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## Chilostomatous Bryozoa from Aldinga and the River-Murray Cliffs, South Australia

Arthur Wm. Waters

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### Notes

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28. CHILOSTOMATOUS BRYOZOA from ALDINGA and the RIVER-MURRAY CLIFFS, SOUTH AUSTRALIA. By ARTHUR WM. WATERS, Esq., F.G.S. (Read February 25, 1885.)

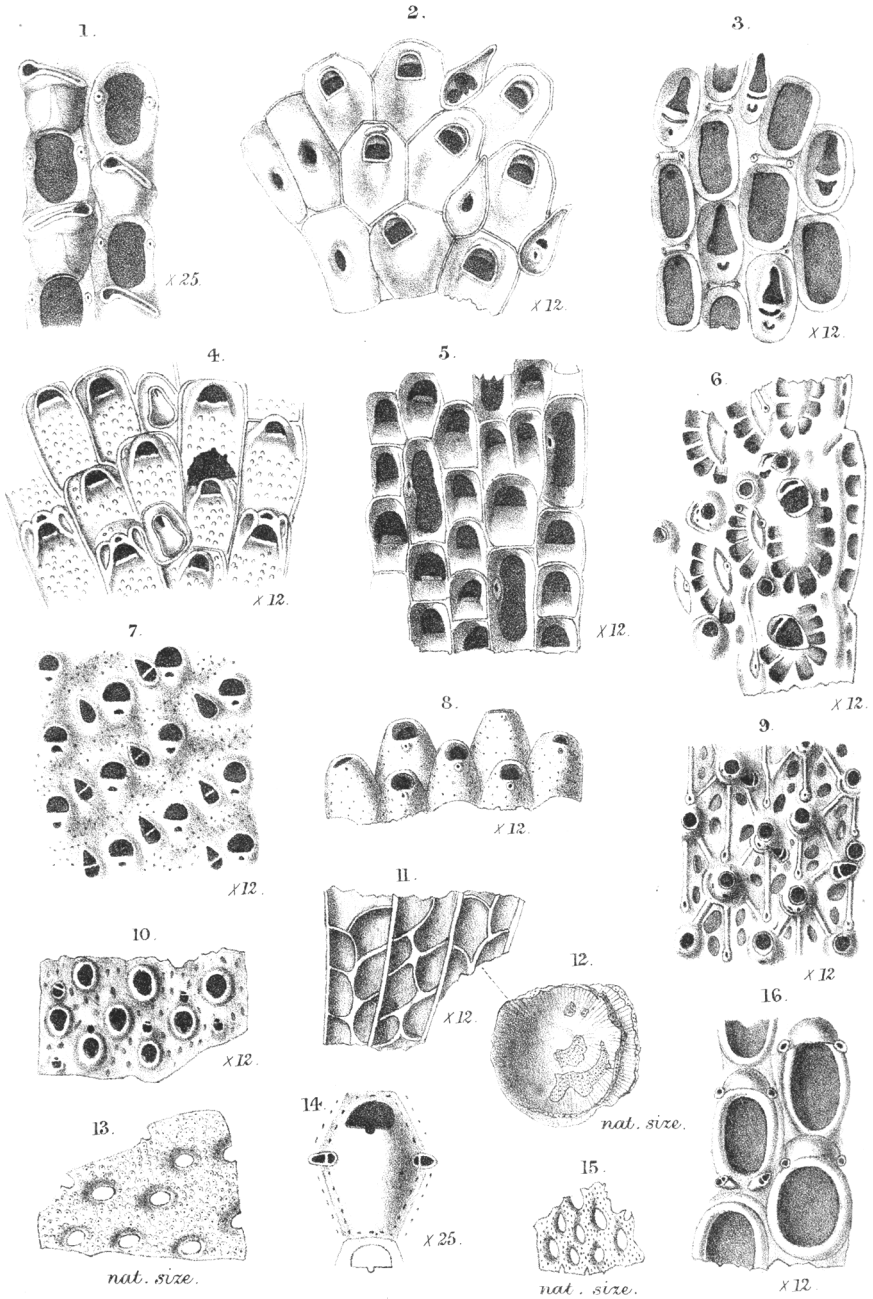
[PLATE VII.]

THE fossils described in the present paper were collected by Professor Ralph Tate, who kindly sent them over to me for description. With a few exceptions, they are from Aldinga, or the "River-Murray Cliffs." A few small and imperfectly preserved specimens are from a bore-hole in Adelaide, representing a find which seems to have considerable geological interest. They are evidently from a clay matrix, and belong to species common in the clay of Curdies Creek. The collection furnished various Cyclostomata, which have already been dealt with in a former paper (Quart. Journ. Geol. Soc. vol. xl. p. 674).

As a considerable number of Australian fossil Chilostomata have already been described, we naturally find many old friends; but there are also several new forms of extreme interest, especially as bearing upon the question of the various modes of growth of the Chilostomata. The previous collections have furnished a large number of instances of a species growing in both Eschara- and Lepralia-forms, and we again find new examples of this, among which *Membranipora rhynchota*, Busk, in the Eschara stage, is especially interesting; and there are examples of already-known *Smitticea* and *Monoporella* occurring in a reticulate form; but this time the chief interest is in a number of specimens which grow in a cupulate manner, which we might either call Cupularia- or Lunulites-form, and for convenience we will adopt the latter. There is *Lepralia edax* in this form; a *Microporella* for which the name *pocilliformis* is proposed; and, further, a second *Microporella*, which was named by Mr. Tenison-Woods *Lunulites magna*; also *Membranipora aperta*, Busk, in this form. We are already acquainted with *Cumulipora transilvanica*, Rss., which is a *Microporella* growing in a solid form. *Stichopora clypeata*, Hag., and *Lunulites Goldfussi*, Hag., are both Membraniporidae; *Cellepora crustulenta*, Hag., has zoecia similar to those of *Selenaria maculata*, Busk; *Lunulites incisa*, Hincks (*Conescharrellina conica*, Haswell)\* is a species of the Schizoporellidae; *Cellepora tridenticulata*, Busk, found by the 'Challenger' expedition in the lamellar condition, is represented by several fossil specimens, some of them in the most regular *Lunulites*-form. Another *Cellepora* also occurs in this shape.

The genus *Cellepora* is, even when well-preserved recent specimens are available, a most difficult one to deal with, and with fossils where the terminal portion of the cell is often only imperfectly preserved the difficulty is immensely increased; but after repeatedly returning to this genus the results obtained are interesting. In a paper "On

\* These two names were published in the same year, and I am unable to find out at present which has precedence.



A.W. Waters del. A.T. Hollick lith.

Mintern Bros. imp.

SOUTH-AUSTRALIAN CHILOSTOMATOUS BRYOZOA

the Use of the Opercula in the Determination of the Cheilostomatous Bryozoa"\*, I figured the opercula of some *Celleporæ*, and pointed out that the "opercula may assist very much to bring this family out of its present confusion." Mr. Busk took up the idea, when working at the 'Challenger' Bryozoa, and the results he obtained are of great value; and I may say that my own collection of opercula indicates that many difficult genera may be brought into order by the study of the chitinous organs.

The opercula are, of course, wanting in fossils, but the exact knowledge of the oral aperture thus gained may nevertheless be used. In comparing recent with fossil species it is most important to study the opercula, and in describing this series of Australian collections such comparison has always been made when possible.

In the *Celleporæ* the shape of the zoecial or vicarious (Busk) avicularia † is of great value; but I must here repeat what I have already said (Quart. Journ. Geol. Soc. vol. xxxix. p. 424) regarding other genera, namely, that the presence or absence of these avicularia cannot be made a specific character. Among several specimens of recent *Cellepora albirostris* from the Semaphore, Adelaide, there are some in which the vicarious avicularia abound; in one or two I do not find any; while in other cases, after searching over a large part of the colony in vain, a part is found where ten or twelve may come under the field of the microscope at the same time. Similar conditions obtain in recent *C. tridenticulata* from the same locality, and among the fossils we find the same thing; for in one large block of this species only one avicularium was found after a complete search among many thousand zoecia. In the present paper the vicarious avicularia are figured of *Monoporella sexangularis*, corresponding with those already known from European localities, thus showing that it had been rightly determined before these avicularia were found. Many specimens of *Cellaria angustiloba* have now been examined; but it seems that avicularia have only been found in two cases. In the Australian fossil *Membranipora Michaudiana* only one has been found. In *Microporella elevata* most interesting lateral zoecial avicularia are now for the first time made known. As bearing upon this subject, it may be mentioned that in reexamining my collection I was surprised to find in *Membranipora Dumerilii* a vicarious avicularium, so that here is a case of a common *Membranipora* in which none have previously been found now yielding an isolated example ‡.

Only a short time ago the presence or absence of these organs was

\* Manchester Lit. & Phil. Soc. vol. xviii. p. 8, pl. i.

† These zoecial avicularia have been named "onychocellaria" by Dr. Jullien; and it is doubtful whether it would not have been better to adopt this than to give a new name. The mandible he then names "onychocellium."

‡ Mr. Busk, in his paper "On the Use to be made of the Chitinous Organs" &c., describes a slender process rising from the middle of the base of the avicularian mandible, and this he terms the "columella," and here and in the 'Challenger' Report, p. xix., says that it only occurs in one division of the genus *Cellepora*, and in this division "only in those belonging to the southern hemisphere." This is by no means the case, as it is to be found in *Cellepora*

made a generic test, and the tendency still remains to attach great weight to their absence; but the instances furnished in this and former papers show that great caution is necessary here, though certainly when present they furnish characters of the greatest value. Their presence also often materially changes the general appearance of the colony, and no doubt many reductions of supposed species will have to be made, just as entomologists have frequently found that the male and female insects have received different names. We ought now to give greater attention to the nature of each character than to the general appearance of the zoarium, which often superficially varies greatly when young or old and from different depths.

Since my last paper was published the most valuable and interesting 'Report' on the 'Challenger' Bryozoa has appeared, in which, as we expected, Mr. Busk puts into our hands a series of splendid illustrations and concise descriptions. In this place we can only consider those parts which have a bearing upon the fossils found in Australia, and the number of representatives of this fossil fauna is not so large as we expected, but we find *Porina coronata*, Rss. (*Eschara gracilis*, Busk), *Schizoporella phymatopora* (*Myriozoum honolulense*, Busk), *Cellepora albirostris*, *C. tridenticulata*, and *Monoporella crassatina*, W., all of which seem to have been common fossils. It will be seen that the generic names used are not in every case the same; and we may point out that Mr. Busk has, of course, abandoned the classification which he found it convenient to adopt thirty-two years ago, before the labours of Smitt, Hincks, and others had shown that the zoecial characters must be taken as of most importance. It is not, however, astonishing that Mr. Busk should now and then show a predilection for a style of classification not quite in accordance with the thorough changes which some of us feel must be adhered to; but these are now matters of detail, as the main modern principles are recognized, and we may say all leading authorities are now working in the same direction.

As instances, the divisions of the families Membraniporidae and

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*sardonica*, W., from the Mediterranean, and in *C. coronopus*, *C. retusa*, var. *caninata*, and other species. Mr. Busk (*loc. cit.* p. 90, note) seems to have looked in vain in *C. sardonica* for it; but perhaps he only examined the oral avicularia, in which none are to be found, whereas in the small semicircular mandibles it is readily distinguished. On referring to a drawing of a mandible made when describing *C. sardonica* some years ago. I find that there is a large columella shown, and upon reexamination I find them usually quite distinct, though in some other species they are but rudimentary. In many species there is a denticle in this position rising from the calcareous bar which divides the avicularium, and this is shown in my figure of *C. sardonica* (*Ann. & Mag. Nat. Hist.* ser. 5, vol. iii. pl. 14. fig. 5), and may be seen in *C. albirostris*, *C. tridenticulata*, various *Retepora*, *Lepralia edax*, &c., being by no means confined to *Cellepora*. It is thus seen that it may sometimes be a useful character in determining fossils. The mandible of *Diachoris magellanica*, Busk, has a double "columella." I think that it will be found that what Mr. Busk describes as "short hairs" on the columella are only the remains of the attachment of muscular threads. The subject of the avicularian mandibles I have dealt with more fully in a paper which will appear in the Journal of the Royal Microscopical Society, ser. 2, vol. v. pt. iv.

Microporidæ seem singularly unfortunate, although, no doubt, *Membranipora* must be broken up, not merely because it has become unwieldy, but because species are included in it in which there are important differences of organization. It seems clearly advisable to include in one family only those forms in which the operculum is fixed in the flexible membrane covering the zoœcial area (opesia, Jullien), as in *Membranipora angulosa*, *M. membranacea*, &c.; whereas those like *Micropora uncifera*, Busk, which have a "complete" operculum placed in a corresponding aperture with a calcareous border should be placed in another family; but in the 'Report' *Amphiblestrum capense*, Busk\*, a species in which the aperture is entirely closed by a thick operculum, is put among the Membraniporidæ, a family in which the calcareous aperture is opesial, and not opercular. Then again, under the Microporidæ, we find as type the genus *Micropora*, which always has an opercular opening; next, the genus *Vincularia*, in which there is an opesia, and in the membranous cover an operculum closely resembling those of *Membranipora angulosa*, Rss., *Selenaria maculata*, &c., while *Steganoporella* has opercular apertures.

Both *Vincularia* and *Eschara* are genera that have included widely divergent forms, and on the cylindrical, or erect bilaminar, mode of growth the genera have been based; therefore it is much to be regretted that they have been revived. Two species of *Eschara* are described. *E. elegantula*, Busk, as to the position of which we may at present withhold judgment; and *E. gracilis*, Busk, a species which is found in all stages, from a very delicate *Vincularia* form to large flat foliaceous growth, and which in this and former papers is called *Porina coronata*, Rss., a determination based upon direct comparison with typical *P. coronata* from the Italian Miocene, with recent specimens sent over by Mr. Haswell, and with a considerable series of Australian fossils. The divisions of the family Escharidæ are partly based upon the mode of growth, which is interesting for momentary classification, if we do not forget that the form is often so variable that we might almost call it accidental. This variability can be seen in *Cribrilina monoceros*, *C. terminata*, and over a hundred other species.

*Myriozoum* is a name given by Donati to the living erect cylindrical *M. truncatum*, which has some structures so different from those of the majority of the Chilostomata, that it is doubtful if it should not be placed in a separate division. The central spongy structure is entirely wanting in the species which Mr. Busk now places under *Myriozoum*, but probably all the 'Challenger' species will be found to fall into existing genera. *M. honolulense* is really in the Hemescharine stage, and is, in the present and previous papers, called *Schizoporella phymatopora*. *M. simplex* is known as *Cellepora margaritacea*, Pourtales, but cannot remain with the *Celleporæ*. The name of *M. immersum* must be changed, as it is very near to a species called *Onchopora immersa* by Mr. Haswell.

Mr. Busk proposes a genus *Adeonella* for forms which have pre-

\* This I have from Algoa Bay.

viously been placed under *Microporella*, and as many occur fossil from Australia and other places, it becomes necessary to give especial attention to this new genus. It would certainly seem that a number thus placed have marked characteristics, which make it advisable to separate them; but Mr. Busk has certainly overlooked important points, which make it necessary to reduce his list very largely; for some have a median pore entering into the zoëcial cell, while others have a pore or opening above the opercular aperture, and every one, whatever his ideas of classification, will admit that this is a most important distinction, placing them in different families in spite of a certain similarity in general appearance. The importance of noticing the position of the median pore or opening I pointed out (Quart. Journ. Geol. Soc. vol. xxxviii. p. 269) when considering *Porina larvalis*, MacG., and this distinction is recognized by Mr. Busk when creating the genus *Haswellia*. My own collection is not very rich in these groups, but nevertheless is ample to study them. *Adeonella platatea*, Busk, for which I am indebted to Mr. Haswell, who sent it over as *Eschara hexagonalis*, is a most characteristic *Adeonella*, with oral operculum and avicularian mandible corresponding with Mr. Busk's figure, and here the pore enters into the peristome just above the operculum, which is placed very low down. *Adeonella polystomella*, Rss. (*Eschara Pallasii*, Heller), living near Naples and elsewhere in the Mediterranean, and fossil from the Miocene and Pliocene, has the characteristic operculum of the *Adeonella* group, and the central pore opens above the oral aperture, so that when a young cell is examined, there is no pore, but one is afterwards formed by the growth of the peristome which at an early stage bridges over the front, just as figured by Mr. Busk in *Smittia jacobensis* (pl. xix. fig. 7). The oral aperture of *Adeonella polystomella* has a sinus which is seen through the central pore. *Microporella violacea*, Johnst., which Mr. Busk would now include in a genus *Reptadeonella*, has a true median pore which enters into the zoëcial cavity, and is formed when the zoëcium is in an early stage. It also has an operculum with a straight edge, similar to that of *Microporella ciliata*, &c.

From Mr. Busk's figures and from specimens collected near Capri, it is clear that *Microporella distoma* is not an *Adeonella*, nor is *M. coscinopora*, Rss., which is distinct from *M. distoma*. *M. lichenoides*, M.-Edw., and *M. fissa*, Hincks, have also the median pores opening into the zoëcial cavity, and must at present be united with *Microporella*, though possibly they may some day be placed in a separate genus. This leaves us with *Adeonella polymorpha*, B.; *A. platatea*, B.; *A. intricaria*, B.; *A. atlantica*, B.; *A. pectinata*, B.; *A. polystomella*, Rss.

Seeing that the median pore of the Microporellidæ, and the central pore of *Adeonella* are structurally different, and that the oral aperture and operculum in the two families have different shapes, we feel sure that it merely requires this to be pointed out for Mr. Busk and every one else to see that they cannot be placed in the same genus; for it would be going back in classification if we were to be misled





List of Species (continued).

	Page.	Living.	Aldinga.	R. Murray Cliffs.	Curdies Creek.	Mt. Gambier.	Bairnsdale.	Muddy Creek.	Allies and Localities.
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47. — <i>seriata</i> , Res. ....	300	*	*	*	*	*	*	*	
48. — <i>Milneana</i> , B., v. <i>coequata</i> , W.	300	*	*	*	*	*	*	*	
49. <i>Schizoporella vulgaris</i> , Moll. ....	300	*	*	*	*	*	*	*	
50. — <i>simplex</i> , J., var. ....	300	*	*	*	*	*	*	*	
51. — <i>phymatopora</i> , Res. ....	300	*	*	*	*	*	*	*	
52. — <i>striatula</i> , Sm. ....	301	*	*	*	*	*	*	*	
53. — <i>fenestrata</i> , Waters .....	301	*	*	*	*	*	*	*	
54. — <i>Cecilii</i> , Aud. ....	301	*	*	*	*	*	*	*	
55. — <i>protensa</i> , sp. nov.....	301	*	*	*	*	*	*	*	
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65. — <i>pertusa</i> , Sm. ....	305	*	*	*	*	*	*	*	
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72. <i>Cupularia canariensis</i> , Busk .....	308	*	*	*	*	*	*	*	
73. <i>Selenaria maculata</i> , Busk .....	309	*	*	*	*	*	*	*	Bird Rock.

1. CELLARIA MALVINENSIS, Busk.

*Salicornaria malvinensis*, Busk, Cat. B.M. p. 18, pl. lxiii. figs. 1, 2; pl. lxxv. (bis), fig. 1; 'Challenger' Rep. Zool. pt. xxx. p. 91, pl. xii. figs. 1, 5, 7.

*Cellaria malvinensis*, Waters, Quart. Journ. Geol. Soc. vol. xxxvii. p. 321, pl. xiv. fig. 3.

*Salicornaria immersa*, T. Woods, Corals and Bry. of Neoz. Per. in New Zealand Colon. Mus. & Geol. Surv. 1880, p. 27, fig. 27.

There are a few small fragments of *Cellaria* from the River-Murray Cliffs, and in only one piece is there a zoecial avicularium. This avicularian cell is of the same shape as a zoecium, but is slightly smaller, with a wide avicularian aperture. Possibly a second species is also represented. *C. malvinensis* was found by the 'Challenger' widely distributed in the southern hemisphere in depths varying from 5 to 1450 fathoms.

Loc. Living: Falkland Island, South Patagonia, Straits of Magellan (*Darwin*). Six stations of 'Challenger' Exped., from Kerguelen, Marion Island, S. America, Fiji Islands, New Zealand (*Hutton*). Port Wellington (*Miss Jelly's Coll.*). Fossil: Mt. Gambier, Bairnsdale, Muddy Creek, Curdies Creek (Australia).

Nelson (from Leda marls vi.), Waipukerau, Shakespeare Cliff (Wanganui) [New Zealand].

2. *CELLARIA ANGUSTILOBA*, Busk; Waters, Quart. Journ. Geol. Soc. vol. xxxviii, p. 260, pl. ix. figs. 28-30.

The avicularia are all situated at the edge of the zoarium. The notch noticed in the avicularium of the Mount-Gambier specimens is not distinguishable in the Aldinga fossil.

3. *MEMBRANIPORA APERTA*, Busk. (Pl. VII. fig. 3.)

*Membranipora aperta*, Busk, Crag Polyzoa, p. 33, pl. iii. fig. 13.

A specimen from Aldinga has the zoarium conical, resembling *Lauvulites*. The opesia opening is about 0.4 millim. long and 0.25 millim. broad, and the avicularia are about the same size. The avicularium has three openings, the upper one large, triangular; below this a slit-like opening, and still lower down a semilunate opening; when these last two are broken down, they form a single opening, as figured by Busk. There is one distal rosette plate which is semilunate.

This is not the *Membranipora aperta* of Manzoni (Bri. di Castrocara, p. 9, pl. i. fig. 4).

Loc. Coralline Crag.

4. *MEMBRANIPORA CIRCULARIS*, d'Orb.

*Flustrina circularis*, d'Orb. Pal. Franç. p. 305, pl. 602. figs. 11-13.

? *Membranipora tuberculata*, Busk, Crag Polyzoa, p. 30, pl. ii. fig. 1.

In a specimen from the River-Murray Cliffs the zoarium consists of many layers, forming an irregular subglobular mass, but perhaps the colony commenced on a *Cellepora*. The opesia are variable, in some cases being quite round, in others subtriangular, with the lower edge straight and rounded, and contracted towards the top; in other cases the opening is more oval. Opesia of average cell 0.20-0.25 millim. long. There are two small avicularia above each opesia opening; but as the zoecia are arranged in quincunx, this makes them appear as if surrounded by six avicularia.

The structure of *Flustrina baculina*, d'Orb., and *F. pentagona* is similar.

Loc. Sougé, près de Vendôme (Loir et Cher), Cretaceous; River-Murray Cliffs.

5. *MEMBRANIPORA SAVARTII*, Aud.

*Membranipora ligerensis*, d'Orb. loc. cit. p. 550, pl. 607. figs. 5, 6.

*Flustrellaria tubulosa*, d'Orb. loc. cit. p. 532, pl. 727. figs. 9, 10.

*Membranipora subtilimargo*, Reuss, Bry. CEst. Ung. Mioc. p. 179 (39), pl. ix. fig. 3.

*Membranipora Lacroixii*, Reuss, loc. cit. p. 40, pl. ix. fig. 8.

? *Membranipora reticulum*, Reuss, Foss. Polyp. d. Wien. Tert. p. 98, pl. xi. fig. 25.

- Vaginopora texturata*, Reuss, loc. cit. p. 73, pl. ix. fig. 1.  
*Membranipora Savartii*, Busk, Crag Polyzoa, p. 31, tav. ii. fig. 6.  
*Biflustra Savartii*, Manzoni, Bri. di Castrocaro, p. 38, pl. ii. figs. 17, 17a; Smitt, Floridan Bry. p. 20, tav. iv. figs. 92-95; Busk, Rep. of 'Challenger' Polyzoa, p. 67, pl. xiv. fig. 2.  
*Biflustra delicatula*, Busk, Crag Polyzoa, p. 72, pl. i. figs. 2 & 4, pl. ii. fig. 7; Manzoni, Bry. foss. Ital. Contr. II. p. 4, pl. i. fig. 5; MacGillivray, Zool. of Vict. decade vi. p. 28, pl. 57. fig. 2.

For further synonymy, see Smitt's 'Floridan Bryozoa,' to which list probably several fossil *Membraniporæ* should be added.

I have some rather large pieces of bilaminate *Biflustra delicatula* from the Crag of Leiston, in which I am unable to find any denticle within the lower margin, and Professor MacGillivray draws attention to the fact that it exists only in two or three of the cells of the Queenscliff specimen, and is altogether absent in those from Queensland. In the Italian Pliocene fossil species I do not find it, nor does it seem to occur in the Australian or New Zealand fossils that I have examined; on the other hand, in a recent specimen, in the Vincularia-form, from Palm Island, it is seen in all the zoecia. Smitt has called attention to the inconstancy of the tubercles in this species; and in a recent specimen from Penang, some zoecia have tubercles while others are without. The recent specimen from Penang has the opesia about 0.3 millim. long and 0.24 millim. wide, which is slightly smaller than in the fossil adnate upon a *Retepora* either from Aldinga, or the River-Murray Cliff. *Biflustra regularis*, d'Orb., from Royan, is very closely allied, with rather larger opesial openings.

*Loc.* Senonian of France, Miocene of Austria. Crag and Pliocene of England, Italy, and Sicily. Living: Florida, 29 fathoms; Queenscliff (Victoria); Port Curtis (Queensland); Philippine Islands, 10 fathoms; Penang, &c.

6. *MEMBRANIPORA RADICIFERA*, Hincks; Waters, Quart. Journ. Geol. Soc. vol. xxxviii. p. 262.

In a specimen from the River-Murray Cliffs there are small open spaces between the zoecia.

7. *MEMBRANIPORA RHYNCHOTA*, Busk. (Pl. VII. fig. 1.)

*Membranipora rhyrchota*, Busk, Crag Polyzoa, p. 33, pl. iii. fig. 7.

A specimen from Aldinga is in the Eschara-form. The zoecia have large opesial openings 0.3 millim. long and 0.2 millim. wide. Below the opesia there is a large avicularium, with its opening much prolonged, and with the end very narrow for the acute mandible. The ovicell, with a keel down the centre and slightly depressed at each side, is surmounted by an avicularium.

There has been much confusion with this species, as by an oversight Mr. Busk gave a description of *M. minax* as *M. rhyrchota*

(Q. J. Mic. Soc. viii. p. 125), and the fossil from Bruccoli, which I called *Biflustra rhynchota*, should be renamed.

*Loc.* Crag.

8. *MEMBRANIPORA TEMPORARIA*, sp. nov. (Pl. VII. fig. 16.)

Although this *Membranipora* comes very near to several species, I have been unable to identify it with any. The zoecia are very large, with a large opesia, about 0.6 millim. long, whereas in few species is it more than 0.3–0.4 millim. Above each zoecium there are two avicularia with oval openings directed outwards. The ovicell is small, short, and but little raised. The species in most particulars corresponds with *M. pura*, Hincks, but that has spines in place of the avicularia.

*Loc.* River-Murray Cliffs.

9. *MEMBRANIPORA (AMPHIBLESTRUM) FLEMINGII*, Busk.

*Membranipora Flemingii*, Busk, Cat. B. M. ii. p. 58, pl. lxxxiv. figs. 3–5 (only); Hincks, Brit. Mar. Polyzoa, p. 162, pl. xxi. fig. 1–3.

A specimen from Aldinga is growing upon a *Retepora*. There has been considerable confusion with the species, as it was at first made to include forms which have since been separated, but the fossil is undoubtedly *Membranipora Flemingii*, as defined by Mr. Hincks. It has the six oral spines, an ovicell similar to recent specimens, and sometimes two avicularia below the area, but more frequently there is only one, and this often at the end of a long tubular projection. In some cases this chimney-like avicularium is nearly as long as a zoecium. In no recent specimen has the avicularium been found as much elevated, though it is always raised.

MacGillivray refers (Trans. Roy. Soc. Vict. vol. xviii. p. 120) with doubt to specimens "seemingly referable to" *M. Flemingii*, from Port Phillip Heads, Victoria.

*Loc.* Recent; European Seas, widely distributed.

10. *MEMBRANIPORA (AMPHIBLESTRUM) CYLINDRIFORMIS*, Waters, Quart. Journ. Geol. Soc. vol. xxxvii. p. 323, pl. xvii. fig. 74, and vol. xxxviii. p. 263, pl. viii. fig. 13.

11. *MEMBRANIPORA (AMPHIBLESTRUM) PARVICELLA*, T.-Woods. (Pl. VII. fig. 5.)

*Selenaria parvicella*, T.-Woods, Trans. Phil. Soc. Adelaide, 1880, p. 10, pl. ii. fig. 10; Waters, Quart. Journ. Geol. Soc. vol. xxxix. p. 441.

Some fragments from the River-Murray Cliffs are better preserved than those from Muddy Creek and Bird Rock; and here we see there was a spine, or process, over the elongate "avicular (?) cells," and a broad denticle within the lower margin of the zoecial cells. The dorsal surface is granulated, with a few large pores, and is divided by parallel lines, which apparently radiate from the centre of the colony; cross-lines, which are very indistinct, divide the dorsal surface into zoecial areas. The lateral rosette-plates form a regular

line along the middle of the lateral walls, and correspond with those of *Biflustra delicatula*, Busk, with which perhaps this species should be united.

Mr. Woods's description and figures are from the fossil upside down.

12. MEMBRANIPORA (AMPHIBLESTRUM) MICHAUDIANA, d'Orb.

*Cellepora Michaudiana*, d'Orb. Pal. Franç. p. 404, pl. 604. figs. 7, 8, pl. 712. figs. 3, 4.

*Membranipora permunita*, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. vii. p. 151, pl. x. fig. 2; MacGillivray, Trans. Roy. Soc. Vict. vol. xviii. p. 118.

*Membranipora falcata*, MacGillivray, Trans. Roy. Soc. Vict. vol. ix. p. 132.

The fossil differs from a recent specimen dredged off the coast of Victoria in having the zoëcia and also the opesia a trifle smaller. The avicularium of this fossil and of the one figured by d'Orbigny is a little smaller than that in the recent specimens, in which it occurs at the base of an abortive zoëcium; at least, this is my interpretation of a very curious structure, but this does not seem to be Mr. Hincks's view, and it is well worth further examination. In the fossils the ovicells are simply rounded, without a raised rib; and this is the case in some of the ovicells of my recent specimens, while others have it.

Perhaps the recent forms should rank as *M. Michaudiana*, var. *permunita*, on account of the small zoëcia to which the avicularia are attached.

*Loc.* Fossil: Cretaceous; Le Mans, Le Havre, Tourtenay; Aldinga (growing on *Microporella elevata*). Living: off Curtis Island, Bass's Straits; off Victoria (on *Adeona*), Schnapper Point (*MacG.*).

13. MEMBRANIPORA (AMPHIBLESTRUM) TRIFOLIUM, Busk, var. PROPINQUA.

*Lepralia trifolium*, MacG. Trans. Roy. Soc. Vict. 1868, p. 9; Prod. of Zool. of Vict. decade iv. p. 28, pl. xxxvii. fig. 2.

The fossil from Aldinga has the zoëcial avicularia and globular ovicells described by MacGillivray. The aperture (opesia) is about the same size as that of a Crag specimen of *Membranipora trifolium*, Busk, in my possession, but it differs in having a zoëcial avicularium (onychocellarium) and no other avicularia. The zoëcia, in shape, are very similar to those of recent *Selenaria maculata*, Busk. In the Report on the 'Challenger' Polyzoa, Mr. Busk figures as *Amphiblestrum umbonatum* (pl. xv. fig. 66) a species or variety with avicularia, which is closely allied to this.

It is strange that two forms so closely allied as *Membranipora trifolium*, Busk, and *Lepralia trifolium*, MacGillivray, should have received the same specific name when placed under different genera.

The genus *Amphiblestrum* may be a convenience, but, as at present defined, it cannot be looked upon as sharply separated, and

with a large number of species it would be extremely difficult to say whether they should be placed in *Membranipora* or *Amphiblestrum*. We see in *A. papillatum*, Busk, that it really has a thick border extending inwards, and not a plate, as in *Membranipora Rosselii*. As the genus *Membranipora* is so large, and contains such a variety of forms, it is to be hoped that other characters may be found to separate this genus more definitely.

*Loc.* Living: Queenscliff, Williamstown, and Western Port (MacG.). Fossil: Aldinga and River-Murray Cliffs,

#### 14. MICROPORA (?) PATULA, Waters. (Pl. VII. fig. 4.)

*Micropora patula*, Waters, Quart. Journ. Geol. Soc. vol. xxxvii. p. 326.

*Steganoporella patula*, Waters, Quart. Journ. Geol. Soc. vol. xxxviii. p. 265, pl. ix. fig. 31.

A specimen from the River-Murray Cliffs, in the Lepralia-stage, is much better preserved than the one from Curdies Creek or Mt. Gambier, and has below many zoecia a zoecial (?) avicularium, surrounded by an almost circular border, within which is the mandibular area, also surrounded by a granulated border, which is at the lower end narrow, but at the distal end becomes very broad. The avicularian opening is small and slit-like. Above the oral aperture there is a small ovicellular opening. The ovicell is scarcely at all raised, and would certainly be overlooked if it were not for this small opening; but in some cases the front wall is broken away, and then the ovicell-chamber is distinctly seen. At each side of the ovicellular aperture there is a depression or opening.

A similar supraoral opening has been figured in *Membranipora semiaperta*, Reuss, *Escharinella muralis*, Gabb & Horn, *Reptofustina heteropora*, G. & H., and *Cellepora Mokli*, Hagenow.

*Loc.* Curdies Creek, Mt. Gambier, River-Murray Cliffs.

#### 15. MICROPORA PERFORATA, MacG.

*Membranipora perforata*, MacGillivray, Trans. Phil. Institut. Vict. 1859; Nat. Hist. of Vict. decade iii. p. 29, pl. xxv. fig. 2.

When speaking of var. *clausa*, Waters (Quart. Journ. Geol. Soc. vol. xxxviii. p. 505), I pointed out that *Monoporella lepida*, Hincks, was allied to *M. perforata*, MacG., but they must be separated, either as varieties or species, on account of the much more fully developed avicularium of *M. lepida*, though the position and direction of the avicularium is similar. From Napier, New Zealand, there are specimens of *M. perforata* without avicularia, and others in which the small avicularium described by MacGillivray is pretty constant. In many zoecia in these Napier fossils there are several pores, as in recent *M. lepida*, from New Zealand; whereas in the Aldinga fossils it is rare to find more than the two below the aperture. The zoecia of the Australian fossils are very regular; but those from Napier show great variation in this respect, and therefore it is very probable that *Steganoporella elongata*, Hincks, is only a synonym.

Aperture about 0·1 millim. wide, which is slightly smaller than that of *M. lepida*.

*Loc.* Living: Queenscliff &c., Australia. Fossil: Aldinga, Mt. Gambier (Australia); Napier, and Tanners Run (New Zealand).

16. *MONOPORELLA CRASSATINA*, Waters.

*Monoporella crassatina*, Waters, Quart. Journ. Geol. Soc. vol. xxxviii. p. 270, pl. vii. fig. 8; *ibid.* vol. xxxix. p. 435.

*Lepralia japonica*, Busk, 'Challenger' Report on the Polyzoa, Cheil. p. 143, pl. xvii. fig. 5.

*Loc.* Living: Cobie, Japan 8-10 fathoms (Busk). New Zealand (from Miss Jelly). Fossil: Napier and Waipukerau (New Zealand); Mt. Gambier, Wauru Ponds, Aldinga, River-Murray Cliffs (Australia).

17. *MONOPORELLA SEXANGULARIS*, Goldf. (Pl. VII. fig. 2.)

*Eschara sexangularis*, Goldf.; Hagenow. Maast. Kreide, p. 81, pl. x. figs. 3, 4, 5.

*Eschara Clarkei*, T.-Woods, Trans. Roy. Soc. N. S. Wales, 1876, p. 2, figs. iv.-vii.

? *Eschara piriformis*, Sturt, 'Two Exped. Interior S. Austr.' 1833, ii. p. 253, pl. 3. fig. 2.

*Vincularia maorica*, Stoliczka, Bry. Orak. p. 153, pl. xx. fig. 8.

*Monoporella sexangularis*, Waters, Quart. Journ. Geol. Soc. vol. xxxix. p. 435.

*Biflustra excavata*, Manzoni, Bri. foss. del Mioc. d'Aust. ed Ung. p. 67 (19), pl. xiii. fig. 14.

There are two specimens from Aldinga, both fenestrate. In the one the fenestræ are about 4 millim. long, in the other they are 7-8 millim., and in the first there are zoecial avicularia (onycho-cellaria), of the same shape as those figured by Hagenow, but without the great elongation. The avicularian opening is elongate in the centre of the avicularium. In my former paper I pointed out that, although identifying it with Hagenow's species, I had not found any avicularia in either; and it is interesting to find that this character now justifies the determination. The oral aperture (0·22 millim.) is rather smaller than in the specimens from Muddy Creek &c.; and in the zoecia surrounding the fenestræ, there is not any oral opening, but an elongate slit, much like the avicularian opening. Beissel describes and figures such border cells in his *Eschara pulchra*, and blind cells are found in *Adeona* and other Chilostomata. There is also a non-reticulated specimen from the River-Murray Cliffs, which Prof. Tate marked *Eschara piriformis*, Sturt; but the *E. piriformis*, Goldf., of the Maestricht beds has much larger zoecia, with very large opesial opening (0·6 millim.) nearly as wide as the zoecium.

Some are flat bilaminar expansions, one is flattened and foliaceous, while others are subcylindrical, and this *Vincularia*-form no doubt represents the *Vincularia maorica* of Stoliczka; and now that I have seen these, I consider that the fossil from Curdies Creek might be called var. *minima* or var. *tuberculata*.

*Loc.* Orakei Bay, New Zealand (in *Vincularia*-form); Muddy Creek, Bird Rock, Waurn Ponds, Murray Cliffs, Aldinga (reticulated and also a compressed branch).

18. *STEGANOPORELLA MAGNILABRIS*, Busk; Waters, Quart. Journ. Geol. Soc. vol. xxxviii. p. 506.

From the River-Murray Cliffs there are specimens in the *Escharan* and *Hemescharan* forms.

In *S. magnilabris* the cells where division is about to take place are larger than the others, so that the large characteristic cells of *Steganoporella* are found to be followed by two smaller ones, each of which commences a new row. The same thing is seen in *Biflustra delicatula* from the Crag, and in other species.

With a cylindrical mode of growth, as in *S. neozelanica*, there is no frequent multiplication of the rows, and no large cells are found.

Mr. Busk, however ('Challenger' Report, p. 76), points out that the operculum of *S. neozelanica* differs from that of *S. magnilabris*, which is the case, as the former has numerous irregular bars across the operculum, and four large teeth instead of the numerous small ones; and therefore I agree with him that they must be separated.

*Loc.* Living: see *loc. cit.* p. 506, and Honoruru, Sandwich Islands (20-40 fathm.) (Busk). Fossil: Miocene; Castelgomberto? Mouille Mognon (Cant. Vaud); Curdies Creek, Mt. Gambier, Bairnsdale, Batesford, River-Murray Cliffs (Australia); Waipukerau and Petani (New Zealand).

19. *STEGANOPORELLA ROZIERI*, Aud., var. *INDICA*, Hincks.

*Steganoporella Rozieri*, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. vi. 1880, p. 379, pl. xvi. figs. 1, 1 a.

For other synonyms see Waters, Quart. Journ. Geol. Soc. vol. xxxviii. p. 505.

In the specimens from the River-Murray Cliffs, the zoarium is in the *Vincularia*-form, with about eight series of zoecia round the axis. There is a large opening replacing a zoecium, which is apparently the aperture of a large elongate avicularium; but from the state of preservation I do not feel sure about this interpretation, and possibly we have here only a broken-down zoecium. There are no other avicularia.

*Loc.* Living: India, Marion Islands, Holborn Islands, Darnley Islands, Torres Straits. Miocene: Söllingen. Bairnsdale, River-Murray Cliffs.

20. *CREBRILINA RADIATA*, Moll. (*non* d'Orb.).

For synonyms see Hincks, Brit. Mar. Polyzoa, p. 185, and Waters, Quart. Journ. Geol. Soc. vol. xxxviii. p. 265.

The specimen from the River-Murray Cliffs has eight ridges on each side, a suboral pore, avicularia with a wide base but elongate, scattered among the zoecia, ovicell globose, about two thirds as wide as the zoecia; oral aperture 0.09 mm. wide.



*Loc. Living:* European seas, Madeira, Florida, Bass's Straits.  
*Fossil:* European Eocene, Miocene, Pliocene, and Postpliocene, and Mt. Gambier.

21. CRIBRILINA FIGULARIS, Johnst.

*Lepralia figularis*, Johnston, Brit. Zooph. ed. 2, p. 314, pl. lvi. fig. 2.

*Cribrilina figularis*, Hincks, Brit. Mar. Polyzoa, p. 196, pl. xxvi. figs. 5-7.

*Cribrilina philomela*, Busk, var. *adnata*, Busk, 'Challenger' Report on the Polyzoa, pt. xxx. p. 132, pl. xxii. fig. 7.

A specimen from the River-Murray Cliffs has characteristic zoecial avicularia (onychozellaria), which correspond most nearly with those figured for *C. figularis*, var. *fissa*, Hincks (*loc. cit.* fig. 8). This, like var. *adnata*, has numerous costæ (nine on each side); more of the front is covered with costæ than in Mr. Hincks's figures, but not quite as much as in Mr. Busk's. Oral aperture 0.13 mm., which is about the same as in the Australian species.

*Loc. Living:* British, French, and Mediterranean seas; Capri, 40 fathoms; off Marion Islands, 50-75 fath.; Heard Islands, 75 fath.  
*Fossil:* River-Murray Cliffs, Crag (*Bell*).

22. CRIBRILINA TERMINATA, Waters.

*Cribrilina terminata*, Waters, Quart. Journ. Geol. Soc. vol. xxxvii. p. 326, pl. xvii. fig. 68, vol. xxxviii. p. 507, pl. xxii. fig. 6, and vol. xxxix. p. 436; pl. xii. fig. 17.

A specimen from the River-Murray Cliffs has two or three minute avicularia above the oral aperture, and the zoecial avicularia are narrower than the one figured from Muddy Creek (*l. c.* vol. xxxix. pl. xii. fig. 17).

*Loc. Fossil:* S.W. Victoria, Bairnsdale, Muddy Creek, and the River-Murray Cliffs.

23. MUCRONELLA MUCRONATA, Smitt; Waters, Quart. Journ. Geol. Soc. vol. xxxvii. p. 328, pl. xvii. fig. 66, vol. xxxviii. pp. 266 & 507, and vol. xxxix. p. 436.

The mucro supports an avicularium directed forwards. It occurs in Eschara- and Hemeschara-form.

24. MUCRONELLA NITIDA, Verrill,

*Discopora nitida*, Verrill, Amer. Journ. Science, vol. ix. p. 415, pl. vii. fig. 3 (1875).

*Mucronella nitida*, Verrill, Proc. U. S. Nat. Mus. p. 195; Waters, Quart. Journ. Geol. Soc. vol. xxxviii. p. 507.

*Smittia nitida*, Hincks, Ann. & Mag. Nat. Hist. s. 5, vol. vii. p. 159, pl. ix. figs. 5, 5 a.

*Lepralia reticulata*, var. *inequalis*, Waters, Ann. & Mag. Nat. Hist. ser. 5, vol. iii. p. 41, pl. ix. fig. 3.

*Smittia trispinosa*, Johnst., var. *ligulata*, Ridley, Proc. Zool. Soc. London, 1881, p. 53, pl. vi. fig. 9.

The Murray-Cliff fossil incrusts a *Cellepora*. It shows considerable variation in the size of the avicularia; sometimes they are ligu-  
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late; on other zoecia they expand considerably towards the extremity. With a form like the present it is difficult to know whether it should be called *Smittia* or *Mucronella*, and the two genera are not sharply defined.

*Mucronella delicatula*, Busk, Chall. Rep. p. 156, is, no doubt, closely related; but the triangular mandible shows that the two forms are not absolutely identical. I have a specimen dredged from the coast of Victoria which has a narrow ligulate avicularium, but I do not think that it ought to be separated from those with a larger avicularium, as the shape is approximately the same. Mr. Busk calls attention to the central denticle being in front of the operculum, as if it were exceptional; but this is the rule in this family.

*Loc.* Living: Vineyard Sound and Long Island Sound (*V.*); Africa (*H.*); Victoria Bank, S.E. Brazil (32 fath.); Victoria (on *Adeona*); Naples (*W.*). Fossil: Crag (*W.*), Bairnsdale and River-Murray Cliffs. This or a variety fossil from Waipukerau and Napier (New Zealand).

25. *MUCRONELLA COCCINEA*, Abildgard, var. *MAMILLATA*, Busk.

A specimen from Aldinga incrusts a *Cerithium* or allied shell. The surface is smooth or faintly sulcate, with a single or double row of pores round the base. The ovicell is very small and decumbent. The fossil is so badly preserved that it was not readily recognized.

*Loc.* Living: coast of Antrim. Fossil: Crag, Aldinga.

26. *MUCRONELLA COCCINEA*, Abildgard, var. *RESUPINATA*, Manz.

*Mucronella coccinea*, Waters, Quart. Journ. Geol. Soc. vol. xxxviii. p. 266.

In well-preserved avicularia it is clear that the mandible was spatulate, but the avicularian opening triangular.

*Loc.* Aldinga; Mt. Gambier.

27. *MICROPORELLA GRISEA*, Lamx., form *ADEONA*.

*Adeona grisea*, Lamouroux, Expos. Méth. p. 40, pl. lxx. fig. 5; Kirchenpauer, "Ueber die Bry. Gatt. *Adeona*," Journ. Mus. Godefroy, 1879, p. 9, pl. i. fig. 8, 8a.

*Dictyopora grisea*, MacGillivray, Nat. Hist. of Vict. decade vii. p. 23, pl. 66. fig. 1, 1a, b, c, d.

*Dictyopora cellulosa*, MacGillivray, Trans. Roy. Soc. Vict. 1868; Nat. Hist. Vict. decade v. p. 37, pl. xlvii. fig. 1, and decade vii. pl. lxvi. fig. 1e.

*Adeona cellulosa*, Kirchenpauer, *op. cit.* p. 10.

*Microporella cellulosa*, form *Adeona*, Waters, Quart. Journ. Geol. Soc. vol. xxxix. p. 437.

From Muddy Creek there is a fragment spreading out in flabelliform manner from the base, to which probably a flexible stem was attached.

From the range of zoecial variability found in specimens that I have examined, and from the published descriptions, there does not seem to be sufficient reason for separating *M. grisea* from *M. cellulosa*.

· *Loc.* Living : various Australian localities. Fossil : Muddy Creek.

28. *MICROPORELLA COSCINOPORA*, Reuss, var. *MUCRONATA*, MacG.

*Lepralia mucronata*, MacGillivray, Tr. Roy. Soc. Vict. 1868.

· *Eschara mucronata*, MacG., Nat. Hist. Vict. dec. v. p. 43, pl. xlviii. figs. 6, 7.

*Microporella coscinopora*, Reuss, var. *armata*, Waters, Quart. Journ. Geol. Soc. vol. xxxvii. p. 331, pl. xv. fig. 25.

· *Loc.* Living : Queenscliff and Schnapper Point (MacG.), Port-Philip Heads (A. W. W.). Fossil : Curdies Creek, Muddy Creek, River-Murray Cliffs.

29. *MICROPORELLA VIOLACEA*, Johnst., var. *FISSA*, H.

· *Microporella fissa*, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. vi. p. 381, pl. xvii. fig. 4.

30. *MICROPORELLA SYMMETRICA*, Waters, Quart. Journ. Geol. Soc. vol. xxxvii. p. 332, pl. xviii. fig. 83.

31. *MICROPORELLA FERREA*, Waters, *loc. cit.* p. 330, pl. xvii. fig. 72.

32. *MICROPORELLA POCILLIFORMIS*, sp. nov. (Pl. VII. fig. 8.)

Zoarium dome-shaped, 7 mm. diameter, in growth resembling *Cupularia*. Zoecia suboval, convex, surface covered with large pores, with a raised suboral pore just below the oral aperture. Oral aperture rounded at the distal end, straight below, 0.24 mm. broad. There are two distal rosette-plates, each of which usually has two openings. On the under surface of the colony the area of each zoecium is distinctly marked and is convex.

· *Loc.* River-Murray Cliffs.

33. *MICROPORELLA MAGNA*, T.-Woods. (Pl. VII. fig. 7.)

· *Lunulites magna*, T.-Woods, Trans. Phil. Soc. Adelaide, 1880, p. 7, pl. i. fig. 6a-6d.

Zoarium large (25 mm. diam.), dome-shaped, consisting, in the specimen examined, of one layer of zoecia, slightly elevated along eight lines radiating from the centre ; Mr. Woods says, " In the younger specimens . . . irregularly pentagonal ; in the older specimens . . . irregularly lobed or sinuated."

On each side of these lines the direction of the avicularia is opposed, being directed diagonally upwards to the right on one side and diagonally upwards to the left on the other side.

Zoecia raised, especially near the aperture, with large pores over the surface and a large suboral pore below the aperture. Oral aperture large (0.23 mm. wide), straight on the proximal edge with the corners rounded ; the distal edge of the aperture forms half a circle. The true shape of the aperture is sometimes obscured in the older cells. Avicularia large, broad ; aperture pointed above, rounded below. I have not had the opportunity of examining the

under surface of the zoarium ; but Mr. Woods says, " Under surface finely radiately ridged, with a narrow slit-like pore at the margin."

*Loc.* Mr. T.-Woods gives Aldinga and Mt. Gambier.

34. *MICROPORELLA (DIPORULA) MAGNIROSTRIS*, MacG.

*Microporella introversa*, Waters, Quart. Journ. Geol. Soc. vol. xxxviii. p. 268, pl. ix. figs. 33, 34.

*Lepralia magnirostris*, MacGillivray, " New or Little-known Polyzoa," pt. 2, Trans. Roy. Soc. of Victoria, vol. xix. p. 134, fig. 6.

Specimens from the River-Murray Cliffs grow either in the Hemescharan form when the dorsal surface is coarsely granulated and has large pores, or in superposed layers with zoecia of the same size as those from Mt. Gambier, but in a better state of preservation ; and here the central pore is very distinct and raised, but with a cleft in the upper (distal) part of the raised tube surrounding the pore. This better-preserved material shows that I was misled in supposing that the avicularia were directed inwards ; I then attributed the avicularia to the wrong zoecia.

*Loc.* Fossil : Mt. Gambier ; River-Murray Cliffs. Living : Port-Philip Heads.

[Since this paper was read, Miss Jelly has sent me a recent specimen from Port-Philip Heads (Australia). This is in the Hemeschara-form, but the dorsal surface was perhaps attached to a sponge, as it is studded with large erect pore-tubes resembling those on the dorsal surface of *Selenaria maculata*, and besides these there are calcareous offsets, which are traversed by numerous tubes, and appear to have a sponge-like structure. I hope to make a further examination and sections of these interesting radicles.]

This and the last species are very closely allied and should perhaps be united under one name. In both the recent specimen and the one from the River-Murray Cliffs the peristome is more raised than in the one I figured.

35. *MICROPORELLA ELEVATA*, T.-Woods. (Pl. VII. figs. 6 and 9.)

*Eschara elevata*, T.-Woods, Trans. R. Soc. N.S.W. 1876, p. 2, fig. 10.

*Microporella elevata*, Waters, Quart. Journ. Geol. Soc. vol. xxxvii. p. 330, pl. xvii. figs. 63, 64, pl. xviii. fig. 90.

When describing the fossil from Curdies Creek I pointed out the great difference in zoecia from different parts of the same colony, and some well-preserved specimens from the River-Murray Cliffs, showing in places the structure given in fig. 63 (*loc. cit.*), have in other parts a much more regular and elaborate structure. The peristomial region is raised and surrounded by a ridge, with small pores within the area thus formed ; down the middle of each zoecium there is a straight ridge which expands at the lower part of the zoecium, surrounding the median pore. On each side of this line there are large irregular openings.

There are very curious zoecial avicularia occurring only near the border of the colony with a nearly round aperture divided by a cross bar near the lower edge.

*Loc.* Curdies Creek ; Mt. Gambier ; Bairnsdale ; Muddy Creek ; Spring Creek ; River-Murray Cliffs.

36. *PORINA CORONATA*, Reuss.

For synonyms, see Waters, Quart. Journ. Geol. Soc. vol. xxxviii. p. 333, to which add:—

*Eschara gracilis*, MacGillivray, Nat. Hist. of Vict. decade v. p. 40, pl. xlvi. fig. 3 ; Busk, 'Challenger' Report, Zool. pt. xxx. p. 141, pl. xxi. fig. 6.

*Porina gracilis*, Hincks, Ann. & Mag. Nat. Hist. 1881, p. 60, pl. iii. fig. 5.

*Haswellia australiensis*, Busk, *loc. cit.* p. 172, pl. xxiv. fig. 9.

Before describing *Porina coronata* from Curdies Creek (Quart. Journ. Geol. Soc. vol. xxxvii. p. 333. I had received from Mr. Haswell specimens of his *Myriozoum (Haswellia) australiense*, in which the peristome is tubular, often entirely surrounded by openings which are either simple pores or have avicularian covers. There is great irregularity in these peristomial pores or avicularia, so that very frequently there is only an avicularium below the aperture ; in other parts in the same colony there may be two or three at the side ; in others they regularly surround the aperture. Sometimes the peristome is flattened on the distal edge. The central pore (median pore) is usually only a rounded aperture ; at other times in the same colony from Holborn Island (collected by Mr. Haswell) it has a tubular projection ; to show an extreme case, I figured from Curdies Creek a very delicate specimen with very marked tubular pores ; and upon reexamination, I find that from such a specimen to the large flat growth there is no break in the series, so that I feel quite convinced that the determinations then made were correct.

The opercula of the specimen sent as *M. australiense* are slightly smaller than those from typical *E. gracilis*, but the shape is the same, and so is the attachment of the muscles. As the ridge for the muscular attachment is characteristic, and differs from any other with which I am acquainted, this species may be made a test case, showing that the modern classification is an advance upon that which laid the greatest stress on the mode of growth. In both fossil and recent specimens the pore is sometimes elongate, sometimes round.

The fossils from the River-Murray Cliffs, Aldinga, and Adelaide are all either in the form *b*, as *vertebralis* (see Bry. from S.W. Victoria, p. 334), or are a little flattened.

37. *LEPRALIA EDAX*, Busk.

*Cellepora edax*, Busk, Crag Polyzoa, p. 59, pl. ix. fig. 6, pl. xxii. fig. 3.

*Lepralia edax*, Hincks, Brit. Mar. Polyzoa, p. 311, pl. xxiv. fig. 7, 7a, 8 ; Smitt, Floridan Bryozoa, pt. ii. p. 63, pl. xi. figs. 220–223 ; Waters, Quart. Journ. Geol. Soc. vol. xxxviii. p. 270.

*Cumulipora angulata*, Reuss, Septarienthon, p. 63, pl. viii. fig. 12.

Zoarium dome-shaped, about 30 millim. diameter, composed of many layers of zoecia. The under surface is cupulate, and the zoecia

here radiate in uniserial rows from the centre, with the greatest regularity, whereas on the upper surface numerous colonies are seen to start from various points of the surface. The under surface is divided by radiating and bifurcating sulci, and the part between these is raised, and along the ridges there are elevations looking like points of attachment. In this respect the dorsal surface resembles that of *Selenaria maculata*. Zoecia very little raised, irregularly hexagonal, separated by distinct raised borders with large pores round the edge of the zoecium; small avicularia below the aperture, with the opening rounded or slightly acute, directed downwards. Oral aperture with the proximal edge nearly straight, the distal edge rounded, formed of more than half a circle, with two contractions inside the aperture near the middle; at widest part about 0.12 mm. wide. Ovicell raised, globular.

I have already pointed out that the aperture in recent specimens is larger than in that from the Crag, and both the specimen from Mt. Gambier and this one from Murray Cliff correspond in this respect with those from Florida. In the Australian fossils no zoecial avicularia (onychocellaria) have been found. Some ovicells show an indistinct area on the front; but this is not distinguishable on all, and the ovicell is more globular than figured by Mr. Hincks.

Mr. Busk\* refers to finding "the backs of the polyzoan cells usually disposed in parallel rows, much as they are on the concave surface of some Lunulites," and Smitt seems to have noticed the same thing; it is therefore interesting to find it now in a true Lunulites-form.

### 38. *LEPRALIA DEPRESSA*, Busk, var.

*Lepralia depressa*, Busk, var.—Waters, Quart. Journ. Geol. Soc. vol. xxxviii. p. 509.

In a specimen of this variety from Aldinga there are small, globular, raised, granulated ovicells.

### 39. *LEPRALIA ROSTRIGERA*, Smitt.

*Escharella rostrigera*, Smitt, Floridan Bryozoa, p. 57, pl. x. figs. 203-205.

A specimen from the River-Murray Cliffs is growing in the Lepralia-stage. The hexagonal zoecia are very little raised and the surface is covered with large pores. The aperture is nearly round, with two lateral contractions; width 0.14 millim. There is usually a small avicularium pointed upwards on one side of the aperture, but seldom on both sides.

*Loc.* Florida, 35-43 fathoms.

### 40. *LEPRALIA ESCHARELLA*, Römer (in *Vincularia*-form).

*Vincularia escharella*, F. A. Römer, "Die Polyparien des Nord-deutschen Tert. Geb." Paleontographica, vol. ix. p. 6, pl. i. fig. 1.

This is evidently allied to *L. burlingtoniensis*, but the hexagonal zoecia are much larger, and the whole surface is covered with large pores. The oval oral aperture is larger, measuring about 0.3 millim. across.

*Loc.* Oligocene of Lattdorf (Römer), Aldinga.

\* Crag Polyzoa, p. 59.

41. *LEPRALIA BURLINGTONIENSIS*, Waters, Quart. Journ. Geol. Soc. vol. xxxviii. p. 270, pl. vii. fig. 6.

42. *LEPRALIA SUBIMMERSA*, MacG.

*Lepralia subimmersa*, MacGillivray, Nat. Hist. of Victoria, Zool. decade iv. p. 23, pl. xxxv. fig. 5.

Zoarium in Eschara-form growing as solid lamellate anastomosing fronds. Zoecia subhexagonal, bounded by prominent slightly sinuous lines; surface smooth, with large pores near the border. Oral aperture round above, concave below, with a small oral avicularium just below the aperture, sometimes in the peristome. The state of preservation does not allow of satisfactory examination of the aperture. From one broken-down ovicell it is clear that it was entirely immersed.

*Loc.* Living: Warrnambool. Fossil: Aldinga.

43. *LEPRALIA CONFINTA*, sp. nov. (Pl. VII. fig. 10.)

Zoarium in Eschara-form, flat. Zoecia indistinct, surface with a few large pores and small round avicularia scattered about; oral aperture round above, slightly contracted below, with a tooth on each side. The aperture (0.15–0.16 mm. wide) is surrounded by a round band. The zoecial characters remind us of *Myrionozoom truncatum*, but the cells and aperture are there larger. It is also allied to *Lepralia crassa*, Reuss, and *L. varians*, Seg. I have some flat bilaminar fragments of a similar recent *Lepralia* dredged by Mr. Brazier from Piper Island (9 fathoms), but the zoecia are much smaller, with the aperture about 0.12 mm., and the surface is dotted over with numerous small round avicularia. Possibly they should be united, although the more robust character of the fossil makes a considerable difference in the general appearance.

*Loc.* Aldinga.

44. *SMITTIA TATEI*, T.-Woods. (Pl. VII. fig. 15.)

*Eschara Tatei*, T.-Woods, Trans. Roy. Soc. N. S. W. 1876, p. 3, fig. xv.

*Smittia Tatei*, Waters, Quart. Journ. Geol. Soc. vol. xxxvii. p. 337, pl. xvii. fig. 65, and vol. xxxviii. p. 271, pl. vii. fig. 10, pl. viii. fig. 21.

*Smittia Perrieri*, Jullien, Bull. de la Soc. Zool. de France, p. 19, pl. xvi. fig. 45.

There are small flattened branches from the Murray Cliffs; and from Aldinga there is a most interesting colony in which the round branches anastomose and form a reticulate mass. The diameter of the branches is about 3 millim. In this specimen there is a peristomial sinus instead of the suboral pore; but this sinus is frequently almost closed in above, and no doubt the function is the same in both cases.

*Loc.* Living: N.W. of Spain, 2108 metres (*Jullien*). Fossil: Curdies Creek Mt. Gambier, Bairnsdale, Waurin Ponds, River-Murray Cliffs, Aldinga.

## 45. SMITTIA LANDSBOROVII, Johnst.

*Lepralia Landsborovii*, Johnst. Brit. Zooph. ed. 2, p. 310, pl. liv. fig. 9.

The aperture of the round suboral avicularium is very small, appearing as a point or a subunate opening. The specimen is in the *Lepralia*-form.

*Loc.* Living: British seas, Mediterranean, Florida, Australia (H.), Greenland. Fossil: River-Murray Cliffs.

## 46. SMITTIA RETICULATA, MacG.; Waters, Quart. Journ. Geol. Soc. vol. xxxviii. p. 272.

47. SMITTIA SERIATA, Reuss; Waters, *loc. cit.* p. 272, pl. viii. fig. 17.

## 48. SMITTIA MILNEANA, Busk, var. COEQUATA, nov.

Mr. Busk described in the Crag Polyzoa a fossil as *Lepralia Edwardsiana* (p. 44, pl. v. fig. 2), but this name he subsequently changed to *L. Milneana* (p. 132). The fossils from Aldinga in general appearance more resemble *Mucronella variolosa*, but the same main characters are found in both. In both the Crag and the Australian fossils there is a broad oral plate extending nearly across the aperture, the peristome is thickened and raised, and there is a small avicularium on one side, which usually forms a peristomial sinus, but sometimes in the Australian fossils it is raised and forms a mucro. The avicularia are in both in about the same position, but in the Aldinga specimens they are not at all raised, and are rounded at both ends with a wide mandibular opening directed inwards. In the variety the zoecia are bordered by a thick raised line, and are surrounded by a row of large pores.

*Loc.* The type occurs in the Coralline Crag (B.) and in my collection from Leiston, Suffolk. The variety is represented by two specimens, one growing on *Cellepora tridenticulata*, B., and the other on *Monoporella saxangularis*, Goldf., both from Aldinga.

## 49. SCHIZOPORELLA VULGARIS, Moll.

*Eschara vulgaris*, Moll, Seerinde, p. 61, pl. iii. fig. 10, A, B.

## 50. SCHIZOPORELLA SIMPLEX, Johnst. var. ALDINGENSIS.

*Lepralia simplex*, Johnston, Brit. Zooph. ed. 2, p. 305, pl. liv. fig. 4.

*Schizoporella simplex*, Hincks, Brit. Mar. Polyzoa, p. 246, pl. xxxv. figs. 9, 10.

A specimen from Aldinga varies from the British species in having no umbo, but we have in many species seen that the umbo is not a constant character, and I have therefore thought it advisable to consider it only as a variety. There are no avicularia, and the width of the aperture is 0.13 millim.

*Loc.* Living: British and Irish. Fossil: Scotch Glacial deposits.

## 51. SCHIZOPORELLA PHYMATOPORA, Reuss.

*Eschara phymatopora*, Reuss, Foss. Anth. & Bry. v. Crosaro, p. 272, pl. xxiii. fig. 1.

*Schizoporella phymatopora*, Waters, Quart. Journ. Geol. Soc. vol. xxxvii. p. 338, pl. xv. figs. 31, 32, and vol. xxxviii. p. 510.



*Myrionozoum honolulense*, Busk, 'Challenger' Report of Polyzoa, p. 170, pl. xxv. fig. 2.

Specimens from the River-Murray Cliffs occur as hollow cylinders of about the same size as those from Bairnsdale. The dorsal surface is divided into oblong zoecial areas. The rosette-plates are at the base of the zoecial wall, with, normally, two distal plates.

*Loc.* Fossil: Bartonian of Val di Lonte & Ferrara di Monte Baldo (Italy); Curdies Creeks; Bairnsdale and River-Murray Cliffs. Living: Sandwich Islands, 20-40 fathoms.

52. SCHIZOPORELLA STRIATULA, Smitt.

*Gemellipora striatula*, Smitt, Floridan Bryozoa, pt. 2, p. 37. pl. xi. fig. 207.

The surface of the specimen from the River-Murray Cliffs is smoother than in the Floridan specimens, and the pores are not so distinct; but the size is the same, with the oral aperture also 0.06 millim. wide, and there is the same characteristic prolongation of the zoecia, with a small round opening at the end.

*Loc.* Living. Florida, 68 fathoms.

53. SCHIZOPORELLA FENESTRATA, Waters.

*Schizoporella fenestrata*, Waters, Quart. Journ. Geol. Soc. vol. xxxviii. p. 399.

A fossil from the River-Murray Cliffs has smaller zoecia and a smaller aperture (0.13 millim.) than the one from Curdies Creek, and should perhaps be called var. *minor*. It has the surface coarsely granular and covered with pores; the aperture is deeply sunk, and there is frequently on one side a little below the aperture an avicularium with a round aperture, which in some cells is replaced by a very large raised avicularium covering the whole cell. The opening of this avicularium is triangular, with a tooth from the cross bar, and is situated at right angles to the axis of the zoarium.

*Loc.* Curdies Creek; River-Murray Cliffs.

54. SCHIZOPORELLA CECILII, Aud.

*Flustra Cecillii*, Aud.; Savigny, Egypte, pl. viii. fig. 3, p. 66.

55. SCHIZOPORELLA PROTENSA, sp. nov. (Pl. VII. fig. 14.)

In Lepralia-form growing on *Microporella elevata*. Zoecia regularly placed, hexagonal, slightly rounded, with a row of large pores round the edge, and with subtriangular avicularium directed outwards, on one or both sides about halfway down the zoecium. Aperture (0.2 millim. wide) rounded at the distal end, below straight with a distinct sinus.

*Loc.* Aldinga.

56. MASTIGOPHORA DUTERTREI, Aud.

*Mastigophora Dutertrei*, Hincks, Brit. Mar. Polyzoa, p. 279, pl. xxxvii. figs. 1, 2.

Specimens from the River-Murray Cliffs and Aldinga are of about the same size as these figured by Mr. Hincks, but the ovicells are

rather larger, and these are sometimes pressed in on the front, giving the appearance of a round depression; but perfect specimens seem to be globular. The surface is smooth and the peristome is but little raised. The oval aperture is about 0.12 millim. with six marginal spines. I feel some doubt about this determination, as the nature of the appendages is not distinguishable, and certainly many cells had neither vibracula nor avicularia.

*Loc.* River-Murray Cliffs, Aldinga.

57. *RETEPORA MARSUPIATA*, Smitt; Waters, Quart. Journ. Geol. Soc. vol. xxxvii. p. 342, pl. xv. figs. 34-36, pl. xvii. figs. 59, 61, 76, 77; vol. xxxviii. pp. 275, 511; and vol. xxxix. p. 439, pl. xii. figs. 13 & 21.

An imperfectly preserved specimen from Aldinga was sent over by Professor Tate marked "*R. vibicata*, Sturt;" but it is impossible to make specific comparison with the fossils found by Sturt, and this does not seem to be the *R. vibicata* of Goldfuss. The ovicell has a double cleft.

58. *RHYNCHOPORA BISPINOEA*, Johnston.

See Hincks, Cat. Mar. Polyzoa, p. 385, pl. xl. figs. 1-5.

A specimen from River-Murray Cliffs has a large avicularium raised as a mucro in front of the aperture, and frequently at the base of this on one side there is a smaller avicularium.

*Loc.* Living: British seas; Mazatlan; Adelaide; Victoria Bank, off S.E. Brazil, 33 fathoms (*Ridley*).

59. *CELLEPORA CORONOPUS*, S. Wood.

*Cellepora pumicosa*, Linn. (non Busk), Syst. Nat. 12th ed. p. 1286.

*Cellepora coronopus*, S. V. Wood, Ann. & Mag. Nat. Hist. vol. xiii. p. 13; Busk, Crag Polyzoa, p. 57, pl. ix. figs. 1, 2, 3; Manzoni, Bry. Foss. Ital. Cont. 4, p. 13, pl. iii. figs. 18, 19; Waters, Ann. & Mag. Nat. Hist. ser. 5. vol. iii. p. 192.

*Cellepora tubigera*, Busk, loc. cit. p. 60, pl. ix. figs. 8-10.

*Cellepora gambierensis*, Busk, Quart. Journ. Geol. Soc. vol. xvi. p. 261 (named only, no description); T.-Woods, Geol. Obs. in S. Australia, pp. 74 & 85; T.-Woods, Trans. R. Soc. Vict. vi. p. 4, pl. i. fig. 3.

*Celleporaria gambierensis*, Stoliczka, Foss. Bry. der Orakei Bay, p. 141, pl. xx. fig. 7.

Although this species is reported to be extremely common in Australia, a badly preserved specimen from Aldinga, which was sent over by Professor Tate marked "*C. gambierensis*," is the first that I have seen, and as the descriptions laid most weight upon the colonial growth, it was impossible to make any comparisons.

It grows in solid round branches about 8 millim. in diameter, and anastomoses regularly. The aperture of the zoecia is round, about 0.13-0.20 millim., with a small avicularium, apparently below the mouth. No zoecial avicularia or ovicells have been found on the specimen.

Stoliczka (*loc. cit.* p. 142) suggested that probably the fossil was *C. coronopus*; and so far as this specimen permits a judgment, I certainly agree with him.

*Loc.* Living: Coasts of Britain and France; Mediterranean. Fossil: Pliocene: Crag; Pliocene of Italy and Sicily; Mt. Gambier (*B.*); Geelong (Wilkinson); Orakei Bay (New Zealand); Aldinga.

#### 60. CELLEPORA AVICULARIS, Hincks.

*Cellepora Redoutei*, Aud. in Sav. Egypte, pl. vii. fig. 6, p. 64.

*Cellepora ramulosa*, form *avicularis*, Smitt, Oefv. Kon. Vet.-Akad. Förh. 1867, Bihang, pp. 32 & 194, pl. xxviii. figs. 202-210.

*Cellepora avicularis*, Hincks, Q. J. Micr. Soc. viii. p. 278; Ann. & Mag. Nat. Hist. ser. 3, vol. ix. p. 304, pl. xii. fig. 6; Brit. Mar. Polyzoa, p. 406, pl. liv. figs. 4-6; Norman, B. Assoc. Rep. 1868, p. 308; Waters, Ann. & Mag. Nat. Hist. ser. 5, vol. iii. p. 193, pl. xiv. figs. 11, 12.

A specimen from the River-Murray Cliffs apparently grew over the stem of some seaweed, and rises into irregular nodulations. The zoëcia are ovate with an avicularium at the side by the lower part of the oral aperture; oral aperture suborbicular, angular at the proximal edge, forming a sinus; large spatulate avicularia distributed over the zoarium. Ovicell globose with large punctures.

The size of the cells, apertures, and avicularia is the same as in my Naples specimens.

*Loc.* Living: British seas; Arctic Ocean; Red Sea; Naples; 10 fathm. Fossil: River-Murray Cliffs.

#### 61. CELLEPORA COSTATA, MacG.

*Cellepora costata*, MacG. Trans. R. Soc. Vict. 1869, p. 11.

*Cellepora retusa*, Manz., var. *caminata*, Waters, Ann. & Mag. Nat. Hist. ser. 5, vol. iii. p. 194, pl. xiii. fig. 1.

A small badly preserved specimen from Adelaide is growing on *Microporella ferrea*, W. This has smaller zoëcia than a recent specimen from Glenelg, S. Australia, in which the aperture is 0.13 millim., while in the fossil it is only 0.1 millim. In the fossil no ovicells are preserved, and the avicularia do not rise above the zoëcia, whereas in the recent specimen the ovicells are the same as those from Naples, and the avicularia, although they turn more inwards, closely resemble those from Naples.

This I believe is related to *Lagenipora spinulosa*, Hincks.

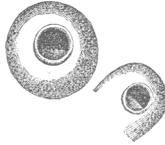
*Loc.* Living: Wilson Promontory and Queenscliff, Victoria (*MacG.*); Glenelg, S. Australia (*A. W. W. coll.*). Fossil: Leithakalk of Nussdorf (Vienna) (*A. W. W. coll.*), Adelaide.

#### 62. CELLEPORA DIVISA, sp. nov.

The zoarium is subglobular, 6-8 millim. in diameter. The zoëcia are small and irregular in shape, with a small round aperture 0.13 millim. wide, and inside this there is a plate extending about one third across the aperture (fig. 1). There is a central "pit" round

which the zoecia are formed, and in this respect and the shape and size of the zoecia it much resembles *C. fossa*, Haswell; but no avicularia are found on the colony. I have a small globular colony (4 millims. diam.) from the Crag of Leiston, with the oral apertures of about the same size, and a similar plate directed inwards. This

Fig. 1.—Zoecia of *Cellepora divisa*, sp. n., showing apertures.  
(Enlarged 25 diam.)



Crag fossil has a rostrum below the aperture with a terminal avicularium, and has plain globular ovicells. Possibly this is the armed condition of the present species.

Loc. Mt. Gambier.

#### 63. CELLEPORA MAMILLATA, Busk.

*Cellepora mamillata*, Busk, Cat. Mar. Polyzoa, p. 87, pl. cxx. figs. 3, 4, 5; Ridley, Proc. Zool. Soc. 1881, p. 54.

*Cellepora mamillata*, var. *atlantica*, Busk, Chall. Rep. Polyzoa, p. 199, pl. xxxv. figs. 4, 5, 13.

In a specimen from the River-Murray Cliffs the zoarium incrusting a shell is raised into large prominent mamillations. Oral aperture nearly round, flattened below, about 0.18 millim. diameter. Avicularia projecting above the zoecia, with large triangular mandibular openings on the median line on the internal aspect.

The mamillation of the zoarium occurs in a very large number of *Cellepora* and cannot be looked upon as a character of specific value. *C. mamillata* only differs from *C. pumicosa*, Busk, in the shape of the aperture.

Loc. Living: Coast of Patagonia; Victoria Bank, S.E. Brazil; Crozet Island, off Bahia; New Zealand (*Hutton*); Victoria (*MacG.*). Fossil: River-Murray Cliffs.

#### 64. CELLEPORA ALBIROSTRIS, Smitt.

*Discopora albirostris*, forma typica, Smitt, Floridan Bryozoa, p. 70, pl. xii. figs. 234-239.

*Cellepora albirostris*, Busk, Journ. Linn. Soc. vol. xv. p. 347; 'Challenger' Report on the Polyzoa, p. 193, pl. xxxiv. fig. 7, pl. xxxv. fig. 3.

A specimen from the River-Murray Cliffs is dome-shaped, resembling *Lunulites*. The zoecia are round, much raised, and smooth; below the oral aperture there are small oral avicularia with rounded openings, but I do not find any vicarious avicularia (onychocellaria); above the aperture there are two spines; aperture

rounded on the distal edge, becoming wider on the proximal, which is slightly concave 0.14–0.17 millim. wide. In the recent and fossil specimens there are at the two sides of the aperture small teeth, one on each side directed downwards towards the neural wall. The shape of the operculum indicates the presence of such teeth, but they have been overlooked. The dorsal surface much resembles that of *C. biradiata*, W., and this species, *C. albirostris*, *C. pertusa*, and *C. tridenticulata*, are no doubt allied.

The specimen that I referred to *pro tem.* as *C. repleta* (Journ. Roy. Micr. Soc. vol. ii. p. 392, pl. xv. figs. 6, 8), is *C. albirostris*, and grows round the stalks of seaweed, rising into ridges with zoecia on each face of the ridge. These have no oral spines, frequently the rostrum bifurcates, and ovicells surmounted with small avicularia are supported by the rostrum. Smitt refers to the Floridan specimens sometimes having two spines and sometimes being without; and as this is made a leading distinction between *C. albirostris* and *C. hastigera*, I should certainly feel inclined to unite them, for in each colony of *C. albirostris* there is great variation in the size and form of the rostral process.

We see in this species and *C. tridenticulata* how little importance we should attach to the mode of growth; and among specimens picked up at the same time near the Semaphore, Adelaide, as being the same species, we have found that although they most closely resembled one another in general appearance, they represent *Heteropora crevicornis*, d'Orb., *Cellepora albirostris*, and *C. tridenticulata*.

*Loc.* Living: Florida, 25–35 fathm.; Sydney (*Sm.*); Heard Islands, 75 fathm. (*B.*); Semaphore, Adelaide (*A. W. W. coll.*). Fossil: River-Murray Cliffs.

#### 65. CELLEPORA PERTUSA, Smitt.

*Discopora pertusa*, Smitt, Floridan Bryozoa, p. 72, pl. xii. figs. 240, 241.

A specimen from Aldinga is irregularly subglobular; diameter 4 to 7 millim. In the shape of the zoecia and of the large oral apertures it corresponds with the Floridan specimens; but in the fossil there are no avicularia, and from Smitt's figures the avicularia only seem to occur on some of the zoecia. Oral aperture 0.28 millim.

*Loc.* Florida, 35–60 fathm.

#### 66. CELLEPORA PERTUSA, Sm., var. LIGULATA.

The zoarium consists of hollow cylindrical branches. The zoecia are ovate, elongate, irregular, with a rounded aperture nearly straight below and slightly contracted at the sides; there is a very minute avicularium below or to the side of the aperture, and besides this there are frequently small ligulate or spatulate avicularia on the zoecia, and here and there an elongate spatulate vicarious avicularium. The oral aperture is 0.12 millim.

I feel much doubt about any determination of this form, but in calling it a variety of *pertusa* the similarity in most points is indi-

cated, but the minuteness of the aperture and the avicularia on the front of the zoecia distinguish it.

*Loc.* River-Murray Cliffs.

67. *CELLEPORA BIRADIATA*, sp. nov. (Pl. VII. figs. 11, 12.)

In a specimen from the River-Murray Cliffs the zoarium is conical, mamillated, in diameter about 20 millim., and has the general appearance of a large *Lunulites*. The zoarium is formed by many superposed layers of zoecia. On the dorsal surface there are radiating lines, and when the outer surface is broken away, the walls of a double row of zoecia are seen, and each such double row is separated from its neighbours by septa (fig. 11).

Zoecia irregular, subglobular, raised, with the oral aperture rounded on the distal edge, nearly straight on the proximal, forming more than a semicircle, 0.12 millim. wide. Below the aperture, a little to one side, is a small raised avicularium, with the mandibular opening forming a nearly equilateral triangle. In one specimen there are two spatulate avicularia, and sometimes three rudimentary teeth can be distinguished in the oral aperture; but this is exceptional. Ovicells subglobose, broader than high, smooth, resembling the ovicells of *Cellepora ramulosa*, L., as figured by Hincks, Brit. Mar. Polyzoa, pl. lii. fig. 8.

This and *C. compressa*, Busk, *C. tridenticulata*, B., and *C. albistrotris*, Sm., all seem closely related.

68. *CELLEPORA TRIDENTICULATA*, Busk.

*Cellepora tridenticulata*, Busk, Journ. Linn. Soc. vol. xv. p. 347; 'Challenger' Report on the Polyzoa, p. 198, pl. xxix. fig. 3, pl. xxxv. fig. 17.

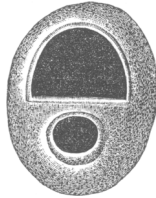
From the River-Murray Cliffs there is a solid dome-shaped colony formed of many layers, measuring about 25 millim. in diameter, and in a colony from Aldinga the zoarium commenced in a dome shape, then spread out to about 10 centim. in diameter and grew into a solid mass 10 centim. high. The zoecia are irregular, immersed, with the oral aperture straight below, rounded at the distal end, forming a little more than half a circle, and a little way down the aperture on the proximal edge there are three narrow teeth directed forwards. Below the oral aperture there is a small rounded avicularium, and there was a spine on each side of the aperture. Oral aperture about 0.2 millim., from which it can be seen that in the fossil it was larger than in the specimen described by Mr. Busk; but recent specimens from the Semaphore, Adelaide, correspond with the fossil. On the under surface the elongate hexagonal shape of each cell is visible, and there are projections for attachment. Out of several fossil specimens I have only found two with a vicarious avicularium (onychocellarium), and in this case it was spatulate, as figured by Mr. Busk. In recent specimens sometimes the avicularium is very small, at others it rises into a large rostral process, and occasionally there are four teeth in the oral aperture. *C. tridenticulata* and *C. honolulensis*, B., are very closely allied.

*Loc. Living*: Off Cape York, lat. 10° 30' S., long. 142° 18' E., 8 fathm. (*B.*); Semaphore, Adelaide (*A. W. W.*). *Fossil*: Aldinga, River-Murray Cliffs (dome-shaped and incrusting); Yorke's Peninsula (irregular cone-shaped); Waipukerau (New Zealand).

69. *CELLEPORA FOSSA*, Haswell, Waters, Quart. Journ. Geol. Soc. vol. xxxvii. p. 343, pl. xviii. fig. 89, and vol. xxxviii. p. 275.

From the River-Murray Cliffs there is a specimen about 25 millim. in diameter, with the one surface, which may be called the under surface, flat; the other is slightly rounded. On the flat surface there are about forty well-marked pits and a few smaller ones.

Fig. 2.—*Zoecium* of *Cellepora fossa*. (Enlarged 25 diam.)



Mr. Haswell, in a "Note on a curious instance of Symbiosis" (Proc. Linn. Soc. N. S. Wales, vol. vii. 1882), refers to his discovery of small red Actinids lodged in cylindrical pits in recent *Cellepora*, and he attributes these pits in *C. fossa* to a similar parasite. It is therefore extremely interesting to frequently find similar pits in fossil *Celleporæ*. Mr. Busk refers to a perforation two thirds through *C. tubulosa*, a fossil from Australia, which, however, cannot be identified, as the description only takes cognizance of the mode of growth.

The straight edge of the aperture is irregularly rough, but there are no teeth.

*Loc. Living*: Holborn Island. *Fossil*: Curdies Creek, Mt. Gambier, River-Murray Cliffs, and Aldinga.

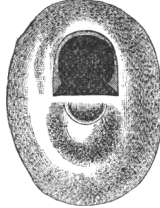
70. *CELLEPORA FOSSA*, HASW., var. *MARSUPIATA*, nov.

*Zoarium* subglobular (6 millim. diam.), with a central pit as in *C. fossa*. In the typical *C. fossa*, the avicularium is very large, often nearly as large as the oral aperture (fig. 2), so that in badly preserved specimens the appearance is of one large round aperture with a bar across. In the present variety the avicularium is much smaller, with the avicularian chamber raised, forming a kind of pouch with a semicircular aperture (fig. 3). Surface granular. The oral aperture (0.1–0.12 millim.) is narrower than in *C. fossa* but is proportionately longer; inside the aperture directed downwards, towards the interior of the zoecium, there is a tooth on each side of the aperture, and sometimes these teeth are continued as a plate round the proximal part of the aperture. In a few cases faint traces of

such teeth can be detected in the typical *C. fossa*, but this is exceptional.

*Loc.* River-Murray Cliffs.

Fig. 3.—*Zoecium* of *Cellepora fossa*, var. *marsupiata*.  
(Enlarged 25 diam.)



71. *LEKYTHOPORA HYSTRIX*, MacG.

*Lekythopora hystrix*, MacGillivray, "Descriptions of New or Little-known Polyzoa," pt. iii. p. 194, Trans. Roy. Soc. Vict. vol. xix. pl. i. fig. 6; also pt. viii. p. 8, pl. ii. fig. 6 (advance copy).

In the growth and the shape of the cells this so much resembles various Cyclostomata that until sections were prepared I did not recognize that it was a Chilostoma; and even after careful examination the fossil remains very incomprehensible, and further study of recent specimens is much to be desired. The state of fossilization is not favourable for studying the minute structure. The zoecia, which are subtubular, open only on one side of the zoarium, and are erect and often more or less in bundles, giving the appearance of *Fron dipora*. The small opening on the side of the aperture which MacGillivray describes as an avicularium, is only distinguishable in a few cases. On the front of the zoarium there are a number of globular mamillations, sometimes with a small opening in the centre. These much resemble the enlargements on the front of the cell which Professor MacGillivray describes as ovicells; but these enlargements in the fossil are usually entire, with comparatively large pores on the surface. The solid under surface of the zoarium has a few irregularly scattered large-sized pores.

72. *CUPULARIA CANARIENSIS*, Busk.

*Cupularia canariensis*, Busk, Q. J. Micr. Soc. vol. vii. p. 66, pl. xxiii. figs. 6-9; Crag Polyzoa, p. 87, pl. xiii. fig. 2; Manzoni, Foss. Ital. Contrib. i. p. 10, pl. ii. fig. 17; Bri. foss. del Mioc. d'Aust. ed Ungh. p. 24, pl. xvii. fig. 56.

*Membranipora canariensis*, Smitt, Floridan Bryozoa, pt. 2. p. 10, pl. ii. figs. 69-71.

Specimens from Aldinga have larger zoecia and larger opesial openings than some recent specimens from Princess Charlotte Bay. In the recent one the sulcate structure of the under surface is very marked; but upon careful examination faint cross-divisions can also be distinguished, thus separating the dorsal surface into zoecial



divisions, while in the fossil the dorsal sulci are not very marked, and there are but few pores in each quadrangular division; again they are more numerous in the Charlotte-Bay example. The difference between this and *C. guineensis* and *C. stellata* consists in the lamina not extending up to the distal border; but this is a variable character, and probably all three should be united under one name.

*Loc.* Living: Madeira and Canaries; Princess-Charlotte Bay (sent by Mr. Brazier); Florida, common, 10-44 fathm. (*Sm.*). Fossil: Miocene—Austria and Hungary. Pliocene, Crag—Hills of Pisa, Castelarquato, Asti, Mt. Mario, Rhode Island; Tortonian and Saharian of Reggio (Calabria) (*Seg.*); Aldinga.

### 73. SELENARIA MACULATA, Busk.

*Selenaria maculata*, Busk, Cat. Mar. Polyz. p. 101, pl. cxvii.; Waters, Quart. Journ. Geol. Soc. vol. xxxix. p. 440, pt. xii. figs. 7, 9, and 12.

A specimen from the River-Murray Cliffs is about 6 millim. in diameter, and is exactly similar to specimens from Muddy Creek and Bird Rock. The dorsal surface is divided by radiating ridges, between which there are single or double rows of large pores. Another specimen from Aldinga (sent over as *Lunulites rutella*) has smaller zoecia and very few vibracular chambers, and on the dorsal surface there are, instead of the large pores, long erect tubes, which may serve for attachment.

Besides the species named there is a small cylindrical fragment of what I believe is *Lepralia (Onchopora) immersa*, Haswell; but with so small a piece, imperfectly preserved, I cannot feel sure of the determination. The collection also contains a *Membranipora* from the River-Murray Cliffs which belongs to the *M.-spinifera* group, and another with oval opesia and a small avicularium above the opening, which might be *M. levata*, Hincks.

Upon reexamining the Mt.-Gambier collection I find that a specimen which I thought was *Retepora rimata*, W., is *R. jacksoniense*, Busk ('Challenger' Report, p. 125, pl. xxvii. fig. 4). These two species are very closely allied, but the avicularia differ in shape. A further study as to the range of variability of *R. jacksoniense* would be of great interest.

### EXPLANATION OF PLATE VII.

- Fig. 1. *Membranipora rhynchota*, Busk. The zoecia on the left have ovicells; those on the right are without.  
 2. *Monoporella sexangularis*, Goldf. From specimen fig. 13.  
 3. *Membranipora aperta*, Busk.  
 4. *Micropora patula*, Waters.  
 5. *Membranipora parvicella*, T. Woods.  
 6. *Microporella elevata*, T. Woods; showing marginal avicularia.  
 7. *Microporella magna*, T. Woods.

- Fig. 8. *Microporella pocilliformis*, sp. nov.  
9. *Microporella elevata*, T.-Woods; drawn from the same colony as No. 6.  
10. *Lepralia confnita*, sp. nov.  
11. *Cellepora biradiata*, sp. nov.; dorsal surface.  
12. Ditto, natural size.  
13. *Monoporella sexangularis*, Goldf.; natural size.  
14. *Schizoporella protensa*, sp. nov.  
15. *Smittia Tatei*, T.-Woods; natural size.  
16. *Membranipora temporaria*, sp. nov.

#### DISCUSSION.

Mr. ETHERIDGE said the author had done valuable service in describing Polyzoa from various countries, and this contribution would doubtless prove a valuable addition to our knowledge.