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“..... per litora spargite muscum,
Naiades, et circum vitreos considite fontes:
Pollice virgineo teneros hic carpite flores:
Floribus et pictum, divæ, replete canistrum.
At vos, o Nymphæ Craterides, ite sub undas;
Ite, recurvato variata corallia trunco
Vellite muscosis e rupibus, et mihi conchas
Ferte, Deæ pelagi, et pingui conchyliis succo.”
N. Parthenii Giannettasii Ecl. 1.

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I.—*On some Deep-sea and Shallow-water Hydrozoa.* By
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[Plates I. & II.]

THE forms described in the present paper consist chiefly of deep-sea Hydroida which were obtained by Mr. C. A. Bishop while engaged in repairing the cable off the Cape Verde Islands. With the exception of the variety of *Diphasia pinaster*, which was taken by Mr. Bishop from the Madeira cable off Lisbon, and the specimens of *Cryptolaria conferta* presented by Miss M'Lea, the Hydroida were taken by Mr. Bishop from the cable off S. Antonio, the depth being, as Mr. Bishop assured me, over 500 fathoms. Though but a very small collection, yet the forms obtained are of great interest, since they belong, with but one exception, either to new or rare species, and throw considerable light on the classification of their allied forms. As a contribution to our knowledge of the Hydroida at great depths the collection is a valuable one, while the many points which it serves to elucidate in the characters of structures which had hitherto been imperfectly known or altogether misunderstood give to it a special interest. A definite contribution is thus made to our know-

ledge of the gonosome of *Streptocaulus*, which throws considerable light on corresponding parts in other genera; while many facts in the variability of the corbula in *Aglaophenia*, in the development of the ramuli in *Streptocaulus* and *Antennularia*, and in the occurrence of nematophores in forms (*Zygo-phylax*) other than the Plumulariidae are clearly established.

The specimens were obtained under circumstances of great personal inconvenience by Mr. Bishop as the cable came in, and were carefully dried, preserved, and brought to the British Museum, since, as he expressed to me, he thought it likely that any specimens from the deep sea might be of interest to naturalists. Mr. Bishop has thus earned the thanks of all zoophytologists for this contribution which he has made to their science, and has at the same time set an example to all those who, whatever may be their station in life, have more or less favourable chances of adding to our stock of knowledge.

The specimens of *Cryptolaria* presented by Miss M'Lea are especially interesting, since they show the nature of the gonotheca. Of much interest also are the specimens of *Distichopora granulosa* and *D. conferta*.

Order HYDROIDA.

Family Eudendriidae.

Eudendrium annulatum.

Eudendrium annulatum, Norman, Ann. & Mag. Nat. Hist. 1864, p. 83, pl. ix. figs. 1-3.

Two small specimens were obtained, which I have doubtfully referred to this rare species, with which they agree in their shrubby habit, in their regularly annulated branches, and in the irregular network of small tubes which cover the surface of the main stems. It seems to differ, however, in that its ramules are often much elongated, while the whole hydrophyton seems to be thinner and much more delicate throughout.

Family Lajoëidae.

Lajoëa tenellula.

Lajoëa tenellula, Allman, Mem. of Mus. Comp. Zool. Cambridge, U.S.A. vol. v. no. 2, p. 12, pl. viii. figs. 3 & 4.

Several specimens growing together on a portion of the cable are referable to this species. The specimen on which the species was founded evidently was quite a young one; for though the ultimate ramuli and the hydrothecæ are com-

paratively minute, yet the whole hydrophyton may attain with age a comparatively large size, becoming erect or suberect and branched, with the stem and chief branches fascicled. The peduncle of the hydrotheca is very variable in thickness, but it never becomes very thin; the rings of elongation of the hydrotheca are generally very distinct and from two to four in number. Height of the largest specimen about 80 millim. when placed in water and allowed to disentangle itself from the closely curled manner in which it dries.

Cryptolaria conferta. (Pl. II. fig. 1.)

Cryptolaria conferta, Allman, Mem. of Mus. Comp. Zool. Cambridge, U.S.A. vol. v. no. 2, p. 17, pl. xii. figs. 6-10.

Specimens which do not seem to me to differ from this species have been presented to the British Museum by Miss M'Lea. On some specimens, which I regard as female stocks, occur curious large elongated bodies, which call to mind the large elongated gonothecæ of various species of *Campanularia*, and which leave no doubt in my mind that they are the real gonothecæ of the species. These bodies are placed on the branchlets and on the distal portion of the main branches, and are directly continuous with one of the fascicled tubes of the stem. They are about from four to six times the length of the free portions of the hydrothecæ on the distal parts, elongato-cylindrical with a plain circular orifice, constricted at the base, where they join the tube of the stem, and attached throughout their whole length to the branch or branchlet from which they arise. They are often much covered at different parts by small fascicled tubes of the stem.

Different structures have been described by Prof. Allman, Mr. S. F. Clarke, and Mr. J. W. Fewkes as occurring on various species of *Cryptolaria*, which have been regarded by them with more or less certainty as being the gonosomes of those species. In the second part of the narrative of the cruise of the 'Challenger,' p. 752, in a note on the Hydroida, Prof. Allman, however, states that on a specimen of this genus, from a depth of 2600 fathoms, "we have been made acquainted with its gonosome, which had not previously been detected." As there have been so many different views as to the structure of these parts, I have deemed it advisable to notify the presence of gonothecæ on this specimen, in order that it may afford what confirmation may be possible to this later view of Prof. Allman.

Loc. North Atlantic. Lat. $48^{\circ} 33' 52''$, long. $10^{\circ} 33' 14''$. Brought up by the sounding-wire from a depth of 500 fathoms (Mr. Hamilton).

Family *Zygophylacidae*.

Hydrothecæ continuous with, but not jointed to, a lateral process of the stem; paired nematophores or nematophore-like bodies at the base of the hydrothecæ, one nematophore being on each side on the lateral process.

ZYGOPHYLAX, nov. gen.

Hydrocaulus erect, branched, composed of many tubes aggregated together; branches unjointed; hydrothecæ biserial, alternate, tubular, sessile, narrowed and constricted towards the base, and continuous with a slightly enlarged lateral projection of the stem. On the raised lateral edges of this process are placed two small, elongated, tubular structures, one on each side at the base of the hydrothecæ, which are constricted and jointed towards their base, and which do not appear to differ in any essential particular from the jointed, stalked nematophores which are characteristic of so many of the Plumulariidæ.

Reproduction unknown.

This genus is only known in the dry state; and the characters of its hydrophyton relate it, on the one hand, to the Lafoëidæ, and on the other to the Haleciidæ. It differs essentially, however, from the forms included under those families, and notably so in the possession of the paired nematophores at the base of the hydrothecæ—a character so striking and constant as to justify, in my opinion, the formation of a new family to receive it.

Prof. Allman, in his Report on the Plumulariidæ of the 'Challenger' expedition (p. 6), has given an extremely valuable note on our knowledge of the occurrence of nematophores or nematophore-like bodies in Hydroids other than the Plumulariidæ, and it is interesting to note that such bodies occur on forms allied or referable to *Lafoëa* and *Halecium*. The present form adds another to the list with much the same relation, though the certainty of its position in classification, based on the details of the structure of the complete hydrosoma, must await the confirmation derivable from fresh or well-preserved specimens.

Zygophylax profunda, n. sp. (Pl. I. fig. 4.)

Stem fascicled, erect, much branched; branches very thin, springing immediately from beneath a hydrotheca, which therefore becomes placed in the axil of the branch. Hydrothecæ very small, alternately placed at regular intervals, short, tubular, and curved so as to look outwards and downwards, with two or three annulations generally well deve-

loped near the margin, the base much constricted and connected with a distinct but small process of the stem; aperture of the hydrotheca circular. Nematophores extremely small, elongated, being more than half the length of the hydrotheca, slightly ringed near the margin, and jointed below to a thicker basal portion which is placed on the proximal side of the base of the hydrotheca.

The specimens of this species form small branched colonies which are about 30 or 40 millim. in height, and when dried are of an earthy brown colour. They were found growing on the cable and also attached to specimens of *Diphasia pinaster*. In these dried specimens the delicate nematophores are often found more or less broken away, but the remaining basal portion easily marks their original position on each side of the base of the hydrothecæ.

Family Sertulariidæ.

Diphasia pinaster.

Sertularia pinaster, Ellis & Solander, Zooph. p. 55, pl. vi. figs. b & B.

Diphasia pinaster, Hincks, British Hydroid Zoophytes, p. 252, pl. 50. fig. 1.

Several specimens of this species were obtained. They agree in nearly every particular with the characteristic form of the species, except that the female gonothecæ are usually tetraspinous, bearing only the single lower circle of spines, while occasionally on other gonothecæ on the same hydrophyton two very small spines of the upper circle are also present. In accordance with the position and prominence of the four larger spines, the female gonothecæ have when dried a more or less quadrangular shape. The spines on the female gonothecæ of this species are thus seen to vary from four to eight. The male gonothecæ are much smaller, and have the characteristic quadrangular shape, with the four angles produced into very prominent spines.

To this species I have referred, somewhat doubtfully, some other specimens obtained from the Madeira cable off Lisbon, in which the distinct fold at the point of divergence of the superior half of the hydrotheca is scarcely or not at all represented. In other respects, in the characters of the hydrothecæ and in the habit of the hydrophyton, they are closely like the present species. They present a decided approach to the *D. coronifera* and the *D. elegans*. No gonothecæ are present on the specimens, and the final position of the form must remain doubtful until the nature of these structures is observed. For the present I distinguish it as

Diphasia pinaster, var. *arcuata*.

Family Plumulariidæ.

Several of the genera of this family are in great need of revision. The characters by means of which *Plumularia*, for instance, is separated from *Antennularia* are now become extremely vague, since the verticillate arrangement of the ramuli in the latter has had to be abandoned as a generic character. In *Antennularia* the ramuli may be few or many, verticillate or scattered, while in the young colonies and on the basal parts of more advanced ones the ramuli are placed singly and alternately, becoming afterwards placed in pairs, a condition that obtains in the young forms of our common *Antennularia antennina*. *Plumularia* does not thus seem to have any constant natural character by which to separate it from *Antennularia*. The genera *Antennopsis* and *Hippurella* seem also inseparable from *Plumularia* and *Antennularia*. In speaking of *Hippurella*, I use the name as defined by Prof. Allman in his "Report on the Hydroids of the Gulf-stream," where it is stated that the "ultimate ramuli are alternate and pinnate towards the proximal ends of the branches, but towards the distal ends surrounding the branches 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."

Mr. J. W. Fewkes states (Bull. Mus. Comp. Zool. Cambridge, U.S.A. vol. viii. p. 134) that in a form which he has identified as *Hippurella annulata*, Allman, these verticillate branches are but verticillate ribs, destitute of hydrothecæ, and that they bear simply a row of nematophores, being thus a special form of the phylactocarp in which the gonophores are borne between successive verticils of these ribs. Mr. Fewkes has not stated, so far as I am aware, that this is a redescription based on a reexamination of Allman's type specimen, so that, until such information be forthcoming, in the face of the explicit statement of Prof. Allman quoted above from his description, it seems unavoidable to conclude that Mr. Fewkes has described some form which, though closely agreeing in many of its features with the *Hippurella annulata*, Allman, is quite distinct from it, and is truly referable to a new genus.

Plumularia variabilis, n. sp. (Pl. II. fig. 2.)

Hydrocaulus attaining a height of more than 60 millims., simple, slender, not fascicled, very indistinctly jointed, and

springing from a tangled mass of small tubular filaments; pinnæ alternate, distichous, extremely thin and slender, each borne close to the distal end of an internode of the stem, where it is supported by a long process much swollen at the base; the mode of jointing of the pinnæ is most variable, the proximal internode is short and destitute of hydrotheca, and is often followed by one or two short internodes before the hydrotheca-bearing internode, so that there may be one, two, or three distinct internodes between the process of the stem and the first hydrotheca-bearing internode; the hydrotheca-bearing internodes always long, frequently alternating with one long non-hydrothecate internode, and not unfrequently with two or three shorter ones, while, as frequently the internodes which follow one another all bear a hydrotheca; in this latter case the internodes are extremely elongated, and instead of bearing the hydrotheca towards the centre of their length, bear them near their proximal extremity. Hydrothecæ very small and shallow, their width and depth scarcely exceeding the general diameter of the pinna. Nematophores extremely numerous. Besides the pair placed at the sides of the hydrotheca there is a single nematophore on the proximal part of each hydrotheca-bearing internode, and in those cases in which these internodes are much elongated and follow directly on one another, two nematophores are placed at short distances on their distal portion. On the long intervening internode two nematophores are present, and when this is replaced by two or more shorter ones, each then bears a single nematophore. The proximal internodes which follow the process bear a nematophore, and the internodes of the stem carry ten or more; of these, two are carried on each side of the internode in a line above the pinnæ, so that there are four nematophores between successive pinnæ on the same side of the stem; one is placed on each side of the proximal part of the internode between the rows of alternate pinnæ, while two pairs are placed on the process which carries the pinna, one at its upper and one at its lower end.

The gonothecæ are short, suboval or slipper-shaped, and slightly curved to one side, with an oval subterminal orifice, borne singly or in pairs on the swollen base of the processes of the stem in the axils of the pinnæ.

In the dried specimens of this species a curious torsion of the stem is observable, so that instead of there being two straight rows of alternate pinnæ, a complete spiral is formed by these rows in about a length of 30 millim. In this state the arrangement of the pinnæ is singularly similar to what is found in the genus *Antennopsis*, Allman, which, judging by

the figures given, can hardly be separated from *Plumularia*, since in all essential features the two genera seem to be identical, with but the slight exception that the single pinna borne by each joint occasionally departs in *Antennopsis* from the ordinary distichous alternate arrangement. This condition seen in the dried state of the present species entirely disappears when the specimen is placed in water; the torsion of the stem becomes lost and the specimen assumes the normal pinnate habit.

In many of its characters this species recalls *P. antennata* and *P. megalocéphala*.

Plumularia delicatula, n. sp. (Pl. II. fig. 3.)

Hydrocaulus attaining a height of more than 100 millim., simple, not fascicled, very distinctly jointed, of very variable thickness in different specimens, and often quite slender, rather wiry, arising from a mass of tubular filaments. Pinnæ alternate, one on each internode, very thin and delicate, attached to a rather short process of the stem, which is scarcely or not at all swollen at the base; regularly jointed with oblique joints; alternate internodes bearing hydrothecæ and rather elongated, being nearly twice the length of the intervening internodes, which are about four times as long as they are broad; each internode more or less marked by slight annular constriction at their extremities, chiefly noticeable on the proximal internode of the pinna. Hydrothecæ rather deeper than their width, which is about twice the general diameter of the internodes. Nematophores numerous, two at the lateral margins of the hydrotheca and one at its proximal side, one on the intervening internode, one or two on the internode which is attached to the process of the stem; one on each side of the base of this process, and two placed singly along the stem on each internode in a line above the process of the internode below.

Gonothecæ borne in the axils of the pinnæ, flask-shaped, elongated, with a short neck.

The delicate pinnæ in this species are often broken off in dried specimens, when but a rather wiry stem is left. Its closest ally seems to be *Plumularia setacea*, from which it differs in the nature of the joints, in the relative length and thickness of the internodes, and in the disposition of the nematophores on the stem and on its processes.

Antennularia irregularis, n. sp. (Pl. II. fig. 4.)

Hydrocaulus simple, jointed, slightly thickened, attaining a

height of about 15–20 centim. or more, closely crowded to form wide dense tufts, the hydrorhiza of which has the form of a rather thin spreading mass of closely crowded entangled filaments of different sizes. Ramuli extremely slender, jointed, arranged in a very variable manner; on the basal part of the hydrocaulus they are alternate, placed singly, one to each joint, but in such a manner that they do not strictly fall in the same plane; higher up the stem they are arranged in pairs, the pairs decussating; while in the larger number of stems this condition is again lost at the upper part by the ramuli becoming placed in threes at each whorl, each three being so placed as to be vertically above or below every alternate three, so that a hexastichous arrangement is produced; these upper ramuli are borne on a long process (of the stem), which is slightly swollen at the base; one or two short internodes follow this process before the first hydrotheca-bearing internode, while between the hydrotheca-bearing internodes one long or two shorter internodes are placed. The internodes are very slender and usually much elongated. The hydrothecæ are small and shallow, slightly wider than the general diameter of the ramulus. Nematophores rather variably arranged; one below each hydrotheca on the same internode and two above it at the lateral margins, two on the intervening long internode or one on each of the replacing shorter ones, and one on each of the short proximal internodes following the process of the stem; on this process one or two nematophores are placed singly along the inner side, and one is placed on each side of the swollen base, nearly in the axil of the ramulus; one nematophore is placed on the stem directly above the point of origin of each ramulus.

Gonothecæ borne singly in the axil of the ramuli, rather short, suboval, and curved, with an oval subterminal orifice.

If the genus *Hippurella* as defined by Allman could be maintained, this form would have to be referred to it; but it seems to me impossible to retain that genus, since the varying position of the ramuli on which it is founded is a common characteristic of *Antennularia*, as shown by their earlier stages. In the common British species, *A. antennina*, the ramuli are at first arranged *alternately*, as in *Plumularia*, then in *pairs*, before attaining their verticillate condition (Hincks, Brit. Hydroid Zoophytes, vol. i. p. 281).

The species, in the general arrangement of its ramuli at different parts of its hydrocaulus, recalls the species *A. hexasticha*, *A. Johnstoni*, *A. decussata*, and *A. Janini*; but in essential characters it cannot be confounded with either of them.

Antennularia profunda, n. sp. (Pl. II. fig. 5.)

Hydrocaulus fascicled at the base and springing from a tangled mass of fine fibres, branched, erect, indistinctly or rarely jointed below, more numerous so above, attaining a height of more than 15 centim., and in the specimen obtained remaining unbranched with subopposite pinnate ramuli for nearly its whole height. At its upper end the ramuli lose their pinnate arrangement and become irregularly placed, forming four or six rows, two or three ramuli being often placed at the same level and alternating with those above and below them, but not closely crowded; where this subverticillate arrangement of the ramuli takes place, young branches on which the ramuli have the same subverticillate arrangement begin to develop. Ramuli thin and long, attached to a long process of the stem, which is swollen below, jointed, each internode bearing a hydrotheca, and having a length between three and four times its diameter. Hydrotheca small and shallow, its width being about equal to the diameter of the internode. Nematophores very numerous, four on each internode of the ramulus, one at its distal and one at its proximal part, and two at the lateral margins of the hydrotheca, two pairs on each of the lateral processes of the stems in the proximal portions of the colony, and three pairs on those in the upper portions, two on the proximal and three on the distal parts of the stem above the point of insertion of each ramulus, while lines of nematophores are found running up the stem between the rows of the ramuli. In the axil of each ramulus is a slight swelling with a small pore, apparently a base for the attachment of gonothecæ. Gonothecæ unknown.

This species is close to *A. ramosa*, from which it differs chiefly in its general habit, in the arrangement of the ramuli, in the relative length and thickness of the internodes of the stem and ramuli, and in the disposition of the nematophores on the stem. It differs markedly in essential characters from *A. tetrasticha*, which it much resembles in general habit. It is close to *A. norvegica*, but is easily distinguished by its branched hydrocaulus, its more verticillate ramuli, by the relatively short and thick smooth internodes, and the number and disposition of the nematophores throughout.

Aglaophenia acacia.

Aglaophenia acacia, Allman, Challenger' Hydroida, pt. i. p. 38, pl. xii. figs. 1-4.

Numerous specimens were obtained which differ in unim-

portant points from the 'Challenger' type specimens. They consist of simple unbranched stems, the larger of which are about 70 millim. in height, and they are thus destitute of the characteristic habit which marks the old specimens of the species. The type specimen figured in the report on the 'Challenger' Plumulariidæ was full-grown and evidently an old specimen, while the present specimens are but young forms. With the exception of this difference of habit, due to age, and of a slight difference in the corbula, the forms agree in every essential respect. The difference in the corbulæ presents itself in their variable length. Sometimes the corbula is composed of a few pairs of leaflets, especially in those at the distal parts of the colony, where there are usually about six or seven pairs, while again there may be present a large number of pairs, ten or more, which are chiefly placed on the proximal parts. The shape of the corbula consequently varies considerably, from a rounded oval to a narrow cylindrical form, the one passing insensibly into the other.

In essential characters this species seems to be extremely close to *A. tubulifera*, *A. calamus*, and *A. rigida*.

Streptocaulus pulcherrimus. (Pl. I. fig. 5.)

Streptocaulus pulcherrimus, Allman, 'Challenger' Hydroida, pt. i. p. 48, pl. xvi. figs. 1-3.

Of this beautiful and extremely interesting form five colonies were obtained, one of which attains a height of about 30 centim. They are especially interesting since they supply the characters of the gonosome which were wanting in the 'Challenger' specimens, while at the same time the origin of the spiral arrangement of the hydrocladia from the pinnate form is clearly seen at the proximal parts of the colonies. In some of the colonies the hydrocladia are absent from the basal part for a distance of about 5-8 centim., while in others they are continued nearly to the extreme base. These basal hydrocladia are confined to one side of the stem and are alternately arranged on each side of a line of more or less rounded adnate nematophores, and spread in opposite directions, thus having a strictly pinnate disposition. Above this basal part the planes of the hydrocladia gradually become closer, until the hydrocladia become placed in one and the same plane intermediate between their former positions, and are attached not on each side, but in the direct line of the nematophores of the stem. The torsion of the stem now gives the spiral arrangement which is so distinctive of this form. In the dried state this spiral arrangement is scarcely

or not at all perceptible; but on placing the specimen in water it assumes its normal habit.

The gonosome consists of gonothecæ, which are borne neither directly by the hydrocladia nor by modified protective branches, but are seated directly on jointed appendages of the hydrocladia, one gonotheca to each joint. These appendages are placed laterally at the upper basal part of the mesial nematophore, immediately below the base of the hydrotheca, and are always situated on the left side—left, that is, to one standing in the hydrotheca, so to speak, and looking towards its pointed margin. They are unbranched and jointed, and are placed either on consecutive mesial nematophores or irregularly. The joints are similar throughout, generally three or four in number to each appendage, narrowed at the base and expanded at the top, so as to be obconical or subtriangular; the expanded upper lateral edges chiefly formed by two rather short nematophores, one at each edge, between which is placed the narrow base of the joint above, while below this point of juncture and on the front of the joint (that is on that part which looks towards the hydrotheca below which the appendage is situated) is seated the gonotheca, which thus occupies the upper anterior portion of the joint. The remaining anterior portion of the joint is evenly divided by two transverse constrictions.

The gonothecæ are sessile and elongato-pyriform, with a suboval subterminal orifice; they are placed one on each joint of the appendage, and, where broken away, leave their base of attachment exposed to view.

From the structure of the parts thus described it will be seen that the genus *Streptocaulus* calls to mind the peculiar condition found in *Cladocarpus*, in which the ramuli bearing gonothecæ are not strictly modified hydrocladia, but appendages of the hydrocladia, with this essential distinction, however, as it seems to me, that while in *Cladocarpus* these structures may possibly be imagined as being more or less protective, and thus as peculiar forms of the phylactocarp according to the definition of Prof. Allman, yet in *Streptocaulus* they can in no sense be considered as protective, but seem rather to be a repetition on a more complete scale of the structures found in such a genus as *Schizotricha*.

In *Schizotricha* the gonothecæ are not strictly borne by the hydrocladia, but on a basal portion which seems strictly homologous with the reproductive ramuli of *Cladocarpus*. A multiplication of such parts as the basal segments of *Schizotricha*, giving a jointed ramulus, in which each joint bears

lateral nematophores and a gonotheca, is the exact condition found in *Streptocaulus*; while in *Cladocarpus* this condition is carried a step further, in that the ramuli become branched, with few or many joints, some of which only bear gonothecæ.

Schizotricha has been referred by Prof. Allman to the section *Gymnocarpa* of the Eleutheroplea, and *Cladocarpus* to the section *Phylactocarpa* of the Statoplea; and, judging on the point of function as to whether the reproductive appendages of the hydrocladia on which the gonothecæ are placed are or are not protective, the genus *Streptocaulus* must be removed from the Phylactocarpal Statoplea, among which it was temporarily placed, to the section *Gymnocarpa*. On the other hand, since the reproductive appendages and segments which bear the gonothecæ seem in the three cases to be strictly homologous, and thus but rudimentary or varying forms of the phylactocarp, it seems necessary, if the terms *Gymnocarpa* and *Phylactocarpa* are to be retained with any definite meaning, that all three genera should be placed among the phylactocarpal forms.

Order HYDROCORALLINEÆ.

Family Stylasteridæ.

In the following descriptions of new species of the genus *Distichopora* detailed mention is made of the characters of the surface of the cœnosteum, of the form and mode of arrangement of the pore-rows, of the relative size, shape, and position of the gastropores and dactylopores, and of the nature of the ampullæ. Short descriptions, with special reference to these characters, are also given of those previously-described species which agree with them more or less closely in general form and coloration, in order to point out the more marked differences which are presented by those species. The characters of the ampullæ call for special notice in the diagnosis of the species, since well-marked differences in the structure of these parts obtain in different species of the genus. Such certainly may be affirmed after a very careful examination of a large number of stocks in which the ampullæ present the appearance of raised more or less vesicular swellings on the cœnosteum. For the figures given of the cyclosystems parts have been selected at some distance from the extreme apical points, since at such points the dactylopores become markedly tubular and prominent in all or nearly all species of *Distichopora*.

Distichopora granulosa, n. sp. (Pl. I. fig. 1.)

Cœnosteum branched, regularly flabelliform, somewhat incrusting at base, of a rich scarlet-red colour on the distal portion of the main branches and throughout the branchlets even to the tips, except where fracture has taken place at the extremities, the small commencing growth at such points being very pale reddish; on the basal part of the main branches and on the incrusting portion the colour becomes of a pink-red. Branches short and thick for the size of colony, being about 7-12 millim. thick at the base of branches that are about 30 millim. in length, and diminishing gradually in size to about 2 millim. diameter at the tips, compressed at the base, round above; branchlets short, round, obtuse, rather thickened at the base and about 2 millim. thick at the apex, which is often slightly expanded where division is taking place. Cœenchyma dense, the surface conspicuously roughened and granulated either by crowded bluntly conical eminences, between which are placed small scattered pores, or by sinuous irregularly confluent or reticulated ridges, which are more usually found towards the distal parts of the cœnosteum.

Cyclosystems regularly arranged on opposite sides in distinct, deep, continuous lateral furrows, the width between the outer edges of the dactylopores being about .75 millim. Gastropores rather small, circular or slightly elongated transversely, slightly unequal and unequally separated, the partition between them often equal to their diameter, and not rising above the bottom of the furrow; style deep, very thin, and obsoletely hirsute; in section the gastro-canal is seen to be nearly smooth. Dactylopores large in comparison with the gastropores, being about one third to one fifth the size of the larger gastropores, placed on the margin of the furrow, at distances apart generally exceeding their width, elongated transversely, with their outer and lateral margins much elevated above the surrounding surface, so as to present in profile a series of distinct tubular or spout-shaped eminences; the inner margin is generally wanting, so that the dactylopores open on that side into the gastropore furrow. Ampullæ abundant, scattered irregularly or closely grouped, forming rounded eminences about .75 millim. in diameter, marked on the upper surface by the small sinuous irregular ridges which are characteristic of the cœnosteum, between which are several small scattered irregular pored openings, which communicate with a single cavity within; the walls of the ampullæ become very thin with age, and finally break away.

Locality. Raratonga? B.M.

Two specimens of this handsome species were presented to the national collection by Prof. Flower.

A marked feature of this species is the strikingly rich coloration, which is continued even to the tips of the cœnosteum, except where fresh growth, consequent on fracture, has commenced. This character, with the special structure of its cœnenchyma and of its cyclo systems, will readily serve to distinguish it from all other species. Special attention must be called to the decided resemblance which obtains between the forms of the dactylo pores in this species and in those of the genus *Errina*.

Distichopora conferta, n. sp. (Pl. I. fig. 3.)

Cœnosteum forming an intricately and crowdedly branched fastigiata clump, in which the branchlets on the separate branches are arranged in a more or less flabellate manner; of a delicate carmine-red colour, with whitish tips. Branches much divided, short, very slender and round, slightly compressed at the extreme base, and very seldom coalescent; branchlets very small, round, obtuse, about 1.5 millim. thick at the apex, which is slightly expanded where division is taking place. Cœnenchyma dense, the surface strongly granulated, marked throughout by small, crowded, conical eminences, between which are minute scattered pores. Cyclo systems regularly arranged on opposite sides in continuous rows, seldom forming furrows, except at the extreme apical points, since the partitions between the gastropores are usually level with the general surface. Gastropores rather large, seldom circular, more often slightly elongated in the direction of the rows, usually with a very irregular outline and rather prominent septa-like internal projections, as though in process of division, unequal and unequally separated, except at the apical parts, where the partitions are very narrow; style very deeply placed, thin and finely hirsute; in section the gastro-canal is found to be papillose. Dactylo pores quite minute, irregular, unequally placed, elongated slightly in a transverse direction, nearly even with the surface, except at the extremities, where they are rather elevated and tubular. Ampullæ (apparently female) abundant, scattered or grouped, forming rounded eminences nearly 1 millim. in diameter, marked by straight radial ridges, generally from 5 to 8, which pass from the centre of the ampulla to the outer border, where a circle of rather large

pored openings, closed by thin membranous tissue and placed between the ridges, leads into the single central cavity of the ampulla.

Locality. Raratonga. B.M.

Two specimens of this beautiful form were presented to the national collection by Prof. Flower. I have been enabled to describe this species through the courtesy of Prof. Charles Stewart, who first remarked its specific distinctness.

A very fine specimen in the museum of the Royal College of Surgeons agrees most closely, except in the characters of its ampullæ, with this species. These ampullæ are raised and confluent, the individual ampulla being undistinguishable in the mass. Their surface is covered by the conical markings characteristic of the cœnosteum, and is irregularly and rather sparsely pored with minute openings. This form of the ampullæ is constant throughout the stock, while that described for the species is constant on the two stocks in the British Museum. I am strongly inclined to think that these confluent ampullate swellings are the forms characteristic of the later stages of the ampullæ of the male stocks, which in the earlier stages are sunk beneath the surface of the cœnosteum. This seems to me borne out by the fact that in a large series of specimens of *D. violacea* in the national collection the two forms of the ampullæ are present—the one with the stelliform much swollen eminences, which, though grouped together, are distinct from each other, and are bounded by an outer circle of pored openings; the other with smaller swellings, in which separate ampullæ are seldom distinguishable, and having scattered minute pores over the surface.

This species, though close to *D. granulosa*, differs from it in many particulars, of which the crowded corymbed mode of growth, the coloration, the smaller and more slender habit, the nature of the surface, the arrangement of its cyclo systems, and the size, position, and form of its dactylo pores and gastropores may be cited.

Distichopora Milesii, Quelch.

D. Milesii may be separated from both of the foregoing species by its very slender regularly flabellate cœnosteum; by the minutely granulated or smooth surface, which is rendered rough and uneven only by the irregular and abundantly developed ampullæ; by its dull lake-red or almost crimson colour; by the very distinct, wide, deep, continuous lateral

furrows, about 1 millim. in diameter from the extreme outer edges of the dactylopores; by the very large gastropores slightly elongated in the direction of the furrow; by the very small dactylopores which are placed on the distinctly raised ridge of the furrow but above which the separate dactylopores are but slightly prominent except at the apical parts; by the papillose gastro-canal; and by the smooth outer surface of the massed ampullæ which are neither roughened by ridges nor lined by regularly-arranged pored openings.

Distichopora coccinea, Gray.

D. coccinea may be distinguished by its flabellate cœnosteum with much compressed branches and branchlets, crowded on their faces with numerous short often tuberculate young branchlets, which at first are perpendicular to the general plane of the cœnosteum; by its dull crimson-red colour; by its smooth surface; by the small and shallow but distinct lateral furrow; by the small gastropores which lead into a smooth canal and are separated by rather wide partitions; by the very minute dactylopores which are not raised above the general surface and which are separated by distances generally greater than their own diameter; and by the distinctly raised ampullæ which are smooth on their upper surface and are surrounded at their base by a circle of comparatively large pored openings which lead to the central cavity and which are separated by septiform partitions passing to neighbouring ampullæ or to the surrounding cœnenchyma.

Distichopora rosea, Kent.

D. rosea is distinguished by its irregularly flabellate cœnosteum with rounded, thick, obtuse branches and branchlets; by its smooth surface which becomes slightly granulated with obtuse conical eminences towards the apical parts; by its deep peach-blossom red colour; by its extremely wide, deep, distinct lateral furrows which are interrupted at the angle of branching; by its comparatively small unequal gastropores, unequally and often widely separated; by the obsoletely papillose gastro-canal; by the extremely large dactylopores (easily distinguishable by the naked eye), the inner margin failing, so that the pore opens into the furrow while the outer and lateral margins are much elevated and thickened; and by the ampullæ, which are undistinguishably massed together in large raised groups with minute pored openings scattered over the irregularly granulated upper surface.

Distichopora breviserialis, Quelch.

D. breviserialis is distinguished by its irregularly flabellate cœnosteum, with short, thick, obtuse branches and branchlets, the branches being much compressed at the base, rounded above, and often coalescent; by its pale aurora-red or deep flesh-red colour; by its granulated surface, the small conical granules being much enlarged and more prominent at the distal parts; by the obliteration of the pore-rows, except at the apical parts of the branches and branchlets and at the parts of the cœnosteum where fresh branchlets originate; by the rather small unequal gastropores, which are placed in an irregular line at the bottom of a shallow furrow at the apical parts, and which gradually diminish and disappear by overgrowth; by the nearly smooth gastro-canal; by the small dactylopores, which are placed on the edges of the shallow furrow at the extremities, but which become gradually even with the surface, and finally are obliterated; and by the ampullæ, which are often grouped together, and consist of a raised central portion which is marked on its upper surface with small, more or less radial, rather sharp ridges, and is surrounded by a circle of comparatively large pored openings, which are separated by thick septiform partitions with which the ridges are continuous, passing to neighbouring ampullæ or to the surrounding cœnenchyma; in the later stages of these ampullæ, when the central portions break away, the group presents the appearance of a rough mass with irregular pores, in which the single central cavities of the ampullæ are hardly distinguishable from the surrounding openings which lead to them.

Distichopora gracilis, Dana.

D. gracilis is distinguished by its regularly flabellate and extremely slender habit; by its fainter or reddish coloration; and by its compressed branches; but a more complete description of the type specimen of this little-known species is required, since little or nothing is known as to the nature of its cœnenchyma, its surface, its cyclo-systems, and its ampullæ.

Distichopora nitida, Verrill.

D. nitida is distinguished by its large regularly flabelliform habit; by its rounded branches, somewhat compressed at the base; by its rounded obtuse branchlets, expanded at the tips during division; by its extremely variable coloration, ranging

from bright red to light orange; by its minutely granular surface, becoming almost smooth at the basal parts; by its obsolete or very shallow lateral furrows, the partitions between the gastropores being generally raised to the surrounding surface; by the unequal large gastropores; by the minute superficial dactylopores; and by the scattered or grouped raised granulated ampullæ, in which the pores communicating with the central cavity are arranged in a circle around the base, the septiform partitions between them passing off to the surrounding cœnenchyma or to neighbouring ampullæ.

Distichopora ochracea, n. sp. (Pl. I. fig. 2.)

Cœnosteum branching in a plane, of a dull ochre-yellow colour, sometimes becoming white at the tips; branches thick, rounded, or slightly flattened; branchlets short and rather thick, rounded, obtuse, expanded at the tips before division takes place. Cœnenchyma rather firm; surface minutely granular at the basal parts of the branchlets, becoming more granulated at the extremities, with crowded, very obtusely conical eminences, between which are scattered pores. Cyclo systems regularly arranged in continuous, wide, shallow lateral furrows. Gastropores irregularly placed, unequal, but generally very large, circular or elongated transversely, separated by very narrow partitions, which are often raised to the general surface; gastro-canal very crowdedly papillose; style very deeply placed, slender, and finely hirsute. Dactylopores very unequal, some rather large, others very minute, elongated transversely, the outer and lateral margins scarcely or not at all raised, except at the extremities of the branchlets, where the inner margin is continuous with the rounded edge of the furrow, along which the dactylopores are closely placed. Ampullæ scattered or grouped, consisting of rounded eminences with slightly developed subradial ridges on the central portion, surrounded at the base by a circle of pored openings which communicate with the single central cavity and which are separated by septiform partitions passing off to neighbouring ampullæ or to the surrounding cœnenchyma.

Locality. Solomon Islands, 14 fath. B.M.

This species is founded on a small piece of a cœnosteum which was dredged by H. B. Guppy, Esq., M.B., R.N., Surgeon to H.M.S. 'Lark,' and by him presented to the national collection. It is very distinct from all known species of the genus, being most closely related to the *D. nitida*, Verrill.

EXPLANATION OF THE PLATES.

PLATE I.

- Fig. 1.* *Distichopora granulosa*, natural size, showing ampullæ.
Fig. 1 a. Ditto: pore-rows, magnified.
Fig. 1 b. Ditto: dactylopores, with ridges of the surface, seen laterally, magnified.
Fig. 1 c. Ditto: ampulla, magnified.
Fig. 2. *Distichopora ochracea*, natural size, showing ampullæ.
Fig. 2 a. Ditto: pore-rows, magnified.
Fig. 2 b. Ditto: ampulla, magnified.
Fig. 2 c. Ditto: gastro-canal in section, magnified.
Fig. 3. *Distichopora conferta*, natural size, showing ampullæ.
Fig. 3 a. Ditto: pore-rows and part of surface, magnified.
Fig. 3 b. Ditto: ampulla, magnified.
Fig. 4. *Zygophylax profunda*: portion of hydrophyton, natural size.
Fig. 4 a. Ditto: branch, magnified.
Fig. 4 b. Ditto: hydrotheca and nematophore of one side, magnified.
Fig. 4 c. Ditto: part of fascicled stem, magnified.
Fig. 5. *Streptocaulus pulcherrimus*: proximal part of stem, magnified.
Fig. 5 a. Ditto: reproductive appendage with gonothecæ, magnified.
Fig. 5 b. Ditto: gonotheca, magnified.

PLATE II.

- Fig. 1.* *Cryptolaria conferta*: part of stem with gonotheca, magnified.
Fig. 2. *Plumularia variabilis*: part of stem with pinna and gonotheca, magnified.
Fig. 2 a. Ditto: part of another pinna, magnified.
Fig. 3. *Plumularia delicatula*: portion of stem with gonotheca and pinnæ, magnified.
Fig. 4. *Antennularia irregularis*: stem, showing arrangement of ramuli.
Fig. 4 a. Ditto: part of stem with ramuli, magnified.
Fig. 4 b. Ditto: gonotheca, magnified.
Fig. 5. *Antennularia profunda*: stem, showing arrangement of branches and ramuli.
Fig. 5 a. Ditto: portion of stem, proximal part, magnified.
Fig. 5 b. Ditto: portion of stem, distal part, magnified.
Fig. 5 c. Ditto: portion of ramulus, magnified.

II.—*Notes to the Australian Sponges recently described by Carter**. By Dr. R. v. LENDENFELD, in Sydney.

AS I am just now engaged in writing a Monograph of the Australian Sponges I was particularly glad to receive the

* H. J. Carter, "Description of Sponges from the Neighbourhood of Port Phillip Heads, South Australia," *Ann. & Mag. Nat. Hist.* ser. 5, vol. xv. p. 196.



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