Art. III.—*Further Notes on Australian Hydroids; with Descriptions of some New Species.*

(With Plates III., IV., V., VI.)

By W. M. Bale, F.R.M.S.

[Read April 13, 1893.]

The hydroids treated of in the present paper were mostly comprised in a collection made by Mr. J. Bracebridge Wilson, M.A., and forwarded to me a considerable time since for examination and report in connection with the work of the committee appointed by this Society to investigate the fauna of Port Phillip. Many of the species included in the collection had already been described and recorded from that locality, and of these for the most part no particular mention is here necessary; but in a few cases the specimens present more or less distinct varietal features, which I have duly noted, and in two or three other instances they include the gonangial capsules, which had not previously been observed. A few of the species had not been recorded from Port Phillip, and among them were nine which proved to be new to science. Two of these, however (one of them forming the type of a new family), have since been described and figured with careful and elaborate detail by Professor Spencer in the Transactions of this Society, under the names of *Plumularia procumbens* and *Clathrozoon wilsoni*.

One Calyptoblastic species probably represents an undescribed genus, but as the specimens consist merely of the polypidom, I content myself with giving a description and figure (without names), pending the discovery of specimens in a fit condition to admit of its true affinities being ascertained. The genus *Halocordyle*, not hitherto known to occur in Australia, is represented by a single incomplete specimen.

Some good examples of *Diplocheilus mirabilis*, Allman, have on examination satisfied me that the character on which the genus was founded, namely, the presence of a secondary envelope

to the hydrotheca, is, as I have previously suggested, illusory, the appearance of an outer calycle being caused by a solid thickening of the perisarc, such as is common in the hydrothecæ of many *Plumulariæ* and at intervals along the hydrocladia of nearly all; while the discovery that this species possesses mesial nemataphores which are unprovided with sarcothecæ assigns to it a place under Jickeli's genus *Kirchenpaueria*, to which genus also it is now evident that the very closely related species *Azygoplon productum (Plumularia producta)*, Bale, must also be relegated.

Two or three species of *Eudendrium* are included in the collection, but although the hydranths are present, their condition is not such as to enable me to decide satisfactorily whether they are to be referred to any of the species already known, some of which differ very slightly from each other, especially in regard to the polypidom. In such cases it appears very desirable that confusion of species should be avoided by describing only such forms as are examined in a perfectly fresh condition, and in which the gonosome is present, as the smallest details, even the colour, must be taken into consideration.

My thanks are due to Mr. A. J. Campbell, F.L.S., for specimens of three or four species representative of the unexplored hydroid-fauna of Western Australia, one of them—a large species of *Aglaophenia*—being new; also to Dr. MacGillivray for a new species of *Plumularia* from the Snowy River, as well as a few other specimens.

Halocordyle australis, n. sp.

Hydrocaulus branched (monosiphonic?), small branches biserial, alternate, polypiferous ramuli biserial, rather irregular, both series directed to the front; all branches strongly and closely ringed for a considerable distance above their point of origin and above the point at which other branches spring from them; polypiferous ramuli and some of the others ringed throughout; polypiferous ramuli not expanded towards the aperture. Hydranths large, flask-shaped, with a stout cylindrical proboscis rounded at the top, about 8 or 10 filiform tentacles springing from the lower part of the body, and four or five short capitate tentacles surrounding the proboscis.

Gonophores pedunculate, borne on the lower part of the hydranth within the circle of filiform tentacles, umbrella with a small opening and four radial canals, manubrium large.

Larger branches deep red-brown, smaller ones lighter.

Hab.—Port Phillip Bay (Mr. J. B. Wilson).

I have only seen a single mounted specimen of this species, and cannot therefore give full particulars of its size and habit. So far as it goes the specimen is monosiphonic, with the small branches alternately directed slightly to the right and the left, while the polypiferous ramules are also directed slightly to right and left, but are not strictly alternate, two often following on the same side. The polypidom could be readily distinguished from that of any other Australian hydroid known to me by the extent and distinctness of the annular wrinkling of the perisarc, which answers to Ellis' description of a "tubulous coralline wrinkled like the windpipe" far more closely than does the *Tubularia larynx* to which that description was applied.

The hydranths differ from those of *Pennaria australis* in no important particular except in having the capitate tentacles fewer in number and confined to a single circlet round the base of the proboscis, instead of being scattered irregularly over the body. It is possible that the number of the filiform tentacles is habitually double that of the capitate ones, but I had not a sufficient number of hydranths in which the tentacles could be counted to satisfy myself that such was the case.

The gonophores, which are borne one or two on a hydranth, are small and regularly ovate, and like those of *Ceratella* as figured by Professor Spencer, are quadrate in transverse view, owing to the enlargement of the umbrella at the four sides where the radial canals are situated. In side view the umbrella is seen to thin rapidly away to the small orifice at the summit (which is closed in by the ectotheca), and no traces of tentacles could be detected. In these points they agree with the immature gonophores of *Pennaria* (except that the structure of the umbrella is more distinct), and it is probable that they also agree with them when mature in being completely open and in the possession of rudimentary tentacles, which condition exists also in the species of *Halocordyle* already known *(H. tiarella)*.

CLATHROZOON WILSONI, Spencer.

(Trans. Royal Soc. Vict., Vol. II, Part I.)

This hydroid was represented only by the polypidom in the collection which I received from Mr. Wilson; other specimens, which the same gentleman collected later on, and which included the soft parts, were forwarded to Professor Spencer, who has described them as the type of a new family.

——— ——, n. gen., and sp. ?

(Plate III., figs. 1, 2.)

Hydrocaulus nine inches (or more) in height, consisting of a stout monosiphonic stem with a few ascending branches, nearly equal in diameter for the greater part of its length, not distinctly jointed, very irregular in shape, being much swollen about the origin of the polyp-tubes; polyp-tubes given off on all sides without any regular order, sometimes very short, scarcely projecting, but usually about as long as the diameter of the stem, straight, or more often irregularly bent or twisted, terminating in a stout annular thickening, darker in colour than the rest. Hydranths unknown.

Gonophores solitary, borne on peduncles which occupy tubes like those of the hydranths.

Hab.—Port Phillip Bay (Mr. J. B. Wilson).

The hollow stem averages about $\frac{1}{30}$ to $\frac{1}{25}$ of an inch in diameter, but varies greatly at different points, owing mainly to its inflated condition at those parts where the polyp-tubes originate. The latter also are far from uniform in shape and size, often having a distorted appearance, and being sometimes, but not invariably, a little expanded at the summit. Here and there the margin, with its thickened ring, is duplicated, as in many caliculate species. There are no hydrothecæ, and I failed to find any hydranths; but one or two of the lower tubes bore gonophores, which appeared to take the form of ovate or oblong sacs, without openings at the summit, but were not in sufficiently good condition to admit of their structure being accurately determined.

I refrain from naming this species at present, as in the absence of the hydranths it is impossible to decide whether it forms the type of a new genus, or whether it may be possible to refer it to one already established.

CAMPANULARIA.

The only species of this genus which I have to describe, though small and of simple habit, agrees in all its more important characteristics with the two or three species for which Professor Allman has proposed the genus *Thyroscyphus*. It is true that a four-sided operculum is given as a feature of that genus, while in *C. tridentata* the operculum is three-sided; but the precise number of opercular valves is obviously not of generic importance; in another direction, however, the genus is unsatisfactory, namely in separating species which are exceedingly close allies, differing in no important particular except in the presence or absence of the operculum. For example, the *Campanularia insignis* of the *Challenger* Report and the *Campanularia Torresii* of Busk (*Thyroscyphus simplex*, Allman) and *T. ramosus*, Allman, are all so closely related that no arrangement which separates them can be regarded as satisfactory. The species mentioned, with some others, though having shortly pedunculate hydrothecæ, are, in regard to the arrangement of the latter and the ramification, more like the genus *Sertularella* than the typical members of the Campanularian family; and as in *Sertularella*, the hydrothecæ may have three or four emarginations of the border, with an operculum of the same number of valves, or may be entire and destitute of any operculum. It cannot be maintained that the presence or absence of the operculum in the one group is in the slightest degree more important than in the other, and as Professor Allman is doubtless justified in remarking concerning species of *Sertularia* provided with membranous opercular valves that "few systematists would think of separating these generically from the closely allied species in which no valves are present," it seems to follow that such separation is equally unwarranted in the Campanularian group. Undoubtedly such species as *C. insignis* and *C. Torresii* form a group distinct from the typical *Campanulariæ*, and it would perhaps be advisable to unite them in a single genus, which, ranking under the CAMPANULARIIDÆ,

would yet exhibit strong affinities with the Sertularians. This was recognised by Lamarck, who included such species as a section of the genus *Sertularia*, thereby, however, placing them on the wrong side of the boundary line.

Campanularia tridentata, n. sp.

(Plate III., fig. 3.)

Hydrocaulus simple, about half an inch in height, each internode bearing a short process from which springs a hydrotheca. Hydrothecæ alternate, tubular above, curving inwards towards the base on the upper side only, so that the lower or outer wall of the cell is straight or concave, while the upper is strongly convex; aperture with three pointed teeth (or three deep emarginations), and an operculum of three pieces.

Gonothecæ?

Hab.—Port Phillip Bay (Mr. J. B. Wilson).

This is a member of the group which includes operculate species such as *C. Torresii* and inoperculate species like *C. insignis* and *C. rufa*. From such of the former as are already known it differs in having three valves instead of four, as well as in its small size and simple habit. In this group each hydrotheca usually springs, as in *Sertularella*, from a distinct internode; the hydrothecæ have short peduncles of one or two joints only, and they are mostly gibbous above the base on the side next the hydrocaulus, but less so or not at all on the outer side. In *C. tridentata* the margin of the hydrotheca proper is scarcely thicker than the valves into which it is continued; the line of demarcation is therefore not conspicuous.

Campanularia insignis, Allman.

This species, described in the *Challenger* Report, appears to be the same which Busk identifies with the *Laomedea antipathes* of Lamouroux. Busk says of *Laomedea Torresii* that "at first sight it is very like *L. antipathes*, Lamx., which occurs in New Zealand, but differs materially in its smaller size and in the four shallow emarginations of the mouth, which part in *L. antipathes* is entire and with the margin a little thickened." As *Campanularia (Laomedea) Torresii* differs from *C. insignis* in precisely these particulars, there is every probability that Busk was speaking of the latter species under the name of *L. antipathes;* it is very doubtful, however, whether it was really the same as that described by Lamouroux; indeed, if the figure given by the latter be at all correct, it cannot be intended for the species mentioned by Busk.

Thyroscyphus simplex, Allman.

The species described under the above name in the *Challenger* Report is identical with *Campanularia Torresii*, Busk, (*Laomedea Torresii* of the "Voyage of the *Rattlesnake*"). Both Busk's and Allman's types came from Torres Strait, and appear to have been wholly alike, except that the latter was a rather larger specimen.

Obelia geniculata, Lin.

A dwarf variety, about one-fourth of an inch in height, and with all its parts small in proportion. The thickenings of the stem-internodes, which give the species its characteristic appearance, are, especially towards the bases of the shoots, even more strongly developed than in the larger forms.

The *Monosklera pusilla* of von Lendenfeld appears to be identical with this variety, so far as can be judged from a comparison with some of the type specimens, from which, however, the hydrothecæ have fallen off.

Port Phillip Bay (Mr. J. B. Wilson).

Halecium gracile, Bale.

Port Phillip Bay (Mr. J. B. Wilson).

The female gonothecæ when mature have the summit notched like those of *H. parvulum*,* and do not differ greatly from them in other respects; it would appear, therefore, that the differences which I have shown as existing between them may depend largely on their state of development. The male gonothecæ are considerably longer than those of my former specimens, which were evidently immature.

* Proceedings of the Linnean Society of New South Wales, 1888, p. 759.

SERTULARELLA MACROTHECA, Bale.

(Plate IV., fig. 3.)

The gonangia are smaller than those of my former specimens, and have the transverse undulations much deeper, closely approximating to those of *S. solidula.*

Port Phillip Bay (Mr. J. B. Wilson).

SERTULARELLA JOHNSTONI, Gray.

Some of the specimens have the hydrothecæ more conical than the commoner forms, therein resembling specimens from New Zealand, but agreeing with other Victorian specimens in the shape of the gonothecæ.

Port Phillip Bay (Mr. J. B. Wilson).

SERTULARELLA ANGULOSA, n. sp.

(Plate IV., fig. 6.)

Shoots simple, short, zig-zag, divided by slightly-twisted joints into internodes, each bearing a hydrotheca on its upper part. Hydrothecæ adnate from one-third to one-half their height, large, divergent, barrel-shaped, but smaller towards the summit, with about six distinct sharp annular ridges; aperture expanding, with four teeth; three internal compressed vertical teeth, two of which are within the two upper emarginations of the border, and the third opposite the inferior marginal tooth.

Gonothecæ ?

Hab.?

In habit resembling *S. polyzonias*, but the lower internodes are mostly more strongly zig-zag than in that species, while the hydrothecæ are less contracted above in proportion to the diameter of the lower portion, are not adnate for so far, and are more particularly differentiated by the distinct ridges encircling them. The internal vertical teeth are arranged exactly as in *S. polyzonias* and *S. microgona*, and, as in those species, are so delicate and transparent as to be easily overlooked, especially when the hydrothecæ are not perfectly free from the soft parts.

The specimens, of which there were very few, only reached about one-fifth of an inch in height, but were doubtless immature. The perisarc of the lower portions was rather thick.

SYNTHECIUM PATULUM, Busk.

Specimens about two inches in height, with several of the pinnæ anastomosing. Some of the hydrothecæ are much stouter and less curved than usual, with the margin more deeply sinuated at the sides, while the portions of the internode outside of the hydrothecæ are correspondingly diminished; the hydrothecæ thus occupy almost the whole internode. These modified internodes are mixed on the same pinna with the normal form.

Mouth of Snowy River (Dr. MacGillivray).

THUIARIA LATA, Bale.

(Plate IV., fig. 1.)

Gonothecæ borne two or three on a pinna, springing from between the two series of hydrothecæ, very large (about $\frac{1}{8}$-inch long), gradually tapering downward, thickest part a little below the summit; presenting, as seen in side view, a dorsal and a ventral aspect, the former regularly undulated most of its length, the latter smooth; summit concave and oblique, more elevated at the back than in front.

Port Phillip Bay (Mr. J. B. Wilson).

(The gonothecæ of this species have not hitherto been described).

THUIARIA FENESTRATA, Bale.

(Plate IV., fig. 2.)

Port Phillip Bay (Dr. MacGillivray).

The gonothecæ are more nearly globular than those of any other species known to me. The sketch of one of them by Mr. Busk, which I copied in the "Catalogue of the Australian Hydroid Zoophytes," and from which I took the description, is evidently erroneous, which may possibly be due to some other species having been mixed with the material. The description in the "Voyage of the *Rattlesnake*" did not mention the gonosome.

Idia pristis, Lamx.

(Plate IV., figs. 4, 5.)

In the *Challenger* Report Professor Allman has given a more complete account of this remarkable hydroid than had previously been possible, having had the advantage of examining specimens sufficiently well preserved to exhibit much more of the detail than could be made out in ordinary dried specimens. It is through an oversight, however, that Professor Allman states in two different parts of his work that the species had previously been known only from Lamouroux' inadequate figure and description and a short notice of the gonosome by Mr. Hincks in the Journal of the Linnean Society of London for 1887, since I had in 1884 described and figured both trophosome and gonothecæ, while Mr. Busk had described the species in 1852, in the "Voyage of the *Rattlesnake*," from which notice I first identified it. The description of the gonothecæ, however, in the work just mentioned was an error, the object described being a parasitic hydroid *(Campanularia costata?)*; but Mr. Busk afterwards observed the true gonothecæ and made sketches of them, which I reproduce. The figures of the gonothecæ given in the *Challenger* Report differ considerably from the specimens I have seen (which resemble Mr. Busk's figures), especially in showing the longitudinal ribs much closer and terminating at the shoulder instead of continuing up to the margin, while they give no indication of the curved wrinklings of the surface which form series of irregular arches joining all the ribs. Possibly the latter feature is a result of the drying of the perisarc, and therefore not present in well-preserved specimens which have not been dried. The gonothecæ are apt to be very irregular in form, sometimes being deeply constricted round the middle, while others have the characteristic ribs absent in parts, and represented by a totally irregular wrinkling of the surface. According to Professor Allman, the hydrothecæ have the peculiarity of opening backwards by a small valvular operculum, but in specimens which have been dried it is scarcely possible to make out the exact form of the aperture, owing to the collapsibility of the delicate perisarc at that part. The stems of the *Challenger* specimens appear to be more slender than usual, and the axillary hydrothecæ are figured like the others on the stem, while in my specimens they are smaller than the rest, and are curved over so as to point directly to the back of the polypidom.

Aglaophenia parvula, Bale, var.

Larger than the type, reaching two to three inches in height, and branched, branches nearly in the same plane.

Port Phillip Bay (Mr. J. B. Wilson).

The largest specimen bore five or six branches, one of which was again branched. I have formerly described the hydrotheca of *A. parvula* as having five teeth on each side, two of which are often folded together so as to resemble a single tooth; judging from most of the specimens I have since observed, however, it would be more correct to describe the number of teeth as four on each side, one of them being sometimes folded and bifid, the latter being the exceptional rather than the normal condition.

Aglaophenia (?) Whiteleggei, Bale.

Port Phillip.

Of this species, hitherto known only from New South Wales, I have received specimens both from Mr. Wilson and Dr. MacGillivray. The largest specimen is about four inches in height, with a slender stem formed of two tubes in addition to the original jointed filament, and the branches given off most freely towards the summit, so that the polypidom is somewhat cymose. In all the specimens I have observed the perisarc is very delicate, so much so that nearly all the cells are generally more or less collapsed and distorted after mounting or drying.

Aglaophenia carinata, n. sp.

(Plate VI., figs. 1–3.)

Hydrocaulus polysiphonic, reaching a height of about eighteen inches, much and irregularly branched, stem and main branches thick, branches ascending, pinnæ short, alternate, one on each internode, both series springing from the front. Hydrothecæ set at an angle of about 40°, deep, narrowed towards the base, not bent, a fold or constriction springing from the side next the

pinna a little above the base, almost crossing the cell and curving towards the aperture; margin with a median anterior tooth and three on each side, the last pair often hidden behind the lateral sarcothecæ; back entire, adnate; front of hydrotheca with an external longitudinal ridge, terminating in an elevated pointed tooth over the anterior tooth of the margin (sometimes absent). Hydrothecal internodes with two folds, one opposite the fold of the hydrotheca, the other at the base of the lateral sarcothecæ. Mesial sarcotheca about three-fourths the length of the hydrotheca, adnate most of its length, slightly projecting, terminal and lateral apertures distinct or united. Lateral sarcothecæ divergent, adnate up to the hydrotheca-margin, free terminal portion short, conical, directed forward, terminal and lateral apertures united. Cauline sarcothecæ stout, with open margin, two on the stem at the base of each pinna.

Gonangial pinna generally springing from the basal part of a branch, and bearing only sarcothecæ on about the first five internodes. Corbula large, closed, composed of about nine pairs of broad leaflets, the junction-lines marked by thickenings, which towards the front of the corbula generally rise into free prominent expansions, and which are beset with short, conical, canaliculate sarcothecæ, except at the base, where each gives off a stout process armed with a very broad sarcotheca and a longer and narrower pointed one below it; each leaflet abruptly narrowed on the proximal side near the base, leaving a series of openings along each side of the corbula. A large sarcotheca projecting into the corbula from the basal part of each leaflet.

Colour.—Light-brown.

Hab.—Rottnest Island, Western Australia.

This handsome species was obtained by Mr. A. H. Courderôt, and by him given to Mr. A. J. Campbell, to whom I am indebted for the opportunity of describing it.

Halicornaria ascidioides, Bale.

(Plate V., fig. 1.)

Gonothecæ in two rows, springing from the bases of the hydrocladia, somewhat pyriform, with the top flattened, and a very distinct circle of highly refractive granules just below the aperture.

Port Phillip Bay (Mr. J. B. Wilson).

(The gonothecæ have not previously been described.)

Halicornaria superba, Bale.

Dongarra Beach, Western Australia (Mr. A. J. Campbell).

Kirchenpaueria, Jickeli, (modified).

Diplocheilus, Allman.

Azygoplon, Bale, not Allman.

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

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

The genus *Kirchenpaueria* was founded by Jickeli for some specimens collected at Trieste, which, though fragmentary, were sufficiently well preserved to exhibit clearly the peculiarity which induced him to establish a new genus for them, namely, the presence of naked sarcostyles above the hydrothecæ. Another feature which seems to me of equal importance was the absence of the lateral sarcothecæ usually found in connection with the hydrothecæ; I have accordingly included this characteristic in the generic definition.

Among the material forwarded to me by Mr. J. B. Wilson were several specimens of the *Diplocheilus mirabilis* of Professor Allman's *Challenger* Report, in which the soft parts were fairly well preserved, and examination of these readily showed them to belong to Jickeli's genus. The hydrothecæ of *D. mirabilis* bore a striking resemblance to those of the small species which I formerly described as *Plumularia producta*, and afterwards as *Azygoplon productum*. I therefore carefully re-examined the latter species, and although none of the specimens retained the

soft parts, I found the circular apertures through which the naked sarcostyles had been protruded, and which would scarcely have been noticed without a special search, owing to the tenuity of the perisarc around them, and to the fact that their peculiar position rendered it difficult to get a clear view of them. The perisarc of the hydrocladium curves upward to meet the back of the hydrotheca, and the circular aperture is situated in this curved-up portion, nearly vertical to the hydrocladium, so that, whether the latter be viewed laterally or in front, the aperture is turned edgewise to the observer, and is therefore not noticeable, the perisarc being so delicate that the interruption of continuity is only to be seen by careful focussing. However, if a hydrotheca can be found tilted up perpendicularly, the orifice is readily distinguished. In *K. mirabilis* the hydrotheca is formed on the same model, but the perisarc is thicker, and the interruption in it can be easily seen in optical section, as I have shown in Figs. 4-5. The sarcostyles, which are present in most of Mr. Wilson's specimens, are not altogether unprotected, as the perisarc is extended into a slight web on each side of the hydrotheca, which it joins to the pinnule, so that the sarcotheca is to a great extent sheltered in every direction except in front. In Jickeli's specimens the cauline sarcostyles were all naked, but in our two species they are usually provided with sarcothecæ more or less developed; I have found them entirely absent, but it is possible that in those cases they had been broken off.

The gonangia have no distinct marginal ring or operculum, but open by an irregularly circular line of fracture at the summit. Those of *K. mirabilis* are very large, and free, those of *K. producta* are smaller but of similar type, modified however by having one side flattened and adnate to the substance to which the hydrorhiza is attached.

As hereafter mentioned, the special character on which the genus *Diplocheilus* was founded is not really present; there is therefore no reason why the only species should not be transferred to the present genus, where it rightfully belongs. (See *Kirchenpaueria mirabilis.*) The genus *Azygoplon*, Bale, must also be cancelled, as the only species, *A. productum*, is now proved to be referable to *Kirchenpaueria.*

KIRCHENPAUERIA MIRABILIS, Allman, sp.

(Plate VI., figs. 4–7.)

Diplocheilus mirabilis, Allman, *Challenger* Report on Hydroida, part i., p. 48, pl. viii., figs. 4-7.

Hydrocaulus about two to three inches in height, monosiphonic or slightly fascicled, sometimes sparingly branched; stem-internodes long, pinnæ alternate, not close, one or two on an internode of the stem, a hydrotheca on each internode of the pinnæ, joints of stem and pinnæ very oblique. Hydrothecæ nearly parallel with the pinna in their proximal portion, distal part curved upwards, aperture circular, margin free, widely expanded; front wall of hydrotheca deeply inflected immediately below the lip, the inflection forming an intrathecal ridge which extends rather more than half across the cavity of the cell; external sinus caused by the inflection completely filled up with homogenous perisarc. A single sarcotheca below each hydrotheca, fixed, erect, upper portion forming a nearly circular concave shield, facing the hydrotheca. A sarcostyle in the angle between the back of each hydrotheca and the pinna, not provided with a sarcotheca, but partly protected on each side by a narrow web which connects the pinna with the back of the hydrotheca. Cauline sarcothecæ—one at the base of each pinna, and one or two others near it, one (conical) in each axil.

Gonangia large, free, with rounded summit, and irregular wide transverse undulations, no distinct marginal ring or operculum, sporosacs two.

Stems brownish yellow, pinnæ nearly colourless.

Hab.—Port Phillip (Mr. J. B. Wilson); Griffiths' Point (Dr. Haswell); Moncœur Island, Bass' Strait (Prof. Allman).

This species was described by Professor Allman in the *Challenger* Report as the type of a new genus—*Diplocheilus*—characterised by the possession of an external calycine envelope in addition to the ordinary hydrotheca. I have suggested in a former paper* that the supposed external envelope was probably a *thickening* of the hydrotheca-wall in front, similar to that which

* On Some New and Rare Hydroida in the Australian Museum Collection.—Proceedings of the Linnean Society of New South Wales, vol. iii., 2nd Series, 1888.

exists in *Plumularia delicatula* and various other species, and which, present in some forms only of *P. setaceoides*, may attain in them a thickness nearly equal to the inside diameter of the calycle itself;* and this view of the structure is completely borne out by an examination of the specimens collected by Mr. Wilson. The hydrothecæ are formed on essentially the same plan as those of *Lytocarpus phillipinus* and many other Statopleans; that is to say, they form a sac, the proximal part of which lies parallel with the hydrocladium, while the distal portion is sharply recurved, the front wall being thereby doubled upon itself so as to form a deep constriction or an intrathecal ridge in front of the cell. In some species—for instance, *Aglaophenia longicornis*—the inflected parts of the wall do not quite meet, but leave a deep open angle on the outside of the calycle-front; in others, such as *Lytocarpus phœniceus* and *Acanthocladium Huxleyi*, the hydrotheca is more strongly recurved, so that the two parts of the inflected wall come into close apposition and union, forming a completely internal partition.† In *K. mirabilis* a somewhat intermediate condition occurs; the thin wall of the recurved portion is not brought into contact with that of the proximal part, but the external angle formed by the inflection of the sac is entirely filled up by a solid homogeneous chitine, appearing, as seen in lateral view, as a stout wedge-shaped projection, extending fully half across the diameter of the hydrotheca, from a point immediately below the lip. This ridge, however, is only a thickening of the adjacent perisarc, as may be readily observed in optical section, where the substance of the ordinary hydrotheca-wall is seen to expand gradually into the thickened ridge, which is bounded by a single contour only, proving that it is not an enclosed cavity, but a homogeneous continuation of the perisarc. In precisely the same way the perisarc along the front of the

* Further analogous cases are afforded by the thickening of the stem-internodes in *Obelia geniculata*, the almost complete filling-up of the hydrotheca by perisarc in *Hypanthea* and *Eucopella*, and the thickening of the calycle-wall in *Campanularia calciculata*, so as to give the appearance in optical section of two calycles, an inner and an outer, often differing considerably in form from each other. In most instances the extent to which the perisarc is thickened varies greatly in different examples of the same species.

† In *Halicornaria superba* and its allies the partition is considerably below the aperture, and the mesial sarcotheca continues in union with the front of the hydrotheca up to the margin; the partition or ridge therefore appears to spring from the sarcotheca, and its homology is not at first sight so obvious as in the species already mentioned.

hydrocladia is thickened at intervals to form those internal transverse ridges which are found in most species of *Plumularia* and its allies. In viewing the hydrotheca in front the inner boundary of the ridge presents a biconcave aspect, or it may be nearly straight in the central portion, except for a distinct median tooth or point. The hydrothecæ are very transparent and colourless, but (in this instance at least) they bear immersion in Canada balsam without shrinkage of the wall-thickenings or distortion of any kind, though the everted circular margins are of such tenuity that they are scarcely traceable in balsam unless exactly in focus.

The cauline sarcothecæ are somewhat variable in number and arrangement, but there appears to be always an erect conical one in the axil of every hydrocladium, with two or three on the front of each stem-internode, the latter being very much of the same character as those in front of the hydrothecæ. I have had for a long time some specimens collected by Dr. Haswell at Griffiths' Point, which consisted only of the basal parts of the stem with bunches of gonangia, and which I now identify as belonging to this species by comparison with Mr. Wilson's specimens. They have no sarcothecæ on the stem, but only apertures; it is quite possible, however, that sarcothecæ may have been formerly present.

The stem-internodes bear sometimes one, sometimes two hydrocladia, the longer ones being mostly found in the older parts of the polypidom and the shorter ones nearer the summit; they are, however, sometimes interspersed. The species appears normally monosiphonic, but the lower part is sometimes slightly fascicled.

The gonangia, which have not been hitherto known, reach about one-eighth of an inch in length, with a few very irregular transverse undulations and no neck or marginal ring.

Kirchenpaueria producta, Bale.

Plumularia producta, Bale, Journ. Micr. Soc. Vict., Apr., 1882, p. 39, pl. xv., fig. 3; Catal. Aust. Hyd. Zooph., p. 133, pl. x, fig. 4.

Azygoplon productum, Bale, Proc. Lin. Soc. N.S.W., 2nd ser., vol. iii., p. 774, pl. xix., figs. 1 to 5.

Hydrocaulus about one-third of an inch high, monosiphonic, unbranched; stem-internodes long, pinnæ alternate, not close, one or two on an internode of the stem; a hydrocladium on each internode of the pinnæ; joints of stem and pinnæ very oblique. Hydrothecæ nearly parallel with the pinnæ in their proximal portion, distal part curved upwards, aperture somewhat oblong, margin free, not widely everted at the sides; a strong intrathecal ridge springing from the front wall of the hydrotheca, a little below the lip, and extending rather more than half across the cavity of the cell. A single sarcotheca below each hydrotheca, fixed, erect, upper portion forming a concave shield facing the hydrotheca. A sarcostyle in the angle between the back of each hydrotheca and the pinna, not provided with a sarcotheca, but partly protected on each side by a very narrow web which connects the pinna with the back of the hydrotheca. Cauline sarcothecæ one (conical in form) at the base of each pinna, and one in each axil, sometimes an additional one on the stem-internode.

Gonangia flattened on one side, by which they are adnate to the substance on which the colony is attached, a few irregular indistinct transverse undulations on the upper side, aperture subterminal, without any distinct marginal ring or operculum.

Colour.—Yellowish.

Hab.—Queenscliff, Williamstown, Portland, Port Jackson.

This species, though closely allied to *K. mirabilis* in its more important features, differs from it entirely in its dwarf habit, its adnate gonothecæ, and, to a certain extent, in the form of the hydrotheca, which is here somewhat more recurved, so that the distal and proximal portions become closely united in the front, forming the ordinary intrathecal ridge, instead of leaving a space to be filled up with solid perisarc, as in *K. mirabilis*. The hydrothecæ, however, are rather variable in form, and in some specimens the lip projects strongly, and the angle just below it, along with the constriction which marks the origin of the intrathecal ridge, is filled up by chitinous matter, which in my specimens was evidently not of dense consistence, as it shrivelled on immersion in balsam; indeed the whole polypidom is of fragile texture, and generally shrivels more or less on drying, or on immersion in a dense medium.* In front view the hydrotheca appears very different to that of the other species, on account of the aperture being of an oblong or elliptic form, due to the lateral margins being erect instead of widely expanded, so that the aperture, though long, is no wider than the body of the hydrotheca, while in *K. mirabilis* the sides are strongly everted, contributing to form the wide circular rim characteristic of that species. The intrathecal ridge as seen in front view is not toothed or pointed at the centre, but has the margin convex or sometimes nearly straight. The mesial sarcothecæ are variable in the extent to which the upper loculus is developed, generally approximating in form to those of the last species, but sometimes being much narrowed at the sides; those on the rachis are not constant in number. The internodes of the stem may bear either one or two hydrocladia.

The gonangia being attached by the whole of the lower side, the aperture is on the upper surface, close to the end, and is formed by the rupture of the perisarc in a circular form; at least, such was the case in all the specimens I have examined except one, which had the orifice partly terminal and partly lateral, with the margin more distinctly outlined than usual. The undulations on the upper surface are so faint as to be scarcely perceptible except in dry specimens.

Plumularia campanula, Busk.

Marktanner-Turneretscher† states that the *P. rubra* of von Lendenfeld is an unbranched but pinnate form of this species, a conclusion which was to be expected, seeing that their minute structure is identical, though they had not previously been found in conjunction. Busk, however, in his original description of *P. campanula*, mentioned that simple and branched shoots grew together in the same colony, and there can be little doubt that the hydrosoma always commences its growth as a simple shoot, bearing hydrothecæ, that it afterwards gives off pinnate hydro-

* It is worthy of note that in this and other species the terminal or newest hydrothecæ occasionally retain their shape perfectly, while all the older parts of the perisarc are more or less shrunken and distorted.

† Die Hydroiden des k.k. naturhistorischen Hofmuseums, Wien, 1890.

cladia, and finally assumes a branched form. In most *Plumulariæ* the primary form is pinnate, and they bear no hydrothecæ on the rachis; but in species like *P. campanula* there is no difference between the structure of pinnæ and stem until the latter begins to assume a polysiphonic form.

Plumularia tubulosa, n. sp.

(Plate V., figs. 2–5.)

Shoots simple, slender, about one-third of an inch in height, divided by very oblique joints into rather long internodes, each of which bears a hydrotheca at its lower end. Hydrothecæ set at an angle of 40° to 45°, tubular, cylindrical, sometimes slightly bent, twice as long as broad, and free for half their length; aperture plain, the sides slightly and evenly sinuated, lip curved a little outwards in front. Sarcothecæ bithalamic, canaliculate, fixed and stout at the base, one at each side of the hydrotheca (pedunculate), one in front, one midway between every two hydrothecæ, on the same internode as the lower.

Gonothecæ—female, large, pear-shaped, broad, somewhat flattened above, tapering below, with a distinct sub-globular segment at the base of the capsule, and a sarcotheca at each side a little above the base; a circular operculum at the summit, the border of the aperture slightly thickened; male—smaller, with one sarcotheca only.

Almost colourless.

Hab.—Port Phillip Bay (Mr. J. B. Wilson).

Closely allied to *P. campanula*, differing, however, from the stemless form of that species in the much greater proportionate length of the hydrothecæ. It is just possible that it may prove to be only a variety, but so far I have failed to find any intermediate forms, and the difference in the hydrothecæ seems to fully warrant its being regarded, at least provisionally, as a distinct species. Most of the Plumularians in which the hydrocladia spring direct from the hydrorhiza are known to be merely stemless forms of ordinary pinnate species, and probably the present species may prove no exception to the general rule; so far, however, no pinnate specimens have been observed.

The perisarc is ordinarily thin, but in some of the shoots the walls of the hydrothecæ are much thickened. The male and female gonangia were on different shoots; the former seemed rather larger in proportion than those of *P. campanula*, otherwise there was no important difference.

Plumularia filicaulis, Pœppig.

Port Phillip Bay (Mr. J. B. Wilson).

The specimens consisted of pinnate and undivided shoots growing abundantly from the same hydrorhiza.

Plumularia procumbens, Spencer.

(Plate V., figs. 11–12.)

(Trans. Royal Soc. Vic., Vol. II., Part I.)

Since I received the specimens from Mr. Wilson, Professor Spencer has very fully described and illustrated this species (also from specimens collected by Mr. Wilson); I may however add that in a few instances I have found sarcothecæ on the short internodes of the hydrocladia, which ordinarily bear no appendages of any kind. The hydrothecæ are very small, and in proportion to them the sarcothecæ are unusually large.

Plumularia compressa, Bale, var.

A form differing from the type only in the size, which does not exceed about $\frac{1}{8}$-inch in height, with all the parts small in proportion. Dongarra Beach, Western Australia (Mr. A. J. Campbell). A similar variety occurs in Port Jackson.

Plumularia flexuosa, n. sp.

(Plate V., figs. 6–10).

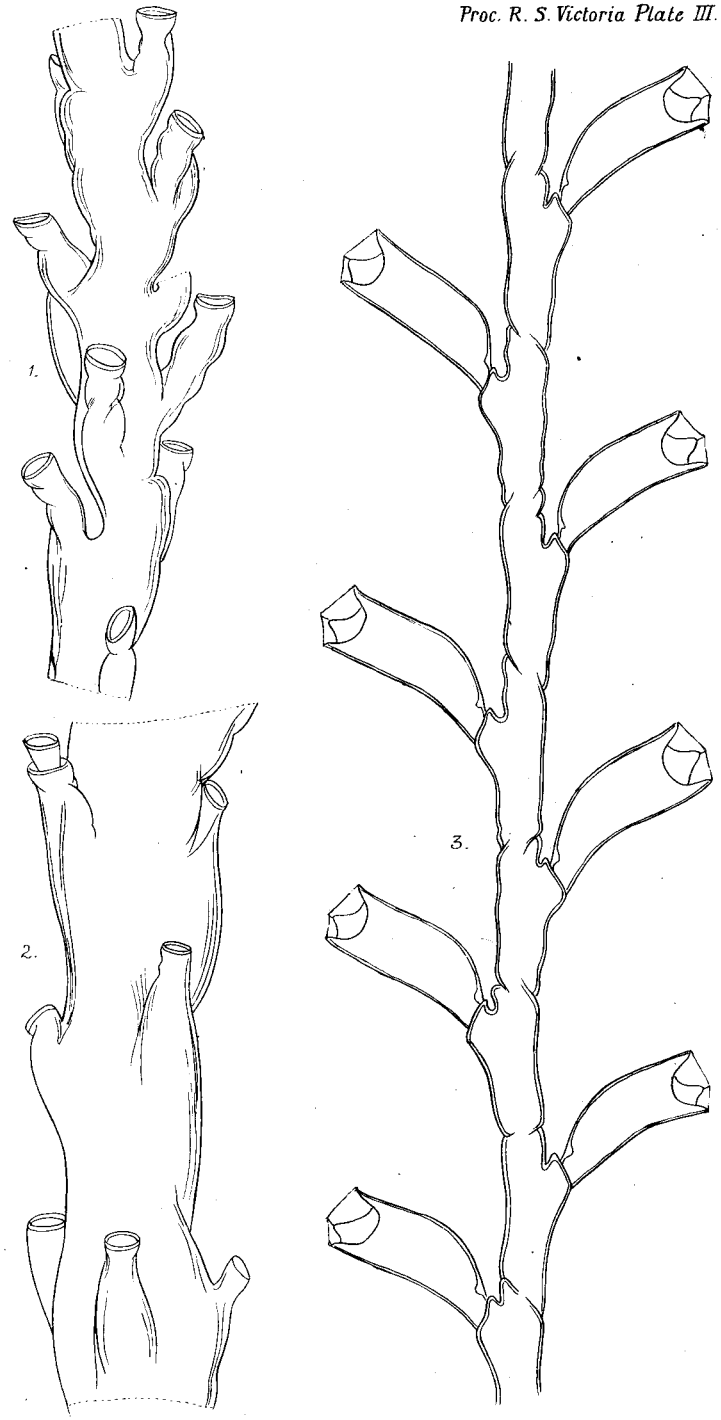
Hydrocaulus monosiphonic, unbranched, about one-eighth of an inch in height, stem very slender, flexuous; pinnæ alternate, each borne towards the upper part of an internode and supporting a single hydrotheca, distal part curving abruptly from under the hydrotheca, widening upwards, generally with a constriction

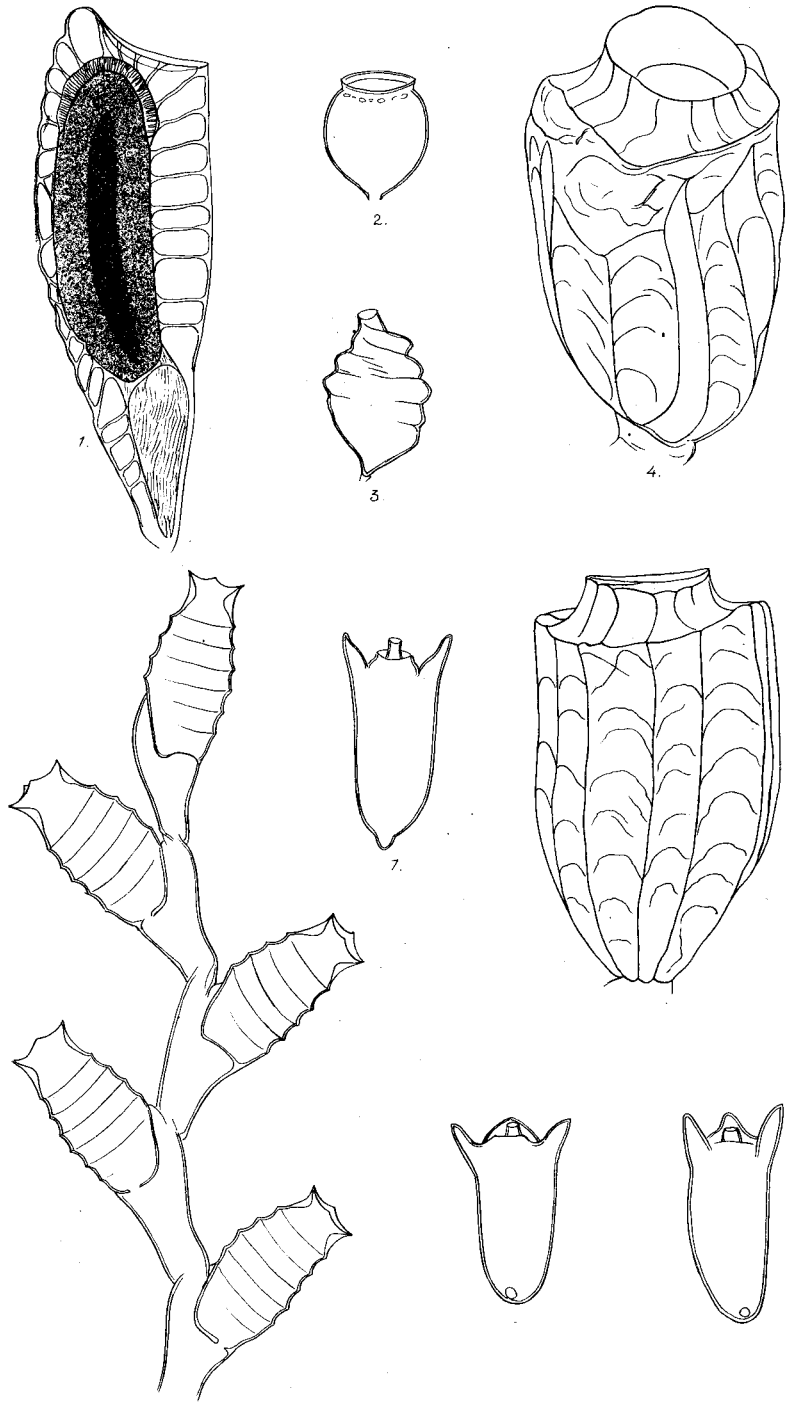
behind the hydrotheca. Hydrothecæ campanulate, margin entire, slightly everted, rising a little above the summit of the pinna, at right angles to it and the cell. Sarcothecæ bithalamic, canaliculate, with slender bases, one below each hydrotheca, one on each side above it, two in each axil, and one on the lower part of each stem-internode. Gonothecæ 7-8 times the length of the hydrothecæ, ovate, aperture terminal, rather small, somewhat oblique, without internal teeth, sometimes with an elevated rim.

Hab.—Mouth of Snowy River and Cape Lefebvre (Dr. MacGillivray).

This species is very close to *P. pulchella*, of which I at first considered it a variety. So far as the trophosome is concerned, it is distinguished by its very small size and extremely slender stems, which are strongly flexuous, and bear the pinnæ near the summit of the internodes. In *P. pulchella*, on the other hand, the whole structure is much more robust, the stem a good deal wrinkled or annulated, with the internodes straight, very short in proportion to their length, and bearing the pinnæ for the most part about the middle. The form and arrangement of the hydrothecæ and sarcothecæ is the same in both species, except that *P. flexuosa* has a sarcotheca on the lower part of each stem-internode in addition to having two in each axil. The gonothecæ furnish the most important distinction—those of *P. pulchella* are stout with a large aperture directed laterally, and surrounded inside with large smooth teeth projecting into the interior, those of *P. flexuosa* are much narrower in proportion to the length, with a smaller aperture, only slightly oblique, and without teeth. The aperture in some cases only is surrounded by an elevated margin, and the general outline of the gonotheca is somewhat apt to be irregular, showing at times a decided tendency towards a transversely undulated form.

Some fragments from Bondi, which I have hitherto considered a dwarf variety of *P. pulchella*, agree with the present species except in the absence of the inferior sarcothecæ of the stem-internodes, a distinction not sufficiently important to forbid their reference to *P. flexuosa* if the gonothecæ should prove similar to those of that species.

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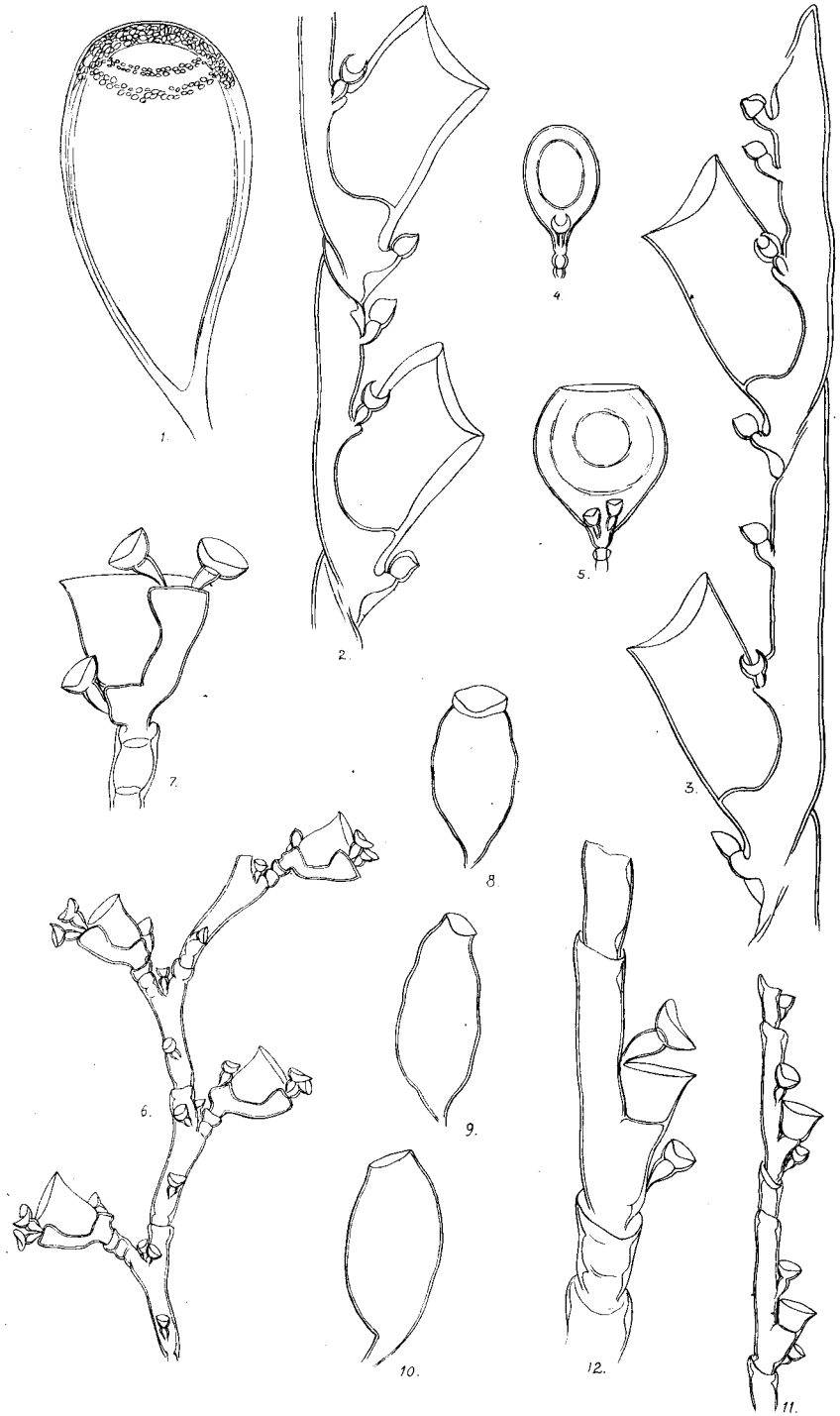
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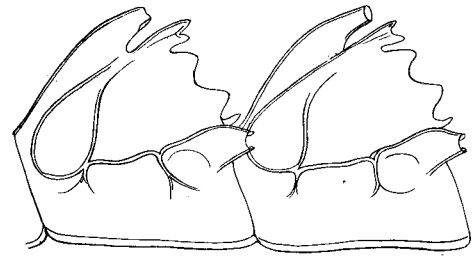

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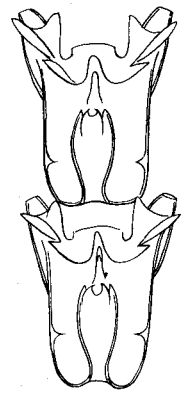

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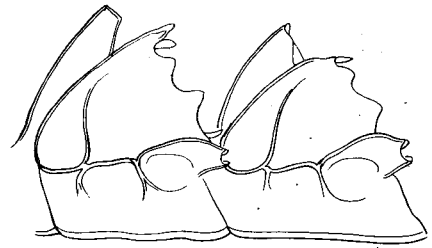

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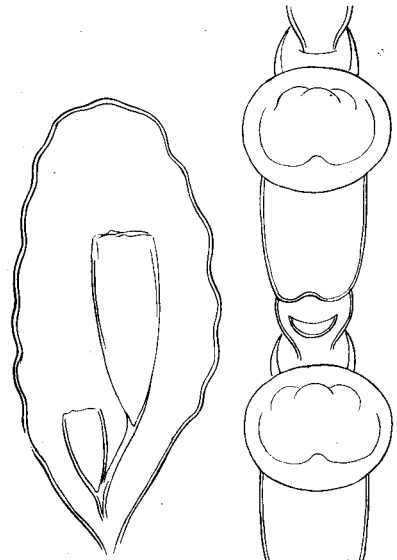

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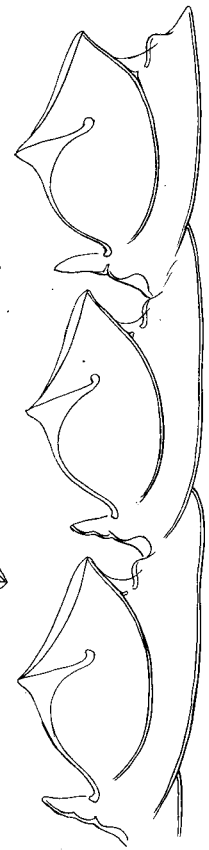

4.

EXPLANATION OF PLATES.

Plate III.

Fig. 1.—n. gen. and sp. ?, distal portion. × 20.
" 2. " " proximal portion. × 20.
" 3.—*Campanularia tridentata*, n. sp. × 40.

Plate IV.

Fig. 1.—Gonangium of *Thuiaria lata*, Bale. × 20.
" 2. " " *Thuiaria fenestrata*, Bale. × 20.
" 3. " " *Sertularella macrotheca*, Bale. × 20.
" 4-5. " " *Idia pristis*, Lamx. (From drawings by Mr. Busk).
" 6.—*Sertularella angulosa*, n. sp. × 40.
" 7-9.—Gonangia of *Sertularella longitheca*, Bale. × 20.

Plate V.

Fig. 1.—Gonangium of *Halicornaria ascidioides*, Bale. × 40.
" 2.—*Plumularia tubulosa*, n. sp., thick-celled specimen. × 80.
" 3. " " thin-celled specimen. × 80.
" 4. " " male gonangium. × 25.
" 5. " " female " × 25.
" 6.—*Plumularia flexuosa*, n. sp. × 80.
" 7. " " more enlarged.
" 8-10. " " gonangia. × 40.
" 11.—*Plumularia procumbens*, Spencer. × 80.
" 12. " " more enlarged.

Plate VI.

Fig. 1-3.—*Aglaophenia carinata*, n. sp. × 80.
" 4-6.—*Kirchenpaueria mirabilis*, Allman, sp. × 80.
" 7. " " gonangium. × 20.