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REPORT

ON THE

HYDROIDA

COLLECTED DURING THE EXPLORATION OF THE GULF STREAM BY L. F. De POURTALÈS, ASSISTANT UNITED STATES COAST SURVEY.

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BY

GEO. J. ALLMAN, M.D., LL.D., F.R.S., M.R.I.A., Cor.M.Z.S.L., F.R.C.S.I.,
PRESIDENT OF THE LINNÆAN SOCIETY, MEMBER OF THE ROYAL DANISH ACADEMY OF SCIENCES,
EMERITUS REGIUS PROFESSOR OF NATURAL HISTORY IN THE
UNIVERSITY OF EDINBURGH,
ETC.

WITH THIRTY-FOUR PLATES.

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INTRODUCTORY.

The collections of Hydroids obtained by Mr. de Pourtalès during the exploration of the Gulf Stream between Florida and Cuba, while assistant of the Coast Survey, were sent to me by Mr. Alexander Agassiz for determination. The collection, which had been put up in spirits and is, for the most par , in an excellent state of preservation, proves to be a very large one, and to contain a great number of undescribed species. The determination of the specimens, and the drawing and description of the new species, have occupied more time than I had anticipated, and with the pressure of other avocations have caused more delay than I could have wished in the publication of the results.

All the enlarged drawings and details of structure have been carefully made by myself, while most of the drawings representing the natural size of the hydroid, as well as the completion of some of my sketches and the drawing of the whole on stone, have been executed by Mr. Hollick; and I must here bear testimony to the truthfulness of his work and the almost photographic actuality with which he has reproduced the natural form of the specimen.

One of the most striking features of the collection consists in the large number of undescribed species, and the small percentage which can, with probability, be referred to forms known to exist on the European side of the Atlantic.

Leaving out of consideration a few specimens whose characters, in consequence of their imperfect preservation, could not be ascertained, the collection consists of seventy-one species. Sixty-four are here figured and described for the first time, and none of these have as yet been known to occur beyond the area to which the exploration was confined. There thus remain only seven species which, so far as their identification is possible,

are already known as European forms. These are *Filellum immersum*, *Halecium muricatum*, *Sertularella polyzonias*, *Sertularella Gayi*, *Antennularia ramosa*, *Plumularia catharina*, and probably *Tubularia indivisa*, whose identification is, in consequence of the absence of all the soft parts, less certain than in the others.

One of the specimens here described, *Halecium capillaris* Pourtalès, has been already examined and named (*Thoa capillaris*) by Mr. de Pourtalès in No. 6, Bull. M. C. Z., Vol. I. Mr. de Pourtalès has also described *Tubularia crinis*, but this has not been received by me in a condition sufficiently perfect to admit of further examination.

The Gymnoblastic genera sufficiently well preserved for satisfactory determination consist of nine species, all new and referable to two genera, Eudendrium and Bimeria. Species of Tubularia would also seem to exist in the collection, and one of these, as just said, is probably the *Tubularia indivisa* of the European seas; but as in none of the specimens of apparent Tubularia does anything remain beyond the tubular perisarc, the characters needed for a reliable determination are entirely wanting.

Several of the specimens referred to Eudendrium have, on the contrary, their soft parts well preserved, and leave no doubt of the correctness of this determination; while others may, with a provisional reservation, be referred without much hesitation to the same genus. In the little hydroid referred to Bimeria the soft parts are well preserved both in the trophosome and the gonosome.

Of species referable to Calyptoblastic genera fifty-six are here described and figured. Of these, fifty-five are now recorded for the first time, while I have figured one form which occurs also on the eastern side of the Atlantic, and has been elsewhere * described by myself as a variety of *Sertularella Gayi*.

Of the fifty-five new Calyptoblastic species forty-five belong to the Sertularinæ and ten to the Campanularinæ.

The collection is especially rich in the Plumularidæ; no less than twenty-eight out of the seventy-one determinable species belong to this beautiful family. Of these, twenty-six species are now described for the first time, the remaining two, so far as it is possible to determine specimens in which no gonosome is present, are identical with the *Antennularia ramosa* and the *Plumularia catharina* of the European shores.

* Reports on the Hydroids collected during the Expeditions of H. M. S. Porcupine, Trans. Zoöl. Soc, London, February, 1873.

It is thus obvious that the region from which the present collection has been obtained, and which includes an area between the Florida Reef on the north and west, and Cuba, the Salt Key, and Bahama Banks on the south and east, is characterized by a very distinct hydroid fauna, and must form part of a special province in the geographical distribution of the Hydroida. How far the same forms will be found to extend beyond the limits of the exploration must remain for future researches to decide.

The European species which was met with in greatest abundance over this area is the *Sertularella Gayi*, which occurred chiefly in the condition of the strong irregularly branched variety already referred to. It was among the most widely distributed species of the area, and was obtained from no less than nineteen different dredgings.

Among the specimens of Gymnoblastea the gonosome is present in a considerable proportion of species. So also a large proportion of the Plumularidæ is provided with the gonosome, and presents some interesting and beautiful modifications of this part of the hydroid colony. From the other Calyptoblastic forms, however, the gonosome is in almost every instance absent. The very rare cases in which it is present are from some of the deepest dredgings made.

Among the new species are many which must be regarded as representatives of new generic groups. Indeed, throughout the whole collection we meet with features many of which are of great interest and significance in their general bearing on hydroid morphology.

Bathymetrical Distribution. — With very few exceptions a careful record had been kept of the depths from which the specimens had been dredged. These depths varied from that of quite shallow water to four hundred and seventy-one fathoms. The following table will show at a glance the relative richness in hydroid life of the various depths explored: —

Species whose depths have been recorded.	Depths from which the species have been dredged.	Species whose depths have been recorded.	Depths from which the species have been dredged.
10	Between 1 and 10 fathoms.	0	Between 200 and 250 fathoms.
2	" 10 " 20 "	6	" 250 " 300 "
5	" 20 " 50 "	2	" 300 " 350 "
13	" 50 " 100 "	0	" 350 " 400 "
10	" 100 " 150 "	2	" 400 " 450 "
6	" 150 " 200 "	2	" 450 " 500 "

DEFINITIONS OF TERMS.

In the descriptions of the genera and species I have adopted the terminology which I have used on other occasions, and these descriptions will perhaps be rendered more intelligible by giving here definitions of the principal terms employed.

Hydrosoma. The entire hydroid colony.

Ectoderm. The more external of the two organized layers of which the body of every hydroid is composed.

Endoderm. The more internal of the two organized layers of which the body of every hydroid is composed.

Perisarc. The unorganized chitinous excretion by which the soft parts are to a greater or less extent invested.

Zooids. The more or less independent products of non-sexual reproduction, forming by their association the hydroid colony.

Trophosome. The entire assemblage of such zooids as are destined for the nutrition of the colony.

Gonosome. The entire assemblage of such zooids as are destined for the sexual reproduction of the colony.

Hydranths. The proper nutritive zooids, or those which carry the mouth and proper digestive cavity, and which are almost always set with tentacles.

Hydrotheca. The cuplike chitinous receptacle which protects the hydranth in the Calyptoblastic genera.

Intrathecal Ridge. An imperfect septum by which in many Plumularidæ the cavity of the hydrotheca is transversely divided into a distal and a proximal portion.

Hydrophyton. The common basis of the hydrosoma by which its zooids are connected into a single colony.

Hydrorhiza. The proximal end of the hydrophyton by which the colony fixes itself to other bodies.

Hydrocaulus. All that portion of the hydrophyton which intervenes between the hydrorhiza and the hydranth. It is *polysiphonic* or fascicled when it is composed of several mutually adherent tubes; *monosiphonic*, when consisting of a single tube. In some species the cavity of its perisarc may be divided by annular ridges or imperfect septa,—*septal ridges*. The *rachis* is that portion of the hydrocaulus along which in the Plumularidæ the hydrothecæ are arranged.

Cœnosarc. The common organized fleshy portion of the hydrophyton; the living bond by which the zooids are organically united to one another.

Nematophores. Peculiar bodies developed in certain genera from definite points of the hydrosoma, and consisting of a chitinous receptacle with sarcode contents in which thread-cells are usually immersed. They are eminently characteristic of the family of the Plumularidæ. They are *supracalycine* when situated one on each side of the orifice of the hydrotheca; *mesial* when situated on the mesial line of the hydrotheca or rachis.

Gonophore. The ultimate generative zooid which gives origin directly to the generative elements, — ova or spermatozoa.

Gonangium. An external chitinous receptacle within which in the Calyptoblastic genera the gonophores are developed.

Acrocyst. An external sac which in certain hydroids is formed on the summit of the gonangium, where it constitutes a receptacle into which the ova are discharged in order to pass within it through some of the earlier stages of their development.

Corbula. A basket-shaped receptacle which encloses groups of gonangia in certain plumularian hydroids.

Phylactogonia. Special branches intended for the protection of the gonangia in certain plumularidans.

Gymnoblastic. The condition of a hydroid when no external protective receptacle (hydrotheca or gonangium) invests either nutritive or generative buds. GYMNOBLASTEA, the name of one of the suborders of HYDROIDA.

Calyptoblastic. The condition of a hydroid when an external protective receptacle (hydrotheca or gonangium) invests either the nutritive or generative buds. CALYPTOBLASTEA, the name of one of the suborders of HYDROIDA.

DESCRIPTIONS OF NEW GENERA AND SPECIES.

Suborder GYMNOBLASTEA.

Family **EUDENDRIDÆ.**

Genus EUDENDRIUM Ehrenberg (in part).

Eudendrium eximium.

Pl. I. Figs. 1, 2.

Trophosome. — Hydrocaulus attaining a height of about six inches, much branched, with the main branches and subordinate ramuli alternate and distichous; main stem and origin of the principal branches fascicled; ultimate ramuli with nearly obsolete annulation at their origin. Hydranths with about twenty tentacula.

Gonosome. — Female sporosacs springing irregularly from the body of the hydranth and from its supporting ramulus.

Dredged from a depth of 43 fathoms off the Florida Reef.

This is a fine species, rendered conspicuous by its size and by its profuse ramification. All the branches, both the primary ones and the subordinate ramuli, are in the same plane. The main stem is strongly fascicled, and towards its base acquires a thickness of nearly two lines.

From *E. ramosum* of the European coasts the present species differs in the more extensive fasciculation of its main stem, in the disposition of its ultimate ramuli, which are not, as in *E. ramosum*, confined to one side of their supporting branch, and in the absence of very decided annulation at the origin of the branches.

All the specimens preserved in the collection are female, and the hydranth of the sporosac-bearing ramulus shows no tendency to atrophy.

Eudendrium exiguum.

Pl. I. Figs. 3, 4.

Trophosome. — Hydrocaulus attaining a height of about an inch, irregularly branched, fascicled in main stem; principal branches and ultimate ramuli slender, mostly annulated at their origin. Hydranths with about twenty tentacula.

Gonosome not known.

Dredged from a depth of 98 fathoms off the Florida Reef.

This is a small species; it is strongly fascicled towards the proximal end of the main stem, but the branches are for the most part monosiphonic, very slender, and with very thin perisarc.

Eudendrium fruticosum.

Pl. II. Figs. 1, 2.

Trophosome. — Hydrocaulus attaining a height of about two inches, much and irregularly branched; main stem and base of principal branches fascicled. Hydranths with about twenty tentacles.

Gonosome. — Male gonophores bithalamic, springing in a verticil of about ten from the body of the hydranth. Female gonophores oval, also springing in a verticil from the body of the hydranth.

Dredged off Key West from a depth of 135 fathoms.

This is a strong, confusedly branched form. The annulation of the perisarc is either altogether obsolete or is at most represented by a few obscure rings at the origin of the ultimate branches, or an occasional group of rings near the middle of their length. The stem is thick and strongly fascicled below, where it resolves itself into numerous hydrorhizal filaments.

In the hydranths which carried the gonophores there was no tendency to atrophy in the male, and but little in the female.

The specimen was loaded with small spherical capsules, — probably a molluscan or annelidan nidus. — which adhered to the stem and branches in dense clusters.

Eudendrium attenuatum.

Pl. II. Figs. 3, 4.

Trophosome. — Hydrocaulus attaining a height of about two inches, not fascicled, very slender, alternately branched; ultimate ramuli short, given

off alternately at short and nearly equal intervals along the stem and branches; main branches and ramuli annulated at their origin; stem with a few annulations here and there.

Gonosome not known.

Dredged S. S. W. of Tortugas from a depth of 60 fathoms.

The specimen was destitute of both gonosome and hydranths, but its very slender non-fascicled stem, and short regularly disposed hydranthal ramuli, afford characters sufficiently diagnostic. In the absence, however, of hydranths and gonosome, the species is only provisionally referred to Eudendrium.

Eudendrium laxum.

Pl. III.

Trophosome. — Hydrocaulus attaining a height of about two inches, irregularly branched, not fascicled; ultimate ramuli alternate, rather long, and with a few annulations at their origin.

Gonosome. — Sporosacs (male) bithalamic, springing in a verticil of about ten from the body of the hydranth.

Dredged off Sand Key from a depth of 100 fathoms.

This is a loosely branched, somewhat straggling species, with unusually long, flexile, hydranth-bearing ramuli.

Imbedded in the cœnosareal walls of the lower end of the hydrocaulus and in those of the hydrorhiza, there occurred in the specimen clear spherical bodies of whose nature I am unable to give any satisfactory account. They showed no trace of a nucleus, but are too regular to be mere lacunæ. Their real nature can scarcely be determined without an examination in the recent hydroid.

Eudendrium gracile.

Pl. IV. Figs. 1, 2.

Trophosome. — Hydrocaulus attaining a height of upwards of an inch, slender, fascicled at extreme base, alternately branched; ultimate ramuli with nearly obsolete annulation at their origin.

Gonosome not known.

Dredged at Double-Headed Shot Key from a depth of from 3 to 4 fathoms.

This is a slender and delicate species. The hydranths were well preserved in the specimen, but no gonosome was present.

Eudendrium tenellum.

Pl. IV. Figs. 3, 4.

Trophosome. — Hydrocaulus attaining a height of about half an inch, very slender, not fascicled, irregularly branched; branches annulated at their origin; main stem and branches with groups of two or three annuli at distant and irregular intervals.

Gonosome not known.

Dredged off Double-Headed Shot Key from a depth of 471 fathoms.

Eudendrium tenellum is a minute and very slender form, perhaps the most slender species as yet referred to the genus Eudendrium. Its reference to this genus is probably correct, but as neither hydranths nor gonophores were present in the specimen, it may possibly have its true place in some other.

The specimens were obtained along with *Sertularella amphorifera* from the deepest dredgings made.

Eudendrium cochleatum.

Pl. V. Figs. 1, 2.

Trophosome. — Hydrocaulus attaining a height of between two and three inches, not fascicled, alternately branched; main branches and ultimate ramuli with very distinct oblique annulation at their origin, and here and there with groups of three or four ordinary transverse annuli.

Gonosome not known.

Dredged off Cape Fear River from a depth of 6 fathoms.

The strongly marked screw-like annulation at the origin of the branches forms a characteristic feature of this species. Some of the hydranths were well preserved in the specimen, but no gonophores were present.

Attached to it were numerous specimens of a little tube-dwelling crustacean.

Family **BIMERIDÆ.**

Genus BIMERIA Str. Wright.

Bimeria humilis.

Pl. V. Figs. 3, 4.

Trophosome. — Hydrocaulus attaining a height of about a line and a half, springing at intervals from a creeping and ramified stolon, sending off

short, alternate hydranth-bearing ramuli which are marked at their origin by spiral corrugations, and which, increasing in thickness towards their distal ends, gradually pass into the piriform body of the hydranth; perisarc very opaque. Hydranths large, assuming for the most part a drooping attitude.

Gonosome. — Gonophores (male?) oviform, supported on short spirally corrugated peduncles, scattered on the hydrocaulus.

Dredged at Tortugas in shallow water.

The massive-looking hydranths and the enlargement of the hydrocaulus towards their base give a peculiar aspect to this little hydroid. The perisarc, which is very opaque, is apparently continued for some distance over the tentacles, as in *B. vestita* Wright, the only species of the genus hitherto described. In the condition of the specimens of *B. humilis*, however, it was not possible to make this out satisfactorily.

The massive hydranths and comparatively slight development of the hydrocaulus distinguish this species from *B. vestita.* In both species the hydranths exhibit a tendency to assume a drooping attitude.

It occurred in considerable profusion, creeping over the surface of a seaweed which it covered with a low but rather dense growth.

Suborder CALYPTOBLASTEA.

Tribe **CAMPANULINÆ.**

Family **CAMPANULARIDÆ.**

Genus OBELIA Peron & Lesueur.

Obelia marginata.

Pl. VI. Figs. 1, 2.

Trophosome. — Stem attaining a height of nine inches, monosiphonic, pinnately branched; pinnæ alternate; stem and pinnæ gently zigzag, with a strong short process given off from the salient angle of each geniculation, and with a joint at the distal side of the process. Hydrothecæ supported on short stout peduncles which rest on the processes of the stem and pinnæ, large, nearly cylindrical, slightly oblique at the inner side of the base, and with a circular even orifice which is margined by a narrow, more transparent rim.

Gonosome not known.

Dredged off Logger-Head Key from a depth of 9 fathoms.

This is a very large, strong form, rendered striking by its regularly pinnate hydrocaulus, and its large, nearly cylindrical hydrothecæ, with perfectly even orifice margined by a narrow clear band.

Without a knowledge of the gonosome its reference to Obelia must be regarded as purely provisional.

The beautiful little *Lafoëa venusta* crept over the stem and pinnæ of one of the specimens.

Obelia longicyatha.

Pl. VII. Figs. 4, 5.

Trophosome. — Hydrocaulus attaining a height of nearly an inch, fascicled below, alternately branched; main stem annulated for a short distance above each ramulus; ramuli annulated at their origin; hydrothecal peduncles of moderate length, more or less annulated. Hydrothecæ narrow, deep, nearly cylindrical above, and then tapering towards the base; the orifice cut into about twenty acute, deep, narrow teeth.

Gonosome not known.

Dredged from a depth of 90 fathoms off the Florida Reef.

The specimens were found attached to *Halecium macrocephalum*. It is a delicate species with the hydrothecæ very thin and compressible. No gonosome was present, and its reference to Obelia is therefore only provisional.

THYROSCYPHUS Allman nov. gen.

Generic Character. *Trophosome.* — Hydrocaulus divided into internodes, each internode carrying a hydrotheca. Hydrothecæ pedunculate; orifice closed by an operculum which is formed by four converging valves.

Gonosome not known.

The small and definite number (4) of valve-like segments composing the operculum of the large and strong hydrothecæ, combined with the very definite division of the hydrocaulus into distinct and equal internodes, distinguishes the genus Thyroscyphus from the other operculate genera of the Campanularidæ. It is highly probable that if we were acquainted with the gonosome other and still more important characters would be found.

Thyroscyphus ramosus.

Pl. VI. Figs. 5, 6.

Trophosome. — Hydrocaulus attaining a height of about two inches, much and rather irregularly branched. Hydrothecæ alternate, large and deep, oblique at the inner side of the base, supported each on a short peduncle which consists of two oblique rings and which springs from the summit of a short thick process given off from the distal end of the internode; orifice with a narrow border; opercular valves broadly triangular.

Gonosome not known.

Dredged south of Sand Key from a depth of 10 fathoms.

Thyroscyphus ramosus is a large and strong species, rendered striking by its large valvular and bordered hydrothecæ. It contrasts markedly with the other operculate Campanularinæ, which are all, so far as is known, small and delicate forms.

Genus CAMPANULARIA Lamarck (in part).

Campanularia macroscypha.

Pl. VIII. Figs. 1, 2.

Trophosome. — Peduncles short, rising from a creeping stolon, marked with a few distant annulations, and having a discoid internode just below the hydrotheca. Hydrothecæ large, cylindrical from above downwards for the greater part of their length, and then tapering rapidly to the base; orifice cut into about twelve conspicuous, rather blunt teeth.

Gonosome not known.

Dredged off Sand Key from a depth of 120 fathoms.

This is a simple creeping species, and though of humble growth is remarkable for the large size of its hydrothecæ.

Family **LAFOËIDÆ** Lamouroux.

Genus LAFOËA.*

Lafoëa venusta.

Pl. VI. Figs. 3, 4.

Trophosome. — Hydrophyton minute, creeping. Hydrothecæ borne on moderately long, slightly corrugated peduncles, which spring at short in-

* It is difficult to find characters for the definition of the genus Lafoëa. I regard, however, as an essential character of the genus the absence of any definite floor to the hydrotheca, a character which

tervals from the creeping filament, cylindrical, deep, slightly curved in one aspect, regularly annulated; orifice circular with everted lip.

Gonosome not known.

Dredged along with *Obelia marginata* at Logger-Head Key from a depth of 9 fathoms.

This elegant little campanularian was found creeping over the branches of *Obelia marginata*.

Lafoëa tenellula.

Pl. VIII. Figs. 3, 4.

Trophosome. — Hydrothecæ very minute, slightly curved, contracted below into a short thick peduncle, springing at intervals from a creeping tubular filament.

Gonosome not known.

Dredged south of Marquesas from a depth of 140 fathoms.

This is a very minute species. The form of the hydrothecæ resembles that of the hydrothecæ of *L. dumosa*, but the whole hydroid is more minute and delicate. The hydrothecæ are usually marked by rings of elongation behind the orifice.

Lafoëa convallaria.

Pl. IX.

Trophosome. — Stem attaining a height of about an inch, simple, fascicled below, sending off simple, non-fascicled, alternate pinnæ. Hydrothecæ stalked, alternately disposed along the main stem and pinnæ, tumid towards the base and contracted towards the orifice, which is turned towards one side.

Gonosome not known.

Dredged from a depth of 152 fathoms off the Florida Reef.

Lafoëa convallaria is a beautiful little hydroid. Its cornucopia-like hydrothecæ on their short stalks, with their regular symmetrical disposition along the main stem and pinnæ, give to the entire hydrophyton a remarkable and very elegant aspect.

The form of the hydrotheca appears to change somewhat by age, for while in some the distal end is turned only slightly to one side, in others

it possesses in common with the opereulate genus Cuspidella. The cavity of the hydrotheca thus passes uninterruptedly into that of the supporting pedunele, or if the hydrotheca be sessile, into the eavity of the stem or branch which carries it. Admitting the correetness of this view, it appears to me very doubtful whether many of the species referred to Lafoëa are rightly so plaeed.

the orifice is turned quite downwards by a curving of this part of the hydrotheca. In many of the hydrothecæ annular indications of growth show themselves just behind the orifice. The peduncles are nearly equal in length to that of the hydrothecæ which they support.

The pinnæ of one side are not given off from the middle point of the interval between two pinnæ of the opposite side, but rather nearer to one of these than to the other.

The species is probably correctly referred to the genus Lafoëa, but in the absence of all knowledge of the hydranths this determination must be taken as only provisional.

Lafoëa coalescens.

Pl. X.

Trophosome. — Hydrocaulus attaining a height of about half an inch, alternately branched, fascicled below, springing from a network of tubular filaments. Hydrothecæ borne on the summit of peduncles which are for the most part given off from the sides of a common tube to which they become immediately adnate until within a short distance of their extremities. Hydrothecæ very deep, tubular, tapering towards the base, and again slightly narrowing towards the margin, which is itself slightly everted.

Gonosome not known.

Dredged south of Marquesas from a depth of 140 fathoms.

The adnate condition of the hydrothecal peduncles gives to this elegant little hydroid a remarkable character. This must, however, be regarded as a continuation of the fascicled state of the lower part of the stem. Occasionally hydrothecæ occur which are borne on shorter peduncles springing from the main stem, but free in their entire course, while there are also some which are borne on free peduncles springing from the hydrorhiza.

The hydrothecæ in every case pass gradually into the supporting peduncle without any basal diaphragm.

Genus CUSPIDELLA* Hincks.

Cuspidella pedunculata.

Pl. VIII. Figs. 5, 6.

Trophosome. — Hydrosoma very minute. Hydrothecæ springing by

* The genus Cuspidella was instituted by Hincks for certain minute operculate Campanularinæ which he separated from Calycella (*Campanularia syringia* of authors) on the ground of the sessile condition

rather long peduncles from a creeping filament, very delicate and filmy, deep, tapering toward the base, where they gradually pass into the peduncle without any definite line of demarcation.

Gonosome not known.

Dredged south of Tortugas from a depth of 260 fathoms.

OPLORHIZA Allman nov. gen.

Generic Character. *Trophosome.* — Hydrothecæ tubular, provided with a floor and having the orifice cut into thin collapsible segments; borne by peduncles which spring from a creeping network of tubes. Hydrorhizal network carrying peculiar appendages which are in the form of tubular receptacles with an orifice in the summit, and which enclose a granular, fleshy column, supporting a cluster of thread-cells.

Gonosome not known.

The genus Oplorhiza is nearly allied to Lafoëina Sars. In Lafoëina, however, the hydrothecæ are absolutely sessile on the hydrorhiza, and their cavity passes directly into that of the hydrorhiza without the intervention of an infrathecal diaphragm or floor.

The genus Lafoëina was established by Michael Sars for a little Lafoëa like hydroid (*Lafoëina tenuis*) obtained off the Norwegian coast, and essentially distinguished from Lafoëa by the presence of peculiar urticating appendages which are borne by the hydrorhiza.* These appendages in Lafoëina are long, filiform, and flexuous, while in Oplorhiza they are short and cup-shaped. In both genera they remind us strongly of the nematophores of the Plumularidæ. Like these they consist of a chitinous receptacle with fleshy contents which are probably of a simply sarcodic nature, and in which thread-cells are immersed. In the species on which the genus Oplorhiza is founded, these contents extend through the proximal part of the appendage in the form of a cylindrical column, which towards the summit becomes enlarged into a bulb in which numerous very long, curved thread-cells are imbedded. A very similar condition exists in *Lafoëina tenuis.*

of the hydrothecæ. A more important character, however, will be found in the absence of any definite floor or basal diaphragm in the hydrothecæ. It is the only known operculate form of the Campanulinæ in which the cavity of the hydrotheca thus passes uninterruptedly into that of the supporting tube as in the non-operculate genus Lafoëa. The sessile or pedunculate condition must be regarded as of merely secondary or specific value.

* G. O. Sars, *Bidrag til Kundskaben om Norges Hydroider. Forhandlinger i Videnskabs-selskabet i Christiania*, 1873, p. 119.

Lafoëina and Oplorhiza afford the only known instances in which organs resembling true nematophores occur outside of the family of the Plumularidæ.

Oplorhiza parvula.

Pl. VII. Figs. 1–3.

Trophosome. — Hydrosoma very minute, scarcely attaining a line in height. Hydrothecæ deep, narrowing towards the summit and towards the base; peduncles with about two rings just below the hydrotheca, and several less distinct ones at their origin from the hydrorhiza. Hydrorhizal appendages very minute, clavate, scattered over the upper side of the hydrorhiza.

Gonosome not known.

Dredged south of Marquesas from a depth of 296 fathoms.

Family **HALECIDÆ.**

Genus HALECIUM Oken.

Halecium filicula.

Pl. XI. Figs. 1–4.

Trophosome. — Hydrocaulus attaining a height of about three inches, alternately branched; branches pinnately disposed; internodes rather long; main stem and principal branches fascicled, but becoming monosiphonic toward their distal ends. Hydrophores* with one or more usually oblique and irregular annulations at their base, then gradually widening from the most distal annulation to the summit, where they terminate in a circular and abruptly everted margin.

Gonosome not known.

Dredged south of Marquesas from a depth of 140 fathoms.

This species is rendered striking by the graceful trumpet-shaped form of its hydrophores. Many of these are provided with a double or even triple margin, caused by the hydranth in its growth leaving behind it the old dilated extremity of the hydrophore, and becoming encircled by a new one, — a common occurrence among the various species of Halecium.

* The genus Halecium is destitute of true hydrothecæ, and the term hydrophore is here used for the appendages of the stem which take the place of the hydrothecæ in giving support to the hydranths.

Just within the everted margin of the hydrophore is the circle of minute brilliant points which is scarcely ever absent in any species of Halecium.

Halecium capillare.

Thoa capillaris POURTALÈS. Bull. M. C. Z., I. No. 6.

Pl. XI. Figs. 5, 6.

Trophosome. — Hydrocaulus attains a height of about an inch and a half, slender, irregularly branched, fascicled at the origin of the main stem and principal branches; internodes rather long. Hydrophores short, nearly cylindrical.

Gonosome not known.

Dredged five miles S. S. W. of Sand Key from a depth of from 90 to 100 fathoms.

This is a small and delicate species. The circle of brilliant points which in almost every species of Halecium occurs just within the margin of the hydrophore is not here obvious.

This is one of the specimens examined by Mr. de Pourtalès, who has assigned to it the specific name here adopted.

Halecium macrocephalum.

Pl. XII. Figs. 1–5.

Trophosome. — Hydrocaulus attaining a height of about two inches, rigid, stout, and very irregularly branched in all directions; main stem and principal branches fascicled, becoming monosiphonic distally; internodes of moderate length. Hydrophores suppressed. Hydranths very large, supported directly on the fixed lateral processes of the stem.

Gonosome. — Gonangia springing from the sides of the lateral processes which support the hydranths; female slipper-shaped, with the orifice situated near the middle of one side; male smaller than female, cylindrical, with truncated summit.

Dredged off Sand Key from a depth of 120 fathoms.

Halecium macrocephalum is remarkable for the suppression of the hydrophore, whose sole representative is found in the narrow membranous lip, which is here quite sessile on the fixed bracket-like process of the stem.

In some of the specimens the form of the hydranths was well retained. These were very large, reaching when fully extended the height of about two internodes of the stem.

In their slipper-shaped form the female gonangia come very near to those of *H. Beanii*. The orifice, however, in the latter is more exserted than in the present species.

Halecium macrocephalum, in the suppression of its hydrophores, and in the great size of its hydranths, comes very near to *H. sessile* Nordman. It is, however, a much stouter form than *H. sessile*, which, moreover, judging from the figures and descriptions of that species, has a monosiphonic instead of a fascicled stem.

As a rule, the hydranths are relatively large in the various species of Halecium, and this fact, taken in connection with the absence of a true hydrotheca, is not without significance.

Tribe **SERTULARINÆ.**

Family **GRAMMARIDÆ.**

Genus CRYPTOLARIA Busk.

Cryptolaria conferta.

Pl. XII. Figs. 6–10.

Trophosome. — Hydrocaulus attaining a height of about two inches, much and irregularly or subdichotomously branched, fascicled except towards the terminations of the branches. Hydrothecæ adnate for somewhat more than half their height, and in the fascicled portion of their stem deeply immersed, then becoming free and arching outwards; adnate portion slightly narrowing downwards, free portion cylindrical, with circular and entire orifice behind which the walls are marked by several annular striæ.

Gonosome?

Dredged off Cojima, Cuba, from a depth of 450 fathoms.

Cryptolaria conferta forms crowded entangled tufts. The proximal portions are strongly fascicled, but towards the extremities the fascicled condition disappears. Here the whole form of the hydrothecæ is frequently visible, but farther down the greater part of every hydrotheca is immersed and concealed in the fascicled portion.

The hydrotheca where fully seen in the non-fascicled portion of the hydroid is found to have a distinct floor perforated by an offset from the cœno-

sarc of the branch. It is possible that this floor disappears with age, and that the older hydrothecæ, where they are immersed in the fascicled stem, are without it. In *Cryptolaria longitheca*, another species occurring in the present collection, the hydrothecæ appear to pass continuously into the tubes of the hydrocaulus without the intervention of a perforated floor. I have had no opportunity of examining the nearly allied genus Grammaria, but according to Sars the hydrothecæ in this genus form continuous tubes passing uninterruptedly into the tubes of the fascicled stem and allowing of the entire retraction of the hydranth from the hydrothecæ into the tubes of the stem.

On the branches of the specimen here described there occurred here and there certain very remarkable bodies, the real nature of which I have not succeeded in placing beyond doubt. They are of an irregularly fusiform shape, and at the spots where they occur surround the branch like minute sponges. A closer examination shows them to consist of a multitude of flask-shaped, apparently chitinous receptacles (Figs. 9, 10), adnate to one another by their sides, and springing by a narrow base from an irregular network of tubes which encircles the branch. The distal extremity of each is prolonged into a free neck-like extension which terminates in an even circular orifice.

Each receptacle gives exit after a time to a single spherical body, which is retained for a period in an external membranous sac connected by a narrow neck to the orifice of the flask-shaped receptacle (Fig. 9, *a*, *a*).

It is scarcely possible not to recognize in these bodies an assemblage of true hydroid gonangia, each giving origin within it to a single ovum, which is subsequently expelled from its cavity and lodged in an acrocyst in which it continues to be for some time retained.

With the exception, indeed, of there being no apparent hydrothecæ intercalated among the gonangia, the bodies in question resemble in all essential points a colony of Coppinia. For, just as in Coppinia, we have here a colony of mutually adherent gonangia, each containing a sporosac with a single large ovum, which after a time is carried out and retained within an acroeyst. The absence of apparent hydrothecæ, however, will not allow us to make too close a comparison with Coppinia or to regard these enigmatical bodies as constituting a hydroid colony complete in itself.

Another view, however, suggests itself. May they not represent the gonosome of the hydroid with which they are associated? In favor of this interpretation it may be urged that nothing else which can be regarded as a gonosome occurs in the specimen, and that if we look upon them as

merely a parasitic hydroid we should have in these bodies a gonosome without its correlative trophosome. Further, the tubular base from which the gonangia spring forms a close irregular plexus which embraces the fascicled stem of the supporting hydroid, and I believe I have traced a communication between this plexus and the cavities of the outermost tubes of the stem.

If we admit the reasonableness of this view, we may compare the entire hydroid to a Coppinia in which the trophosome, instead of consisting of a number of sessile hydrothecæ intercalated among the gonangia of the gonosome, as in the only known species of Coppinia, is further differentiated, and assumes the form of a branching hydrocaulus with the hydrothecæ distributed along its length.

I do not wish, however, to lay too much stress on this view. I do not feel that I have been able to place beyond all doubt the reality of a communication between the tubular base of the incrusting body and the tubes of the stem, while the fascicled condition of the stem increases the difficulty. Against its constituting the proper gonosome of the supporting hydroid, may also be urged the facts of its irregular form and of its sometimes extending in such a way as to embrace a portion of more than one branch, exactly as a foreign incrusting growth might do. The question, however, of its exact relation to its associated hydroid must await for its solution the examination of recent specimens.

Cryptolaria longitheca.

Pl. XIII Figs. 4, 5.

Trophosome. — Hydrocaulus attaining a height of about two inches, pinnately but not profusely branched; fasciculation disappearing towards the ends of the branches. Hydrothecæ cylindrical, adnate in the non-fascicled portion for about half their height, then becoming free and bending outwards; margin circular and even, surrounded by annular striæ.

Gonosome not known.

Dredged off Double-Headed Shot Key from a depth of 315 fathoms.

Cryptolaria longitheca is a far less profusely branched species than *C. conferta*, and from this species it further differs in the pinnate disposition of its branches and in being a stronger form with larger hydrothecæ. The hydrothecæ, moreover, where a complete view of them can be obtained, as in

the unfascicled portion of the hydrocaulus, are cylindrical throughout, presenting no diminution of their diameter towards the base as in *C. conferta.* They appear alsò to pass continuously into the tubes of the hydrocaulus, no distinct floor being apparent in the hydrothecæ of any part of the specimen.

The circular striæ which surround the margin of the hydrothecæ are here as in other species most probably indications of successive elongations occurring during the growth of the hydroid.

Cryptolaria abies.

Pl. XIII. Figs. 1–3.

Trophosome. — Hydrocaulus attaining a height of about two inches, irregularly branched, with a pinnate disposition of the ultimate ramuli. Hydrothecæ, where completely visible, near the ends of the branches where the fasciculation ceases, flask-shaped, adnate by somewhat more than half their height, and then bending outwards; margin circular, even, and without obvious annular striation.

Gonosome not known.

The hydrothecæ of this species are considerably smaller than those of either *C. conferta* or *C. longitheca.* They can be seen, too, in the distal, non-fascicled portions of the hydrocaulus, where they are fully exposed, to be of a very different shape from those of the two former species, being here of an elongated flask-shape, tumid below and gradually narrowing towards the orifice. Here also they are plainly provided with a distinct floor, and in all respects resemble a typical sertularian hydrotheca. In the fascicled portion of the stem, where they are in great part immersed and concealed, their form cannot be satisfactorily determined.*

Cryptolaria elegans.

Pl. XIV. Figs. 1, 2.

Trophosome. — Hydrocaulus attaining a height of about an inch, delicate, pinnately and very regularly branched; pinnæ alternate fascicled only at their base or entirely monosiphonic. Hydrothecæ alternate, tubular, nearly cylindrical, narrow, adnate for somewhat more than half their height on the distal portions of the hydrocaulus, with the free part bending outwards

* The label placed with the specimens of this species had become effaced, so that neither their exact station in the area explored nor the depth from which they were dredged could be ascertained.

at nearly a right angle to the adnate part. Margin circular, even, frequently surrounded by annular striæ.

Gonosome not known.

Dredged from a depth of 152 fathoms off the Florida Reef.

This is a much smaller and more delicate form than any of the other species of Cryptolaria in the collection, its hydrothecæ having only about half the diameter of those of *C. abies*, the species which in this respect approaches it most nearly. The fasciculation is not carried to the same extent as in the other species, for it usually disappears from the pinnæ at a short distance from their origin, and those pinnæ which are given off near the summit of the stem are generally quite monosiphonic.

In the monosiphonic portions the hydrothecæ are seen to arise from the sides of a common tube to which they are generally adnate for more than half their height; they are here provided with a distinct floor, and are entirely differentiated from the supporting tube. In the fascicled portion they are, as in all the other species, deeply immersed and in great part concealed.

The pinnæ are so disposed that those of one side do not arise from the middle point of the space opposite to the interval between two pinnæ of the opposite side, but from a point quite near to one end of this space.

Family **SERTULARIDÆ.**

Genus SERTULARELLA Gray.

Sertularella conica.

Pl. XV. Figs. 6, 7.

Trophosome. — Hydrocaulus attaining a height of about an inch and a half, simple or with an occasional short branch, not fascicled. Hydrothecæ distant, each springing from a point close to the distal end of an internode, tumid towards the base, much narrowed towards the orifice, slightly marked with transverse corrugations on its upper side.

Gonosome not known.

Dredged southwest of Tortugas from a depth of 60 fathoms.

Sertularella conica is a rather rigid species. It is distinguished from *S. polyzonias* by its nearly simple habit, by the greater distance of the hydrothecæ from one another, and by their more conical form, resulting from their rapid narrowing towards the orifice.

Sertularella amphorifera.

Pl. XV. Figs. 8–10.

Trophosome. — Hydrocaulus very slender, dichotomously branched; internodes long, attenuated, each carrying a hydrotheca near its distal end. Hydrothecæ nearly cylindrical, deep, adnate to the internode for about their proximal third, then becoming free and bending outwards; margin with three teeth, one internal and two lateral.

Gonosome. — Gonangia springing each from a point near the base of a hydrotheca; obovate, strongly annulated, rapidly narrowing to its point of attachment, and terminating distally in a conical neck, which carries on its summit a small circular orifice with everted margin.

Dredged off Double-Headed Shot Key from a depth of 471 fathoms.

Sertularella amphorifera is very closely allied to the *S. tricuspidata* of Alder. It is destitute, however, of the two or three oblique annulations which at intervals give to the stem in *S. tricuspidata* a twisted appearance, while the disposition of the teeth of the hydrotheca is also different, there being an anterior but no posterior tooth in Alder's species. Further, the gonangia of the present species become much more rapidly narrow towards their point of attachment, a condition which makes them closely resemble in form the old Roman amphora.

The specimens in the collection were mere fragments, so that the full size to which the species grows could not be ascertained. They were obtained from the deepest dredgings of the exploration

Sertularella Gayi var. robusta.

Pl. XV. Figs. 3–5.

I have assigned to the well-known species *Sertularella Gayi* the hydroid here figured, which I regard as one of the many variations of that species, from the typical form of which it differs in its more irregular ramification and stouter habit. The specimens examined had attained a height of two or three inches, and sprung from a hydrorhiza composed of a dense tow-like mass of fine tubular filaments, formed by the disunion, free extension, and repeated division of the tubes which constitute the fascicled stem.

The valvular apparatus by which the orifice of the hydrotheca is closed was well seen in some of the specimens, and the four bands by which the valves are connected with the body of the hydranth were in some cases visible (Fig. 4).

These bands, so far as I am aware, have not been hitherto described. I have found them in many other Sertularidans, and they are especially obvious in young hydrothecæ. They are destitute of fibrillation, and appear to consist of a cord of protoplasm enclosing nucleus-like bodies, and are plainly intended to close the valves forming the operculum of the hydrotheca during the retreat of the hydranth.

Specimens of the same variety, but in which the strong, robust habit was still better marked, were dredged by the "Porcupine," in the eastern parts of the North Atlantic.*

Genus SERTULARIA Linnæus (in part).

Sertularia marginata.

Pl. XVI. Figs. 1, 2.

Trophosome. — Hydrocaulus attaining a height of about an inch, simple; internodes elongated, attenuated below every pair of hydrothecæ. Hydrothecæ opposite, deep, tubular, free, and divergent above for about three fifths of their height, slightly tumid below; orifice entire, with a broad rim formed by close striæ, which run in a circular direction round the distal end of the hydrotheca.

Gonosome not known.

Dredged from a depth of 324 fathoms, off Florida Reef.

The species is remarkable for its distant pairs of long tubular hydrothecæ, with the orifice surrounded by a band of delicate circular striæ. The specimen is destitute of gonangia; it is possibly immature, and may become ramified before attaining its adult condition.

Sertularia tumida.

Pl. XVI. Figs. 3, 4.

Trophosome. — Hydrocaulus attaining a height of $\frac{3}{4}$ of an inch simple; internodes of moderate length, thinning away for some distance below each pair of hydrothecæ. Hydrothecæ opposite, short, tumid below, aduate to the stem for about half their length, and with the distal half free and diverging at nearly a right angle.

Gonosome not known.

Tortugas, shallow water.

* See Report of the Hydroids collected during the Expeditions of H. M. S. Porcupine, Trans. Zoöl. Soc. London, 1873.

The present species resembles in its general habit *Sertularia pumila*, and might, without examination, be mistaken for it. It is, however, distinguished from that species by its tumid hydrothecæ, and by the wide angle at which their distal portion diverges from the stem; as well as by the greater length of the internodes and consequent separation of the pairs of hydrothecæ.

No gonangia were present, and the specimen may not have attained its full growth. In some of the hydrothecæ the hydranths were fairly preserved, and the opercular bands were recognizable.

Sertularia tubitheca.

Pl. XVI. Figs. 5, 6.

Trophosome. — Hydrocaulus attaining a height of upwards of an inch, branched; branches opposite; internodes of moderate length, thinning away below every pair of hydrothecæ. Hydrothecæ long, tubular, cylindrical, free, and divergent for a little more than their distal half, with the orifice circular, abruptly but slightly everted, and having close behind it an annular ridge resembling the margin of a former orifice.

Gonosome not known.

Dredged from a depth of 16 fathoms at the Tortugas.

Sertularia tubithcea is a small but elegant species. The double-lipped condition of the hydrothecæ was constant in the specimens examined, and seems due to the existence of an earlier orifice, to which the present one has succeeded. It is possible that indications of more than one such earlier orifice would be found in older specimens.

Sertularia exigua.

Pl. XVI. Figs. 7, 8.

Trophosome. — Hydrocaulus minute, simple, attaining the height of about $\frac{1}{4}$ of an inch; internodes very short, not prolonged by an attenuated continuation below the pairs of hydrothecæ. Hydrothecæ opposite, not tumid below; free and divergent on their distal half, and with the opposed sides of each pair parallel to one another.

Gonosome unknown.

Dredged off Cape Fear from a depth of 9 fathoms.

This little Sertularia might be mistaken for *S. pumila;* unless, however,

the specimens are immature, and would have acquired a greater development in their adult state, it is a much smaller form than *S. pumila*. Further, in *S. pumila* the opposed sides of the hydrothecæ composing each pair converge from above downwards, while in *S. exigua* they are parallel.

Sertularia distans.

Pl. XVI. Figs. 9, 10.

Trophosome. — Hydrocaulus attaining a height of about an inch, simple or with an occasional branch; internodes rather long and prolonged by an attenuated extension below each pair of hydrothecæ. Hydrothecæ tubular, with the distal half free and divergent, and the opposed sides of the proximal halves parallel.

Gonosome not known.

Dredged off Tennessee Reef from a depth of 21 fathoms.

This species bears considerable resemblance to *S. pumila*, from which, however, it differs in the much greater length of its internodes and consequent distance of its pairs of hydrothecæ. The orifice of the hydrotheca is cut off obliquely above and below, so as to present two broad lateral teeth, and the intervals between these are closed by two thin membranous valves. Each of these valves is composed of delicate superimposed laminæ, which may be usually seen partially separated from one another, as thin exfoliating films.

The species resembles also *S. gracilis* Hassall in the length of its internodes, but it is a larger form.

In the absence of gonosome it is impossible to approximate it closer to any European form.

DESMOSCYPHUS Allman nov. gen.

Generic Character. *Trophosome.* — Hydrocaulus jointed, each internode corresponding to one or more pairs of hydrothecæ. Hydrothecæ adnate to one another in pairs, each pair adnate to the side of the hydrocaulus.

Gonosome. — Gonangia simple, borne along the front of the hydrocaulus.

The genus Desmoscyphus was originally constituted for a hydroid from the New Zealand shores.* It resembles most of the species of Thuiaria in the extent to which the hydrotheeæ are adnate to the hydrocaulus, but it

* Allman on New Genera and Species of Hydroida, Journ. Linn. Soc. Zoölogy, Vol. XII.

differs from this genus in the fact that the hydrothecæ are also adnate to one another in pairs, and thus brought all to one side of the hydrocaulus; while a still further difference is found in the fact that the internodes may in some cases carry each a single pair of hydrothecæ, as in Sertularia.

In the New Zealand species, *Desmoscyphus Buskii*, the main stem is divided into internodes of variable length, carrying each a variable number of pairs of hydrothecæ, while the branches are regularly divided into equal internodes each with one pair of hydrothecæ. In the species here described from the Gulf Stream (*D. longitheca*), the entire hydrocaulus is regularly divided into internodes, each carrying a single pair of hydrothecæ.

Desmoscyphus longitheca.

Pl. XIV. Figs. 3–6.

Trophosome. — Hydrocaulus attaining a height of about an inch, pinnately branched; pinnæ alternate, much contracted at their origin; main stem and pinnæ divided into regular internodes, each internode carrying a single pair of hydrothecæ. Hydrothecæ long, tubular, with semicircular orifice, which is closed by a valve-like lid; along the branches and the greater part of the main stem adnate to one another in pairs for nearly their entire height, but becoming free and diverging from one another close to their distal ends; towards the basal end of the stem the hydrothecæ of each pair receding from one another and ultimately disposed on two diametrically opposite sides of the internode.

Gonosome not known.

Key West, shallow water.

Desmoscyphus longitheca constitutes an interesting transition form by which the genus Desmoscyphus becomes connected with Sertularia. For while in *D. Buskii* the branches alone are divided into equal internodes, each carrying a single pair of hydrothecæ, the main stem being composed of internodes of variable length, each with a variable number of hydrothecæ, in the present species both stem and branches possess the Sertularian character of division into equal internodes, with a single pair of hydrothecæ upon each.

Further, in *D. longitheca* the hydrothecæ composing each pair, where they approach the base of the main stem, begin to recede from one another, the separation gradually increasing, until just above the hydrorhiza they are situated upon opposite sides of their supporting internode exactly as in a

true Sertularia; while the resemblance of this part of the hydroid to a Sertularia is further increased by the occurrence of a deep constriction between each internode.

Genus THUIARIA Fleming.

Thuiaria distans.

Pl. XVII. Figs. 1, 2.

Trophosome. — Stem attaining a height of about four inches, simple, non-fascicled, sending off alternate pinnæ, which extend from its distal end to within a short distance of the base; pinnæ with transverse joints at distant but uncertain intervals; main stem with an oblique joint just above the origin of each pinna. Hydrothecæ distant, alternate, borne upon the stem and pinnæ, to each of which they are adnate for very nearly their entire height; short, tubular, slightly enlarging upwards and bending outward, with a somewhat wavy margin destitute of teeth, and with a narrow, though distinct border.

Gonosome not known.

Tortugas, shallow water.

Thuiaria distans is remarkable for the length of the intervals by which the hydrothecæ of each side are separated from one another. The internodes of the stem are regular in length, and support each three hydrothecæ; those of the pinnæ are irregular in length, and vary in the number of hydrothecæ to which they give support.

The cœnosarc of the stem is canaliculated.

Thuiaria plumulifera.

Pl. XVII. Figs. 3–6.

Trophosome. — Stem attaining a height of about six inches, slender, flexile, emitting numerous pinnate branches which are disposed from distance to distance rather irregularly on all sides of the stem, and which carry the hydrothecæ both upon their axis and pinnæ; pinnæ alternate, much contracted at their origin. Hydrothecæ alternate, deep, adnate for nearly their entire length; orifice with two strong, broad teeth, beyond which the walls of the hydrothecæ are continued as a thin, membranous, collapsible tube.

Gonosome not known.

Dredged off Cape Fear from a depth of 9 fathoms.

Thuiaria plumulifera has a good deal of the habit of *Hydrallmania falcata*. The pinna-bearing branches are regularly divided into equal internodes, each internode carrying three hydrothecæ and giving off a pinna from alternate sides just above its proximal end. The pinnæ are much contracted at their origin, and united to the branch which carries them by a very short, nearly globular internode. The joints of the pinnæ are at distant and uncertain intervals.

The hydrothecæ at their distal ends are thin and collapsible, so that it was very difficult to determine the true form of the orifice. In some cases, however, where the parts were well preserved, it could be seen that the thin collapsible portion was a tubular prolongation of the walls beyond the true orifice, which was provided with two strong, broad lateral teeth.

The gonangia had all fallen, but the indications of their attachment were visible just below many of the hydrothecæ.

Thuiaria pinnata.

Pl. XV. Figs. 1, 2.

Trophosome. — Stem attaining a height of nearly three inches, sparingly branched, fascicled below, alternately pinnate; pinnæ given off at nearly right angles to the stem, jointed at distant and uncertain intervals. Hydrothecæ borne both by stem and pinnæ, deep cylindrical with obscurely 4-toothed margin, adnate to the axis in their whole length.

Gonosome not known.

Double-headed Shot Key from a depth of 3 to 4 fathoms.

Thuiaria pinnata is a strong, rather rigid form, rendered somewhat striking by the very open angle at which the pinnæ are given off from the stem. Some of the hydranths were well preserved in the specimen, and it would appear that they are capable of extending themselves far beyond the orifice of the hydrotheca.

Thuiaria sertularioides.

Pl. XVI. Figs. 11, 12.

Trophosome. — Hydrocaulus attaining a height of three inches, slender cylindrical, sending off short, simple branches which spring from the anterior aspect of the axis. Hydrothecæ opposite, with the distal half free and divergent, gradually narrowing from the base to the orifice,

which is obliquely cut above and below so as to present two broad lateral teeth.

Gonosome not known.

In its opposite hydrothecæ adnate to the axis for only half their height, and disposed in distant pairs, this hydroid has so much of the aspect of a Sertularia that it might at first sight be easily referred to that genus. The fact, however, that the pairs of hydrothecæ are not separated from one another by a joint removes it from Sertularia, and notwithstanding the freedom of the hydrotheeæ for so considerable a portion of their height, brings it into the genus Thuiaria.*

It is a slender form, with a somewhat rigid habit which it would seem to owe to the non-jointed condition of the axis.

Family **PLUMULARIDÆ.**

Genus PLUMULARIA, Lamarck (in part).

Plumularia filicula.

Pl. XVIII. Figs. 1, 2.

Trophosome. — Hydrocaulus attaining a height of about two inches, simple or with an occasional branch close to the root, not fascicled; pinnæ alternate, one borne by each internode of the stem, immediately below a joint, where it is supported on a long process of the internode; proximal internode of the pinnæ short and destitute of hydrotheca; following internodes elongate, every alternate one carrying a hydrotheca, the hydrotheca-bearing internodes slightly longer than the intervening ones. Hydrothecæ small, each borne near the middle of its supporting internode. Supracalycine nematophores large; a single mesial nematophore borne by the hydrothecal internode at the proximal side of the hydrotheca, two by each of the intervening internodes, and a single one by the short proximal internode.

Gonosome. — Gonangia elongate, oval, smooth, narrowed below into a

* I regard the presence of a joint at regular intervals between every two or every two pairs of hydrothecæ as an essential character of the true Sertularidans (Sertularia, Sertularella, Diphasia) quite irrespectively of the extent to which the hydrothecæ are adnate to the hydrocaulus. In Thuiaria, on the other hand, the joints occur at distant, and for the most part irregular intervals, thus allowing numerous hydrothecæ to follow one another without any intervening joint. See Journ. Linn. Soc. Zoölogy, Vol. XII. p. 267.

short peduncle, by which they spring from the axils of the pinnæ, opening on the summit by a wide oblique aperture.

Off Alligator Reef, from a depth of 88 fathoms.

This species grows in tufts, numerous undivided stems springing from a common base. It is of a rather rigid habit; the pinnæ are close set; besides the nematophores of the pinnæ we find on each internode of the stem two large, alternately placed, solitary nematophores, and two pairs of nematophores which are borne by the lateral process on which the hydrothecal ramulus is supported.

Plumularia macrotheca.

Pl. XVIII. Figs. 3, 4.

Trophosome. — Hydrocaulus attaining a height of about two inches, simple, fascicled, springing from an entangled mass of fine tubular filaments; pinnæ very slender, alternate, composed each of a succession of long internodes alternating with short ones, each of the long internodes bearing a hydrotheca. Hydrothecæ deep, tubular, with very slightly everted margin. Supracalycine nematophores springing each from a short process which projects from the long internode, just below the margin of the hydrotheca, one mesial nematophore carried by the same internode at the proximal side of the hydrotheca, and another on each of the short internodes.

Gonosome not known.

Off Cojima, Cuba, from a depth of 450 fathoms.

Plumularia macrotheca is remarkable for its long narrow hydrothecæ. Its very slender pinnæ are rather widely set upon the stem, which is fascicled, and, like other fascicled stems, resolves itself below by the separation of its component tubes into a loose plexus of hydrorhizal filaments.

Plumularia attenuata.

Pl. XVIII. Figs. 5, 6.

Trophosome. — Hydrocaulus branched, fascicled below; pinnæ alternate, each arising from a point of the stem close to the distal end of an internode; internodes of pinnæ elongated, becoming abruptly slender in the distal two thirds of their length. Hydrothecæ small, borne by the thicker basal portion.

Supracalycine nematophores springing from tooth-like processes which

flank the hydrotheca on each side; mesial nematophores, one at the distal and one at the proximal side of each hydrotheca.

Gonosome not known.

Off Boca Grande, from a depth of 105 fathoms.

The abruptly attenuated distal portion of the internodes of the pinnæ is sufficient to distinguish this species. The internodes of the stem are short, and the pinnæ are in consequence close set, resembling in this respect those of *P. filicula*. In the stem each internode carries two nematophores which are placed laterally and alternately, and one pair of nematophores which is borne by the lateral process.

Plumularia megalocephala.

Pl. XIX. Figs. 1, 2.

Trophosome. — Hydrocaulus irregularly branched, not fascicled; pinnæ alternate, each borne close to the distal end of an internode of the stem, where it is supported on a long stout process of the internode; proximal internode of pinna short and destitute of hydrotheca; following internodes longer, every alternate one carrying a hydrotheca, and slightly longer than the others. Hydrothecæ small and shallow, each borne near the middle of its internode, and supporting a very large hydranth. Besides the supracalycine pair of nematophores, each hydrotheca-bearing internode carrying a single mesial nematophore at the proximal side of the hydrotheca; intervening internode carrying two mesial nematophores, and short basal internode carrying one.

Gonosome not known.

Off Alligator Reef, from a depth of 14 fathoms.

The specimens from which the description has been written were imperfect, and the height to which they had attained could not be determined with certainty, but it was probably about two inches. The internode intercalated between the hydrotheca-bearing internodes was sometimes present, sometimes absent, and was of variable length. The internodes of the stem carry two nematophores placed laterally and alternately, and one or two pairs on its lateral process.

Some of the hydranths in the specimens were sufficiently well preserved to afford a sketch of their outline. They are of enormous size in comparison with the hydrothecæ, into which they could never have been retracted. The very large pear-shaped body was supported on a slender stalk, the only part which lay within shelter of the hydrotheca.

Plumularia geminata.

Pl. XX. Figs. 1–4.

Trophosome. — Stem attaining a height of about one inch, dichotomously branched; internodes towards the distal extremity of the branch alternately longer and shorter; each shorter internode carrying near its middle a hydrotheca, on each side of which springs an ultimate ramulus, also composed of alternately longer and shorter internodes; each shorter one carrying a hydrotheca. Hydrothecæ campanulate with slightly everted margin, free for about its distal half. Lateral nematophores borne each on a strong tooth-like process of the internode; mesial nematophores carried upon both the hydrothecal and the intervening internodes.

Gonosome. — Gonangia pyriform, borne on short two-jointed peduncles which spring from the mesial line immediately below the hydrotheca, the narrow proximal end of the gonangia carrying a nematophore on each side.

Off Sand Key, from a depth of 120 fathoms.

Plumularia geminata is a very remarkable form; the ultimate ramuli given off in regular pairs from the principal branches confer upon it a very striking aspect. All these pairs of ramuli are directed towards one side of the branch from which they spring. The proximal joint of each hydrotheca-bearing internode in the ultimate ramuli is very oblique, the distal one transverse. This internode carries a single mesial nematophore, which is situated at the proximal side of the hydrotheca, while each intervening internode of the ramulus carries three. In the main branches each hydrotheca-bearing internode carries also a nematophore at the distal side of the hydrotheca, while four nematophores are borne on every intervening internode.*

HALOPTERIS Allman nov. gen.

Generic Character. *Trophosome.* — Hydrosoma pinnate plumose; stem and pinnæ divided into internodes. Hydrothecæ adnate to side of pinnæ, unilateral. A pair of nematophores flanking the hydrotheca, one on each side, and adnate to it. Mesial nematophores two (or more), not adnate to the hydrotheca, fixed, monothalamic, with an oblique aperture continued into a lateral slit.

Gonosome not known.

* See Addenda, p. 56.

The genus Halopteris constitutes an intermediate form between Aglaophenia and Plumularia. To Aglaophenia it shows an affinity by its paired nematophores being adnate to the hydrothecæ, and by its fixed monothalamic mesial nematophores with slit-like aperture. To Plumularia it is connected by having more than one azygous nematophore seated on each internode of the pinnæ, and all at a distance from the hydrotheca, by the wide separation of the hydrothecæ from one another, and by their even margin.

Halopteris carinata.

Pl. XIX. Figs. 3–7.

Trophosome. — Hydrocaulus attaining a height of about two inches, simple, non-fascicled; pinnæ alternate, springing one from each internode of the stem, near its proximal end; internodes of pinnæ separated from one another by oblique joints, each carrying a hydrotheca near its middle. Hydrothecæ very large, adnate to internode for about two thirds of their height, and then becoming free, deep, nearly cylindrical in lateral aspect, infundibuliform in front aspect, margin even, with a slightly prominent cusp in front, from which a slight keel is continued for some distance along the front of the hydrotheca. Lateral nematophores in the form of a long tubular stalk which springs from the internode at a point near its middle, and thence passing obliquely across the side of the hydrotheca, reaches the margin, where it terminates in a cup-like dilatation. Mesial nematophores free, fixed by a narrow base, two on each internode, one being just below the hydrotheca, and one at a little distance above it.

Gonosome not known.

Off Carysfort Reef, from a depth of 35 fathoms.

This is a remarkable hydroid, rendered striking by its long tubular lateral nematophores, and by the peculiar form and large size of its hydrothecæ. The stem carries between the pinnæ longitudinal rows of short fixed nematophores whose oblique aperture is continued into a lateral slit. Though the mesial nematophores of the pinnæ are attached by a narrow base, they are firmly fixed, thus, along with the nematophores of the stem, contrasting with the movable and easily detached nematophores of the true Plumulariæ. In this respect, and in their oblique and slit orifice, they resemble the nematophores of Aglaophenia.

Genus ANTENNULARIA Lamarck.

Antennularia simplex.

Pl. XXI. Figs. 1, 2.

Trophosome. — Hydrocaulus attaining a height of about three inches, simple; verticils closely set, each composed of about five ramuli; ramuli borne each on a stout process from the stem, and composed of long, nearly equal internodes, every internode carrying a hydrotheca near its proximal end. Hydrothecæ small, campanulate, flanked on each side by a short tooth-like process from the internode. Supracalycine nematophores borne on the tooth-like processes; two mesial nematophores on each internode, one at the proximal and another at the distal side of the hydrothecæ; a pair of nematophores borne on the basal process and single nematophores scattered over the common stem.

Gonosome not known.

Off Alligator Reef, from a depth of 86 fathoms.

The present species comes very near to *Antennularia ramosa*, from which, however, it differs in its simple habit, and in the position of the hydrothecæ, which are here situated further towards the proximal end of each internode.

ANTENNOPSIS Allman nov. gen.

Generic Character. *Trophosome.* — Stem jointed, sending off scattered jointed ramuli which carry the hydrothecæ. Hydrothecæ with entire margin, unilateral, associated with a pair of movable supracalycine nematophores and with movable azygous nematophores borne along the hydrothecal side of the ramuli.

Gonosome. — Gonangia not protected by corbulæ or other appendages.

The genus Antennopsis differs from Antennularia, to which it is closely allied, by the scattered disposition of its ramuli, which in Antennularia are verticillate.

In all the species of Antennularia which I have examined, the cœnosarc is canaliculated in the stem, the hydrosomal cavity being there represented by a network of intercommunicating canals. In *Antennopsis hippuris* the hydrosomal cavity is of the ordinary simple type, but we do not yet know enough of the species which may compose the genus Antennopsis to enable us to regard this as a true generic character.

Another feature in which *Antennopsis hippuris* differs from the species of Antennularia consists in the absence of the tow-like mass of filaments which forms the hydrorhiza of the various species hitherto referred to the latter genus, the place of these entangled filaments being here taken by a small knot of free tubular fibres.

Antennopsis hippuris.

Pl. XXI. Figs. 3, 6.

Trophosome. — Hydrocaulus attaining a height of about two inches, springing from a cluster of distinct tubular fibres; stem simple, non-fascicled, divided into rather short internodes; ramuli slender, supported each by a thick process of the rachis which is given off from all sides irregularly, every alternate internode of the ramulus supporting a hydrotheca. Hydrothecæ small, cup-shaped. Hydrothecal internodes carrying besides the supracalycine nematophores two mesial nematophores, one at the proximal and one at the distal side of the hydrothecæ; intervening internodes with two mesial nematophores.

Gonosome. — Gonangia shortly pedunculate, borne singly in the axils of the ramuli; male? elongated oval, with an oblique terminal orifice; female? slipper-shaped with the distal end curved over to one side, and with a sub-terminal orifice.

Off Double-Headed Shot Key, from a depth of 195 fathoms.

Antennopsis hippuris is a small and rather delicate species. Like almost every other hydroid, it is dioecious, and the collection contains specimens of each sex, which differ from one another considerably in the form of the gonangia. The contents of the gonangia were not well enough preserved to enable their nature to be determined, and it is therefore with hesitation that, guided by the analogy of some other forms, I have regarded the long oval gonangia as male, and the shorter slipper-shaped ones as female.

HIPPURELLA Allman nov. gen.

Generic Character. *Trophosome.* — Hydrocaulus branched, ultimate ramuli pinnate on the proximal portion of the branches, but distributed on all sides towards their distal extremities. Hydrothecæ borne on the ultimate ramuli, unilateral, with entire margin, associated with a pair of

supracalycine nematophores, and with azygous nematophores along the hydrothecal side of the ramulus.

Gonosome not known.

The genus Hippurella unites in itself the characters of a Plumularia and of an Antennularia or Antennopsis. Indeed, the genera Plumularia, Antennularia, Antennopsis, and Hippurella differ from one another mainly in the disposition of the ultimate ramuli. The characters thus afforded have long been recognized as of generic value in the separation of Antennularia from Plumularia, and the application of the same principle to other forms necessitates the construction of Antennopsis and Hippurella as legitimate genera.

Hippurella annulata.

Pl. XXI. Figs. 7, 8.

Trophosome. — Hydrocaulus attaining a height of about three inches, springing from a dense bundle of tubular filaments, fascicled throughout the main stem, which sends off numerous non-fascicled branches, which are pinnately disposed below, but given off irregularly towards the distal end of the hydrocaulus; ultimate ramuli alternate and pinnate towards the proximal ends of the branches, but towards the distal ends surrounding the branch on all sides, and here either scattered or regularly verticillate; each composed of alternate long and short internodes with intervening groups of very short ring-like internodes, each of the long internodes carrying a hydrotheca. Hydrothecæ deep, thimble-shaped, with slightly everted margin. Besides the supracalycine pair of nematophores, there are two mesial nematophores, borne by the ramulus, between every two hydrothecæ.

Gonosome not known.

Off Pacific Reef from a depth of 283 fathoms.

The species is rendered striking by the large size and deep thimble-shaped form of its hydrothecæ, and by the annulation, at intervals, of its ultimate ramuli.

MONOSTÆCHAS Allman nov. gen.

Generic Character. *Trophosome.* — Stem branched; hydrothecal ramuli confined to one side of their supporting branches. Hydrothecæ unilateral

with entire margin, associated with a pair of supracalycine nematophores, and with free mesial nematophores.

Gonosome. — Gonangia not contained in corbulæ, or connected with special branches.

The unilateral disposition of the hydrothecal or ultimate ramuli on the main branches is very remarkable, and, being absolutely constant, becomes a character of generic value.

Monostæchas dichotoma.

Pl. XXII. Figs. 1–5.

Trophosome. — Hydrocaulus attaining a height of about an inch and a half, pellucid, dichotomously branched; every alternate internode of the hydrothecal ramuli carrying a hydrotheca and separated from the others by a transverse distal joint, and a very oblique and more strongly marked proximal one. Hydrothecæ rather large cup-shaped, flanked on each side by a prominent tooth-like process of the internode. Supracalycine nematophores borne by the tooth-like processes, one mesial nematophore borne by the hydrotheca-bearing internode at the proximal side of the hydrotheca, and two by the intervening internode; numerous nematophores borne in a single series along the opposed sides of the bifurcating branches.

Gonosome. — Gonangia pyriform, contracted below into a short stalk, which springs from a slightly prominent process of the internode, just below the base of the hydrotheca, and carries a nematophore on each side of it.

Off Pacific Reef, from a depth of 283 fathoms.

The present species closely resembles, in several important characters, the *Plumularia catharina* of Johnston. In the form and position of the hydrothecæ, in the internodes and nematophores of the ultimate ramuli, and in the form and position of the gonangia, the resemblance is so close, even in minute details, that it is impossible to find in these parts any characters by which the one hydroid can be distinguished from the other.

It is entirely different, however, with the *ramification* of the species for which I have here founded the genus Monostæchas. This ramification is of a very remarkable kind, so much so, indeed, that I regard it as affording a character of generic value. It has not only no resemblance to that of *Plumularia catharina*, but belongs to a type which has no representative in any other known Plumularidan.

ANTENELLA Allman nov. gen.

Generic Character. — *Trophosome.* — Hydrocaulus consisting of simple stems, which spring from a congeries of tubular filaments; stems divided into internodes, destitute of pinnæ, and directly bearing the hydrothecæ. Hydrothecæ with entire margin. Nematophores free and movable.

Gonosome not known.

If in a true Plumularia the rachis had never been developed, and the pinnæ had thus come to stand immediately on the hydrorhiza, we should have a form with the essential characters of Antennella.

Antennella gracilis.

Pl. XXII. Figs. 6, 7.

Trophosome. — Hydrocaulus attaining a height of about an inch, simple or with an occasional division near its base, springing in dense tufts from a mass of creeping, tortuous, inosculating, and entangled filaments, divided into internodes by very oblique joints, and with an intervening obscure horizontal joint, also generally apparent. Hydrothecæ borne along the hydrocaulus from its distal end to within a short distance of its base, rather large, cylindrical, deep, with a circular margin, free for about half their height. Supracalycine nematophores borne each on the extremity of a long hollow process which flanks the hydrotheca on each side; mesial nematophores usually four between every two hydrothecæ.

Gonosome not known.

Dredged off Carysfort Reef from a depth of 60 fathoms.

A form nearly allied to the *Antennella gracilis* of the present Report has been dredged off the British coast by Hincks, who regards it as a variety of *Plumularia catharina* Johnston, and believes it to be identical with the *Antennularia cyathifera* of Dana, and with the *Sertularia secundaria* of Cavolini. That all these belong to the form for which I have constituted the genus Antennella, there can, I think, be little doubt.

Throughout that section of the Plumularidæ which is characterized by its movable nematophores, and of which *Plumularia setacea* may be taken as the type, the modifications of ramification as expressed in the disposition of the hydrothecal or ultimate ramuli admit of being thrown into a series whose members present a definite relation to one another.

Taking as our point of departure such forms as *Plumularia setacea* of

the European shores or *P. filicula*, etc. of the present Report, we find that the hydrothecal ramuli are given off on two opposite sides of the simple or branching stem from which they spring with a regularly alternate arrangement. In *P. catharina* the hydrothecal ramuli, instead of being alternate, are exactly opposite. In *P. geminata*, while the points of origin of these ramuli are opposite to one another, as in *P. catharina*, the ramuli themselves are all directed to one side, and thus lie in unilateral pairs along the supporting branch. In the genus Monostæchas, as represented by the single species *M. dichotoma*, the main stem is dichotomously branched, and every alternate prong of the forks gives off — from one side only — the hydrothecal ramuli. In Antennella the whole of the main stem has disappeared, and the hydrothecal ramuli come to be borne directly on the hydrorhiza.

Again, in Antennularia the hydrothecal ramuli are disposed in regard verticils along the stem. In Antennopsis they also surround the stem, but instead of being disposed in verticils they are scattered. What Antennularia is to *P. catharina* with its opposite distichous ramuli, Antennopsis is to *P. setacea* with its alternate distichous ramuli. Finally, in Hippurella we have a transition between the alternate and distichous ramuli of *P. setacea* and the scattered ramuli of Antennopsis or verticillate ramuli of Antennularia; the proximal parts of the branches having their hydrothecal ramuli disposed as in *P. setacea*, while towards the distal extremity these ramuli become scattered as in Antennopsis or verticillate as in Antennularia.

Each of these modifications is in itself so well marked that it may be justly taken as characterizing a distinct specific form, or, in some cases, even a generic group. Any one of them, however, may be regarded as an easily understood derivation from others, while all may obviously have descended from a single ancestral form

Genus AGLAOPHENIA Lamouroux (in part).

Aglaophenia ramosa.

Pl. XXIII. Figs. 1–4.

Trophosome. — Hydrocaulus attaining a height of about six inches, subdichotomously branched, fascicled in main stem and branches, and becoming monosiphonic only near the distal ends; pinnæ given off at an acute angle from the anterior aspect of the branches; internodes of rachis with a

strongly marked septal ridge on a level with the intrathecal ridge, and with a less distinct one at the base of the supracalycine nematophores. Hydrothecæ deep, with strongly dentate oblique margin, and with the intrathecal ridge extending obliquely upwards across the entire width of the hydrotheca. Supracalycine nematophores strong, overtopping the hydrotheca; mesial nematophore attaining nearly the level of the margin of the hydrotheca, and adnate to it for nearly its entire height; cauline nematophores forming a longitudinal series on front of the stem.

Gonosome not known.

Florida Reef, from a depth of from 2 to 3 fathoms.

This is a tall-growing species, with a loose, somewhat straggling habit.

In the absence of all knowledge of the gonosome, its reference to Aglaophenia is only provisional.

Aglaophenia rhynchocarpa.

Pl. XXIII. Figs. 5–8.

Trophosome. — Hydrocaulus attaining a height of about two inches, non-fascicled, simple, springing in dense plumose tufts from a network of tubular fibres; internodes of pinnæ divided transversely by three or four strongly marked imperfect septa. Hydrothecæ incurved in front, margin deeply dentate with the anterior tooth strong and bifid; intrathecal ridge well marked, stretching obliquely upwards across the entire width of the hydrotheca. Supracalycine nematophores slightly overtopping the margin of the hydrotheca; mesial nematophore adnate for nearly its entire length to somewhat less than the proximal half of the hydrotheca.

Gonosome. — Corbulæ closed, with the rachis continued beyond the distal end in the form of a beak; leaflets each with a strong process at its base directed outwards and towards the distal end of the corbula; nematophoral ridges not rising in prominent crests.

Key West, Triangle Shoal, 3 to 4 fathoms.

This is a very beautiful species, and presents several well-marked characters. The hydrothecæ are rendered striking by their rather prominent base giving rise to a sinus-like depression of the anterior wall, and by the bifid anterior tooth of the margin. It is, however, in the corbula that the most marked characters are to be found. The prominent beak-like distal extension of the rachis forms a striking feature, while the processes

which the leaflets of the corbula give off at their base form a series of pinnæ upon each side of the rachis, very obvious when the corbula is viewed either from above or below. These pinnæ-like processes carry nematophores along their upper side, and when viewed from below are seen to send off a somewhat triangular, flat, wing-like expansion from the lower. The beak-like extension of the rachis carries also on its upper surface nematophores which are disposed in two pairs. The peduncle of the corbula carries a single hydrotheca.

Aglaophenia lophocarpa.

Pl. XXIV. Figs. 1–4.

Trophosome. — Hydrocaulus attaining a height of between two and three inches, simple, not fascicled; pinnæ alternate, springing from a point near the distal end of each internode. Hydrothecæ deep, somewhat tumid below, margin slightly everted, with nine equal very distinct teeth; intrathecal ridge transverse. Supracalycine nematophores slightly overtopping the hydrothecæ; mesial nematophore adnate to within a very short distance of its summit, and attaining nearly half the height of the hydrothecæ; cauline nematophores two on each internode of main stem, one close to the axil of the pinna and the other near the proximal end of the internode.

Gonosome. — Corbula with about ten pairs of leaflets; leaflets broad, united into a completely closed corbula, the distal margin of each carrying numerous well-developed denticles, and projecting from the sides of the corbula in the form of a pectinated ridge which is continued as a free serrated crest beyond the roof; a spur-like denticle at the base of each leaflet; peduncle of corbula carrying a single hydrotheca.

Off Tortugas, from a depth of 68 fathoms.

The corbula of this species, with its pectinated ridges and crests, is a very beautiful object, and affords a well-marked specific character.

Aglaophenia apocarpa.

Pl. XXIV. Figs. 5–9.

Trophosome. — Hydrocaulus attaining a height of about two inches, simple, not fascicled; pinnæ alternate; internodes of pinnæ somewhat bent backwards at their proximal end so as to give rise to a slight angular bend at the point of junction of every two internodes. Hydrothecæ deep; margin with about nine deeply cut teeth, slightly everted;

intrathecal ridge transverse. Supracalycine nematophores stout, slightly overtopping the hydrotheca; mesial nematophore attaining nearly half the height of the hydrotheca, adnate for nearly its entire length; two cauline nematophores on each internode of stem, one of which is situated close to the axil of the pinna, and the other near the distal end of the internode.

Gonosome. — Corbula with about ten pairs of leaflets; leaflets quite free, narrow, with denticles nearly equally developed on each edge and with a spur-like denticle at its base; peduncle of corbula carrying a single hydrotheca.

Off Sand Key, from a depth of 100 fathoms.

In its trophosome this species comes very near to *Aglaophenia lophocarpa*. It differs from it, however, in the occurrence of a slight angular bend between every two internodes of the pinnæ, and more especially by its open corbulæ.

There can be little doubt that the open condition of the corbulæ is not here the result of an immature state of these bodies. Like a similar condition of the corbulæ of other species, it is of considerable morphological interest as a persistent state of a condition elsewhere transitory.

The nature of the denticles along the edges of the leaflets is very obvious in this species. They are plainly seen to be nematophores of the ordinary Aglaophenian type. Their cavity communicates by an aperture in the base with the interior of the leaflet, and through this aperture their contents become united with the cœnosarc of the leaflet. The cœnosarc does not uniformly fill the leaflet, but is disposed in the form of a loose, irregular network of intercommunicating channels.

Aglaophenia gracilis.

Pl. XXV. Figs. 1–4.

Trophosome. — Hydrocaulus attaining a height of about three inches, sparingly branched, not fascicled; pinnæ alternate, springing from a point near the distal end of each internode; internodes of pinnæ with two strong but short septal ridges, one on a level with the short, strong intrathecal ridge, the other on a level with the base of the supracalycine nematophore. Hydrothecæ deep, slightly widening towards the orifice, with strongly toothed margin; intrathecal ridge strong and short,

situated near the bottom of the hydrotheca. Supracalycine nematophores scarcely overtopping the hydrotheca; mesial nematophore adnate to less than half the height of the hydrotheca, and with a short, free extremity; cauline nematophores two on front of each internode of the stem, one of these close to the axil of the pinna, and the other near to the proximal end of the internode.

Gonosome not known.

Off Carysfort Reef, from a depth of 52 fathoms.

This species comes very near to *Aglaophenia rigida* in the form of its hydrothecæ. The hydrothecal internodes, however, are longer and narrower than in that species. *A. rigida*, moreover, is a much more ramified and a taller form.

Aglaophenia rigida.

Pl. XXV. Figs. 5–9.

Trophosome. — Hydrocaulus attaining a height of about nine inches, springing from a mass of tortuous filaments, non-fascicled, slender, wiry, much branched towards the distal ends of the stems; branches given off from a point on the anterior side of the stem, from which they frequently spring in pairs; pinnæ alternate, springing from a point a little below the distal end of each internode; hydrothecal internodes short, each with two short septal ridges. Hydrothecæ closely set, deep, slightly widening towards the orifice, and with strongly toothed margin. Supracalycine nematophores slightly overtopping the hydrotheca; mesial nematophore adnate to about half the height of the hydrotheca and terminating in a short, free extremity.

Gonosome. — Corbulæ completely closed, long, nearly cylindrical, with about fourteen ridges rising into slightly prominent crests; denticles of ridges cup-shaped, with the basal one in the form of a tubular divergent spur.

Off Cape Fear, from a depth of 9 fathoms.

The pinnæ appear to be easily detached in this species, for most of the specimens were nearly destitute of them, and presented little more than a cluster of long, naked, wiry stems.

The ramification is peculiar, the branches springing from the anterior side of the stem, where each is usually accompanied by a second from

the same point of origin, the twin branches then directing themselves forwards and remaining nearly parallel to one another.

The hydrothecæ are so closely set that the summit of each is on a level with the base of the next above it.

This species closely resembles the preceding, *A. gracilis*, of which it may possibly be regarded as a variety.

Aglaophenia distans.

Pl. XXVI. Figs. 1–8.

Trophosome. — Hydrocaulus attaining a height of about four inches, simple, rooted by an entangled bunch of tubular filaments, fascicled below, becoming non-fascicled above, and here divided into equal internodes, each of which carries a pinna on alternate sides; pinnæ distant, attaining the length of nearly an inch. Hydrothecæ deep, nearly cylindrical above, narrowed below; margin crenate, with a single long tooth-like process in front; intrathecal ridge not conspicuous. Supracalycine nematophores not overtopping the hydrotheca; mesial nematophore attaining about a third of the height of the hydrotheca, to which it is adnate for its entire length.

Gonosome. — Corbulæ composed of numerous pairs of ribs, which are quite free from one another, each carrying a small hydrotheca near its origin, and having numerous tooth-like nematophores along its distal edge; peduncle of corbula rather long, carrying three hydrothecæ.

Dredged off Pacific Reef, from a depth of 283 fathoms.

The present species is rendered very distinct by the long tooth-like process on the front margin of the hydrotheca, and by its remarkable open corbulæ. The form of the hydrotheca is not absolutely constant, and occasionally there may be seen on the same pinna with the ordinary form others in which the narrowing of the hydrotheca towards the base is much less marked. (Fig. 4.)

The corbulæ, which closely resemble those of *Aglaophenia bispinosa*, are in the highest degree instructive, and afford a beautiful example of morphological transformation. Like the corbulæ of other species they are metamorphosed pinnæ, but the change here undergone is of such a character as to bring out very distinctly their true morphology. The pinna (Fig.) 7, which is here to become a corbula, retains nearly its ordi-

nary form for some distance from its origin. It is, however, somewhat more attenuated, while its hydrothecæ are slightly smaller than in the ordinary pinnæ. In the specimens examined these hydrothecæ were three in number, and the first and third internode carried each a small accessory mesial nematophore (not represented in the figure) at the proximal side of the principal one. After the third internode the principal transformation of the pinna suddenly commences and continues to its distal end.

This transformation consists in the hydrothecæ ceasing to be adnate to the rachis of the pinnæ, and becoming elevated on short stalks while they become at the same time approximated and thrown alternately to the right and left, so that the pinna carries now two alternate rows of short processes, each bearing a little cup similar to that of the ordinary hydrotheca except in being somewhat smaller.

With the elevation of the hydrotheca above the level of the rachis the supracalycine and mesial nematophores are carried up with it (Fig. 8). The former (*b*) retain nearly their ordinary shape and size, but the mesial nematophore (*c*) becomes enormously developed, being not only greatly increased in length, but becoming broad, flattened, and somewhat sabre-shaped, while a row of small tubular nematophores is developed along the distal edge of each, as well as along the proximal edge of the stalks (*a*) which carry them.

It is the mesial nematophores thus singularly transformed which mainly constitute the ribs which form the sides of the corbula. Between these and the mesial nematophores of the proximal portion of the pinna, which remains nearly unaltered, there is no gradual transition, but it is interesting to note that the internodes of this part of the pinna differ from those of the ordinary pinnæ in carrying a small accessory mesial nematophore, which is repeated and multiplied on the short stalks which form the bases of the ribs in the corbula.

The joints, which are very distinct in the proximal portion of the pinna, become obsolete in the corbula.

Aglaophenia sigma.

Pl. XXVI. Figs. 9, 10.

Trophosome. — Hydrocaulus attaining a height of about six (?) inches, simple, fascicled almost to the tip; pinnæ alternate, with their origin from the front aspect of the stem. Hydrothecæ deep, nearly cylindrical,

with the margin cut into rather shallow teeth, and with the cavity divided into a distal and proximal portion by a distinct intrathecal ridge of a sigmoid form. Supracalycine nematophores not overtopping the hydrotheca; mesial nematophore adnate to the proximal fourth of the hydrotheca, becoming free only close to its point.

Gonosome not known.

Dredged off Alligator Reef, from a depth of 110 fathoms.

The remarkable sigmoid form of the intrathecal ridge constitutes a very distinctive character of this species. Another striking feature is found in the numerous well-marked septal ridges by which the internodes of the pinnæ have their cavity divided into intercommunicating chambers. It is a strong, rather rigid species, and attains a considerable size; but as the specimen had lost its hydrorhizal extremity, the entire length attained by it could not be determined with certainty.

In the absence of the gonosome its reference to the genus Aglaophenia is of course only provisional.

Aglaophenia bispinosa.

Pls. XXVII. and *XXVIII.*

Trophosome. — Stem attaining a height of eight inches, stout, simple, rising from an entangled mass of branching tubular filaments, fascicled below, and presenting from distance to distance knot-like projections; pinnæ alternate, attaining a length of nearly an inch and a half. Hydrothecæ deep, widening upwards; margin with a single, strong tooth-like process in front, and with short, blunt teeth in the rest of its extent; intrathecal ridge not conspicuous. Supracalycine nematophores stout, not overtopping the hydrotheca; mesial nematophores two in number, the distal one adnate to the hydrotheca, along which it extends for about one third of the height of the hydrotheca, the proximal one forming a short, stout spine-like process just below the distal.

Gonosome. — Corbulæ open, formed by two alternate or sub-opposite series of free, rib-like processes, each of which carries near its base a small hydrothecal cup, and along its distal margin a series of numerous tooth-like nematophores; the rachis of the corbula continued towards the common stem as a long peduncle carrying about five unchanged hydrothecæ.

Dredged off Alligator Reef, from a depth of 156 fathoms, and off Tennessee Reef, from a depth of 200 fathoms.

Aglaophenia bispinosa is a beautiful species, and is surpassed in size by very few hydroids. The proximal part of the stem is composed of a congeries of tubes (Pl. XXVII.), which at rather regular intervals become curiously contorted into knot-like projections, and which, at the extreme proximal end, become separated from one another, and here form a large entangled mass of hydrorhizal filaments. Knot-like projections of quite a similar kind occur in the European *Aglaophenia myriophylla*. Towards its distal extremity the stem loses its polysiphonic or fascicled condition and becomes monosiphonic. In the specimens examined the pinnæ were borne along somewhat less than the distal half of the stem.

The hydrothecæ are remarkable for the long, strong tooth which projects from the front of the margin; but a still more remarkable character is found in the presence of a second mesial nematophore situated on the internode, just behind the normal one and unconnected with the hydrotheca. (Pl. XXVIII.)

The corbulæ (Fig. 3) are very beautiful. They closely resemble those of *A. distans*, present the same elements in their formation, and, like these, afford a most instructive illustration of the essential morphology of the organ. The peduncle which connects them with the common stem, and which consists of the proximal portion of the pinna, which, in its terminal portion, becomes transformed into the corbula, is unusually long (Fig. 4), and consists of five scarcely altered internodes with their hydrothecæ; an additional mesial nematophore, however, is developed near the proximal end of each of these internodes.

Aglaophenia constricta.

Pl. XXIX. Figs. 1–4.

Trophosome. — Stem attaining a height of about eight inches, thick, fascicled, springing from an entangled mass of wiry filaments, and sending off numerous, irregularly disposed, simple branches, which carry alternately disposed pinnæ, three pinnæ springing from every internode. Hydrothecæ with the distal half expanded and separated from the proximal part by a deep constriction; margin with four broad teeth. Supracalycine nematophores slightly overtopping the margin of the hydrotheca; mesial nematophore nearly equalling in length the height of the hydrotheca, to which it is almost entirely adnate; cauline nema-

tophores two on the axil of each pinna, and one immediately below the pinna in front.

Gonosome not known.

Off Conch Reef, from a depth of 30 fathoms.

This is a well-marked species. The expanded summit of the hydrotheca and the deep constriction between this and the proximal portion are striking features. No gonosome was present in the specimen, and it is quite possible that if this were known we should find it necessary to remove the species from Aglaophenia.

Aglaophenia perpusilla.

Pl. XXIX. Figs. 5–7.

Trophosome. — Hydrocaulus attaining a height of about one fourth of an inch; stem simple, non-fasicled; pinnæ alternate, each springing from the anterior aspect of an internode in the axil of a strong tooth-like process, which carries on its proximal side a fixed nematophore, and just below which another strong fixed nematophore also springs from the internode. Hydrothecæ deep, slightly widening upwards; margin with about nine strong and deeply cut teeth, the anterior tooth continued into a narrow keel, which runs down the front of the hydrotheca; intrathecal ridge distinct, horizontal, situated at the junction of the lower and middle third of the hydrotheca. Supracalycine nematophores strong, overtopping the hydrotheca; mesial nematophore scarcely reaching the intrathecal ridge, adnate as far as its oblique terminal orifice.

Gonosome not known.

Dredged off the Quicksands from a depth of 34 fathoms.

Aglaophenia perpusilla is the most minute of all the hitherto described species of Aglaophenia, and is further rendered very distinct by certain special characters. The tooth-like processes given off from the anterior side of each internode of the stem have not been found in any other Aglaophenia. These processes appear bifid from the fact of their carrying in front a strong nematophore, while just below this another similar nematophore is also borne by the internode. A peculiar feature in the mesial nematophore of the hydrotheca consists in the constriction of its cavity by a process which projects transversely into it from its anterior wall.

The species occurred sparingly, growing over a seaweed. No gonosome

had been developed in the specimens obtained, which were possibly examples of young individuals; but though the entire colony might increase in size with age, it is not probable that older specimens would present any important change of form.

In the absence of a gonosome the reference of the species to Aglaophenia is provisional.*

CLADOCARPUS Allman nov. gen.

Generic Character. *Trophosome.* — Hydrosoma pinnate, plumose. Nematophores fixed; supracalycine nematophores one on each side of the orifice of the hydrotheca; mesial nematophores either adnate to the front of the hydrotheca or free.

Gonosome. — Gonangia not included in corbulæ, but borne on the sides or at the base of special protective branches (phylactogonia), which are appendages of the pinnæ.

The genus Cladocarpus was originally defined by me for the reception of a remarkable Plumularidan obtained in the eastern parts of the North Atlantic during one of the expeditions of the "Porcupine."† Its most important character is found in the possession of peculiar branching appendages, which are destined to support the gonangia, or in some other way to afford protection to them. It is convenient to have a special name for these appendages, and that of "phylactogonium" is suggested by the function which devolves upon them.

The phylactogonia differ essentially from the corbulæ, whether open or closed, of the Aglaopheniæ; for they are not, like corbulæ, metamorphosed pinnæ, but appendages superadded to the normal pinnæ.

In Kirchenpauer's subgenus Macrorynchia the gonangia are also borne on special appendages, but the pinnæ which in Cladocarpus retain their normal form, and support the phylactogonia, are here suppressed, and are represented only by short stunted processes destitute of hydrothecæ.

The macrorychial Aglaopheniæ of Kirchenpauer are further distinguished from Cladocarpus by the form of the mesial nematophores, which are very long, usually far surpassing the height of the hydrothecæ, and which, as Kirchenpauer first pointed out, are always provided with a lateral as well as a terminal orifice after they cease to be adnate to the hydrotheca.

* See Note on p. 56.

† Report on the Hydroida collected during the Expeditions of H. M. S Porcupine, Trans. Zool. Soc. Lond., Vol. VIII. Part VIII.

To the genus Cladocarpus I must also refer a Plumularidan dredged by Oscar Sars in the North Atlantic, and described by him under the name of *Aglaophenia bicuspis*.*

In the *Cladocarpus paradisea* of the present Report the gonangia are borne exclusively on the sides of the phylactogonia; while in *C. dolichotheca* and in *C. ventricosus* they are borne only on the main stem, the phylactogonia arching over them so as to afford them protection in the manner of the leaflets of a corbula. In *C. formosa* of the Porcupine Report, the gonangia are borne both by the phylactogonia and by the main stem.

Cladocarpus dolichotheca.

Pl. XXX.

Trophosome. — Stem attaining a height of about an inch and a half, carrying alternate pinnæ for a short distance from its distal end, and with three four or very oblique internodes just below the pinnate portion. Hydrothecæ widely separated from each other, deep, tubular, with the margin carrying a single long tooth in front, crenate in the rest of its extent; each hydrotheca overarched by the portion of the pinna which intervenes between it and the next above it; intrathecal ridge obsolete. Supracalycine nematophores tubular, overtopping the hydrotheca; mesial nematophore not adnate to the hydrotheca, but springing from a point just below its base, where it forms a free tubular spine-like process with a long oblique slit-like orifice.

Gonosome. — Gonangia ovate, with a latero-terminal orifice, borne on the front of the stem, each one singly, close to the axil of one of the distal five or six pinnæ, which become here more or less diminished in length, and carry each near its origin a dichotomously divided branch (phylactogonium) which forms three bifurcations, and arches over the front of the stem, and the gonangium there situated.

Dredged off Pacific Reef from a depth of 283 fathoms.

This is a remarkable and beautiful species. It is rendered very striking by its deep and widely separated hydrothecæ, each overarched by that portion of the rachis which intervenes between it and the next above it; the freedom of the mesial nematophore from the hydrotheca is also a well-

* G. Oscar Sars, Bidrag til Kundskaben om Norges Hydroider. Forhandlinger i Videnskabs-Selskabet i Christiania, 1873, p. 98, Tab. II., figs. 7 - 10.

marked character. The parts of the rachis to which the backs of the hydrothecæ are applied are divided, by imperfect septa (septal ridges), into numerous very distinct chambers, while a few similar ridges also project into the cavity of the intervening portion.

Where the stem ceases to give off pinnæ, it becomes divided into three or four internodes by very oblique joints, so as to assume, for some way down, the appearance of being twisted, and then continues towards the hydrorhiza as a simple continuous tube (Fig. 5). Along nearly the whole of its course from the termination of the pinnate portion to the base, the stem carries a longitudinal series of tubular nematophores, which are situated at short and equal intervals from one another, and give to this part of the hydrosoma a close resemblance to certain forms of graptolites.*

The phylactogonia, or protective appendages of the reproductive capsules, resemble in form the antlers of a stag. Their branches are set with large tubular nematophores. They arch over the front of the stem, their branches crossing one another from opposite sides, and forming a cage-like roof over the gonangia. They occur only on some of the pinnæ, which are situated close to the distal end of the stem, one springing from each pinna close to its origin. Though the pinnæ which carry them retain their normal form, they are all more or less shortened, most of them supporting only a single hydrotheca.

It is difficult to form any well-founded opinion as to the exact homology of these appendages. The nature of the changes which have resulted in the formation of a corbula in certain species of Aglaophenia might lead us to suspect that in *Cladocarpus dolichotheca* the phylactogonium represents the mesial nematophore of the proximal hydrotheca of its supporting pinna. The fact, however, that this nematophore is at the same time present in its normal state renders such an explanation untenable. The phylactogonium probably represents, in a greatly modified condition, the mesial nematophore of a hydrotheca, which had itself been totally suppressed.

The sex of the gonophores could not be determined in the specimen.

* I have elsewhere (Gymnoblastic Hydroids, p. 176) endeavored to show the probability that the denticles of graptolites represent the nematophores of the Plumularidæ, the hydrothecæ being entirely suppressed; and I have attempted to support this view on both anatomical and embryological grounds. As the nematophores of the Plumularidæ are filled with sarcode capable of a rich development of pseudopodia, the graptolites would by this comparison be brought into close relation with the Rhizopoda. They would thus represent an ancestral form in which the affinities looked on one side to the Hydroida, and on the other to the Rhizopoda. No hydranths were developed in them, for the hydroid characters had not yet gained that ascendency over the rhizopodal which we see in the existing Plumularidæ, which, according to this hypothesis, have inherited their nematophores from the extinct graptolites.

Cladocarpus ventricosus.

Pl. XXXI.

Trophosome. — Stem attaining a height of about an inch and a half, not fascicled, simple; pinnæ alternate, each springing from a rather long, lateral process of the stem, somewhat waved. Hydrothecæ distant; front wall with a depression just below the margin, then greatly inflated; margin with a long, strong tooth in front, and with shallow crenations in the rest of its extent; intrathecal ridge strong, transverse, springing from a projection of the posterior wall of the hydrotheca near its fundus, and reaching a point about midway between this and the anterior wall. Supracalycine nematophores scarcely overtopping the hydrotheca; mesial nematophore quite detached from the hydrotheca.

Gonosome. — Phylactogonia springing from the proximal internodes of a certain number of the pinnæ, which are situated near the distal end of the stem, twice bifurcating; gonangia springing from the stem in groups, each group close to the axil of a pinna, obovate, with the summit curved over the termino-lateral orifice.

Dredged off Sand Key from a depth of 100 fathoms.

This is a well-marked form; its singular ventricose hydrothecæ, and the complete removal of the mesial nematophore from the hydrotheca, at once distinguish it. In *Cladocarpus dolichotheca* the mesial nematophore, while equally free from the hydrotheca, originates close to its base, but in the present species its point of origin is removed much farther back, and the entire nematophore is adherent to the front of the internode. The septal ridges of the hydrothecal internodes are very distinct.

Where the stem towards its proximal end ceases to carry pinnæ, it is provided with two or three very oblique joints, each of which carries a fixed nematophore, and similar nematophores are continued down the stem in a longitudinal series, at short and equal intervals (Fig. 5); here, again, as in *Cladocarpus dolichotheca*, strongly suggesting the disposition of the denticles in one of the single-sided graptolites. Near the base of the stem the nematophores may become biserial and opposite. Cauline nematophores are also situated, one on the axil of each pinna and one on the stem in the intervals between the pinnæ. The sex of the gonangia could not be determined. The phylactogonium has a single bifurcation close to its origin, and one of its branches again bifurcates.

There are thus two bifurcations in this species, while in *Cladocarpus dolichotheca* there are three. This difference appears constant.

The branches of the phylactogonia are all provided with well-developed tubular nematophores, which are arranged along each branch in a single longitudinal series.

Cladocarpus paradisea.

Pls. XXXII. and *XXXIII.*

Trophosome. — Stem attaining a height of fourteen inches, irregularly branched, fascicled, and thick below, gradually losing its fascicled condition, and becoming monosiphonic towards the distal ends of the main stem and branches; pinnæ alternate, rather distant, attaining a length of about one inch and a quarter. Hydrothecæ large, deep, widening upwards; margin with two strong teeth in front; rest of the margin destitute of teeth; intrathecal ridge faintly marked, forming a waved line which stretches across the middle of the hydrotheca. Supracalycine nematophores bracket-shaped, not overtopping the margin of the hydrotheca; mesial nematophore attaining about one third the height of the hydrotheca, to which it is aduate to within a short distance of its extremity.

Gonosome. — Gonangia-bearing appendages (phylactogonia) in the form of pinnately branched offshoots, which spring each from a pinna of the trophosome close to its origin, and is set with cup-shaped nematophores along its stem and branches; branches of phylactogonia alternate; female phylactogonium larger than male, and carrying a single gonangium in front of the axil of each of its branches; male with a cluster of gonangia at the base of each branch; female gonangia obovate, with a latero-terminal transversely elongated orifice over which the summit of the gonangium bends in the manner of a hood; male gonangia smaller than female, obovate, with a sub-terminal orifice not arched over by the summit.

Dredged off Tennessee Reef, from a depth of 174 fathoms, and off Samboes, from 123 fathoms.

Cladocarpus paradisea is a magnificent species. I take for granted that the difference presented by the gonosomes in the specimens examined is a sexual one, for there is no difference in the trophosomes; but though I believe I am right in regarding the larger gonosome (Pl. XXXIII. Fig. 3.) as the female, I could not from the specimens determine this point with certainty.

The two strong teeth on the front margin of the hydrotheca are so situated, that with the slightly everted intervening portion of the margin they give to this part the appearance of the lip of a jug, and constitute a striking character. The pinnæ arise somewhat from the anterior aspect of the stem, and their internodes exhibit four well-marked septal ridges.

There are usually three or four male gonangia (Fig. 5) in a cluster, and of these one is always placed in front of the axil between the stem of the phylactogonium and its branch; towards the distal end of the phylactogonium the clusters are often reduced to a single gonangium.

The branches of the female phylactogonium carry two longitudinal series of large cup-shaped nematophores. (Figs. 3, 6.) These are situated exactly opposite to one another, one on the front, the other on the back of the branch, each series extending from the base to the apex of the branch, and formed by about three equally distant nematophores. Along the stem of the phylactogonium two series of similarly shaped nematophores also occur. These are confined to the front of the stem, and are disposed alternately. There is farther on the back of the phylactogonium in each axil a somewhat bracket-shaped nematophore. (Fig. 4.)

In the male (Fig. 5) the phylactogonia as well as the gonangia are much smaller than in the female. Both stem and branches carry cup-shaped nematophores as in the female, but in the male these are all confined to the front. A bracket-shaped nematophore is carried on the back of the phylactogonium over the axil of each branch, as in the female.

Genus HALICORNARIA Busk (modified).*

Halicornaria speciosa.

Pl. XXXIV.

Trophosome. — Stem strong, attaining a height of about five inches, simple, monosiphonic pinnate almost to the base; internodes of stem each giving off two pinnæ, which are opposite, or nearly so, towards the base of the stem, but more alternately disposed towards the distal end, where the internodes become longer and more oblique. Hydrothecæ wide;

* The genus Halicornaria founded by Busk, who used it in a wider sense, is here intended to include only those Plumularidæ which, with a trophosome formed on the general type of Aglaophenia, have gonangia which are never included in corbulæ or protected by phylactogonia.

margin with wide, rather shallow crenation; intrathecal ridge springing from the anterior side of the hydrotheca about midway between the margin and base, and extending transversely to about the middle of its lateral walls. Supracalycine nematophores stout, overtopping the margin of the hydrotheca; mesial nematophore reaching the margin of the hydrotheca, and adnate to it in nearly its entire length.

Gonosome. — Gonangia cylindrical, with a broad, truncated summit, contracted below into a short, stout latero-basal peduncle, which springs from the front of the stem close to the origin of a pinna.

Double-Headed Shot Key, from a depth of from 4 to 5 fathoms.

Halicornaria speciosa is a strong, handsome species. The pinnæ are absolutely lateral, showing no disposition to arise from the anterior aspect of the stem. The stem is unusually thick for a monosiphonic or non-fascicled form, and each of its internodes carries four nematophores, one just above and one just below the point of origin of the pinna at each side.

The gonangia in the specimen are small in proportion to the size of the trophosome, and are possibly immature.

ADDENDA.

See Text, Page 32.

Plumularia geminata.

Between the present species and the *Plumularia catharina* Johnston there is a close relation. The form of the hydrotheca, of the gonangia with their basal nematophores, and of the internodes in the ultimate ramuli, is very similar in the two species, while between the same parts in *Plumularia catharina* and *Monostæchas dichotoma* (see p. 37) a corresponding identity of form will be found.

Foot-note to Page 49.

I am indebted to Miss Gatty for an opportunity of examining a second species of the same remarkable form, which may well constitute a subgenus of Aglaophenia. From *Aglaophenia perpusilla* this differs chiefly in the width of the keel which runs down the front of the hydrotheca, and in the presence of a shallow constriction between that portion of the hydrotheca which lies at the proximal side of the strong intrathecal ridge and that which lies at the distal side. A decided bithalamic character is thus given to the hydrotheca. The specimens scarcely surpass *A. perpusilla* in size. They are from the Gulf of Mexico, are attached to Gulf Weed, and are destitute of gonosome. I have assigned to the species the name of *A. late-carinata*.

DESCRIPTION OF THE PLATES.

PLATE I.

Figs. 1, 2. **Eudendrium eximium.**

Fig. 1. Natural size.
Fig. 2. Portion of a colony with female gonophores, magnified.

Figs. 3, 4. **Eudendrium exiguum.**

Fig. 3. Natural size.
Fig. 4. Portion, magnified.

PLATE II.

Figs. 1 – 2ª. **Eudendrium fruticosum.**

Fig. 1. Natural size. A cluster of capsular bodies; probably a molluscan or annelidan nidus has become attached to the stem and branches.
Fig. 2. A portion with hydranths and male gonophores, magnified.
Fig. 2ª. A ramulus with hydranth and female gonophores, magnified.

Figs. 3, 4. **Eudendrium attenuatum.**

Fig. 3. Natural size.
Fig. 4. A portion, magnified.

PLATE III.

Figs. 1 – 4. **Eudendrium laxum.**

Fig. 1. Natural size.
Fig. 2. A portion with hydranths and male gonophores, magnified.
Fig. 3. A portion of the hydrorhiza magnified, showing the clear spherical bodies in the cœnosarc.
Fig. 4. A portion of the stem with similar bodies, still further magnified.

PLATE IV.

Figs. 1, 2. **Eudendrium gracile.**

Fig. 1. Natural size.
Fig. 2. A portion with hydranths, magnified.

Figs, 3, 4. **Eudendrium tenellum.**

Fig. 3. Natural size.
Fig. 4. A portion, magnified.

PLATE V.

Figs. 1, 2. **Eudendrium cochleatum.**

Fig. 1. Natural size. The tubes of a little tubicolous crustacean are seen attached to some of the branches.
Fig. 2. A portion with hydranths, magnified.

Figs. 3, 4. **Bimeria humilis.**

Fig. 3. A colony growing over the surface of a seaweed, natural size.
Fig. 4. A portion magnified, with hydranths and male (?) gonophores.

PLATE VI.

Figs 1, 2. **Obelia marginata.**

Fig. 1. Natural size. Drawn from a small specimen.
Fig. 2. A branch, magnified. Creeping over it is a colony of *Lafoëa venusta*.

Figs. 3, 4. **Lafoëa venusta.**

Fig. 3. Natural size. It is seen ereeping over a branch of *Obelia marginata*.
Fig. 4. A portion, magnified, creeping over *Obelia marginata*.

Fig 5, 6. **Thyroscyphus ramosus.**

Fig. 5. Natural size.
Fig. 6. A portion of a braneh, magnified.

PLATE VII.

Figs. 1 – 3. **Oplorhiza parvula.**

Fig. 1. Natural size.
Fig. 2. Portion of a eolony, magnified.
(*a*, *a*) Hydrorhizal appendages.
Fig. 3. One of the hydrorhizal appendages, still further magnified.

Figs. 4, 5. **Obelia longicyatha.**

Fig. 4. Natural size.
Fig. 5. Portion of a eolony, magnified.

PLATE VIII.

Figs. 1, 2. **Campanularia macroscypha.**

Fig. 1. Natural size.
Fig. 2. Portion of a colony, magnified.

Figs. 3, 4. **Lafoëa tenellula.**

Fig. 3. Natural size.
Fig. 4. Portion of a colony, magnified.

Figs. 5, 6. **Cuspidella pedunculata.**

Fig. 5. Natural size.
Fig. 6. Portion of a colony, magnified.

PLATE IX.

Figs. 1, 2. **Lafoëa convallaria.**

Fig. 1. Entire eolony, natural size.
Fig. 2. Distal portion of a colony, magnified.

PLATE X.

Figs. 1, 2. **Lafoëa coalescens.**

Fig. 1. Entire colony, natural size.
Fig. 2. The same, magnified.

PLATE XI.

Figs. 1 – 4. **Halecium filicula.**

Fig. 1. Natural size.
Fig. 2. Portion of a pinna with hydranth, magnified.
Fig. 3. Portion of main stem near its distal extremity, earrying hydrophores and a pinna; magnified.
Fig. 4. Distal extremity of a hydrophore with double margin, still further magnified.

Figs. 5, 6. **Halecium capillare.**

Fig. 5. Natural size.
Fig. 6. Portion of a branch, magnified.

PLATE XII.

Figs. 1 – 5. **Halecium macrocephalum.**

Fig. 1. Entire colony, natural size.
Fig. 2. Portion of a branch with hydrophores and hydranths, magnified.
Fig. 3. Portion with two hydrophores, still further enlarged.
Fig. 4. An internode carrying a male gonangium.
Fig. 5. An internode with a female gonangium.

Figs. 6 – 10. **Cryptolaria conferta.**

Fig. 6. An entire colony, natural size.
(*a*) One of the clusters of flask-shaped bodies associated with it.
Fig. 7. A portion taken from a point near the proximal end where the stem is still fascicled; magnified.
Fig. 8. A portion taken from a point near the distal end where the stem is monosiphonic; magnified.
Fig. 9. A portion of one of the associated clusters of flask-shaped bodies as seen in section, parallel to the axis of the cryptolaria stem; magnified.
(*a*, *a*) Acrocysts (?) into which the contents of the capsule have escaped.
Fig. 10. A portion of the same as seen in section transverse to the axis of the stem.
(*a*) Flask-shaped capsules with their contents still included.
(*b*, *b*) The basal tubes seen in tranverse section and surrounding the larger and thicker-walled tubes (*c*, *c*) which form the fascicled stem of the cryptolaria, and are here also seen in transverse section.

PLATE XIII.

Figs. 1 – 3. **Cryptolaria abies.**

Fig. 1. Natural size.
Fig. 2. Portion of a branch taken from a point near its distal end, where it has lost its fascicled condition; magnified.
Fig. 3. Portion of stem with the proximal parts of two branches showing the fascicled condition of the hydrocaulus; magnified.

4, 5. **Cryptolaria longitheca.**

Fig. 4. Natural size.
Fig. 5. Portion of a colony, magnified.

PLATE XIV.

Figs. 1, 2. **Cryptolaria elegans.**

Fig. 1. Entire colony, natural size.
Fig. 2. Portion taken from the distal extremity of the colony, magnified.

Figs. 3 – 6. **Desmoscyphus longitheca.**

Fig. 3. Several stems attached to some foreign body, natural size.
Fig. 4. Front aspect of a portion of a colony from a point near the basal end of the stem; magnified. The lowest hydrothecæ have begun to recede from one another.
Fig. 5. Portion of stem viewed laterally, magnified.
Fig. 6. Proximal extremity of stem, magnified. The hydrothecæ of each pair have receded from one another, and now occupy opposite sides of the stem.

PLATE XV.

Figs. 1, 2. **Thuiaria pinnata.**

Fig. 1. Entire colony, natural size.
Fig. 2. Portion of a pinna with hydranths, magnified.

3 – 5. **Sertularella Gayi** var. **robusta.**

Fig. 3. Natural size.
Fig. 4. Portion of a branch with hydrothecæ and gonangium, magnified. In the uppermost hydrotheca

contractile (?) bands are seen passing from the inner side of the hydrothecal valves to the body of the hydranth.

Fig. 5. Portion of branch with front view of the hydrothecæ; magnified.

Figs. 6, 7. **Sertularella conica.**

Fig. 6. Natural size.

Fig. 7. Portion magnified.

Figs. 8–10. **Sertularella amphorifera.**

Fig. 8. Natural size.

Fig. 9. Portion of a colony with gonangium; magnified.

Fig. 10. Hydrotheca still further enlarged.

PLATE XVI.

Figs. 1, 2. **Sertularia marginata.**

Fig. 1. Natural size.

Fig. 2. Distal end of colony, magnified.

Figs. 3, 4. **Sertularia tumida.**

Fig. 3. Natural size.

Fig. 4. A portion, magnified. In one of the hydrothecæ the hydranth and two opercular bands are still visible.

Figs. 5, 6. **Sertularia tubitheca.**

Fig. 5. Entire colony, natural size.

Fig. 6. A portion, magnified.

Figs. 7, 8. **Sertularia exigua.**

Fig. 7. Colony growing on a seaweed; natural size.

Fig. 8. A portion, magnified.

Figs. 9, 10. **Sertularia distans.**

Fig. 9. Natural size.

Fig. 10. A portion, magnified.

Figs. 11, 12. **Thuiaria sertularioides.**

Fig. 11. Natural size.

Fig. 12. A portion, magnified.

PLATE XVII.

Figs. 1, 2. **Thuiaria distans.**

Fig. 1. Entire colony, natural size.

Fig. 2. A portion, magnified.

Figs. 3–6. **Thuiaria plumulifera.**

Fig. 3. Entire colony, natural size.

Fig. 4. Portion of a branch with pinnæ, magnified.

Fig. 5. Hydrotheca more enlarged, lateral view.

Fig. 6. Same, front view.

PLATE XVIII.

Figs. 1, 2. **Plumularia filicula.**

Fig. 1. Natural size.

Fig. 2. A portion with gonangia, magnified.

Figs. 3, 4. **Plumularia macrotheca.**

Fig. 3. Entire colony, natural size.

Fig. 4. A portion of a pinna, magnified.

Figs. 5, 6. **Plumularia attenuata.**

Fig. 5. Natural size.

Fig. 6. Portion of stem with pinna, magnified.

PLATE XIX.

Figs. 1, 2. **Plumularia megalocephala.**

Fig. 1. Natural size.
Fig. 2. A portion of a branch with pinnæ, magnified.

Figs. 3 – 7. **Halopteris carinata.**

Fig. 3. Entire colony, natural size.
Fig. 4. Portion of stem with pinnæ, magnified.
Fig. 5. Portion of a pinna, still further magnified; lateral view.
Fig. 6. Same, front view.
Fig. 7. Same, back view.

PLATE XX.

Figs. 1 – 4. **Plumularia geminata.**

Fig. 1. Natural size.
Fig. 2. A portion, magnified.
Fig. 3. A portion, still further magnified; front and back view of pinnæ.
Fig. 4. Lateral view of pinna.

PLATE XXI.

Figs. 1, 2. **Antennularia simplex.**

Fig. 1. Natural size.
Fig. 2. A portion, magnified.

Figs. 3 – 6. **Antennopsis hippuris.**

Fig. 3. Natural size.
Fig. 4. A portion, magnified; with male (?) gonangia.
Fig. 5. Portion of a pinna, still further magnified.
Fig. 6. Portion of a colony with female (?) gonangia.

Figs. 7, 8. **Hippurella annulata.**

Fig. 7. Entire colony, natural size.
Fig. 8. Portion of a branch with pinnæ, magnified.

PLATE XXII.

Figs. 1 – 5. **Monostæchas dichotoma.**

Fig. 1. Entire colony, natural size.
Fig. 2. A portion, magnified.
Fig. 3. Portion of a pinna, still further magnified; front view.
Fig. 4. Same, lateral view.
Fig. 5. Young gonangium.

Figs. 6, 7. **Antennella gracilis.**

Fig. 6. Entire colony, natural size.
Fig. 7. One of the pinna-like stems, magnified.

PLATE XXIII.

Figs. 1 – 4. **Aglaophenia ramosa.**

Fig. 1. Natural size.
Fig. 2. Portion of a branch with pinnæ, magnified.
Fig. 3. Hydrotheca, still further magnified; front view.
Fig. 4. Same, lateral view.

Figs. 5 – 8. **Aglaophenia rhynchocarpa.**

Fig. 5. An entire colony, natural size.
Fig. 6. Portion of a pinna, magnified; lateral view.
Fig. 7. Hydrotheca of same; front view.
Fig. 8. Corbula, magnified.

PLATE XXIV.

Figs. 1–4. **Aglaophenia lophocarpa.**

Fig. 1. Natural size.
Fig. 2. Portion of pinna, magnified; lateral view.
Fig. 3. Portion of stem with pinnæ, magnified; front view.
Fig. 4. Corbula, magnified.

Figs. 5–9. **Aglaophenia apocarpa.**

Fig. 5. Natural size.
Fig. 6. Portion of a pinna, magnified; lateral view.
Fig. 7. Portion of stem with pinnæ, magnified; front view.
Fig. 8. Corbula, magnified.
Fig. 9. Part of a leaflet of a corbula showing the lateral nematophores; still further magnified.

PLATE XXV.

Figs. 1–4. **Aglaophenia gracilis.**

Fig. 1. Natural size.
Fig. 2. Portion of a pinna, magnified; lateral view.
Fig. 3. Same, front view.
Fig. 4. Portion of stem with pinna, magnified; oblique view of pinna.

Figs. 5–9. **Aglaophenia rigida.**

Fig. 5. Entire colony, natural size.
Fig. 6. Portion of pinna, magnified; lateral view.
Fig. 7. Same, front view.
Fig. 8. Corbula, magnified.
Fig. 9. Part of one of the ridges of the corbula, still further magnified.

PLATE XXVI.

Figs. 1–8. **Aglaophenia distans.**

Fig. 1. Entire colony, natural size.
Fig. 2. A portion, magnified.
Fig. 3. Portion of the hydrotheca, still further enlarged to show the anterior tooth-like process.
Fig. 4. A hydrotheca differing somewhat in form from the normal hydrothecæ, but associated with these in the same colony; magnified.
Fig. 5. Orifice of hydrotheca viewed from above.
Fig. 6. Portion of a pinna with two hydrothecæ viewed in front; magnified.
Fig. 7. Corbula, magnified.
Fig. 8. One of the leaflets of a corbula, still further magnified.
(*a*) Pedunele of leaflet.
(*b*) Supracalycine nematophores but slightly altered.
(*c*) Mesial nematophore greatly enlarged and altered in form. The slightly altered hydrotheca is seen included between the supraealycine and mesial nematophores.

Figs. 9, 10. **Aglaophenia sigma.**

Fig. 9. Natural size.
Fig. 10. Portion of a pinna, magnified.

PLATE XXVII.

Figs. 1–3. **Aglaophenia bispinosa.**

Fig. 1. An entire colony, natural size; front view.
Fig. 2. The same, lateral view.
Fig. 3. Distal portion of the stem, magnified.

PLATE XXVIII.

Figs. 1 – 5. **Aglaophenia bispinosa.**

Fig. 1. Portion of stem and pinna, magnified; front view.
Fig. 2. Portion of pinna, magnified; lateral view.
Fig. 3. Corbula, magnified; viewed from above.
Fig. 4. Peduncle of corbula, more magnified.
(*a*, *a*) Internodes of peduncle showing the three mesial nematophores borne by each internode.
Fig. 5. Base of proximal rib of corbula, still further magnified.
(*a*) Supracalycine nematophores slightly altered.
(*b*) Base of mesial nematophore which has become transformed into a rib of the corbula. Between *a* and *b* is seen the slightly altered hydrotheca with a hydranth still visible in it.

PLATE XXIX.

Figs. 1 – 4. **Aglaophenia constricta.**

Fig. 1. A specimen, natural size, with some sponges growing over its stem.
Fig. 2. Portion of stem with the proximal ends of the pinnæ; magnified.
Fig. 3. Portion of a pinna, still further magnified; viewed laterally.
Fig. 4. Same, viewed in front.

Figs. 5 – 7. **Aglaophenia perpusilla.**

Fig. 5. Entire colony, natural size.
Fig. 6. Portion of a pinna, viewed laterally; magnified.
Fig. 7. Portion of stem with the proximal ends of two pinnæ, magnified.

PLATE XXX.

Figs. 1 – 5. **Cladocarpus dolichotheca.**

Fig. 1. Entire colony, natural size.
Fig. 2. Distal end of a colony, magnified.
(*a*, *a*) Phylactogonia.
Fig. 3. Portion of a pinna with hydrotheca, magnified; viewed laterally.
Fig. 4. Same, front view.
Fig. 5. Portion of stem near proximal end, showing nematophores disposed like the denticles of a graptolite.

PLATE XXXI.

Figs. 1 – 7. **Cladocarpus ventricosus.**

Fig. 1. A colony, natural size.
Fig. 2. Distal end of a colony, magnified.
(*a*, *a*) Phylactogonia.
Fig. 3. Portion of a pinna, still further magnified; viewed laterally.
Fig. 4. Same, front view.
Fig. 5. Portion of stem near the proximal end, with a longitudinal series of nematophores; magnified.
Fig. 6. Gonangium, magnified; lateral view.
Fig. 7. Same, front view.

PLATE XXXII.

Cladocarpus paradisea; an entire colony, natural size.

PLATE XXXIII.

Figs. 1 – 6. **Cladocarpus paradisea.**

Fig. 1. Portion of a pinna, magnified; lateral view.
Fig. 2. Portion of stem with proximal end of pinna, not so highly magnified; front view.

Fig. 3. Proximal end of a pinna carrying a phylactogonium; magnified.
(*a*) Pinna.
(*b*) Phylactogonium with gonangia; female (?); front view.

Fig. 4. Portion of a phylactogonium from a point near its distal end, carrying a single young gonangium; female (?); back view.

Fig. 5. Portion of a pinna with a phylactogonium, magnified.
(*a*) Pinna.
(*b*) Phylactogonium with gonangia; male (?).

Fig. 6. Portion of one of the branches of a phylactogonium with two of its nematophores; still further magnified.

PLATE XXXIV.

Figs. 1 – 5. **Halicornaria speciosa.**

Fig. 1. Natural size.

Fig. 2. A portion taken from a point towards the proximal end; magnified.

Fig. 3. Same, from a point near the distal end.

Fig. 4. Portion of a pinna, still further magnified; front view.

Fig. 5. Same, lateral view.

ALPHABETICAL INDEX.

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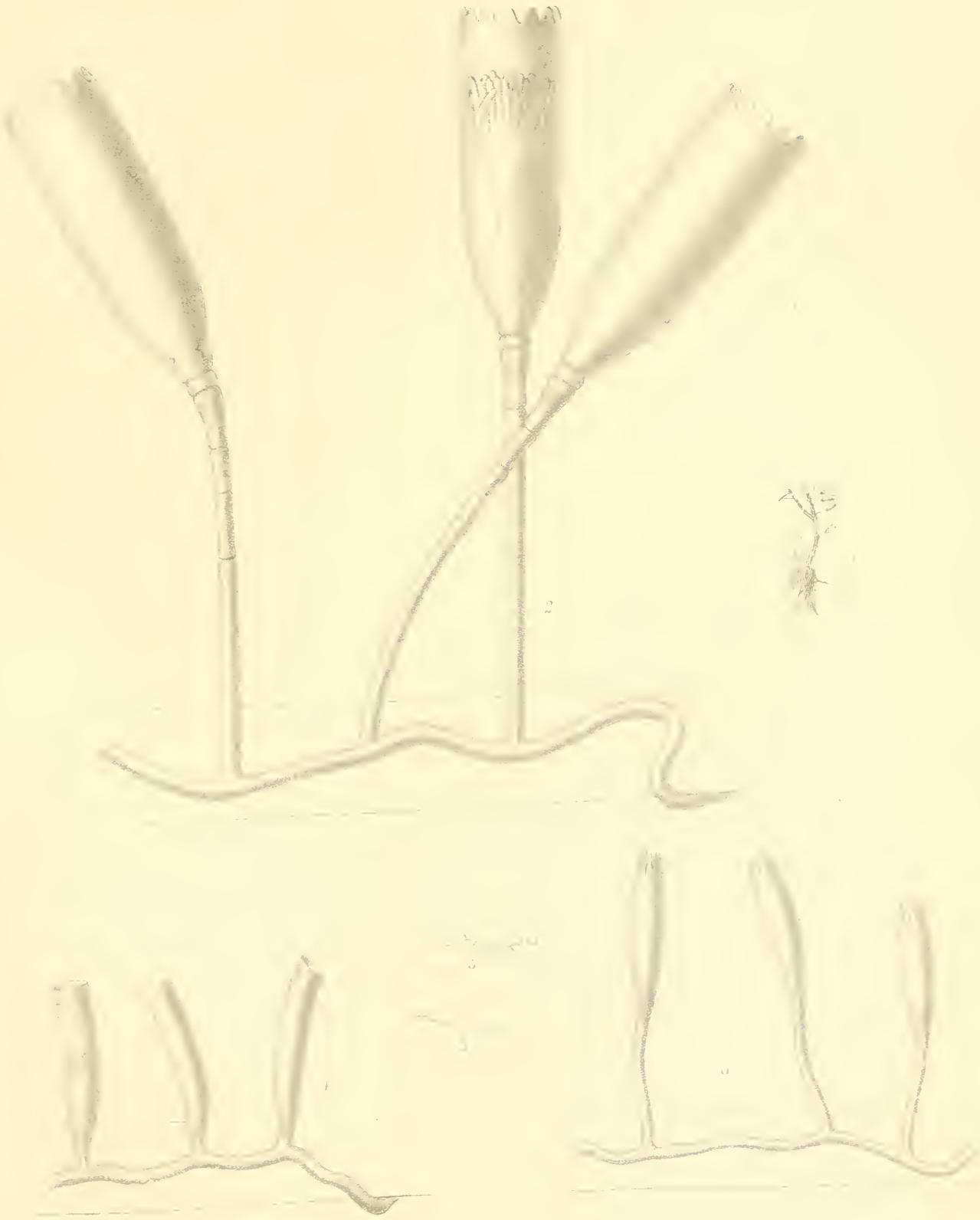

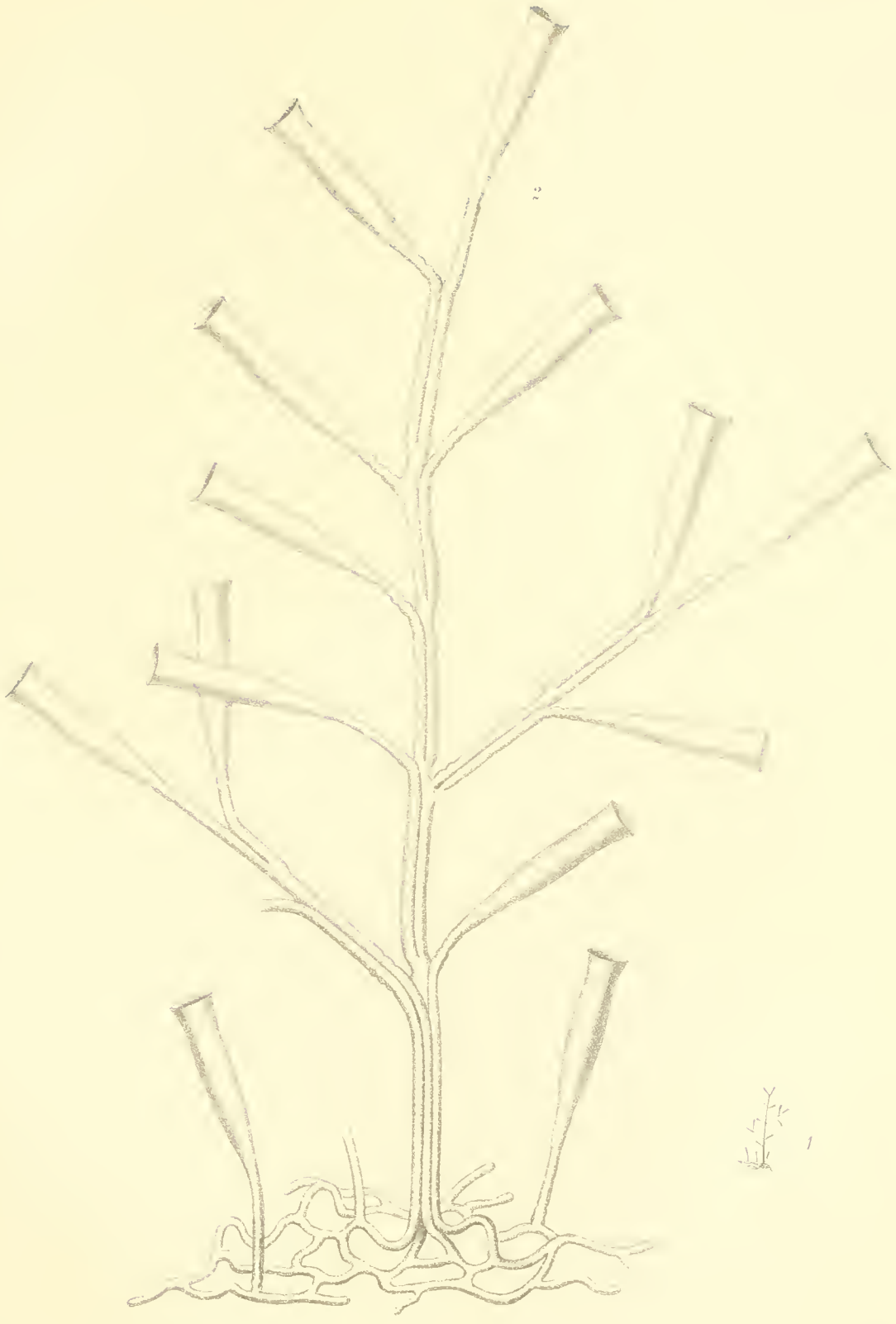

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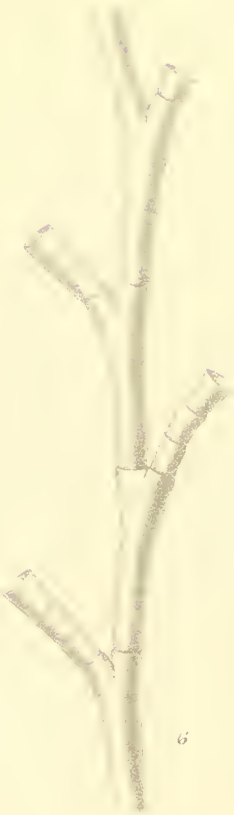

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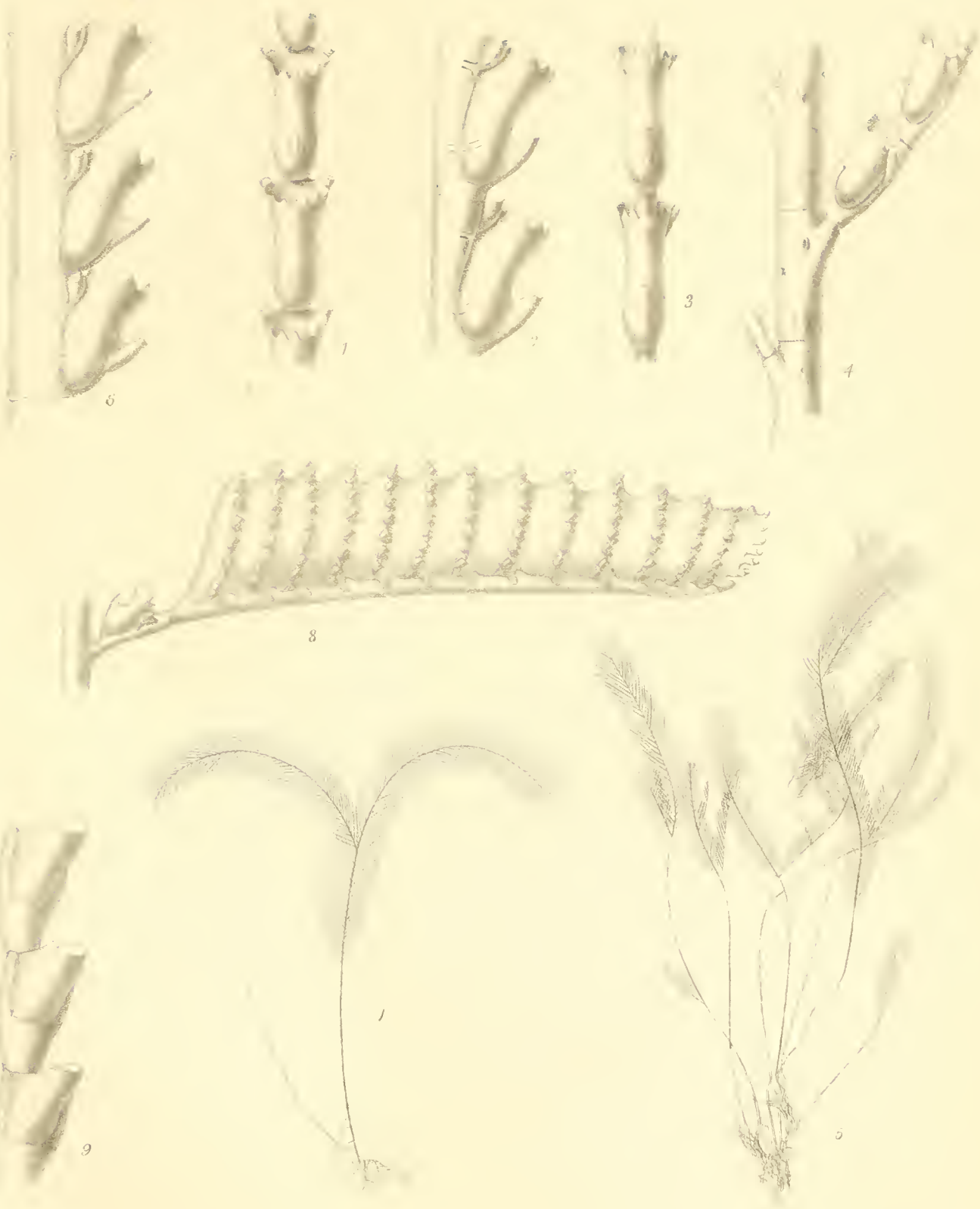

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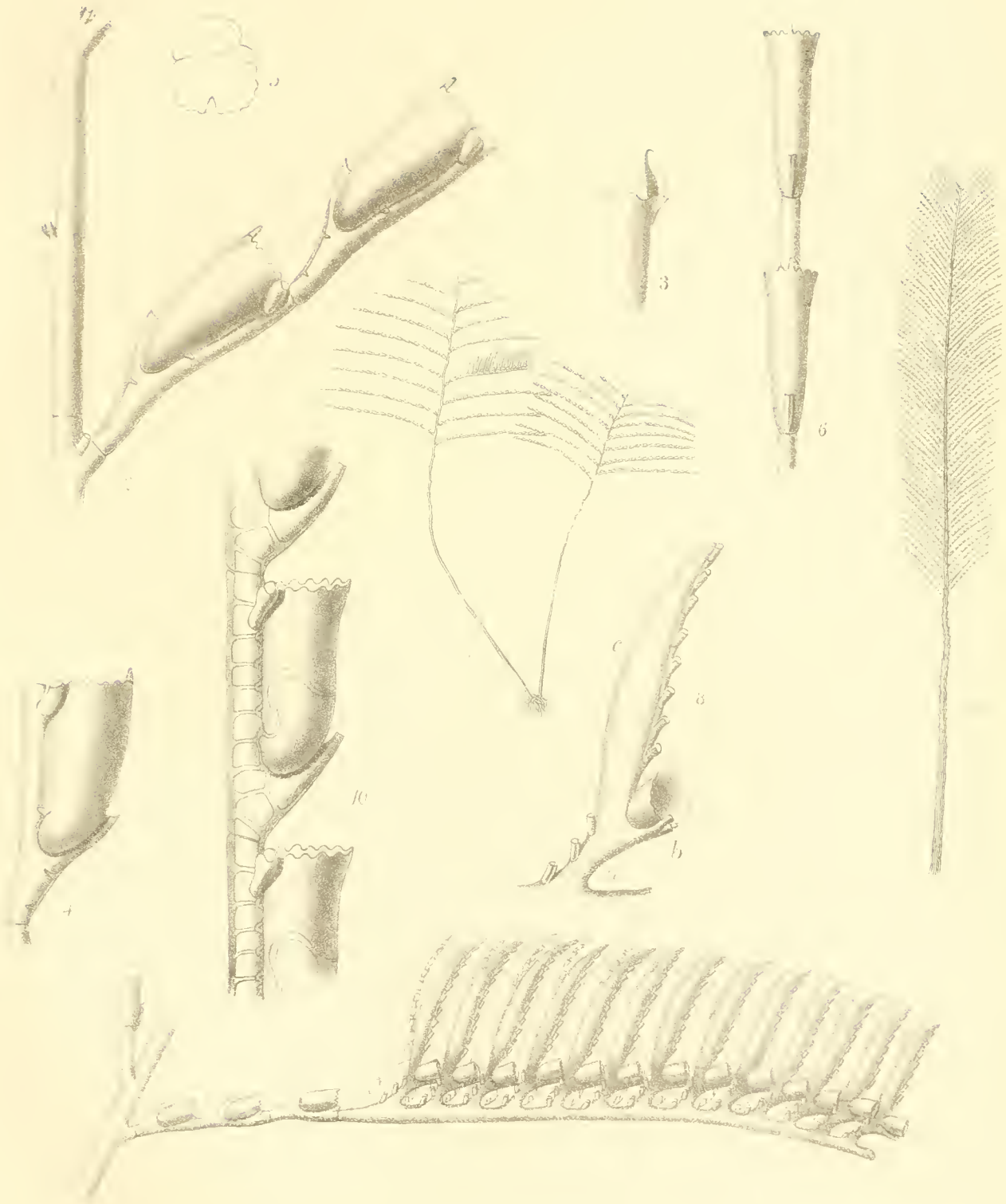
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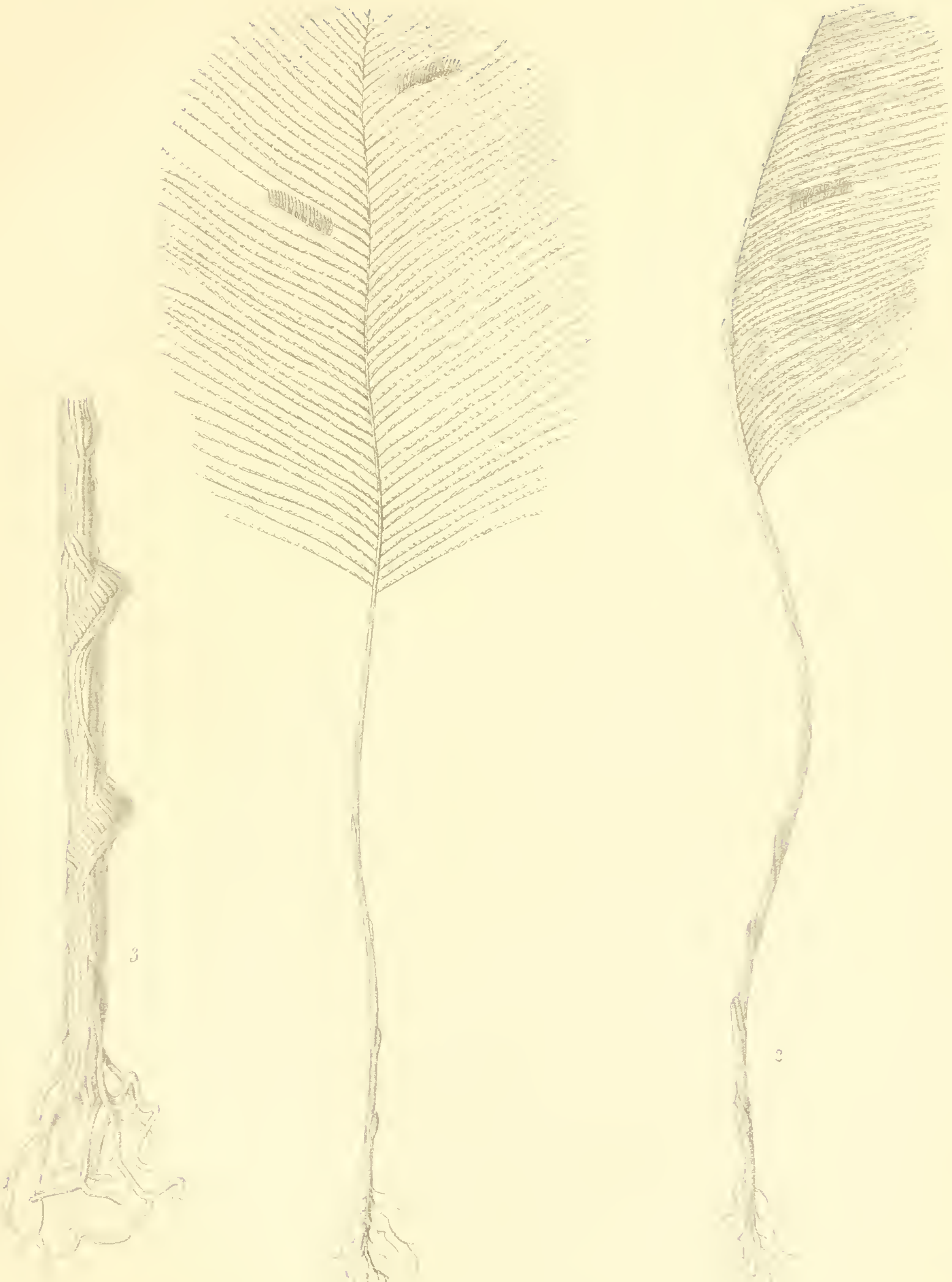
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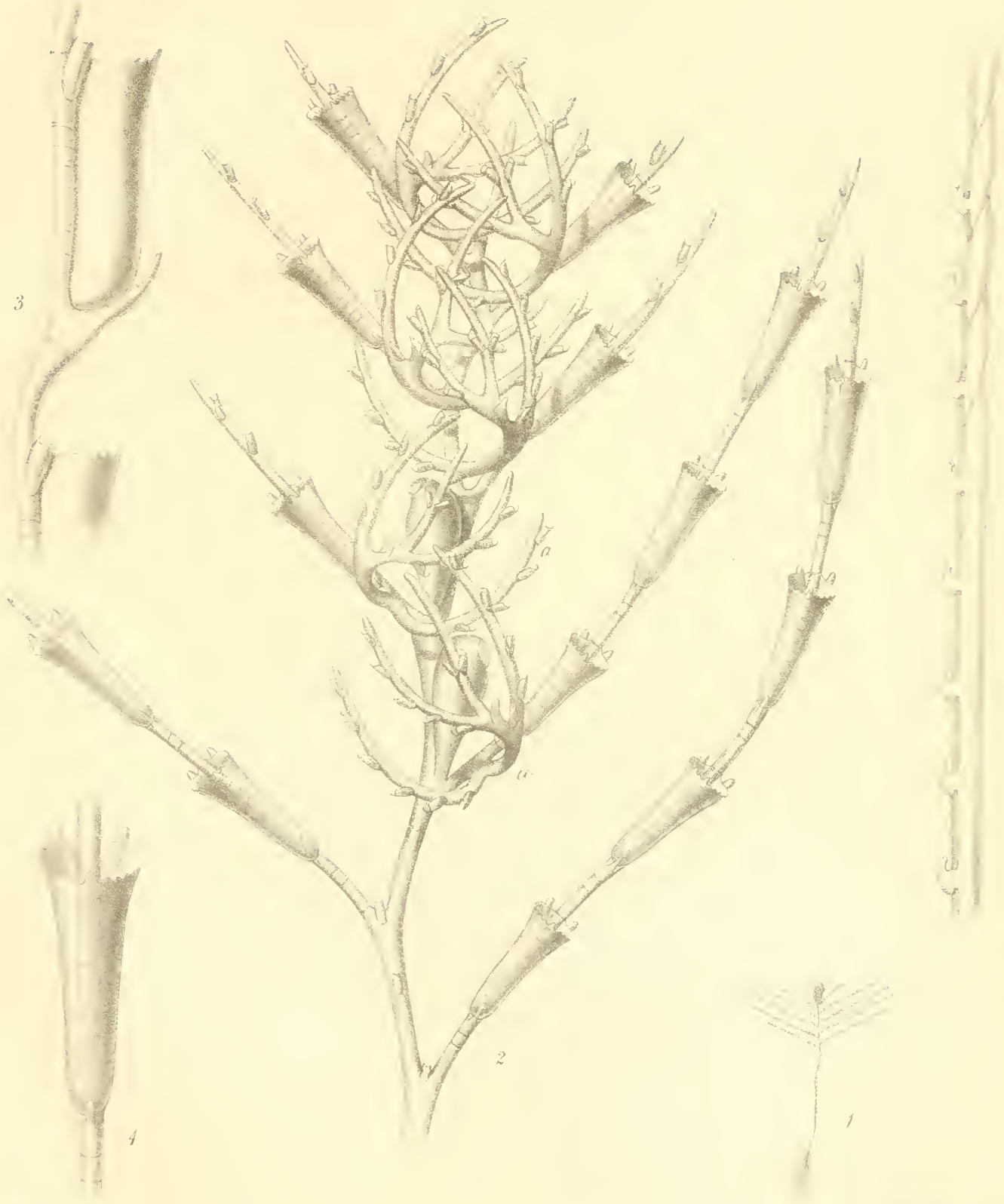
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