. Sci. nat., Zool.* (9), ix.
—— 1910. Revision d'une partie de la Collection des Hydroïdes du British Museum, *Ann. Sci. nat., Zool.* (9), xi.
—— 1913. *Les Hydroïdes de l'Expédition du "Siboga,"* I, Plumulariidae.
BORRADAILE, L. A., 1905. The Hydroids, *The Fauna and Geography of the Maldive and Laccadive Archipelagoes*, ii.
BRIGGS, E. A., 1914. Hydrozoa from One Hundred Fathoms, Seven Miles East of Cape Pillar, Tasmania, *Records Aust. Mus.*, x.
—— 1915. Notes on Tasmanian Hydrozoa, *Proc. Roy. Soc. N.S. Wales*, lxviii.
—— 1918. Descriptions of Two New Hydroids, and a Revision of the Hydroid Fauna of Lord Howe Island, *Records Aust. Mus.*, xii.
BROCH, H., 1918. *The Danish Ingolf Expedition*, Hydroida, Part II, in vol. v.
BUSK, G., 1851. A List of Sertularian Zoophytes and Polyzoa from Port Natal, Algoa Bay, and Table Bay, in South Africa, *Rep. Brit. Assoc.* (*Edinb., 1850*).
—— 1852. An Account of the Polyzoa and Sertularian Zoophytes collected in the Voyage of the "Rattlesnake" on the Coast of Australia and the Louisiade Archipelago, J. MacGillivray's *Narrative of the Voyage of the "Rattlesnake," commanded by the late Captain O. Stanley during the years 1846–1850, I, App. 4.*
CALKINS, GARY N., 1899. Some Hydroids from Puget Sound, *Proc. Boston Soc. Nat. Hist.*, xxviii.
CAMPENHAUSEN, B. VON, 1897. Beiträge zur Systematik der Hydroiden, Hydroiden von Ternate, *Abhandl. Senckenb. naturf. Gesellsch. Frankfurt-a-M.*, xxiii.
COUGHTREY, MILLEN, 1874. Notes on the New Zealand Hydroideae, *Trans. N.Z. Inst.*, vii.
—— 1875. Critical Notes on the New Zealand Hydroida, *Trans. N.Z. Inst.*, viii.
—— 1876. Critical Notes on the New Zealand Hydroida, *Ann. and Mag. Nat. Hist.* (4), xvii.
D'ORBIGNY, A., 1839. Zoophytes, *Voyage dans l'Amérique méridionale*, v.
ELLIS, JOHN, 1755. *An Essay towards a Natural History of the Corallines and other Marine Productions of the like kind, commonly found on the Coasts of Grea Britain and Ireland.*

FARQUHAR, H., 1895. Descriptions of Two New Gymnoblastic Hydroids, *Trans. N.Z. Inst.*, xxvii.
—— 1896. List of New Zealand Hydroida, *Trans. N.Z. Inst.*, xxviii.
FRASER, C. MCLEAN, 1911. The Hydroids of the West Coast of North America, with Special Reference to those of the Vancouver Island Region, *Bull. Lab. Nat. Hist. State Univ. Iowa*, vi.
—— 1914. Some Hydroids of the Vancouver Island Region, and Notes on some Alaskan Hydroids, *Trans. Roy. Soc. Canada* (3), viii.
GRAY, J. E., 1843. Additional Radiated Animals and Annelides, E. Diffenbach's *Travels in N.Z.*, ii.
HARTLAUB, C., 1900. Revision der Sertularella-Arten, *Abh. nat. Ver. Hamburg*, xvi.
—— 1901. Hydroiden aus dem Stillen Ocean, *Zool. Jahrb.*, xiv.
—— 1905. Die Hydroiden der magalhaensischen Region und chilenischen Küste, *Zool. Jahrb., Suppl. vi*, iii.
HILGENDORF, F. W., 1897. On the Hydroids of the Neighbourhood of Dunedin, *Trans. N.Z. Inst.*, xxx.
—— 1911. On some Calyptoblast Hydroids from the Kermadec Islands, *Trans. N.Z. Inst.*, xliii.
HINCKS, Rev. T., 1868. *A History of the British Hydroid Zoophytes.*
HUTTON, F. W., 1872. On the New Zealand Sertularians, *Trans. N.Z. Inst.*, v.
INABA, M., 1890–92. Hydroidea obtained in Misaki, &c., *Zool. Mag. Tokyo.*
JÄDERHOLM, E., 1896. Ueber aussereuropäische Hydroiden des biologischen Museums der Universität Upsala, *K. svenska Vet.-Akad. Handl.*, xxi.
—— 1903. Aussereuropäische Hydroiden im schwedischen Reichsmuseum, *Arkiv. för Zoologi, K. svenska Vet.-Akad.*, i.
—— 1905. Hydroiden aus antarktischen und subantarktischen Meeren, *Wissenschaftliche Ergebnisse der schwedischen südpolar Expedition, 1901–1903*, v.
—— 1909. Northern and Arctic Invertebrates in the Collection of the Swedish State Museum, IV, Hydroiden, *K. svenska Vet.-Akad. Handl.*, xlv.
—— 1910. Ueber die Hydroiden welche Dr. C. Skottsberg in den Jahren 1907–1909 gesammelt, *Arkiv. för Zoologi, K. svenska Vet.-Akad.*, vi.
—— 1916. Results of Dr. E. Njoberg's Swedish Scientific Expeditions to Australia, 1910–13, Hydroiden, *K. svenska Vet.-Akad. Handl.*, lii.
—— 1916–17. Hydroids from the South Seas, *Redogörelse för Norrköpings H. Allm. Luroverk Lasåret, 1916–17.*
—— 1919. Zur Kenntniss der Hydroidenfauna Japans, *Arkiv. för Zoologi, K. svenska Vet.-Akad.*, xii.
JOHNSTON, GEORGE, 1847. *A History of the British Zoophytes*, 2nd ed.
KIRCHENPAUER, G. H., 1864. Neue Sertularıden aus verschiedenen Hamburgischen Sammlungen, nebst allgemeinen Bemerkungen ñber Lamouroux's Gattung *Dynamena, Verhandl. K. Leopold.-Carol. deutschen Akad. Naturf.*, xxxi.
—— 1872. Ueber die Hydroidenfamilie Plumularidae, einzelne Gruppen derselben und ihre Fruchtbehälter, I, *Aglaophenia, Abh. Nat. Ver. Hamburg*, v.
—— 1876. Ueber die Hydroidenfamilie Plumularidae, einzelne Gruppen derselben und ihre Fruchtbehälter, II, *Plumularia* und *Nemertesia, Abh. Nat. Ver. Hamburg*, vi.
—— 1884. Nordische Gattungen und Arten von Sertulariden, *Abh. Nat. Ver. Hamburg*, viii.
KIRK, H. B., 1915. On *Ascidioclava*, a New Genus of Gymnoblastic Hydroids, *Trans. N.Z. Inst.*, xlvii.
KIRKPATRICK, R., 1890. Reports on the Zoological Collections made in Torres Straits by Professor A. C. Haddon, 1888–1889, Hydroida and Polyzoa, *Sci. Proc. Roy. Dublin Soc.* (n.s.), vi.
LAMARCK, —, 1816. *Histoire naturelle des Animaux sans Vertèbres*, II, Polypes.
LAMOUROUX, J. V. F., 1816. *Histoire des Polypiers coralligènes flexibles vulgairement nommés Zoophytes.*
—— 1824. *Description des Polypiers flexibles dans Freycinet, Voyage autour du monde, exécuté sur les Corvettes de S.M. l' "Uranie" et la "Physicienne," pendant les années 1817–1820.* Zoologie par Quoy et Gaimard.
LENDENFELD, R. VON, 1883. *Eucopella campanularia, Zool. Anzeig.*, vi.
—— 1884. The Australian Hydromedusae, *Proc. Linn. Soc. N.S. Wales*, ix.
LEVINSEN, G. M. R., 1913. Systematic Studies on the Sertulariidae, *Vidensk. Meddel. fra den naturh. Foren. i Kbhvn.*, lxiv.
LINNÉ, C., 1758. *Systema Naturae*, edit. 10.
MARKTANNER-TURNERETSCHER, G., 1890. Die Hydroiden des K. K. naturhistorischen Hofmuseums, *Annalen K. K. naturhistorichen Hofmuseums Wien*, v.

MULDER, J. F., and TREBILCOCK, R. E., 1914. Victorian Hydroida, with Description of New Species, Parts III and IV, *Geelong Naturalist* (2), vi.

NUTTING, C. C., 1900. American Hydroids, Part I, the Plumularidae, *U.S. Nat. Mus. Special Bulletin.*

—— 1904. American Hydroids, Part II, the Sertularidae, *U.S. Nat. Mus. Special Bulletin.*

—— 1905. Hydroids of the Hawaiian Islands, collected by the Steamer "Albatross" in 1902, *U.S. Fish. Comm. Bull. for 1903.*

—— 1915. American Hydroids, Part III, The Campanularidae and the Bonneviellidae, *U.S. Nat. Mus. Special Bulletin.*

PALLAS, P. S., 1766. *Elenchus Zoophytorum.*

PENNINGTON, A. S., 1885. *British Zoophytes.*

PFEFFER, G., 1892. Die niedere Thierwelt des antarktischen Ufergebietes, *Ergebinsse der deutschen Polar-Expeditionen, Allg. Theil,* ii.

PICTET, C., 1893. Étude sur les Hydraires de la Baie d'Amboine, *Rev. suisse de Zoologie,* i.

RIDLEY, S. O., 1881. Account of the Zoological Collections made during the Survey of H.M.S. "Alert" in the Straits of Magellan and on the Coast of Patagonia, Coelenterata, *Proc. Zool. Soc. Lond., 1881.*

RITCHIE, J., 1909. Supplementary Report on the Hydroids of the Scottish National Antarctic Expedition, *Trans. Roy. Soc. Edinb.,* xlvii.

—— 1910*a*. The Hydroids of the Indian Museum, No. 1, *Records of the Indian Museum,* v.

—— 1910*b*. Hydroids from Christmas Island, Indian Ocean, collected by C. W. Andrews, D.Sc., F.R.S., F.Z.S., in 1908, *Proc. Zool. Soc. Lond., 1910.*

—— 1910c. The Marine Fauna of the Mergui Archipelago, Lower Burma, collected by Jas. J. Simpson, M.A., B.Sc., and R. N. Rudmose-Brown, D.Sc., University of Aberdeen, February to May, 1907, the Hydroids, *Proc. Zool. Soc. Lond., 1910.*

—— 1911. Scientific Results of the Trawling Expedition of H.M.C.S. "Thetis" off the Coast of New South Wales in February and March, 1898, Part 16, Hydrozoa (Hydroid Zoophytes and Stylasterina), *Mem. Aust. Mus.,* iv.

SCHNEIDER, K. C., 1897. Hydropolypen von Rovigno, nebst Uebersicht über das System der Hydropolypen im Allgemeinem, *Zool. Jahrb.,* x.

STECHOW, E., 1907. Neue japanische Athecata und Plumularidae aus der Sammlung Dr. Doflein, *Zool. Anzeig.,* xxxii.

—— 1909. Hydroidpolypen der japanischen Ostküste, I Teil, Athecata und Plumularidae, *Abh. math.-phys. Klasse K. Bayer Akad. der Wissensch., i Suppl.-Bd.*

—— 1912. Hydroiden der Munchener Zoologischen Staat-sammlung, *Zool. Jahrb.,* xxxii.

—— 1913. Hydroidpolypen der japanischen Ostkuste, II Teil, Campanularidae, Halecidae, Lafoeidae, Campanulinidae und Sertularidae, nebst Ergänzungen zu den Athecata und Plumularidae, *Abh. math.-phys. Klasse K. Bayer Akad. der Wissensch, iii Suppl.-Bd.*

—— 1919*a*. Zur Kenntniss der Hydroidenfauna des Mittelmeeres Amerika's und anderen Gebiete, *Zool. Jahrb., Abt. f. Systematik, &c.,* xlii.

—— 1919*b*. Neue Ergebnisse auf dem Gebiete der Hydroidenforschung, *Sitzungsberichten der Gesellschaft fur Morphologie und Physiologie in Munchen, 1919.*

THOMPSON, D'A. W., 1879. On some New and Rare Hydroid Zoophytes (Sertulariidae and Thuiariidae) from Australia and New Zealand, *Ann. Mag. Nat. Hist.* (5), iii.

THORNELY, L. R., 1904. *Report to the Government of Ceylon on the Pearl-oyster Fisheries of the Gulf of Manaar,* Suppl. Report viii, on the Hydroida.

—— 1908. Reports on the Marine Biology of the Sudanese Red Sea, X, Hydroida collected by Mr. C. Crossland from October, 1904, to May, 1905, *Jour. Linn. Soc. Zool.,* xxxi.

TORREY, H. B., 1902. The Hydroida of the Pacific Coast of North America, *Univ. California Publ.,* i.

—— 1904. The Hydroids of the San Diego Region, *Univ. California Publ.,* ii.

TRASK, JOHN B., 1857. On Nine New Species of Zoophytes, *Proc. Calif. Acad. Nat. Sciences,* i (2nd ed., 1873).

WELTNER, W., 1900. Hydroiden von Amboina und Thursday Island, *Semon, Zoologische Forschungsreisen in Australien und dem Malayischen Archipel.*