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X.—Contributions towards a general history of the marine Polyzoa

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secondaries suffused with greyish fuliginous, with reddish-brown veins, fringe between the veins cream-coloured; a few indistinct, confused, submarginal whitish spots, similar to those on the external area of the primaries: thorax whitish at the sides, in front, and along the centre, with black tufts behind the tegulæ; abdomen with blackish sides (except upon the last two segments) and a dorsal longitudinal blackish stripe; pectus black; tarsi sandy whitish; venter sandy yellowish. Wings below pale sandy brown; the markings less distinct than above. Expanse of wings, ♂ 4 inches 2 lines, ♀ 4 inches 6 lines.

Darjiling (*Lidderdale*). Type B. M.

Hepialidæ.

15. *Hepialus marcidus*, sp. n.

Primaries above either pale buff or testaceous, mottled all over with greyish brown; a broad interrupted central belt, spotted with little transverse dashes of the ground-colour, and with blackish spots across its centre, grey or greyish brown, sometimes becoming gravel-yellow upon the inner margin (where it is broken up into three or four unequal spots); a discal band, either grey or gravel-yellow, spotted in the centre with black; margin grey, sinuated internally: secondaries semitransparent greyish brown: body dark greyish brown, with testaceous anus; thorax sometimes reddish. Under surface greyish, the markings obsolete. Expanse of wings, ♂ 1 inch 9 lines, ♀ 2 inches.

Darjiling (*Lidderdale*). Type B. M.

In the examples before me the more brightly coloured form is the male, the greyer form the female; it is possible, however, that much variation of tint may occur in individuals of both sexes.

[To be continued.

X.—*Contributions towards a General History of the Marine Polyzoa.* By the Rev. THOMAS HINCKS, B.A., F.R.S.

[Plates IX., X., XI.]

IN the present and following papers I propose to describe and figure a large number of marine Polyzoa from various parts of the world which have hitherto, I believe, escaped notice, and thus to offer a contribution towards that general history of the class which still remains to be written. It is by no

means my intention, however, to confine myself to bare diagnosis. The following points especially may, I hope, receive some elucidation:—(1) geographical distribution—any new localities for known species will be recorded; (2) local variation—the differences exhibited by the same type under differing circumstances will be noted whenever the opportunity presents itself of comparing specimens of the same species from various parts of the world; (3) the limits of variability in each case, and the elements of structure most liable to variation; (4) the true principles of classification. With the descriptions of new forms will be combined notes on such as are little known or misunderstood; and, so far as the space at my command will permit, I shall endeavour to indicate in the case of each genus the number of species already ranked under it, and its geographical range. If I should be able to carry out with any completeness this portion of my programme, these papers will serve as an index to the foreign species which have already been described, as well as an introduction to many that are new.

The classification employed will be that which I have adopted in my 'History of the British Marine Polyzoa,' so far as it applies, and with such modification as may be suggested by an increased knowledge of the morphology of the tribe.

At the close of the series of papers a bibliographical list will be given, containing the principal faunistic and other works which deal with the foreign species of Polyzoa.

I shall commence with an account of a very interesting series of specimens from Madeira, for which I am indebted to Mr. J. Y. Johnson, who is so well known as an investigator of the fauna of that island.

I. MADEIRAN POLYZOA.

Subclass HOLOBRANCHIA, Lankester.

Group *ECTOPROCTA*, Nitsche.

Order **GYMNOLEMATA**, Allman.

Suborder CHEILOSTOMATA, Busk.

Family **Membraniporidæ**.

MEMBRANIPORA, Blainville.

Membranipora tenuirostris, n. sp. (Pl. IX. fig. 3.)

Membranipora Flemingii, Waters, Bryoz. Bay of Naples, Ann. Feb. 1879, p. 122, pl. xiii. fig. 2.

Zoæcia oval, or broad below and narrowed above (rather

irregular in shape), somewhat produced below the aperture, with a broad strongly crenated border sloping slightly outwards; front wall wholly membranous, with the orifice at the very top of it; an acuminate spine at the bottom of the aperture bending inward, and usually two or three on each side. *Avicularia* distributed over the zoarium in the intercellular spaces, placed near the top of the zoecium at one side; beak straight, raised, slanting upwards, elongate, with a narrow central channel; mandible broad at the base, produced above into a slender vibraculoid spine, slightly curved in towards the tip. *Oecium* rounded, silvery, frosted.

Loc. Madeira, on *Pinna* (*J. Y. J.*); Naples, from just below low-water mark to 40 fathoms (*Waters*).

This is undoubtedly the form figured by Mr. Waters, in his catalogue of the Polyzoa of the Bay of Naples, as *M. Flemingii*. It has, however, no close affinity with that species, but belongs to the same section of the genus as the British *M. curvirostris*, mihi, in which there is no trace of a calcareous lamina in front. The avicularium is a striking feature, with its long slender mandible rising from an expanded subtriangular base. The spines are variable in number; but there are usually two on each side, besides the one at the base of the aperture, which is often tall and acuminate. I have met, however, with four on one side and three on the other. The portion of the zoecium which is produced below the aperture is very commonly concealed by the crowding of the cells.

Membranipora nodulifera, n. sp. (Pl. IX. fig. 2.)

Zoecia slender-oval, elongate, wholly membranous in front; margins thin, set with numerous, small, white nodules. *Avicularia* rather large, elliptical, raised in front, generally placed transversely at the top of each cell on a distinct area; mandible rounded (?). *Oecium* very small and shallow, a mere hood over the extremity of the cell, smooth, projecting in front into a sharp prominent point.

Zoarium forming a very regular and delicate network.

Loc. Madeira (*J. Y. J.*).

The nodulated margins constitute the salient characteristic of this very pretty species.

Membranipora crassimarginata, n. sp.
(Pl. IX. fig. 1.)

Zoecia very large and deep, of a regular oval shape, the margin, from the upper rim to the junction with the membranous area (forming a broad border), very strongly crenate;

no calcareous lamina; spines none. *Avicularia* resembling the ordinary zoöcia in form, sometimes rather smaller, occasionally elongated and narrowed, interspersed among the cells; mandible rounded. *Oœcium* somewhat depressed in front, smooth and glossy.

Loc. Madeira (*J. Y. J.*).

In this fine species the cells are distinguished by their regularity of form, their depth, and the broad strongly crenated borders. The *avicularia* are remarkable for their close resemblance to the ordinary zoöcium; in dead specimens they are only distinguishable from it by the stout calcareous bar which crosses the area, and on which the mandible works in the living state. They are probably amongst the simplest of the "primary" forms*.

Membranipora granulifera, n. sp. (Pl. IX. fig. 4.)

Zoöcia irregular in shape, usually expanded towards the bottom and somewhat narrowed at the top; area surrounded by a slightly raised smooth edging, the lower portion filled in by a minutely granular calcareous lamina, which is carried up on each side of the aperture; aperture obscurely trifoliate. A pair of acute *avicularia* above it, one placed on each side, the mandibles directed towards one another.

Loc. Madeira (*J. Y. J.*).

In what seems to be the normal condition the zoöcium is broad below and becomes narrower towards the top; but the cells are closely packed together, and there are considerable differences in the shape, which are, no doubt, due to this circumstance; not unfrequently the lower extremity is produced and pointed. A smooth marginal line encloses the area, which, with the exception of the subtrifoliate aperture, is filled in by a beautifully beaded or granulous plate. The two *avicularia* at the top of the aperture constitute a striking feature, and are constantly present; they are somewhat raised, and are placed one on each side, close to the margin, their pointed extremities directed towards one another and frequently meeting in the centre. There is a total absence of spines in the specimens which I have examined. The species belongs to the *M. Flemingii* group, but is a very well-marked form.

* I have ranged the *avicularia* under three classes—the *primary*, exhibiting the smallest amount of differentiation, the *secondary* or *transitional*, and the *articulated* (Hist. of Brit. Mar. Polyzoa, Introduction).

Membranipora sceletos, Busk.

Lepralia sceletos, Busk, Quart. J. Micr. Sc. 1858, Zoophytol. pl. xx. fig. 3.

This curious species was referred by Busk, who described it from Madeiran specimens, to *Lepralia* of Johnston; but it presents the essential characters of the genus *Membranipora*, and must be ranked under it. I at one time supposed that its nearest affinity was with *Membraniporella*, Smitt; but though the spines meet in the centre of the area and interdigitate, they do not unite so as to form a single piece, nor are they modified into flattened ribs, as in the last-named genus.

There are usually about six spines on each side of the cell, which are very massive, and bend inward abruptly, meeting and interdigitating more or less in the centre. On each side of the orifice is placed a broad and shield-like process (modified spine) bearing some resemblance to the operculum of the Cellulariidae, which has, no doubt, a protective function. Mr. Busk speaks of "an ascending spine at each lower angle of the aperture;" but this is hardly a correct description of the pedunculate lamina or plate which closes in at each side the entrance to the cell. The oöcium is rounded, smooth, and silvery.

Family **Microporidæ**.

SETOSELLA, Hincks.

Setosella vulnerata, Busk. (Pl. IX. fig. 5.)

This interesting form occurs amongst the Madeiran dredgings and in considerable plenty. It has hitherto only been recorded from Shetland and the coast of Norway (Bergen), and has not been noticed at any intermediate station.

The primary zoöcium is very small, with a subtrifoliate aperture, which occupies more than half the area; that is, it exhibits the Membraniporidan structure. Below the area it is produced and somewhat pointed.

There is a peculiarity in the vibracular cell which has not, I believe, been noticed. One side of the margin is more elevated than the other, and, to some extent, overhangs the area; and in the centre of the projecting portion there is a minute prominence. This probably marks the point where the base of the seta is articulated. The same structure is shown in Busk's figures of *Cupularia*, a genus which is nearly allied to *Setosella* (B. M. Cat. vol. ii. pls. cxiv. & cxvi.). Indeed, in any natural system, these two forms must be closely asso-

ciated. I am not acquainted with any other species of *Setosella*.

Loc. Funchal Bay, in 30 fathoms.

Hab. On small shells and fragments of shell.

Family Cribrilinidæ.

CRIBRILINA, Gray.

Cribrilina radiata, Moll, var. (Pl. X. fig. 1.)

Amongst several varieties of this variable species there is one of great beauty which merits special notice. The cells are sometimes much elongated and slender, always delicate in texture, and with a bright and silvery surface. The punctures range continuously across the front wall; and the lines are separated by very inconspicuous ridges; there is no central keel. The triangular space and pore below the orifice are present; but the former is not a prominent feature. The avicularium is of remarkable length, often nearly as long as the cell, narrow and pointed, and not raised (Pl. X. fig. 1). This form has some points in common with the *Lepralia Pouilletii* of Busk, described from a Madeiran specimen; but the latter is destitute of avicularia—a difference, however, of small significance. The *Flustra Pouilletii* of Audouin, with which Busk identifies his Madeiran species, is clearly, in my judgment, a variety of *C. radiata*; and the latter is probably nothing more.

The avicularium of this species is liable to many variations; but I have never seen it so much elongated as it is in the present form.

Of the genus *Cribrilina* few recent species have been recorded. Besides the five which occur on the British coasts (*radiata*, *figularis*, *annulata*, *punctata*, and *Gattyæ*) I only know of three—*Lepralia cribrosa*, Heller, allied to the last-named, *Flustra Jaubertii*, Audouin (probably), and *Cribrilina floridana*, Smitt—which are referable to it. The last may be a mere variety.

Family Microporellidæ.

MICROPORELLA, Hincks.

Microporella decorata, Reuss.

Lepralia decorata, Reuss, Foss. Pol. d. Wien. Tertiärbeck. 89; Manzoni, Bryoz. foss. Ital. Contr. 2, p. 4, pl. x. fig. 25.

Zoecia ovate, separated by deep sutures, highly calcified,

the walls of great thickness, round the edge a conspicuous row of punctures, often channelled; orifice raised, with the peristome somewhat thickened, arched above, almost straight below, rather taller than broad, with about nine marginal spines; in the centre of the front wall, about one third the length of the cell below the orifice, a large circular or elliptical pore, often with a number of nodules about it, and shielded on one side by a low calcareous ridge; on the other side a very large pointed *avicularium*, directed upwards, and reaching to about the middle of the orifice; sometimes an *avicularium* on each side. *Occium* very prominent, gibbous in front, partially invested towards the base with one or more layers of a dense whitish crust.

Loc. Madeira, in 30 fathoms (*J. Y. J.*).

Range in Time. Vienna basin (*Reuss*); Italian Pliocene (*Manzoni*).

Lepralia decorata, Reuss, is a characteristic member of the present genus, ranking alongside our British *M. violacea*. It has hitherto only been known as a Tertiary fossil; but it seems, judging from the number of specimens amongst Mr. Johnson's dredgings, to be far from uncommon at Madeira, and is a very interesting addition to the recent fauna.

It is a very thick-walled species, and, in its older states, presents a very coarse and rugged appearance, the surface being covered with nodules and bosses or traversed by ridges. In some cases the central pore is in great part surrounded by a continuous wall. The punctures are sometimes diffused over the whole surface; often they are arranged concentrically in two or more series. There is generally only a single *avicularium*; but cells frequently occur which are armed with two, and in some specimens almost every cell has one on each side. In young and fresh specimens the texture is delicate and the surface glossy and of a greyish-white colour.

As in *M. violacea*, there is often a striking diversity in the size of the zoecia within the limits of the same colony. There seem to be no differences of any moment between recent and fossil examples; Manzoni's figure of the species is very characteristic.

I am not in a position to give an exhaustive list of the published species which rank under this genus (*Microporella*). The following are all that occur to me at present as belonging to it:—the four British species, *M. ciliata*, *Malusii*, *impressa*, and *violacea*, of which the first two have a very wide range of distribution; *Lepralia californica*, Busk, and *L. personata*, id., both of which are probably vars. of *M. ciliata*;

Lepralia bicristata, id. (Cape Horn), *L. diadema*, Macgillivray, and *L. ceramia*, id. (Australia); *Porina serrulata*, Smitt, and *P. subsulcata*, id. (Florida); and *Lepralia plagiopora*, Busk (Florida and the Crag), which seems to be a mere variety of *M. violacea*.

Family **Myrizoidæ** (part), Smitt.

SCHIZOPORELLA, Hincks.

Schizoporella sanguinea, Norman.

This species, which has occurred on our south-western coasts, attains a remarkable size and beauty in the only Madeiran example which I have seen. The zoecia are perfectly white and porcellaneous, the walls of great thickness and pierced by circular, shaft-like pores. The orifice is large; and its peculiar structure is admirably displayed. The avicularia are much more numerous than I have seen them before, and are of two kinds; they are placed on each side of the orifice:—one raised, with an acute or subacute mandible, usually set transversely almost in a line with the lower lip; the other oval, generally depressed or subimmersed, with a rounded mandible, directed upwards, placed most commonly towards the upper part of the orifice. The positions are not quite constant; but in a large proportion of cases they are as I have described them. The oval avicularium has not, I believe, been noticed before in this species.

Range of Distribution. Britain, south-west; Mediterranean; Madeira; Florida, deep water.

Schizoporella biaperta, Michelin.

The range of this species also is extended to Madeira. A study of Mr. Johnson's specimen shows that the small lateral avicularium is often replaced by a large spatulate one, as in the kindred *S. armata*, mihi. Usually the peristome is elevated round the front and sides of the orifice; and in this respect also an approach is made to the last-named species. There are about five marginal spines*. The surface of the zoecia is rather coarsely granulous, whereas in the British specimens which I have examined it is smooth and polished.

Range of Distribution. England (south-east); Guernsey;

* This character is omitted in the account of this species in my Hist. of the Brit. Polyzoa (vol. i. p. 255), not having been noticed in any British example.

Mediterranean ; Madeira, 30 fms. (*J. Y. J.*) Floridan sea ; Arctic sea.

Family *Escharidæ* (part), Smitt.

LEPRALIA (part), Johnston.

Lepralia Pallasiana, Moll. (Pl. X. fig. 3.)

The oœcia of this handsome and common species have not hitherto been noticed. It is extremely abundant on our south-western coasts ; but amongst the multitude of specimens examined no trace of an ovicell has occurred to me. No writer on the Polyzoa, so far as I am aware, has described them ; but they are present on a specimen from Madeira. They are very shallow, almost semilunate in form, and closely united to the cell above.

Lepralia Kirchenpaueri, Heller.
(Pl. IX. figs. 7, 7 a.)

Var. *teres*.—*Zoœcia* more or less lozenge-shaped, quincuncial, well defined, surface smooth ; orifice arched above, decidedly constricted a little above the lower margin (which is straight) by two prominent denticles, much taller than broad ; peristome slightly raised and somewhat thickened ; a small oval or roundish *avicularium* (or *vibraculum*) on each side, a little below the orifice (generally), placed on a slight eminence. *Oœcium* rounded, smooth, with a rib round the front of it.

Loc. Funchal Bay, 30 fms. (*J. Y. J.*).

It seems better to rank this form as a variety of Heller's species, though there are several points of difference between the two. In the Madeiran specimens the zoœcium is perfectly smooth, whereas in *L. Kirchenpaueri* from the Adriatic the surface is described as "wrinkled and punctured," and Manzoni has figured it from Mediterranean examples with the punctures disposed in distinct radiating furrows. This very marked sculpture certainly contrasts strongly with the simplicity of the Madeiran form ; but the superficial characters of the cell-wall are liable to wide variations. A more important difference perhaps is found in the oœcium, which is described by Heller as only slightly elevated and traversed by radiating ribs ; in the Madeiran species it is by no means depressed and has a smooth surface, the front of which is enclosed by a prominent ridge. In the latter, too, the oral extremity of the cell is much less decidedly narrowed than it is represented by Heller and (more especially) by Manzoni.

The appendages placed one on each side below the orifice are described as avicularia by Heller; but Manzoni states that they are really vibracula. They do not occur in a perfect condition on any of the Madeiran examples; but, from the appearance which they present, I should infer that the latter is the correct view of them.

On the whole, I am inclined to regard the present form as a rather strongly marked variety of Heller's *L. Kirchenpaueri*. It seems to bear a close relationship to *Escharella setigera*, Smitt (Floridan Bryozoa, pt. 2, p. 58, pl. x. fig. 206).

The following are referable to the genus *Lepralia*, as limited by Smitt:—*L. foliacea*, *Pallasiana*, *adpressa*, *hippopus*, *edax*, and (with less certainty) *pertusa* and *polita* (all British); *lata*, Busk (probably identical with *adpressa*), *Kirchenpaueri*, Heller (Adriatic), *Poissonii*, Audouin, *inornata*, Smitt, *cleidostoma*, id., *turrita*, id. (Florida), *depressa*, Busk (Ægean sea). I should also feel inclined to rank with the foregoing the following Floridan species, which are placed by Smitt in his genus *Escharella*, viz. *E. Audouinii*, *rostrigera*, and *setigera* (see Flor. Bryozoa, pt. 2, figs. 56–58).

PORELLA, Gray.

Porella nitidissima, n. sp. (Pl. X. fig. 2.)

Zoecia depressed, disposed in linear series, rectangular, bounded by raised lines; a row of large foramina round the margin, surface punctured and with nodulous ridges, crystalline and lustrous; orifice not raised, arched and expanded above, contracted below, inferior margin straight, frequently a swelling under it; a round avicularium within it. On each side of the orifice, immediately above the lower margin, a small oval avicularium, placed on a prominence and encroaching on the mouth, so as to give it a trifoliate appearance. *Oecium* depressed, half immersed, roughened or granulous.

Loc. Madeira (*J. Y. J.*).

The real shape of the orifice in this species is masked by the two lateral avicularia, which project over it, one on each side, and make it appear distinctly trifoliate. Before their development it presents the characteristic form of the genus, such as we have it in *P. concinna*, Busk. The surface of the zoecium is much depressed and very bright and glossy. There are frequently nodulous processes on the ovicell.

Five British species of this genus have been described.

SMITTIA, Hincks.

Smittia marmorea, Hincks. (Pl. IX. fig. 6.)

? *Lepralia arrogata*, Waters, Bryoz. Bay of Naples, Ann. & Mag. Nat. Hist. ser. 5, iii. (1879) p. 39.

Several fine specimens of this form occur on Mr. Johnson's slides; and they enable me to speak with confidence as to its complete distinctness from *S. cheilostoma*, Manzoni.

Seven British species of this genus have been described. *Lepralia marionensis*, Busk (from Marion Island), belongs to it, and probably *L. galeata*, id., from the Falkland Islands.

Range of Distribution. Cornwall; Guernsey; ? Bay of Naples; Madeira (*J. Y. J.*).

PHYLACTELLA, Hincks.

Phylactella lucida, n. sp. (Pl. X. fig. 4.)

Zoecia somewhat flask-shaped, smooth, and subhyaline, ovate below, rather tumid, distinct, the peristome much elevated, forming an erect, neck-like extension of the cell, surrounding the front and sides of the orifice; margin thin, bearing 5-8 spinous projections, the central one stout, and supporting a minute oval avicularium; a groove round the base of the peristome; orifice suborbicular.

Loc. Madeira, on shell (*J. Y. J.*).

Before the development of the raised peristome the zoecium is simply ovate, with a plain suborbicular or slightly elliptical orifice. When fully formed, the erect neck-like extension nearly equals in length the rest of the cell; it is not continued round the upper margin of the orifice. The edge is slightly everted, and bears a variable number of spinous projections, and an aviculiferous process in the centre. The texture is very delicate, and the surface perfectly smooth.

This form is referred with some doubt to *Phylactella*; it differs from the other known members of the genus in the more erect and tubular character of the raised peristome, and the presence of aviculiferous processes.

Besides the species already noted as occurring in Madeira, the following have been identified amongst Mr. Johnson's specimens:—

Aetea recta, Hincks.

Cribrilina punctata, Hassall.

Membraniporella nitida, Johnston.

Range. Kara sea; North sea; Britain (*passim*); France, S.W.; Bay of Gibraltar; Madeira.

Microporella Malusii, Audouin.

One of the most widely distributed forms.

Chorizopora Brongniartii, Audouin.

Range. British Isles ; France, S.W. ; Mediterranean and Adriatic ; Madeira.

Schizoporella auriculata, Hassall.

Very widely distributed.

Schizoporella armata, Hincks.

Range. England, S.W. ; Algiers ; Madeira.

Schizoporella venusta, Norman.

Range. Guernsey ; Madeira ; Florida.

Mastigophora Hyndmanni, Johnston.*Lepralia adpressa*, Busk.

Range. England, S.W. ; Mediterranean ; Madeira ; Chiloe ; Mazatlan.

Lepralia pertusa, Esper.*Phylactella labrosa*, Busk.

In a series of papers which appeared in the 'Quarterly Journal of Microscopical Science' some years since, Mr. Busk published a list of Madeiran Polyzoa which he had received from Mr. Johnson, and described a considerable number of new forms. About fifty species were recorded as occurring off the island, of which eighteen (or about a third) are also British. In the present paper twenty-five species are added to the Polyzooan fauna of Madeira, raising the whole number to about seventy-five ; and of these seventeen are British ; so that thirty-five species, or nearly one half of those recorded in these papers from the island, are common to it and our own coasts*. Of these, eight (or about a quarter) are confined to the south-western or south-eastern (Hastings) portions of the English coast, whilst about a third have been found in the Crag.

* A large proportion of these have been found in the Mediterranean.

II. FOREIGN MEMBRANIPORINA.

Family Membraniporidae.

MEMBRANIPORA, Blainville.

a. Species with a membranous front wall.

Membranipora albida, n. sp. (Pl. X. fig. 5.)

Zoecia set closely together, oval, wholly membranous in front; border crenate, with a somewhat sharp edge or margin, destitute of spines. *Avicularia* numerous, scattered over the zoarium, placed in somewhat rectangular hollow spaces amongst the cells, which they partially fill; base of avicularium depressed, the beak raised, curved towards one side, extending to the top of the hollow (or avicularian cell), traversed by a narrow central groove; mandible expanded and somewhat crescentic at the base, above slender, curved, spine-like. *Oecium* small, shallow, subarcuate, finely frosted (almost smooth).

Loc. Singapore, on *Tubipora musica* (Mr. Moore, Liverpool Free Museum).

This species, of which the avicularium is the most marked feature, is allied to the British *M. curvirostris*, mihi, from which, however, it is distinguished by the total absence of spines, the form of the oecium, and the very different character of the avicularian appendages.

Membranipora plana, n. sp. (Pl. XI. fig. 2.)

Zoecia large, oval, distinct, surrounded by a narrow border, which is rounded and finely crenate, sometimes slightly produced below the aperture and pointed; front wall wholly membranous, very much on a level with the margin of the cell, so as to give a flattened appearance to the surface of the zoarium. *Avicularia* scattered, placed in somewhat lozenge-shaped intercellular spaces; beak elongate, straight, occupying the centre of the area, traversed by a narrow groove which expands towards the lower extremity; mandible with an enlarged base, above it setiform, slightly curved at the top. *Oecium* rounded, rather large, frosted.

Loc. Australia (*Miss Jelly*).

This species and the preceding are really much more distinct than they might appear to be from a comparison of the descriptions.

A reference to the figures will show the amount of the difference between them. *M. plana* is specially characterized by the large size of its zoecia and the flatness of its surface.

Ann. & Mag. N. Hist. Ser. 5. Vol. vi.

Membranipora armifera, n. sp. (Pl. XI. fig. 5.)

Zoecia ovate, wholly membranous in front, margin smooth, two spines at the top; on each side, just below the upper margin, an acute *avicularium* standing out very prominently and somewhat obliquely from the edge of the aperture; the mandible directed straight outwards. *Oæcium* (?).

Loc. Gulf of St. Lawrence, on *Flustra membranaceo-truncata*, Smitt (*Dr. Dawson*).

Allied to the Arctic *M. Sophiæ* of Busk, from which it differs in the character of the avicularium and the absence of the lateral spines. The avicularia are placed horizontally on the top of very prominent brackets rising from the margin of the cell on each side, which are somewhat carinate in front. The extremity of the acute mandible points outwards. Not unfrequently there is a large raised avicularium at the base of the cell.

Membranipora horrida, n. sp. (Pl. X. fig. 6.)

Zoecia oval; aperture occupying the whole of the front, with a membranous covering, margins thin; three or four spines on each side, of which the uppermost pair are tall, stout, and erect, the rest smaller, acuminate, somewhat bent in over the aperture; a large *avicularium* at the bottom of the *zoecium*, placed transversely, and usually extending some way up one side of the cell, very slightly raised; mandible elongate, linguiform, occasionally replaced by a small avicularium with short mandible. *Oæcium* rounded, smooth, with an arched rib in the front.

Loc. California (*Miss Jelly*).

The marked character of this species is the large linguiform avicularium at the base of the cells; it has a tendency, however, to revert to a smaller and more usual form.

Membranipora Carteri, n. sp. (Pl. XI. fig. 8.)

Zoecia membrano-calcareous, ovate, wide and patulous, suberect, disposed in linear series; margin thin and smooth, two very stout clavate spines at the top, and two somewhat smaller placed one on each side about halfway down the cell. *Avicularia* sparingly developed, capitate, articulated, rounded behind (not elongate), with a short slightly bent beak; placed on one side of the cell, immediately below the spine at the top. *Oæcium* (?).

Loc. Australia, incrusting weed (*Mr. H. J. Carter*).

This form has a special interest, as being the only known *Membranipora* which possesses a fully developed bird's-head

appendage identical in structure with that of the genera *Bugula* and *Bicellaria**. In other respects it exhibits points of affinity with the last named. The zoarium is but slightly calcified; the zoecia are disposed in lines, and are in some degree suberect and overlap one another above. The avicularia are placed in the same position as those of *Bugula*, which they exactly resemble. Altogether the species has much the general appearance of a decumbent *Bugula*, whilst at the same time it is technically an undoubted *Membranipora*. It helps to connect the two types. The spines are massive, subclavate, white and polished, and constitute a striking feature.

I have much pleasure in dedicating this very interesting form to so able a naturalist as my friend Mr. Carter.

Membranipora pura, n. sp. (Pl. XI. fig. 3.)

Zoecia large, more or less ovate, closely united, surrounded by a perfectly smooth border, which slopes up to a ridge-like marginal line; front wall wholly membranous; at the top of the cell two stout spinous processes, one on each side, which are frequently united by an elevation of the margin (forming a wall between them). *Avicularia* none. *Oecium* (?). *Zoarium* white, smooth, glossy, subhyaline.

Loc. Australia or New Zealand (*Miss Jelly*).

It would be almost impossible to frame a description of this form that would be sufficient in itself to ensure certain identification; a figure is indispensable. The same may be said of great numbers of species; in the case of the Polyzoa, at least, the practice cannot be too much reprobated of publishing new names unaccompanied by a recognizable figure of the form intended.

In *M. pura* the cells are of large size, sometimes regularly oval, sometimes broad-ovate, arched above and with the lower margin somewhat flattened, sometimes expanded above and narrowing off slightly towards the lower extremity. They are closely soldered together, so that there is only an inconspicuous furrow between the contiguous margins; the border is quite smooth, without any trace of beading or crenature. The screen-like elevation of the peristome between the two spines at the top is a good diagnostic mark, but it is not present on all the zoecia.

* *M. minax*, Smitt (*M. princeps*, mihi), is furnished with an avicularium which has the form of the "bird's head;" but it is fixed (destitute of a basal joint) and wholly calcareous, instead of being partly corneous and partly calcareous. *M. Carteri* is the only species in which the perfect "articulated" appendage has yet been met with.

Perhaps one of the most characteristic features of the species is the glossy smoothness and whiteness of the zoarium.

Membranipora villosa, n. sp. (Pl. X. fig. 8.)

Zoæcia membrano-calcareous, elongate, rectangular, disposed in lines, with a membranous front wall, margins thin; inner surface of the cell-wall crenate; two acuminate spines, one on each side at the top, and frequently a broad, membranous, strap-like process between them, usually a smaller spine on each side a little below the top; front wall covered with delicate spinules. *Avicularia* none. *Oœcium* (?).

Loc. California, incrusting weed (*Miss Jelly*).

This species is remarkable for the profusion of spinous processes with which it is furnished. The *zoæcia* seem to be very slightly calcareous; and the spines are simply membranaceous, and, when dried, are more or less shrivelled and bent. In the centre of the upper margin there is often one of the broad, strap-like spines which are so characteristic of the species; they run to a point above, and in the dry state are flattened and present a bright and glossy surface.

The front wall is rather thickly covered with slender sharply-pointed spinules.

a'. Cell prolonged below the aperture.

Membranipora distorta, n. sp. (Pl. X. fig. 7.)

Zoæcia ovate or subturbinata, prolonged below the aperture, quincuncial, disposed with great regularity; walls white and rather silvery, covered with minute perforations; aperture oval, occupying about three fourths of the front of the cell, with membranous covering, surrounded by a smooth, thickened, and somewhat sinuated rim, bearing three spines, two a little below the top, which almost meet across the area, and one near the bottom on the outer side, calcareous towards the base, with membranaceous extremities; the *zoæcia* as if heeled over towards the inner side, so that the aperture appears somewhat distorted, the lower extremity pointing inwards and in contact with the wall of the neighbouring cell; at the top of each cell a smooth semicircular space, slightly hollowed, enclosed by a narrow edging, forming a kind of alcove. *Avicularia* none. *Oœcium* (?). *Zoarium* branched; branches of varying width.

Loc. Ceylon, on weed (*Miss Jelly*).

This is a remarkably beautiful species, and I have hesitated to give it a name which might seem to imply the contrary. Of course it merely refers to the curious twist of the cells,

which adds to the picturesqueness without at all impairing the beauty of the species.

The zoecia are turned over, as it were, towards the inner side; and on this side, of course, no cell-wall is to be seen, the margin of the aperture lying close against the neighbouring cell, whilst on the opposite a considerable tract of it is visible. In most of the branches a central line of zoecia is traceable, which are straight and of the usual appearance; and on each side of this line the zoecia turn inwards towards it, so that those on the opposite sides face one another.

The wall below the aperture is prettily ornamented with minute punctures. The sinuated appearance of the margin of the aperture is caused by the spines, which exhibit a curious peculiarity: the lower portion is solid; but the points are simply membranous, and in the dried state have either shrivelled up or disappeared.

There is an evident affinity between this interesting form and the common *M. pilosa*, Linn.

b. With a calcareous lamina.

Membranipora nitens, n. sp. (Pl. XI. fig. 4.)

Zoecia quincuncial, somewhat pyriform, expanded above and narrowed downward, prolonged below the aperture, closely united to one another; walls smooth and glassy; aperture ovate, occupying rather more than half the front of the cell, with a thin smooth margin, covered in by a very transparent membrane, which lies on a level with the edge, a very shallow calcareous expansion at the very base of the aperture; on each side, immediately below the upper margin, a small white tubercle; the portion of the cell below the aperture bearing a single large boss or nodule, white and polished. *Avicularia* none. *Oecium* (?). *Zoarium* lobed or branched.

Loc. Australia, on a Polyzoon (*Miss Jelly*).

This Australian form is certainly distinct from the South-Atlantic *M. tuberculata*, Bosc (which is so commonly found on the Gulf-weed), though it may be said to belong to the same section of the genus. The general appearance of the zoarium is bright and glossy, and is due in part to the polish of the calcareous portions, and in part to the shining surface of the membrane which closes the cells. The latter lies quite on a level with the top of the margin, and extends to the very bottom of the aperture, covering the slight calcareous plate. The two small white tubercles immediately below the upper margin are constantly present. There is a considerable prolongation of the cell below the aperture; and this portion is almost entirely

occupied by the single prominent boss. This is somewhat truncate above, and has a semicircular or wedge-shaped outline below.

Membranipora delicatula, Busk. (Pl. XI. fig. 1.)

Biflustra delicatula, Busk, Crag Polyzoa, p. 72, pl. i. figs. 1, 2.

? *Biflustra denticulata*, Smitt, Floridan Bryozoa, pt. ii. p. 18, pl. iv. figs. 89-91 (not *Membranipora denticulata*, Busk).

Zoæcia quincuncial, quadrangular (the upper angles often rounded), sometimes elongate, sometimes short and broad, margins granulated transversely, about a quarter of the area below occupied by a delicate lamina, finely granular, which bears on its upper margin a projecting lobe or denticle (frequently absent) set with minute spines or prickles, lamina sometimes carried upwards to a slight extent along the inner edge of the area, which occasionally bears a few denticulate processes; aperture ovate or elliptical, more or less frequently a low blunt knob at each of the upper angles, sometimes only a single knob, often none. *Avicularia* none. *Oæcium* (?).

Loc. Florida, incrusting weed (*Miss Jelly*).

Range. Crag; Australia; ? Manilla; Florida.

This seems to be the *Biflustra delicatula* of Busk (an Australian and Crag species), although, in some points, the two differ; and on this account I have given a description and figure of the Floridan form. The latter is simply incrusting, whereas the former is erect and foliaceous; but this is not a point of any significance, as the two states commonly enter into the same life-history. Busk makes no mention of the nodules; but they are often absent; nor of the denticles, which in the fossil would probably not survive, and are frequently wanting in the Floridan specimens. The transverse granulation, too, on the border of the cells is much more marked, as represented in Busk's figure, than in the latter. But all these differences amount to little, and there can be no doubt of the identity of the two forms. I am also inclined to think that the Floridan species described and figured by Prof. Smitt under the name of *Biflustra denticulata** is the same thing. It is true he does not mention the "serrated denticle" on the edge of the lamina; but though, when present, it is a very striking feature, it is often undeveloped or very partially developed, and I have seen large tracts of the crust in which scarcely one was to be found. The figures, too, do show a

* This must be accounted quite distinct from Busk's *Membranipora denticulata*, a Mazatlan form, described in Carpenter's 'Catalogue of Mazatlan Mollusca in the British Museum' (1855-57), p. 1.

slight spinous elevation on the margin of the lamina. Prof. Smitt (though doubtful) is inclined to identify his Floridan species with *M. tuberculata*, Bosc*; but this, though belonging to the same group and exhibiting the same general facies, is, in my judgment, essentially distinct. I shall give hereafter figures of *M. tuberculata*, which I have from various parts of the Atlantic and also from California. In *M. delicatula* the form of the cell is normally quadrangular and elongate; but there are many irregularities: very commonly the angles are obliterated above, and the upper part of the cell is rounded; there are also diversities in size. The nodules at the upper angles of the aperture are very inconstant; they sometimes occur on only a few cells in a colony; at best they are rather small blunt knobs.

The genus *Biflustra* was originated by D'Orbigny and adopted by Busk for forms with a Membraniporidan cell and an erect foliaceous or ramose growth; that is, it was constituted to represent a mere variation in colonial habit. Smitt has retained the name, but with a very different and, it seems to me, rather vague application. He says, "The quadrangular shape of the zoecia, as well as their strong, unusually high, and hardly calcificated and granular margins, in most cases will make the Biflustridan type recognizable." He also remarks that "the most striking characteristic for this family . . . will be the relatively great size of the zoecia" (Flor. Bryoz. pt. 2, p. 17). These characters, I confess, seem to me to be much too vague and unimportant to stand as the criteria of a family group; whilst, on the other hand, D'Orbigny's generic diagnosis, though definite enough, being based on mere colonial habit, and not on any difference in the structure of the zoecium, can hardly be maintained, if the later views of Polyzoon classification are sound. For the present I shall rank the species of *Biflustra* (both of Busk and Smitt) under *Membranipora*.

? *Membranipora trifolium*, S. Wood, var. *minor*.
(Pl. XI. fig. 6.)

Zoecia somewhat pyriform, slightly narrowed above, expanded in the middle and tapering off below, closely united; the lower half of the area filled in by a granulated lamina, which is carried up on each side of the aperture, where it is slightly crenate; aperture obscurely trifoliate, margins scarcely raised, not beaded. Frequently a small *avicularium* on the lower

* Floridan Bryozoa, pt. 2, p. 18. He expressly states, however, that he leaves "the question yet undecided."

part of the lamina; mandible pointed, directed upward. *Oœcia* (?).

Loc. Bahia, on shell (*Miss Jelly*).

This form is referred doubtfully to *M. trifolium*. The cells are smaller than in that species; the margin is less elevated and exhibits no distinct crenature; the lamina is more strongly calcified. It seems better, however, to rank it for the present as a variety, though the locality may suggest a doubt as to its identity with *M. trifolium*, which has hitherto only been known as a northern form (Britain, north; Norway; Arctic Sea; Labrador).

Membranipora antiqua, Busk. (Pl. XI. fig. 7.)

Membranipora antiqua, Busk, Quart. Journ. Micr. Sc. vi. p. 262, pl. xx. figs. 1, 2.

This species is described by Busk as being furnished with vibracula; but the remarkable appendages which occur, placed on distinct areas, and distributed amongst the zoœcia, are in reality avicularia, though of very peculiar structure. The fixed beak is long and somewhat falciform, with a rather broad central groove; the mandible expanded and subtriangular at the base, above tapering and setiform. Along one side of the mandible extends a membranous expansion, which is broad and spreading for about two thirds of the length, and narrows off into a mere edging near the top. What the precise use of this curious structure may be it is difficult to say: it certainly renders the appendage quite unfitted for any prehensile work; but it may make it a more efficient organ of defence.

The orifice in this species is surrounded by a narrow solid border, and the operculum is fully developed and works on a distinct hinge.

- c. With a membranous front wall, the orifice surrounded by a border; operculum with a distinct hinge.

Membranipora mamillaris, Lamouroux.
(Pl. X. fig. 9.)

Zoœcia elongate, rectangular, with membranous front wall, margins thin and smooth; orifice surrounded by a raised, somewhat thickened border, taller than broad, arched above, slightly narrowed towards the top; lower margin straight; operculum with a distinct hinge, of a dark horn-colour; on each side of the orifice a stout blunt spine, white and lineated longitudinally. *Avicularia* interspersed amongst the cells, placed at the top of a rectangular area, the fixed portion

(beak) made up of two opposed calcareous plates, which slope up to a central groove, narrow and linear above, expanded towards the base; the mandible elongate, triangular below, running out into a slender pointed process. *Oæcium* (?)

Loc. Australia, incrusting weed.

This species was long ago described by Lamouroux. I have figured it in order to show the remarkable avicularium, which has not hitherto been specially noticed. It illustrates very strikingly the homological nature of this appendage: the area on which it is placed exactly resembles that of the ordinary zoœcia, except that it is a shade smaller; the avicularium itself occupies the position of the orifice, of which it is plainly a modification. The basal subtriangular portion of the mandible is the equivalent of the opercular valve; the setiform process into which it is prolonged above is the superadded element. The calcareous plates which enclose the groove into which the mandible falls are a modification of the calcareous border of the zoœcial orifice, and possibly of the lateral spines.

The very definite character of the operculum in this species and the thickened border by which it is enclosed are points of much significance. The orifice is very much that of the Escharine (Smitt) or old Lepralian group. We have in this form and others like it an intermediate stage between the simple Membraniporidan structure and that of the Microporidæ, in which a similar orifice is associated with the complete calcification of the front wall. It may be a question whether the structural peculiarities of the present species should not be made the basis of a distinct generic group*.

It may be noted that on the outskirts of the colony abnormal cells are sometimes met with, in which the space usually filled by the orifice and the two spines is occupied by a broad, continuous, calcareous plate, stretching from wall to wall across the entire width of the zoœcium.

Membranipora transversa. (Pl. XI. fig. 9.)

Zoœcia elongate, rectangular, disposed in regular transverse (and longitudinal) series; aperture occupying more than half the front of the cell, with a wholly membranous covering; margin thin, smooth; orifice arched above, lower margin slightly curved outwards, surrounded by a definite border, on each side a very stout blunt spine, white and lineated

* In the normal *Membraniporæ* the orifice is a simple semicircular opening in the front wall, and the operculum only differs from the membranous covering in being of slightly firmer substance; it does not work on a distinct hinge.

longitudinally; front of the cell much elevated immediately below the aperture, and on the summit of the elevated portion two massive subtriangular nodules, their apices about meeting in the centre (occasionally uniting so as to form a wall across the cell), lineated transversely; below the rising the cell slopes abruptly to the base. *Avicularia* infrequent, distributed over the zoarium, placed at the base of a cell, immediately under the nodules; mandible triangular, sloping upwards. *Oœcium* (?)

Loc. Australia, incrusting stem of weed (*Miss Jelly*).

This species belongs to the same section as the last.

The cells are arranged with great regularity; and the elevated portions bearing the large nodules form prominent transverse ridges across the zoarium. *M. transversa* seems to be nearly related to *M. Woodsii*, Macgillivray *; but the latter is destitute of the peculiar elevation of the front wall and the nodules. *M. dispar*, Macgillivray, is another Australian species belonging to the same group.

SIPHONOPORELLA, nov. gen.

Der. σίφων, a tube, and πόρος.

Gen. char.—*Zoœcia* with raised margins, front depressed, in part membranaceous; a small calcareous tube with wide mouth placed at one side of the lamina below the aperture, and opening into the cavity of the cell. *Zoarium* (in the only known species) incrusting.

We have no clue at present to the function of the curious tubular structure with which each cell is furnished in this form; but we may infer, I think, from its constancy and definite position, that it bears some not unimportant relation to the economy. It is a very marked structural element, and seems well entitled to stand as the characteristic of a generic group. In the only known species the tube is somewhat horn-shaped, expanded towards the mouth, and attenuated towards the base. I have not been able to ascertain whether or not it communicates with the chamber which occupies the lower portion of the cell.

Siphonoporella nodosa, n. sp. (Pl. XI. fig. 10.)

Zoœcia subquadrangular, oblong, slightly arched above, prolonged below the area, arranged pretty regularly in longitu-

* "Description of some new Genera and Species of Australian Polyzoa; to which is added a list of species found in Victoria. By P. H. Macgillivray, A.M., M.R.C.S.," Trans. & Proc. Roy. Soc. Victoria, vol. ix. (1868) pt. 2, p. 130.

dinal series, closely united; area broad-ovate, occupying usually about three quarters of the front of the cell, the lower half filled in by a minutely granular lamina, which slopes steeply up to the top of the inferior portion of the cell; aperture occupying the upper half, somewhat semicircular, with a membranous covering, margin thin and smooth, sometimes of a brown colour; in one corner of the aperture, between the wall of the cell and the lamina, a small horn-shaped tube, opening out below by a wide mouth into the cavity of the cell, and tapering off towards its upper extremity; the portion of the cell below the area elevated, bearing several (one to five) prominent polished nodules, wall smooth and glossy. *Avicularia* none. *Oœcia* (?).

The principal variation to which this extremely interesting form seems to be liable is in the number of the nodular processes. Occasionally the produced lower portion of the cell is altogether obliterated, and the area extends to the top of the neighbouring zoœcium. In such cases a single nodule occurs on the line of junction, or sometimes two. But usually there is a considerable space below the area, which is crowded with the glossy tubercles; they are sometimes separated by delicate raised white lines. The zoœcia are *deep*; and the cell-wall seems to rise a good deal above the level of the membranous covering of the aperture. The zoarium has a bright and shining appearance.

EXPLANATION OF THE PLATES.

PLATE IX.

- Fig. 1. Membranipora crassimarginata*, n. sp. 1 a, elongated avicularian cell and oœcium.
Fig. 2. Membranipora nodulifera, n. sp.
Fig. 3. Membranipora tenuirostris, n. sp.
Fig. 4. Membranipora granulifera, n. sp.
Fig. 5. Setosella vulnerata, Busk (Madeira).
Fig. 6. Smittia marmorea, Hincks.
Fig. 7. Lepralia Kirchenpaueri, Heller, var. 7 a. Oœcium.

PLATE X.

- Fig. 1. Cribrilina radiata*, var.
Fig. 2. Porella nitidissima, n. sp.
Fig. 3. Lepralia Pallasiana, with oœcia.
Fig. 4. Phylactella lucida, n. sp.
Fig. 5. Membranipora albida, n. sp.
Fig. 6. Membranipora horrida, n. sp.
Fig. 7. Membranipora distorta, n. sp.
Fig. 8. Membranipora villosa, n. sp.
Fig. 9. Membranipora mamillaris, Lamx., with avicularium.

PLATE XI.

Fig. 1. *Membranipora delicatula*, Busk.

Fig. 2. *Membranipora plana*, n. sp.

Fig. 3. *Membranipora pura*, n. sp.

Fig. 4. *Membranipora nitens*, n. sp.

Fig. 5. *Membranipora armifera*, n. sp.

Fig. 6. *Membranipora trifolium* (?), var. *minor*.

Fig. 7. *Membranipora antiqua*, Busk. A zoecium, with avicularium, showing the membranous expansion along the mandible.

Fig. 8. *Membranipora Carteri*, n. sp.

Fig. 9. *Membranipora transversa*, n. sp.

Fig. 10. *Siphonoporella nodosa*, n. sp.

[To be continued.]

XI.—*Descriptions of a new Cicindelid and a new Cetoniid from East Africa.* By CHARLES O. WATERHOUSE.

ABOUT two years ago I described (Ann. & Mag. Nat. Hist. 1877, xx. p. 424) a new genus of Cicindelidæ which I called *Styphloderma*. The British Museum has just received a second species of this interesting genus from Mpwapwa, East Africa. I propose to call it

Styphloderma lævicolle.

Nigrum, nitidum; thorace lævi; elytris ovalibus, granulis elongatis dense tectis, politis, margine ipso anguste cyaneo. ♀.
Long. 12 lin.

This species resembles *S. asperatum*, but has the elytra more regularly ovate and a little less depressed at the suture. The head and thorax are quite smooth, the latter having no trace of the granules at the front and hinder margins as in *S. asperatum*. The sculpture of the elytra is somewhat the same, except that the surface is shining, and the asperities are not sharp posteriorly, but are elongate, lanceolate.

Hab. E. Africa, Mpwapwa.

Cetoniidæ.

EUTELES MUS, n. gen.

♂. Clypeus nearly parallel at the sides, as long as broad, concave, biemarginate at the apex. Anterior tibiæ simple, with the common excision at the base below; four posterior tibiæ unarmed. Mesosternal process flat, parallel, truncate