On Tertiary Chilostomatous Bryozoa from New Zealand

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6. *On* Tertiary Chilostomatous Bryozoa *from* New Zealand. By Arthur Wm. Waters, Esq., F.G.S. (Read December 1, 1886.)

[Plates VI.–VIII.]

In the following paper the Chilostomata * from three collections are described, two being kindly lent by Miss Jelly, to whom they had been sent by a correspondent living in the neighbourhood of Napier. They are from Petane and Waipukurau, both representing a well-known horizon, and also some from Waikato † and Trig's Station, Tanner's Run, besides others designated as from the neighbourhood of Napier.

For the third collection, which is only small, I am indebted to the kindness of Professor Hutton, who collected the material from the base of the Shakespeare Cliff, Wanganui.

Petane, Waipukurau, and Wanganui are known localities in what is called the Wanganui system, which Tenison-Woods in his "Corals and Bryozoa of the Neozoic Period in New Zealand" (Colon. Mus. and Geol. Survey Dept. 1880), calls "Upper Miocene," but which Professor Hutton more recently (Quart. Journ. Geol. Soc. vol. xli. 1885, p. 194) calls "Newer Pliocene."

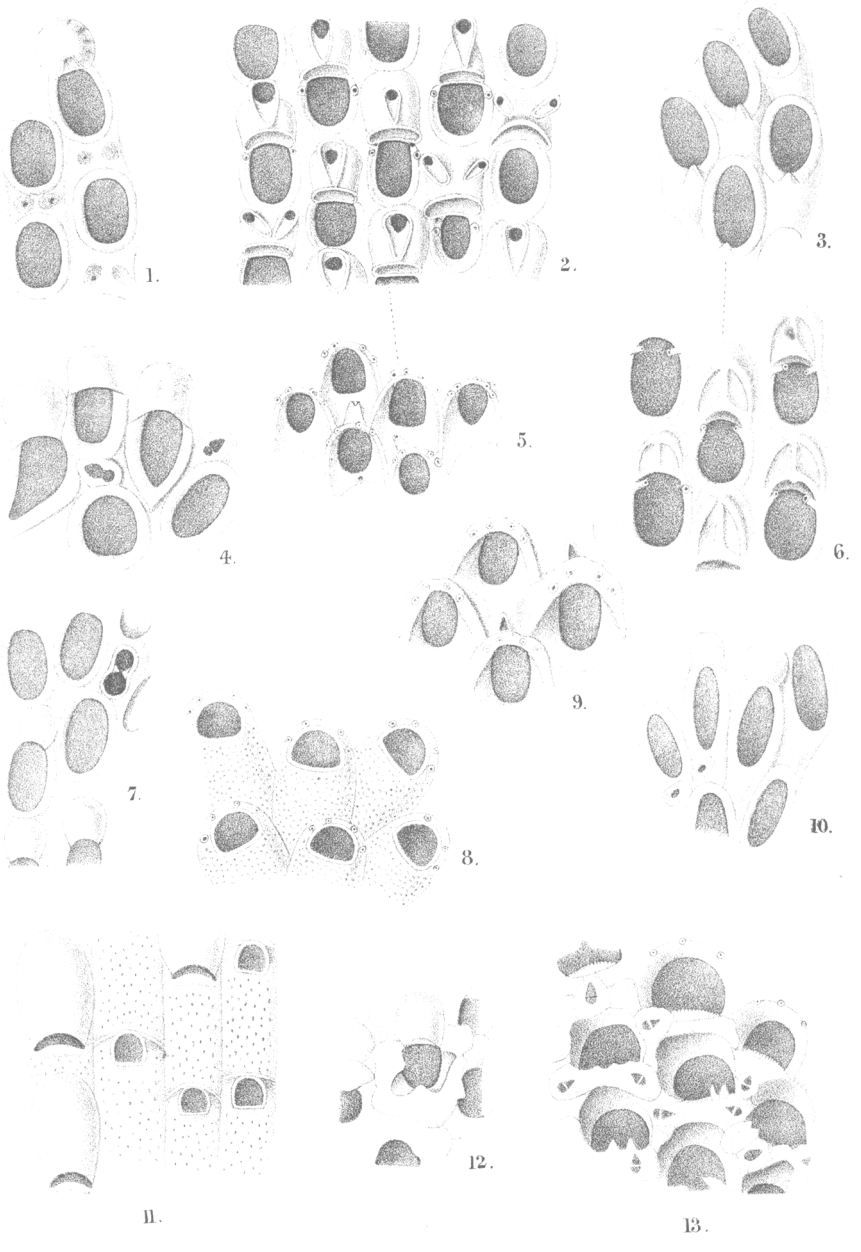
The only papers on New-Zealand fossil Bryozoa with which I am acquainted are those by Tenison-Woods, just mentioned, and one by Stoliczka, "On the Bryozoa from the Marine Beds of the Waitemataschichten of Orakei Bay." The Waitemata beds belong to the Pareora system, and are considered by both Woods and Hutton to be Miocene.

Of some few the state of preservation is very satisfactory, while with most this is by no means the case; yet it is often surprising to find how in badly preserved specimens the characters can be distinctly made out by a detailed examination of cell after cell. As an example, I had examined *Lepralia semiluna*, var. *simplex*, for over an hour before I could tell which was the right way up; but when at last I got the key and examined the best-preserved zoœcia, the characters were made out as distinctly as in any fossil that I have yet examined.

The general appearance depends largely upon the conditions of fossilization, and with most of the fossils now examined is quite useless for specific separation; but during the last few years we have been taught how, in the recent forms, we must look almost entirely to the zoœcial characters, and our knowledge of the fossils must be increased by a study of each character separately. It will most materially help the study of the recent Bryozoa when the descriptions are given of the separate organs with the organic integument removed, and this must be done before comparisons are made with fossils. Through the kindness of Miss Jelly I have been

* The description of the Cyclostomata will shortly follow.

† This is written "Whakati," but I have not been able to find out that there is such a place, whereas Bryozoa of this age are known from Waikato Heads.



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

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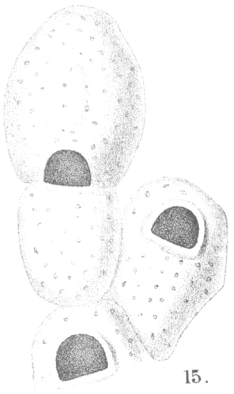
NEW ZEALAND CHILOSTOMATA.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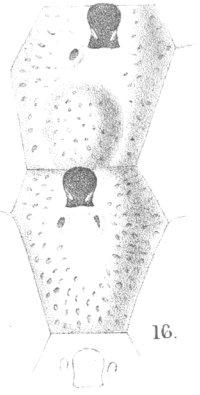
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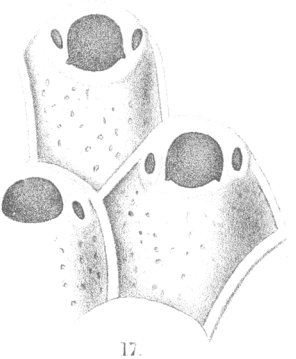
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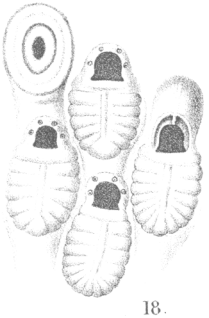
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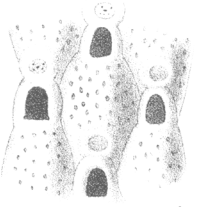
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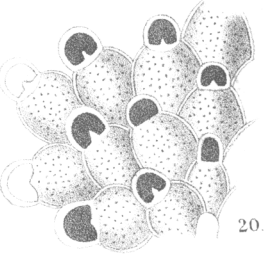
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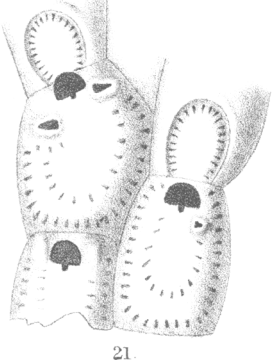
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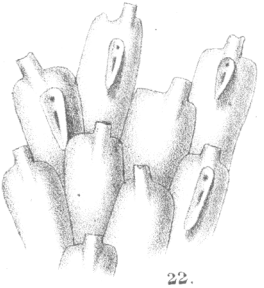
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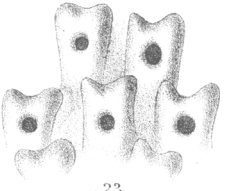
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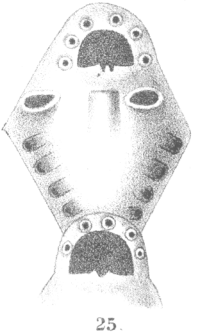
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A. W. Waters del. A. T. Holhck lith.

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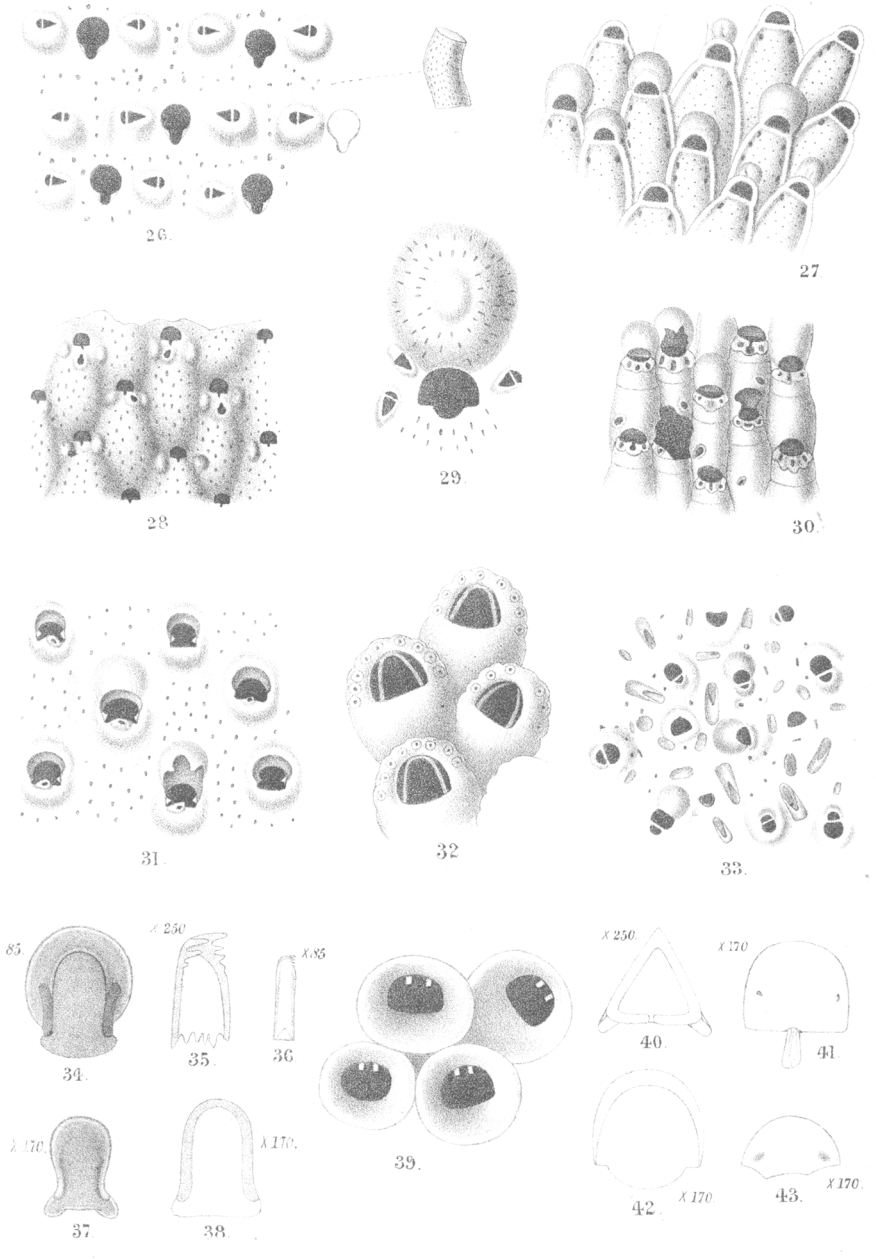
NEW ZEALAND CHILOSTOMATA.



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

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NEW ZEALAND CHILOSTOMATA.

enabled to make such direct comparisons with most of the recent New-Zealand and Australian Bryozoa, making preparations of the covers and other parts, and, during the three years that these collections have been in my hands, have been preparing myself for dealing with the fossils by studying the recent forms.

There are some people who think it is possible to turn aside from other work and off-hand decide on the correctness of an author's interpretation; but, certainly with such a group as the present, criticism such as every author ought to be glad to receive can only be of value when the spirit of the work is entered into after prolonged examination. On this account it is much to be regretted that there are so lamentably few workers on fossil Bryozoa, whereas there are numbers of entirely new fields, and all the older work ought now to be revised from our present stand-point in classification.

The genus *Membranipora*, which is largely represented from near Napier, is not one of the most useful palæontologically, because (1) the shape of the oral aperture is never preserved, but only that of the opesial aperture, which is of but secondary diagnostic value; and (2) in this genus the appearance of the zoœcia is remarkably modified by the presence of ovicells, but these are often wanting both in recent and fossil specimens. In fact, among the recent forms, the ovicells are not known in one half of the species, and even in some of the commonest, such as *M. pilosa*, they have not yet been found.

It will be seen from a reference to figures 2 and 5, 3 and 6 how very different the appearance in various parts of the same colony may be; and this is by no means confined to the genus *Membranipora*, but occurs in numerous genera, an example of which may be seen in different parts of *Microporella elevata*, T.-Woods (see Quart. Journ. Geol. Soc. vol. xli. pl. vii. figs. 6 and 9).

In nearly all the commoner species with wide geographical range, such as *Microporella ciliata*, *Cribrilina radiata*, *Rhynchopora bispinosa*, *Cellepora coronopus*, *Cribrilina monoceros*, *Porella concinna*, &c., the mode of growth, the thickness, the structure of the shell, the size and number of spines*, the position of avicularia, and other characters are known to be liable to great variation, causing the appearance to be quite different. Yet notwithstanding this wide range in common species, it seems to be overlooked that the same is likely to be the case in species with which we are less acquainted; and the comparisons that I have been obliged to make in studying the characters of the fossils have convinced me that not only by those fresh in the field, but also by some of our most competent workers, local varieties, or even specimens, have in many cases been described as species. With the paucity of fossil material, it is impossible that this can always be avoided, but I would urge the advisability of more frequently indicating the relationships.

I have never been satisfied as to the separation of *Smittia* and *Mucronella*; and although we seem on the right track with regard to

* Thus we have *Membranipora Lacroixii* and *M. monostachys* with and without spines.

the classification of the Chilostomata, there are many points which require modification, and the peristomial characters all seem too variable to be used for wider classification.

A list of recent New-Zealand Bryozoa has been drawn up by Professor Hutton (Man. of N. Zealand Moll., Col. Mus. & Geol. Surv. Dept. 1880), and a large number have been described by Hincks in the 'Annals,' and some by Busk in the 'Challenger' Report, besides which, as already said, I have had the opportunity of examining a series, and now our knowledge of the Australian and New-Zealand fauna is being constantly increased by MacGillivray, Hincks, and other workers, so that, although much remains to be done, we are now gaining a fair knowledge of the Australian fauna. We must, however, always remember that in giving the proportion of any fossil series known living, this can only refer to the state of knowledge at one time; even since I commenced writing on the Australian fossils, dredging has brought to light several species at first indicated as only known fossil, so that the proportions then given are somewhat changed.

Besides those mentioned in this and previous papers, *Microporella coscinopora*, var. *armata*, has been found near Port Phillip Heads and Queen's Cliff. *Porella emendata*, Waters, has been described in the 'Challenger' Report (p. 155, pl. xx. fig. 5) as *Mucronella pyriformis*. Mr. Busk does not mention any avicularia, but in a specimen from Port Western I found avicularia to a few cells, placed diagonally as in the fossil. The fossil and recent forms agree in size and every particular.

Cellaria ovicellosa, Waters, has been sent to me recent from Australia by Miss Jelly, and is, no doubt, the *Salicornaria bicornis* of the 'Challenger' Report (p. 90).

Membranipora articulata, Waters, has since been described by Mr. Hincks as *Farciminaria appendiculata*; and I would take the opportunity of again urging the importance of decalcifying recent specimens, for often, as in this case, a very different appearance is given and fresh and important characters are seen. If this had been done, Mr. Hincks would have seen points which have escaped him, and, I think, would then have recognized that the species had already been described.

Micropora cavata, W., is *Aspidostoma giganteum*, Busk. In each paper fresh instances of species with two or more modes of growth have been given; such cases are constantly coming before me and new ones are mentioned in this paper. Recently Dr. Jullien * has made an important addition to our knowledge of the freshwater Bryozoa, and shown that, trusting to the mode of growth, a classification has been used which would often bring various specimens of a species under different genera, and that a revision similar to that which has been made of the Chilostomata is necessary with the Endoprocta.

Enough is not yet known about the New-Zealand and Australian Bryozoa to be able to fix their exact age with certainty, and this

* "Bryozoaires d'eau douce," par Dr. J. Jullien (Bull. Soc. Zool. de France t. x. 1885).

ultimately can only be done by taking into consideration the various groups of fossils; but the facies of those in hand is so recent, that we are inclined to think that some authors have attributed too great an age to the deposits containing them. That they are comparatively recent cannot be doubted, when we consider what a large number are known living in the New-Zealand seas, or are represented there by others very nearly related to them. Out of 78 species, or varieties, 61 are known living, 29 of these from New-Zealand seas, 48 from either New-Zealand or Australian waters, and 28 have been found fossil in Australia.

Figures of a few of the chitinous covers of species discussed are given, as they are the best indication of the shape of the true oral aperture. Figures 34 and 37 are copied and shaded from photographs, and on this account it has been convenient to give them on a larger scale than in my previous papers. Mr. Busk called them the "chitinous organs," which is a very incorrect term, as they cannot in any way lay claim to be organs, but only covers of organs. Neither the opercula nor the mandibles are universally chitinous, although usually so, and it would seem best, when they cannot be spoken of as opercula and mandibles, to call them Bryozoal covers.

With the exception of these and fig. 25 the figures are all magnified 25 times.

List of Species.*

	Page.	Living.	Napier.	Waipukurau.	Petane.	Trig's Station.	Shakespeare Cliff.	Australia (fossil).	Allies and Localities.
1. Cellaria malvinensis, *B.*	45	✳Z	...	✳	...	...	✳	1, 2, 3, 4, 6	
2. Membranipora monostachys, *B.*	45	✳Z	✳						
3. —— lineata, *L.*	45	✳Z	...	...	...	...	✳		
4. —— Lacroixii, var. grandis, W.	45	...	✳	✳					
5. —— Dumerilii, *Aud.*	45	✳	...	✳	...	...	...	...	Crag.
6. —— nobilis, *Rss.*	46	...	✳	...	✳	...	...	2	Miocene.
7. —— solidula, *Ald. & Hincks*	46	✳AZ	...	✳	...	...	✳		
8. —— annulus, *Manz.*	47	✳	✳	✳	✳	...	...	2	Napier Harbour.
9. —— cervicornis, *Busk*	47	✳A	✳	...	...	...	...	2	
10. —— spinosa, *Q. & G.*	48	✳AZ	✳						
11. —— Flemingii, *B.*	48	✳	✳	...	...	...	...	5	
12. —— trifolium, *S. Wood*	48	✳	✳	...	...	...	...	...	Crag.
13. —— occultata, sp. nov.	48	✳Z	✳						
14. Monoporella capensis, *B.*	49	✳	✳	✳	...	...	✳		
15. —— ——, var. dentata, nov.	49	...	✳						
16. —— crassatina, *W.*	49	✳Z	✳	✳	...	...	...	2, 5, 6	Whakati.
17. —— disjuncta, *Manz.*	50	✳Z(?)	✳	...	...	...	...	...	Pliocene (Italy).
18. —— waipukurensis, sp. nov.	50	...	✳	✳	...	✳			
19. Steganoporella neozelanica, *B.*	50	✳Z	✳	✳	✳				
20. Micropora lepida, *Hincks.*	51	✳Z	✳						
21. —— variperforata, sp. nov.	51	✳Z	✳	✳	...	✳	...	...	Whakati.

* A or Z indicates that the form is known living in Australia or New Zealand.
1=Curdies Creek. 2=Mt. Gambier. 3=Bairnsdale. 4=Muddy Creek. 5=Aldinga. 6=Murray Cliffs.

List of Species (continued).

	Page.	Living.	Napier.	Waipukurau.	Petane.	Trig's Station.	Shakespeare Cliff.	Australia (fossil).	Allies and Localities.
22. Membraniporella nitida, *Johnst.* var.	52	✱Z	✱	✱					
23. Cribrilina monoceros, *B.*	52	✱A	✱		✱			3	Petane marls.
24. —— figularis, *Johnst.*	53	✱		✱				6	Crag.
25. —— radiata, *Moll*, var. Endlicheri, *Rss.*	53								Napier Harbour.
26. Microporella ciliata, *Moll*	53	✱AZ	✱	✱		✱		2	Whakati.
27. —— Malusii, *Aud.*	54	✱AZ	✱		✱				Bird Rock (Victoria).
28. —— macropora, *Stol.*	54	✱A		✱					Miocene.
29. —— decorata, *Rss.*, var. angustipora, *H.*	54	✱Z	✱	✱	✱	✱			
30. —— magnirostris, *MacG.*	55	✱A		✱				2, 6	
31. Mucronella mucronata, *Sm.*	55	✱A	✱					1, 2, 3, 4, 6	
32. —— nitida, *Verrill*	55	✱A	✱	✱				3, 6	Tommy Gully, Petane.
33. —— præstans, *Hincks*	56	✱Z		✱				1, 2	Petane marls.
34. —— Peachii, *Johnst.*	56	✱	✱						
35. —— ——, var. octodentata, *H.*	56	✱Z	✱	✱		✱			
36. —— alvareziana, *d'Orb.*	57	✱		✱		✱			Whakati.
37. —— tricuspis, *Hincks*	57	✱AZ			✱				
38. —— ——, var. waipukurensis	57			✱					
39. —— porosa, var. minima	57				✱				Petane marls.
40. —— Liversidgei, *Woods*	58			✱				2	Mount Gambier.
41. —— firmata, sp. nov.	58		✱	✱					
42. Smittia reticulata, *MacG.*	58	✱AZ						2, 3, 6	Whakati.
43. —— Landsborovii, *Johnst.*	58	✱A			✱			6	
44. —— biincisa, *W.*, var. bicuspis, *H.*	58	✱Z		✱					
45. —— Napierii, *Waters*	59	✱A	✱	✱		✱			Waurn Ponds (Australia).
46. Porina grandipora, sp. nov.	59		✱						
47. Lepralia Poissonii, *Aud.*	59	✱AZ	✱	✱	✱		✱		Whakati, Napier Harbour, Miocene, Europe.
48. —— rectilineata, *Hincks*	60	✱Z	✱	✱			✱		
49. —— imbellis, *B*	60		✱	✱	✱				Tommy Gully (Petane).
50. —— pertusa, *Esper*	61	✱	✱					4	Waurn Ponds.
51. —— rostrigera, *Sm.*	61	✱	✱					6	
52. —— longipora, *MacG.*	61	✱A		✱		✱			
53. —— semiluna, *Rss.*, var. simplex	62		✱						
54. —— foraminigera, *Hincks*	62	✱Z		✱					
55. —— bistata, sp. nov.	62			✱					
56. Porella marsupium, *MacG.*	62	✱A		✱					Waurn Ponds.
57. —— ——, var. porifera, *H.*	63	✱	✱	✱					
58. —— concinna, *B.*	63	✱A						2	Tommy Gully (Petane).
59. Hippothoa flagellum, *Manz.*	63	✱Z	✱						
60. Schizoporella circinata, *MacG.*	64	✱AZ		✱					
61. —— auriculata, *Hass.*	64	✱A	✱					2, 3	Tommy Gully (Petane).
62. —— Ridleyi, *MacG.*	64	✱A		✱					
63. —— marsupifera, *B.*	65	✱AZ		✱					
64. —— biaperta, *Mich.*	65	✱ZA		✱					
65. —— cribrilifera, *Hincks*	65	✱Z							Petane marls.
66. —— clavula, *Manz.*	65			✱					Italian Miocene.
67. —— conservata, *Waters*	65	✱A	✱					1, 2	
68. —— obliqua, ? *MacG.*	66	✱A		✱					
69. —— cinctipora, *H.*, var. personata	67	✱Z		✱	✱				
70. —— tuberosa, *Rss.*, var. angustata	67			✱					
71. —— hyalina, *L.*	68	✱AZ		✱		✱			Tommy Gully (Petane).
72. Cellepora albirostris, *Sm.*	68	✱A	✱				✱	6	
73. —— tridenticulata, *B.*	68	✱A		✱				5, 6	Yorke's Peninsula (Aust.).
74. —— coronopus, *S. Wood*	68	✱	✱					2, 5	
75. —— costata, *MacG.*	68	✱A	✱						Miocene (Europe).
76. —— decepta, sp. nov.	69		✱						
77. Rhynchopora longirostris, *H.*	70	✱A	✱						
78. Lunulites petaloides, *d'Orb.*	70		✱				✱	2, 4	Bird Rock.

1. CELLARIA MALVINENSIS, Busk.

Cellaria malvinensis, Waters, Quart. Journ. Geol. Soc. vol. xli. p. 285.

Loc. Living: various localities in the Southern Hemisphere. Fossil: Australia; Nelson (*H.*), Waipukurau and Shakespeare Cliff (New Zealand).

2. MEMBRANIPORA MONOSTACHYS, Busk. (Pl. VI. figs. 3 & 6.)

Membranipora monostachys, Busk, Brit. Mus. Cat. p. 61, pl. lxx.

For synonyms see Hincks, Brit. Mar. Polyzoa, p. 131.

A specimen from Napier has a large spine below the aperture and numerous smaller ones round the opesia. The ovicell, which has not been previously seen in *M. monostachys*, is subglobose, with a strong rib on the front enclosing a subtriangular or suboval space, which is divided into two equal parts by a median rib. The ovicell, in structure, somewhat resembles that of *M. aurita*, Hincks, and the raised rib on the ovicell occurs in many *Membraniporæ*, such as *M. lineata*, *M. galeata*, *M. unicornis*, *M. sophiæ*, *M. circumclathrata*, *M. dentata*, &c. This differs from *M. lineata* in having a large spine below the opesia, but there is no doubt that this, *M. pilosa*, and *M. pyrula*, Hincks, are closely allied. The ovicell is like that of *M. valdemunita*, Hincks. Miss Jelly has a recent specimen from Napier with similar ovicells.

Loc. Fossil: Napier.

3. MEMBRANIPORA LINEATA, L.

In a fossil from Shakespeare Cliff the zoœcium has a thick border and was surrounded with spines. The ovicell is short, and between the zoœcia there are interspersed small cells, with a small, round, or elongate opening; these I have sometimes called blind cells.

The form of the ovicell seems to indicate that this is *M. lineata*; but as there are several species closely allied, it is difficult to speak with certainty in such a case.

4. MEMBRANIPORA LACROIXII, Aud., var. GRANDIS. (Pl. VI. fig. 1.)

There are several specimens of *Membranipora* from Napier which I cannot identify with certainty, but which will be recognizable when again found. The opesia, 0·4 millim. long, is oval, occupying nearly a third of the zoœcia, and has a distinct border upon which I do not find any spines.

The space between the zoœcia sometimes bears an avicularium, but more often is divided into two or three spaces, sometimes with punctures. The ovicell, which is unknown in the typical *M. Lacroixii*, is large, raised, globose.

This is allied to my *M. tripunctata*, but the narrow longitudinal band between the zoœcia is wanting.

5. MEMBRANIPORA DUMERILII, Aud. (Pl. VI. fig. 4.)

Flustra Dumerilii, Aud., Savigny, Descr. de l'Egypte, pl. x. fig. 12.

For synonyms see Brit. Mar. Polyzoa, p. 156.

Although the ovicell is wider than usual, I think this must be regarded as *M. Dumerilii*, and probably the number of synonyms should be largely increased, as there are many fossil *Membraniporæ* described with a small avicularium at the base of each zoœcium. In a recent British *M. Dumerilii* in my collection there is also a vicarious avicularium with the lower part wide and circular and the mandibular end narrow.

A curious mistake has been made in uniting *Cribrilina Pouilletii* to this. This latter is pl. ix. fig. 12 of Audouin; but Alder made a slip between pls. ix. & x., and Busk followed him, evidently without verification.

Loc. Living: European seas. Fossil: Crag; Waipukurau.

6. Membranipora nobilis, Rss. (Pl. VI. figs. 7 & 10.)

Membranipora nobilis, Reuss, Foss. Polyp. des Wien. Tertiärbeckens, p. 98, pl. xi. fig. 26.

Zoarium adnate. Zoœcia oval, surrounded by a border; in one or two cases a vicarious avicularium with semicircular mandible. Ovicell small, smooth, with a border round the central portion.

This much resembles *M. flustroides*, Hincks, in shape and character; but in the fossil the avicularium is larger, the spines are wanting, and the ovicell is somewhat deeper. A round avicularium only occurs in a few *Membraniporæ*, such as *M. crassimarginata*, H., *M. lineata*, Manzoni (Bry. of Castrocaro, p. 11, pl. i. fig. 6), *M. flustroides*, H.

A specimen from Napier has the cells, in part of the colony, very elongate, showing that *M. ovalis*, d'Orb., is only a modification of this species.

Loc. Miocene: Austerlitz. Napier and Petane (N. Z.); Mt. Gambier.

7. Membranipora solidula, Alder & Hincks.

Membranipora solidula, Hincks, Proc. Dublin Univ. Zool. & Bot. Assoc. ii. pt. i. (1860) p. 75; and Brit. Mar. Polyzoa, p. 158, pl. xx. figs. 7, 8.

Membranipora papulifera, MacGillivray, Trans. Roy. Soc. Vict. vol. xviii. p. 116.

Biflustra papulifera, MacGillivray, Zool. of Victoria, decade xi. p. 27, pl. 106. fig. 9.

A fossil from Shakespeare Cliff, growing on *Entalophora*, has the zoœcia plain, suboval, with a thick crenulated border, and a globose ovicell, which is shallow and smooth, with a strong thickened ridge across the upper part. In size and structure of the ovicell this is just the same as specimens from Hastings and Capri, but I do not find any nodules. This, however, in several other species is not a constant character. A specimen from Waipukurau Gorge, which was sent to me queried as *M. papulifera*, is of the same size as the one from Shakespeare Cliff.

Loc. Living: Antrim, Guernsey, Hastings (*H.*), Capri (*A. W.*),

Port Phillip Heads (*MacG.*), New Zealand (*Miss Jelly*). Fossil: Shakespeare Cliff (Wanganui), Waipukurau Gorge.

8. MEMBRANIPORA ANNULUS, Manz. (Pl. VI. figs. 2, 5, & 9.)

Membranipora annulus, Manzoni, Bry. foss. Ital. 4*a* cont. p. 7, pl. i. fig. 6 (?); and Bri. di Castrocaro, p. 12, pl. i. fig. 9.

Membranipora dentata, Waters, Quart. Journ. Geol. Soc. vol. xxxviii. p. 263, pl. viii. fig. 14.

Membranipora galeata, Busk, Brit. Mus. Cat. p. 62, pl. lxv. fig. 5; "Zool. of Kerguelen Island," Phil. Trans. clxviii. p. 195.

There are a number of closely allied forms which, through variations in the shape of the opesial opening, often differ considerably in appearance, but agree in having a central avicularium, supported by two strong spines on each side, sometimes cervicorn, and an ovicell widely open with a raised line arching across the front, a short distance above the opening, enclosing a narrow depressed area. These allies are *M. patula*, Hincks, *M. cervicornis*, B., *Flustrellaria dentata*, d'Orb.

The present form, which I at first thought should be called *M. dentata*, d'Orb., has usually an oval opening; *M. patula* has the lower edge straight: *M. cervicornis*, B., which is no doubt the same as *M. perversa*, Waters, fossil from Mt. Gambier, has the opesia usually nearly straight above and rounded below; but in a large colony of any of these species opesia will be found with very different shapes.

In the New-Zealand fossils the large avicularium on the ovicell is directed downwards to the distal wall.

One specimen from Napier and one from Waipukurau are bilaminate, but the others are adnate. We have also seen *M. cervicornis* (*perversa*, W.) in the *Vincularia*-form. Some specimens have an avicularium below the opesia.

An examination of the British-Museum specimens of *Membranipora galeata*, B., made since my plates were prepared, shows that this is identical with the fossil. The depressed area on the ovicell, which Mr. Busk seems to have overlooked, is very marked; occasionally there are two avicularia, and the cells without ovicells, with the avicularian chamber projecting forwards, exactly resemble my fig. 5.

As Mr. Busk's description was quite insufficient, it will be best to retain Manzoni's name.

Loc. Living: Swains Bay, E. Falkland, in 4–10 fath. (*Darwin*, fide *Busk*). Fossil: Pliocene of Castell-Arquato, Parlascio, Orciano, Castrocaro (*M.*); Mt. Gambier (Australia); Napier, Waipukurau and Petane (New Zealand).

9. MEMBRANIPORA CERVICORNIS, Busk (non Haswell).

Membranipora cervicornis, Busk, Cat. Mar. Polyzoa, p. 60, pl. c. fig. 3; MacGillivray, Zool. of Victoria, decade iii. p. 32, pl. xxv. fig. 8; Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. vii. p. 153.

Membranipora perversa, Waters, Quart. Journ. Geol. Soc. vol. xxxviii. p. 264, pl. ix. fig. 32.

Amphiblestrum cervicorne, Busk, Rep. 'Challenger,' Polyzoa, p. 66.

Loc. Living: Williamstown (Victoria), Curtis Island (*H.*). Station 162, 38 fath. (*B.*), Bondi Bay (N. S. Wales), Adelaide and Port Phillip Heads (*A. W. W. coll.*). Fossil: Mt. Gambier and Napier.

10. MEMBRANIPORA SPINOSA, Quoy & Gaimard. (Pl. VIII. fig. 32.)

Flustra spinosa, Q. & G. Voy. de l'Astrolabe.

Membranipora ciliata, MacGillivray, Trans. R. Soc. Vict. 1868, p. 7; ibid. vol. xviii. p. 3, fig. 11; Zoology of Victoria, decade iii. p. 30, pl. xxv. fig. 3.

Membranipora spinosa, Busk, Trans. Roy. Soc. vol. clxviii. p. 195, pl. x. fig. 3; and 'Challenger' Report on the Polyzoa, p. 64; Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. vii. p. 150.

Chaperia australis, Jullien, "Bry. Cheil." Bull. Soc. Zool. 1881, vol. vi. p. 1 (sep.).

In the fossil from Napier and in a recent specimen from New Zealand there is an elongate lateral chamber on each side below the operculum, and a similar structure occurs also in *M. annulus*, but rather lower down. The length of the opesial opening is in both about 0·25 millim.

Loc. Living: Victoria, Kerguelen Island, S. Patagonia, N. S. Wales, New Zealand. Fossil: Napier, N. Zealand.

11. MEMBRANIPORA 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. figs. 1–3; Waters, Quart. Journ. Geol. Soc. vol. xli. p. 288.

Loc. Living: European Seas. Fossil: Aldinga (Australia), Napier.

12. MEMBRANIPORA TRIFOLIUM, S. Wood.

For synonyms see Hincks, Brit. Mar. Polyzoa, p. 167.

The fossil from Napier has zoœcia about half as large again as specimens in my collection from the English Crag.

The opesia of the Crag specimens are 0·15 millim. wide; these are 0·25 mm., and *M. appendiculata*, which is related (see Q. J. G. S. vol. xxii. p. 504), has the opesia about 0·4 millim. wide. I am much inclined to think that it would be best to follow Smitt and call this *M. Flemingii*, var. *trifolium*. In the New-Zealand fossil the ovicell is flatter on the front than I have before seen.

Loc. Living: Northern Seas. Fossil: Crag, and Napier.

13. MEMBRANIPORA OCCULTATA, sp. nov. (Pl. VI. figs. 12, 13, and Pl. VIII. fig. 40.)

Zoarium adnate. Zoœcia quadrate, sloping inwards towards the opesia, with three spines on the upper border. Opesia nearly straight below, rounded above, with the sides nearly straight, and a broad serrated edge or denticle on the proximal border. In the

older parts there is a thick calcareous deposit between the cells, so that the mouth is buried at the bottom of a deep cavernous opening, and in the raised calcareous part there are numerous triangular avicularia.

A number of the chief characters remind us of *Rhynchopora profunda*, MacGillivray (New or Little-known Polyzoa, pt. iii. p. 2, fig. 8), and possibly some of the characters are hidden by the calcareous growth in MacGillivray's specimen. I should not have been able to make out all the characters from the fossils, but, having seen them in recent specimens, the fossils became quite clear.

Loc. Living: New Zealand. Fossil: Napier (N. Z.).

14. MONOPORELLA CAPENSIS, Busk.

Amphiblestrum capense, Busk, 'Challenger' Report on the Polyzoa, p. 67, pl. xxiii. fig. 3.

Such a form as the present shows at what a great disadvantage the palæontologist is placed in consequence of being unable to find out the form of the Bryozoal covers, for there are many species of *Membranipora* resembling the present species in the shape of the opening; but these, such as *M. dentata*, *M. angulosa*, &c., have a small opercular aperture in the membrane covering the opesia. In this species, on the other hand, the opening is entirely closed by a subcircular or elliptical operculum.

In a recent specimen in my collection, from Algoa Bay, South Africa, the zoarium is erect, cylindrical, or subcompressed, just as figured by Busk, and some cells have the two spines as described; but the majority are without spines, and in none of the fossils do I find any traces of them. The Napier and Waipukurau fossils are both adnate, whereas the one from Shakespeare Cliff is a flat bilaminate fragment. Opesia of all 0·3 mm. wide. Both *Flustrellaria tubulosa*, d'Orb. (Pal. Fr. pl. 727. fig. 10), and *Biflustra Pražáki*, Novak (Böhm. Kreide, p. 18, pl. iii. figs. 20–25), are closely allied to this.

Loc. Living: Simon's Bay, Cape of Good Hope (*B.*); Algoa Bay (*W.*). Fossil: Waipukurau, Wanganui, and Napier.

15. MONOPORELLA CAPENSIS, B., var. DENTATA, nov. (Pl. VIII. fig. 39.)

There is a specimen from Napier which, on account of a curious structure, it may be best to regard as a variety. In the upper part of the zoœcium there appear to be two denticles extending some little distance below the aperture, but these are only a prolongation of a tube from one zoœcium to another; in the middle of this tube is the rosette-plate. The distal rosette-plate is, in many cases (as, for example, *Lepralia foliacea*), in the middle of what we may call a rosette-tube; but I know of no other instance in which it is prolonged in this way.

16. MONOPORELLA CRASSATINA, Waters. (Pl. VII. fig. 15.)

Monoporella crassatina, Waters, Quart. Journ. Geol. Soc. vol. xxxviii. p. 270, pl. vii. fig. 8; *ibid.* vol. xxxix. p. 435, and vol. xli. p. 291.

Having seen a recent specimen from New Zealand, and having

a fossil with a very large, much raised ovicell, both broader and longer than the length or width of a zoœcium, I now think that I made a mistake in uniting *Lepralia japonica* of Busk with this species, although they are no doubt closely allied.

The operculum of the recent specimen from New Zealand is thick, membranous, not chitinous, except at the borders, and has two lateral projections directed towards the basal wall of the zoœcium, showing similarity, in this respect, to *Membranipora* and *Cellaria*. It is about 0·35 mm. wide.

Loc. Living: New Zealand (*A. W. W. coll.*). Fossil: Mount Gambier, Waurn Ponds, Aldinga and River-Murray Cliffs (Australia), Napier, Waipukurau and "Whakati" (New Zealand).

17. MONOPORELLA DISJUNCTA, Manz. (Pl. VI. fig. 8.)

Lepralia disjuncta, Manzoni, Bry. Plioc. Ital. cont. 1*a*, Denkschr. Ak. Wissensch. Wien, vol. lix. 1869, p. 5, pl. i. fig. 8, and Bri. del Plioc. di Castrocaro, p. 26, pl. iii. fig. 35.

? *Lepralia urceolata*, Hutton, Manual of New Zealand Moll. 1880, p. 192.

? *Lepralia Auingeri*, Rss. Foss. Bry. Œst. Ung. p. 166, pl. viii. fig. 2.

Zoarium adnate. Zoœcia subovate, distinct, not very much raised, surface covered with very minute granulations. Four spines above the oral aperture, which is large, rounded above, straight below (0·25 mm. wide).

This I at first called *Monoporella crassatina*, W., var. *micrograna*, but it seems to be identical with the *disjuncta* of Manzoni, and this and the last species no doubt are related to *M. polita*, Norm.

Loc. Living: New Zealand? Fossil: Pliocene, Castell-Arquato, Castrocaro (Italy); Napier (New Zealand).

18. MONOPORELLA WAIPUKURENSIS, sp. nov. (Pl. VI. fig. 11.)

Zoarium adnate. Zoœcia oblong, distinct, arranged in parallel series. Oral aperture (0·15 mm.) about half or a third of the width of the zoœcium, straight below, rounded above, with an umbo below the aperture. Ovicell small, globular, raised; surface of zoœcium and ovicell punctured.

The figure of *Lepralia rubens*, Stimpson, looks like this species, and the fossil is no doubt closely allied to *Cyclicopora prælonga*, Hincks; but from comparison of specimens in my collection they do not seem to be identical.

Loc. Napier, Waipukurau cutting, and Trig's Station.

19. STEGANOPORELLA NEOZELANICA, Busk.

Vincularia neozelanica, Busk, Quart. Journ. Micr. Sci. n. s. vol. i. p. 155, pl. xxxiv. fig. 5.

Steganoporella neozelanica, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. ix. p. 82, pl. v. fig. 9.

It is exceedingly difficult to distinguish *S. magnilabris* and *S. neozelanica* without the opercula, and the determination of fossils

therefore requires great care. In *S. magnilabris* the shelf at the upper part of the opercular opening is much wider than in *S. neozelanica*, in which it is usually quite rudimentary; the lip is also wider and much raised, forming a support for the base of the operculum. The tubular passage is also more distinct in *S. magnilabris*. None of these characters are very satisfactory, as they are all subject to more or less variation. The fossils from Curdies Creek, Mount Gambier, Bairnsdale, Batesford, and Murray Cliffs (Australia) all show the *magnilabris* characters; but a further examination of the Waipukurau and Petane fossils shows that they are *S. neozelanica* in the *Lepralia*-stage.

Loc. Living: New Zealand. Fossil: Waipukurau, Petane, and Napier (New Zealand).

20. Micropora lepida, Hincks.

Monoporella lepida, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. viii. p. 59, pl. ii. fig. 2.

The fossil from Napier, New Zealand, corresponds in size with a recent specimen from New Zealand. The oral aperture in both is 0·1–0·12 mm.

Loc. Fossil: Napier. Living: Curtis Island (*H.*); New Zealand (*E. C. J.*).

21. Micropora variperforata, sp. nov. (Pl. VIII. fig. 27.)

This species has caused me great difficulty, as there are apparently two Australian and New-Zealand species, or varieties, most closely allied, and on none of the characters alone could the separation be made. The first of these two is slightly the larger, but has a narrower operculum (0·12 mm.), relatively longer from the proximal to the distal edge, with lateral hinges as in *Membranipora*, and the whole surface is similar in texture; there are two lateral spines. The ovicell is large and not much raised, and the oral aperture of the ovicelligerous zoœcia is larger than that of the non-fertile ones. On each side a little below the orifice there is a large circular perforation, and in some specimens many zoœcia have a few supplementary pores, usually smaller, round the edge of the cell; the avicularium is smaller than in the following form, and the mandible has a small central opening.

This is *Membranipora stenostoma*, Busk (Cat. Mar. Polyzoa, p. 60, pl. c. fig. 1), but the insufficient description has made it impossible to be sure what was meant, and therefore the name must be dropped as it has since been more fully described as *M. perforata*, MacG. The aperture of the ovicelligerous zoœcium is figured by Busk larger than that of the other zoœcia; but no difference in size is mentioned; his figure has been drawn from a specimen covered with an integument, and the large openings on each side have been overlooked, although they are very distinct in the Museum slide.

The second form, which I now separate with some doubt and call *variperforata*, on the other hand, has an operculum 0·14 mm. wide, with the upper half the thickest and the lower composed of

two layers; the avicularium is smaller, but the opening on the mandible is larger; the ovicell is smaller and more concealed. In this also there is a similar perforation, and also, in some cases, others round the edge of the cell; but this seems to be rare.

The fossils from Napier, Waipukurau, "Whakati," and Trig's Station agree with this last; and while some specimens may have an avicularium to almost every cell, in others they are seldom found, and in one case they seem to be altogether absent. In many zoœcia there is a projecting boss, which seems to be imperforate, replacing the avicularium.

These two forms are evidently closely allied to *M. coriacea*, but differ in not having a knob. The "knob" of *M. coriacea* forms a chamber which communicates with the interior by means of a rosette-plate. (I have already, in a Report to the British Association on the Naples Zoological Station, 1880, pointed out that rosette-plates occur at the base of the spines of *Memb. cervicornis*.) It is also allied to *Micropora lepida*, Hincks, to which it is very similar in appearance when there is a row of pores round the edge. The mandible of *M. coriacea* has a central ridge from the beak, and the same structure is seen in the other two species.

22. MEMBRANIPORELLA NITIDA, Johnst., var. (Pl. VII. fig. 18.)

There are two fossil specimens from Waipukurau, which differ from recent ones from "New Zealand" only in having four spines, and this is probably not a very important character. The lower lip is thickened, and this is the case in a recent specimen from Capri; the ovicell has often more or less of a keel, and has a ridge which cuts off the lower part, and in this respect resembles *M. distans*, MacGillivray (Descrip. of New or Little-known Polyzoa, pt. 2, pl. ii. fig. 5). In the fossils there are no avicularia, whereas in a recent specimen of this variety from New Zealand there is a large spatulate vicarious avicularium, like that figured by Busk for *Cribrilina philomela*, var. *adnata*. The costæ vary from five to eight on a side.

We seem now to have various links, recent and fossil, between *C. figularis*, *C. philomela*, and *Membraniporella nitida*, and there is no hard and fast line between *Cribrilina* and *Membraniporella*.

Loc. Living: New Zealand. Fossil: Napier, Waipukurau.

23. CRIBRILINA MONOCEROS, Busk (non Reuss).

Lepralia monoceros, Busk, Brit. Mus. Cat. p. 72, pl. xciii. figs. 5 and 6; MacGillivray, Zool. of Victoria, decade iv. p. 32, pl. 38. figs. 1 and 2; Ridley, Zool. Coll. 'Alert,' Proc. Zool. Soc. 1881, p. 51.

Cribrilina monoceros, Hincks, Ann. & Mag. N. H. ser. 5, vol. viii. p. 57, pl. iii. fig. 6, and vol. xiv. p. 279, pl. viii. fig. 5; Waters, Q. J. Geol. Soc. vol. xxxviii. p. 507; Busk, Rep. of 'Challenger' Polyzoa, p. 133, pl. xix. fig. 8.

In the Napier fossil the size of the aperture corresponds with that of recent specimens and of the Bairnsdale fossil. In a recent

specimen from Port Western there are lateral denticles and a contraction some distance down the aperture, which may represent the teeth, which are so marked in the Bairnsdale fossil, but have not been found elsewhere. I believe that *L. monoceros* and *L. larvalis* MacGillivray are entirely different.

Loc. Living: Straits of Magellan, 10–20 fath., Tierra del Fuego, 19 fath., Falkland Islands, 4–10 fath., Cape Horn, 40 fath. (*B.*); Elizabeth Island, 6 fath., Sandy Point, 7–10 fath., Tom Bay, 0–30 fath. (*R.*); Bass's Straits (*H.*); Warrnamboul (*MacG.*); 'Challenger:' station 163; Port Jackson, 35 fath.; st. 303, 1325 fath.; st. 235, N. Pacific, 3125 fath.; st. 315, 12 fath. Fossil: Bairnsdale (Victoria) in Eschara-form, Napier (N. Zeal.) adnate, Petane.

24. Cribrilina figularis, Johnst.

Cribrilina figularis, Waters, Quart. Journ. Geol. Soc. vol. xli. p. 293.

Specimens from Waipukurau are very distinctly carinate down the centre, and there is a considerable margin of smooth cell; the ovicells are those characteristic of *figularis*, but I do not find any avicularia. Perhaps this is *Lepralia Haueri*, Rss.

Loc. Living: European Seas, Marion Islands, and Heard Islands. Fossil: Crag; River-Murray Cliffs, Waipukurau.

25. Cribrilina radiata, Moll, var. Endlicheri, Rss.

Lepralia Endlicheri, Reuss, Foss. Polyp. Wien, p. 82, pl. ix. fig. 27, and Foss. Bry. Œst. Ung. Mioc., Denkschr. Ak. Wissensch. Wien, vol. xxxiii. p. 171, pl. i. fig. 9.

A fossil from Napier Harbour has short, broad, oval zoœcia with very solid shell. The ribs are irregular, usually 6 or 7 on a side. The oral aperture is larger (0·15 mm.) than that of typical *C. radiata*, and below it there is a distinct raised tubular pore surrounded by a border, so that it appears marsupiate. The ovicell is about the width of a zoœcium, and, as far as can be judged, this has a radiate structure. The *L. Endlicheri* of Reuss has been found in several Miocene localities of Austria and Hungary.

26. Microporella ciliata, Pall.

Eschara ciliata, Pall. Elench. p. 38, and for synonyms see Hincks, Brit. Mar. Polyzoa, p. 206.

Lepralia calabra, Seguenza, "Formazioni Terziarie," Accad. Lincei, cclxxvii. p. 201, pl. xv. fig. 6.

The fossil from Trig's Station has a large round suboral pore on a prominent mucro, and the avicularian opening is nearly round; surface punctured. Oral aperture 0·1 mm. wide, with six spines. This form is the *Lepralia pleuropora*, Rss. Foss. Bry. Œst. Ung. Mioc. p. 153, pl. iv. fig. 11.

The specimens from "Whakati" and Napier have a smaller round or lunate suboral pore with larger avicularian (vibracular) opening, and the avicularian chamber forms a tube or tunnel with the opening

directed towards the centre of the zoœcium. This form is the *M. calabra* of Seguenza.

The specimen from Waipukurau has rather smaller zoœcia than the others, but the oral aperture of all is about 0·1 mm. wide.

Loc. Living: Cosmopolitan. Fossil: Miocene, Austria and Hungary; Pliocene, Italy and Sicily, English Crag, Mount Gambier (Australia), Napier, Waipukurau, and Trig's Station (New Zealand).

27. MICROPORELLA MALUSII, Aud.

Microporella Malusii, Aud., Waters, Q. J. Geol. Soc. vol. xxxix. p. 437.

Loc. Living: European seas, S. America, N. Zealand, Australia. Fossil: English Crag, and Pliocene of Italy, Bird Rock (Victoria), Napier, Petane (N. Zealand).

28. MICROPORELLA (?) MACROPORA, Stol.

Lepralia macropora, Stoliczka, Olig. Bry. von Latdorf, p. 84, pl. ii. fig. 3; Sitz. Ak. Wien, Math.-nat. Cl. Bd. xlv. Abth. i. 1862.

Escharipora stellata, Smitt, Floridan Bryozoa, p. 26, pl. vi. figs. 130–133.

Microporella macropora, Waters, Quart. Journ. Geol. Soc. vol. xxxviii. p. 267, pl. viii. fig. 18.

Microporella stellata, MacGillivray, "New or Little-known Polyz." pt. 2, Tr. Roy. Soc. Vict. vol. xix. p. 131, pl. i. fig. 4.

The fossil from Waipukurau has an avicularium at each side of the aperture, and should, as I have before pointed out, perhaps be called var. *biarmata* on that account; and I have again to repeat that although no suboral pore is known, the general characters are those of *Microporella*, the genus in which Professor MacGillivray has also placed it.

Loc. Living: Port Phillip Heads (*MacG.*); Port Phillip (*W.*); Florida (*Sm.*). Fossil: Miocene, Latdorf (with one avicularium); Waipukurau.

29. MICROPORELLA DECORATA, Rss., var. ANGUSTIPORA, Hincks.

Microporella diadema, MacG., form *angustipora*, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. xv. p. 249, pl. viii. fig. 3.

MacGillivray and Hincks have made several varieties of *M. diadema*; but it seems to me that they should be called varieties of *M. decorata*, Rss. In the typical *M. decorata* the avicularium is directed directly distally, and in the recent forms there is considerable variation, as, for example, between var. *lata* and var. *lunipuncta*, MacG.

In a fossil specimen of the typical *M. decorata*, from Vigna di Mare, near Reggio, Calabria, the shape of the ovicell is the same as in var. *diadema* and *lunipuncta*, and, so far as the state of preservation allows of comparison, the other characters are the same.

It seems to me that we should divide this group into *M. decorata*, Rss., *typica*; var. *diadema*, MacG.; var. *angustipora*, Hincks; var.

lunipuncta, MacG.; var. *longispina*, MacG.; var. *lata*, MacG.; var. *canaliculata*, MacG.

Loc. Living: New Zealand. Fossil: Waipukurau, Napier, Petane, and Trig's Station (New Zealand).

30. MICROPORELLA MAGNIROSTRIS, MacG.

Lepralia magnirostris, MacGillivray, Trans. Roy. Soc. Vict. vol. xix. p. 134, fig. 6.

Microporella magnirostris, Waters, Quart. Journ. Geol. Soc. vol. xli. p. 296.

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

Porina magnirostris, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. xiv. p. 279.

Both specimens from Waipukurau are in the *Eschara*-stage, and in the one from "W. cutting" it forms a contorted undulating anastomosing mass.

Loc. Living: Port Phillip Heads. Fossil: Mt. Gambier, River-Murray Cliffs, Waipukurau and "Waipukurau cutting."

31. MUCRONELLA MUCRONATA, Smitt.

Mucronella mucronata, Waters, Quart. Journ. Geol. Soc. vol. xli. p. 293.

Loc. Living: Florida. Fossil: Curdies Creek, Mt. Gambier, Bairnsdale, Muddy Creek, and Murray Cliffs (Australia), Napier (New Zealand).

32. MUCRONELLA NITIDA, Verrill.

For synonyms, see Waters, Quart. Journ. Geol. Soc. vol. xli. p. 293, to which add

Smittia reticulata, var. *spathulata*, MacGillivray, Trans. Roy. Soc. Victoria, vol. xix. p. 135, pl. iii. fig. 14.

Smittia reticulata, MacG., var., Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. viii. p. 64.

Although MacGillivray describes his variety as with spathulate avicularia, the avicularium figured can scarcely be called spathulate, and in the shape there seems to be great variability. I have specimens from Rapallo (N. Italy), and Victoria (Australia), in which the large avicularia are broadly ligulate, while the small avicularia are oval and have rounded ends. In all cases, the avicularium on one side is large, on the other small, and the name *inæqualis*, which I gave to the Neapolitan specimen, calls to mind the most important character.

Loc. Living: Vineyard Sound and Long Island Sound (*V.*); Africa (*H.*); Victoria Bank, S.E. Brazil, 32 fath. (*Ridley*); Victoria, Bass's Straits (*Hincks*); Naples and Rapallo (*Waters*). Fossil: English Crag (*W.*); Bairnsdale (*Gippsland*), River-Murray Cliff (*South Australia*); Waipukurau, Napier, and Tommy Gully (New Zealand).

33. MUCRONELLA PRÆSTANS, Hincks.

Mucronella præstans, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. x. p. 99, pl. vii. fig. 1.

Mucronella duplicata, Waters, Quart. Journ. Geol. Soc. vol. xxxvii. p. 328, pl. xvi. fig. 54, and vol. xxxviii. p. 266.

The fossils from Waipukurau are surrounded with large pores, as in the Curdies-Creek specimen, and some cells have similar avicularia, but they do not occur in all. My *M. duplicata* was described from a fragment of only a few cells, and although I also referred to a recent specimen sent over by Mr. Hutton as *Lepralia variolosa*, and gave particulars, it may, perhaps, be best to break the rule concerning priority and adopt Mr. Hincks's name.

This is allied to *M. coccinea*, but differs in the larger ovicell, which is not recumbent.

Loc. Living: New Zealand. Fossil: Curdies Creek (S.W. Victoria); Mt. Gambier in *Vincularia*-stage; Waipukurau, Petane marls.

34. MUCRONELLA PEACHII, Johnst.

This occurs fossil from Napier and probably the other localities; but in the fossils it is very difficult to always distinguish between this and the following variety, which is common.

35. MUCRONELLA PEACHII, var. OCTODENTATA, Hincks.

Mucronella Peachii, var. *β. octodentata*, Hincks, Brit. Mar. Polyzoa, p. 361, pl. li. fig. 2.

Mucronella teres, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. viii. p. 65, pl. ii. fig. 5.

Mucronella spinosissima, Hincks, *loc. cit.* pl. iii. fig. 2.

? *Mucronella ventricosa*, var. *multispinata*, Busk, 'Challenger' Report on the Polyzoa, p. 160, pl. xxii. fig. 11.

? *Mucronella lævis*, MacGillivray, Trans. Roy. Soc. Victoria, vol. xix. p. 136, pl. iii. fig. 16.

Lepralia arrecta, Rss. Bry. Œst. Ung. Mioc. p. 24, pl. ii. fig. 11.

This is a common fossil from Waipukurau. The zoarium is adnate, with distinct, raised, ovate, smooth zoœcia; peristome raised all round, with about eight spines on the upper part, and a broad flat denticle in the oral aperture directed downwards (towards the neural wall); this denticle closes about one third of the aperture. Usually a row of pores round the border of the zoœcium. Ovicell small, globular, smooth, recumbent.

Perhaps this should be called *M. Grotriana*, Stol. (see Reuss, Fauna Sept. p. 57, pl. vii. fig. 1; Denkschr. Ak. Wissensch. vol. xxv. p. 173, pl. vii. fig. 1), which only differs in the absence of spines. *L. Hörnesi*, Reuss, is also closely allied.

Loc. Living: Shetland (*A. M. N.*); Capri (*A. W. W.*); Curtis Island (*H.*); Station 148, and Prince Edward's Island, 80–120 fath. (*B.*); New Zealand species sent by Miss Jelly. Fossil: Waipukurau, Trig's Station (Tanner's Run), and Napier (N. Zealand).

36. MUCRONELLA ? ALVAREZIANA, d'Orb. (Pl. VII. figs. 24, 25.)

Escharina alvareziana, d'Orb. Voyage dans l'Amérique, t. v. p. 14, pl. vi. figs. 1, 4.

Lepralia alata, Busk, Cat. Mar. Polyzoa, p. 71, pl. lxxix. fig. 3.

Mucronella alvarezi, Jullien, "Bry. Cheil." Bull. Soc. Zool. 1881, p. 5.

Two specimens from Waipukurau have subhexagonal zoœcia, with radiating grooves on the front and a very prominent umbo in the centre, a small avicularium or vibraculum on each side about the middle; a row of large pores round the edge of the zoœcium situated between the grooves. Above the oral aperture 4–6 spines. Oral aperture about 0·1 mm. wide, rounded on the distal edge, nearly straight below, forming a semicircle; the lower edge is minutely serrated, with three small teeth in the centre; on each side of the aperture a denticle directed inwards.

This differs from *L. alata*, as described by Busk, in the number of spines, and his description leaves us in doubt as to the aperture; and merely from the fossil it is impossible to be quite sure as to the genus. As *Lepralia alata* has never been returned to the British Museum, I have been unable to make a direct comparison.

Loc. Cape Horn, 40 fath. (*B.*); Peru (*d'O.*); Valparaiso (*J.*). Fossil: Waipukurau, Trig's Station, and "Whakati."

37. MUCRONELLA TRICUSPIS, Hincks.

Mucronella tricuspis, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. viii. p. 66, pl. iii. fig. 1.

Mucronella munita, MacGillivray, Trans. Roy. Soc. Victoria, vol. xix. p. 136, pl. ii. fig. 10.

A specimen from Petane has a row of pores round the edge, and the peristome rises less suddenly out of the zoœcium than in my recent specimen. There are lateral acute avicularia, the ovicell is recumbent, and the fossil most nearly corresponds with MacGillivray's figure.

Loc. Living: Curtis Island (*H.*); Port Phillip Heads and New Zealand (*MacG*). Fossil: Petane.

38. MUCRONELLA TRICUSPIS, Hincks, var. WAIPUKURENSIS, nov. (Pl. VIII. fig. 30.)

There is a worn fossil from Waipukurau, which, upon comparison with *M. tricuspis*, Hincks, turns out to be of the same size, and corresponds with it in the screen-like elevation, in both cases enclosing two tubes, as mentioned on page 59. In the fossil, however, the slender lateral mandibles are wanting; but there have been small and apparently nearly round avicularia near the base of the zoœcia.

39. MUCRONELLA POROSA, Hincks, var. MINIMA, nov. (Pl. VIII. fig. 31.)

A fossil from Petane has the upper part of the zoœcium thickened

and raised, and below this large pores on the surface of the zoœcia. There is a raised suboral avicularium directed laterally, and sometimes also a small round avicularium at the side of the aperture. Ovicell almost concealed in the zoœcium above. The oral aperture is about 0·16 mm., whereas in recent specimens of *M. porosa* from Port Phillip it is 0·33 mm.

40. Mucronella (?) Liversidgei, T.-Woods.

Eschara Liversidgei, T.-Woods, Some Tert. Australian Polyzoa, Roy. Soc. of N.S.W. 1876, p. 3, figs. xi., xii., xiii.

A fossil from Waipukurau has the proximal edge of the aperture nearly straight, the distal rounded, and a little distance down the aperture there is a semicircular ridge which almost divides it into two parts. This, I believe, is the lower edge of the concealed ovicell, as we sometimes see it in *Cellaria*.

Just below the oral aperture there is a much raised protuberance, and on each side of this a large semicircular pore; below the protuberance there is a large round pore, below which, again, there is usually a small one, which may be elongate.

Loc. Fossil: Mount Gambier (*Woods*), Waipukurau.

41. Mucronella firmata, sp. nov. (Pl. VII. fig. 20.)

Zoarium adnate. Zoœcia broadly ovate, distinct, raised, coarsely punctured over the entire surface. Orifice almost semicircular, with a square tooth on the lower margin; peristome forming a broad thickened border round the upper part of the orifice, and thickened at each side near the base.

This differs from *Phylactella labrosa*, B., in having no raised peristome below the mouth.

Loc. Fossil: Napier and Waipukurau.

42. Smittia reticulata, MacG.

A badly-preserved *Smittia* from Whakati seems to be *S. reticulata*.

43. Smittia Landsborovii, Johnst.

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

Loc. Living: Arctic and British seas, Mediterranean, Australia. Fossil: River Murray Cliffs (Australia); Petane (New Zealand).

44. Smittia biincisa, Waters, var. bicuspis, Hincks.

Mucronella bicuspis, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. xi. p. 110, pl. vii. fig. 2.

The fossil from Mount Gambier (Quart. Journ. Geol. Soc. xxxviii. p. 272, pl. vii. fig. 1) has the avicularia more raised and has more large pores; but I have a recent specimen from New Zealand with more pores than Mr. Hincks figured, and with the avicularia more raised. The denticle ranges from being deeply cleft to being expanded and nearly flat at the tip.

In the important characters the two are unmistakably allied,

and it is with some hesitation that I make a variety of the New-Zealand fossil and recent specimens.

Loc. Living: New Zealand. Fossil: Waipukurau.

45. SMITTIA NAPIERII, Waters.

Smittia Napierii, Waters, Quart. Journ. Geol. Soc. vol. xxxix p. 438, pl. xii. fig. 14.

It has been thought that this was the *Mucronella tricuspis* of Hincks (Ann. & Mag. N. Hist. ser. 5, vol. viii. p. 66, pl. iii. fig. 1), and at one time I concurred in this view, which was based upon the examination of a specimen which Mr. Hincks himself had named *M. tricuspis*; but having since found a recent *tricuspis* from Port Phillip, Victoria, I see that they are not identical.

The recent *S. Napierii* has a solid shell, with large pores round the border; the avicularian mucro is directed mostly forwards, that is towards the distal end, and below this there is a narrow bifid denticle. The ovicell is sometimes nearly concealed, and its presence is only revealed by a mucronate elevation, in other cases it is considerably raised and globose.

The *M. tricuspis*, which has also been described as *M. munita*, MacGillivray (Desc. of New or Little-known Polyzoa, pt. 2, p. 136, pl. ii. fig. 10), has a very curious peristome which rises abruptly from the front of the zoœcium and is thick in consequence of being hollow, or rather having a tube on each side of the mucro. This has not been mentioned by Mr. Hincks. Inside the peristome there is no denticle, but the proximal edge of the aperture is a straight plate. My specimen is hyaline.

Loc. Living: Port Phillip (Australia). Fossil: Waurn Ponds (Australia); Napier, Waipukurau; Trig's Station, Tanner's Run, N.Z.

46. PORINA GRANDIPORA, sp. nov. (Pl. VII. fig. 23.)

Although the state of preservation of this fossil from Napier is so unsatisfactory that a full description of it is impossible, yet, if again found, it may, I think, be recognized. The peristome is much raised, hiding the mouth, and there seems to have been a large avicularium on the summit at each side. In the centre of the zoœcium there is a large round pore, and from this it would seem to belong to *Gigantopora* of Ridley.

47. LEPRALIA POISSONII, Aud. (Pl. VIII. fig. 37.)

Flustra Poissonii, Aud., Savigny, Descr. de l'Egypte, pl. x. fig. 5.

Lepralia Poissonii, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. viii. p. 63, and vol. xv. p. 256.

Lepralia setigera, MacGillivray (non Smitt), Trans. Roy. Soc. Victoria, vol. xix. p. 133, pl. i. figs. 2, 3.

Lepralia odontostoma, Rss. Bry. Œst. Ung. Mioc. p. 16, pl. iv. fig. 8.

Lepralia Kirchenpaueri, var. *teres*, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. vi. p. 77, pl. ix. figs. 7, 7*a*.

This is a very common fossil from Waipukurau and corresponds in

size with recent specimens from New Zealand, in which the front surface is smooth, and the small smooth ovicell has a mucronate ridge down the centre.

In recent specimens the spines do not occur in all zoœcia nor in all specimens. The most spinous specimen that I have seen is one from Tahiti, in Miss Jelly's collection. This is nearly related to *Lepralia adpressa*, and I still adhere to my opinion that *L. Kirchenpaueri*, Heller, is only *L. adpressa*, in which, as I pointed out and figured in my paper on the Bryozoa from Naples (Ann. & Mag. N. H. ser. 5, vol. iii. p. 42, pl. xv. fig. 13), there are sometimes "lateral bosses." The best figure of *L. Kirchenpaueri* is given by Manzoni (Supp. alla Fauna dei Bry. Medit. p. 8, tav. iii. fig. 3).

The characters of the opercula of *L. Poissonii* and *L. appressa* (figs. 37, 38) enable these to be readily distinguished, although also showing a near relationship. In the fossil some cells have the central mucro very prominent and in others it is entirely absent.

Loc. Living: Bass's Straits, Tahiti and New Zealand (*H.*); Port Phillip Heads (*MacG.*). Fossil: Napier and N. Harbour; Waipukurau, "Whakati," and Petane; Shakespeare Cliff (New Zealand); Miocene; Rauchstallbrunngraben, near Baden.

48. LEPRALIA RECTILINEATA, Hincks. (Pl. VII. fig. 16; Pl. VIII. figs. 34, 35, 36.)

Lepralia rectilineata, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. xi. p. 110, pl. vii. fig. 5.

In a specimen from Waipukurau there is often a small ridge or boss at each side of the aperture, just below which there are two small avicularia, usually near together. Where the aperture is contracted there is a curved denticle directed inwards, and there is a similar one in *L. Dorhnii*, Kirchenpauer (MS.), from Naples. A specimen from Wanganui has large, elongate avicularia above the aperture, whereas there are none in the one from Waipukurau.

The ovicell, which is not known in the recent form, is raised, globular, about half as wide as a zoœcium. Oral aperture 0·18 millim. at widest part.

Loc. Living: New Zealand. Fossil: Waipukurau, Wanganui, Napier.

49. LEPRALIA IMBELLIS, Busk.

Hemeschara imbellis, Busk, Crag Polyzoa, p. 78, pl. iv. fig. 6, pl. x. fig. 7.

Eschara pertusa, M.-Edwards, "Obs. sur les Foss. du genre Eschare," Ann. des Sc. Nat. ser. 2, vol. vi. p. 9, pl. x. fig. 3; S. Wood, Ann. Nat. Hist. vol. xiii. p. 16; Busk, Crag Polyzoa, p. 65, pl. x. fig. 2.

As *Lepralia pertusa*, Esper, was described before Milne-Edwards published the present species, the specific name must be changed; and seeing that Busk found it in the Crag, in both the Eschara- and the Hemeschara-stage, we can take his second name. The fossil from near Napier is adnate, and has elongate cells with large punctures over the surface. There are no ovicells on these fossils. Without

the avicularium this would be *Lepralia delicatula*, Manzoni (Bry. foss. Ital. 3*a* cont. p. 11, pl. iii. fig. 17).

There are also fossils from Napier, Petane, and Tommy Gully, with shorter cells and large pores arranged in a more or less radiating manner, and in appearance and size much the same as *Lepralia striatula*, Hincks, which I think cannot be regarded as more than a variety of the present. In a specimen of recent *L. striatula* sent me by Miss Jelly there are only two or three zoœcia with avicularia at the side of the orifice. In none of the fossils do I find any, but it is possible that some cells that are partly broken-down may have had such avicularia. A fossil from Waipukurau Gorge has rather short cells with but few pores irregularly arranged. Close allies are *Lepralia regularis*, Rss., *L. circumornata*, Rss., and *L. megalota*, Rss., from the Austrian Miocene, and the living *L. Pallasiana* and *L. pertusa*, Esp.

Loc. Fossil: Crag, Sudbourne (*M.-Ed.*); C. Crag (*B.*); Zanclean of Calabria (*Seguenza*). Pliocene: Rametto (Sicily); Gerace, and Tenda del Prado (Calabria) (*A. W. W.*); Napier (N. Z.), and the short variety from Napier, Petane, Tommy Gully, and Waipukurau.

50. Lepralia pertusa, Esper.

Cellepora pertusa, Esper, Pflanz. Cellep. p. 149, pl. x. fig. 2.

Lepralia pertusa, Busk, B. M. Cat. p. 80, pl. lxxviii. figs. 1 & 3 (non 2), pl. lxxix. figs. 1, 2; Smitt, Floridan Bry. p. 55; Hincks, Brit. Mar. Polyzoa, p. 305, pl. xliii. figs. 4, 5.

Lepralia pertusa, var. *rotundata*, Waters, Ann. & Mag. Nat. Hist. ser. 5, vol. iii. p. 31.

Loc. Living: European seas, Florida, Australia (?); New Zealand (?). Fossil: Muddy Creek; Waurn Ponds (Austr.); Napier (N.Z.).

51. Lepralia rostrigera, Sm. (Pl. VII. fig. 17.)

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

Lepralia rostrigera, Waters, Quart. Journ. Geol. Soc. vol. xli. p. 298.

The specimen from Napier is larger than the recent Floridan examples, or the fossil from the River-Murray Cliffs. It is adnate, and the zoœcia are divided by raised lines; the surface is punctured and granulated; the oral aperture is 0·22 millim., with an avicularium at each side of the aperture. There is a raised border round the aperture.

This is allied to *Lepralia ingens*, Manzoni (Castrocaro, p. 25).

Loc. Living: Florida. Fossil: R.-Murray Cliffs (Australia); Napier (N. Zeal.).

52. Lepralia longipora, MacGillivray.

Lepralia longipora, MacGillivray, "Descript. of New or Little-known Polyzoa," pt. ii., Trans. Roy. Soc. Vict. vol. xix. p. 135, pl. iii. fig. 18.

Cyclicopora prælonga, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. xiv. p. 279, pl. ix. fig. 7.

The fossil from Waipukurau has the upper part of the zoœcium raised, giving a tubular appearance to the peristome. The surface is granular and has more punctures than are figured by MacGillivray. The ovicell is narrower than a zoœcium. In *Mucronella canalifera*, Busk, the peristome is much produced and the ovicell is smaller.

Loc. Living: Port Phillip Heads (Victoria). Fossil: Waipukurau and Trig's Station.

53. LEPRALIA SEMILUNA, Rss., var. SIMPLEX, nov. (Pl. VII. fig. 19.)

Eschara semiluna, Rss. "Die Foram. Anth. und Bry. des deutschen Septar." p. 182 (66), pl. vi. fig. 6, Denkschr. k.-k. Akad. Wissensch. Wien, vol. xxv.

A fossil from Napier is adnate. The zoœcium is suboval, only slightly convex, with rather large pores. Oral aperture elongate, straight below and with the sides straight, curved above. Walls at the side of the aperture thickened, forming a kind of peristome. Above the aperture a nearly concealed ovicell with an oval cribriform depression in the middle.

I am unable to find any suboral avicularia, as described by Reuss, and therefore call it var. *simplex*.

The species is described from Söllingen.

54. LEPRALIA FORAMINIGERA, Hincks.

Lepralia foraminigera, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. xi. p. 109, pl. vii. fig. 1.

The fossil, though there are only the two upper openings, corresponds with recent specimens; the oral aperture, in each case, is about 0·15 millim. in diameter, and the operculum has a characteristic hinge-projection on each side, which Mr. Hincks seems to have overlooked.

Loc. Fossil: Waipukurau. Living: New Zealand (*H.*); Napier (sp. sent by *Miss Jelly*).

55. LEPRALIA BISTATA, sp. nov. (Woodcut, fig. 1.)

Zoarium incrusting. Zoœcia distinct, convex, surface perforated and mamillated. Oral aperture coarctate, with a small denticle at each side where the contraction takes place. Ovicell small, subimmersed, about half the width of a zoœcium, and the ovicelligerous cells have a very much wider oral aperture than the other zoœcia and an extraordinarily thick lower lip. The zoœcia and aperture are about the same size as those of *L. Pallasiana*.

Loc. Waipukurau Gorge.

56. PORELLA MARSUPIUM, MacG.

Porella marsupium, Waters, Quart. Journ. Geol. Soc. vol. xxxix. p. 437.

Loc. Living: Victoria (*MacG.*); Bass's Straits (*H.*). Fossil: Waurn Ponds (Victoria); Waipukurau (New Zealand).

57. PORELLA MARSUPIUM, var. PORIFERA, Hincks.

Porella marsupium, MacG., form *porifera*, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. xiii. p. 24, pl. iv. fig. 4.

Loc. Living: Queen Charlotte Island, off British Columbia (*H.*). Fossil: Waipukurau and Napier (New Zealand).

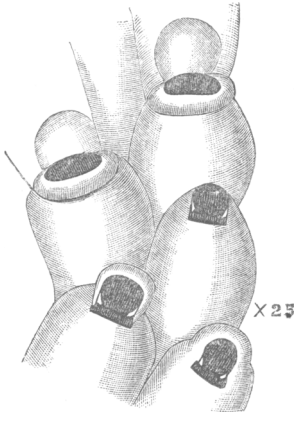
58. PORELLA CONCINNA, Busk.

Porella concinna, Waters, Quart. Journ. Geol. Soc. vol. xxxviii. p. 271.

An incrusting fossil from Tommy Gully, Petane, has the avicularium much raised on a suboral prominence, and in this respect differs from the European types. The zoœcia are divided by raised lines, and the surface has large pores.

Loc. Living: European seas; Bass's Straits. Fossil: Mount Gambier; Tommy Gully (Petane).

Fig. 1.—Lepralia bistata, *Waters, from Waipukurau, New Zealand.*



59. HIPPOTHOA FLAGELLUM, Manz.

Hippothoa flagellum, Manz. Bry. Foss. Ital. 4*a* cont. p. 6, pl. i. fig. 5; Suppl. alla Fauna dei Bry. Medit. 1*a* cont. p. 3; Bri. del Plioc. antic. di Castrocaro, p. 5, pl. i. fig. 14; Hincks, Ann. & Mag. Nat. Hist. 1877, vol. xx. p. 218; Brit. Mar. Polyzoa, p. 293, pl. xliv. figs. 5–7; Busk, Chall. Rep. Polyzoa, p. 4, pl. xxxiii. fig. 7.

Probably also *Terebripora ramosa* et *irregularis*, d'Orb. Voy. dans l'Amér. Mérid.

Loc. British seas and Medit.; Singapore (*H.*); Heard Island, 75 fath.; New Zealand. Fossil: Pliocene of Italy and Sicily; Napier.

60. SCHIZOPORELLA CIRCINATA, MacG. (Pl. VIII. fig. 41.)

Lepralia circinata, MacG., Nat. Hist. Victoria, dec. iv. p. 21, pl. xxxv. fig. 1.

Schizoporella circinata, Busk, 'Challenger' Rep. of Polyzoa, p. 166, fig. 46; Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. xv. p. 253, pl. vii. fig. 1.

This is a common fossil from Waipukurau, and in size is just the same as recent specimens from Napier. The long spatulate avicularium, directed downwards, is usually present; the oral aperture (0·07 millim.) is about half the size of that of *S. Cecilii*, Aud. Mr. Busk describes in both of these a movable appendage jointed to the operculum: but neither of them is figured correctly by him, as in *S. Cecilii* the appendage is a broad plate below the operculum, and does not become narrower, as may be seen in the figure given in my paper "On the Use of the Opercula" &c. (Proc. Manch. Lit. & Phil. Soc. xviii. 1878, fig. 1), and in *S. circinata* it becomes broader below; and this appendage separates very readily from the rest of the operculum, so that it is difficult to prepare them out together. In both there is a small notch in the proximal edge of the larger piece of the operculum, into which the appendage fits; in *S. circinata* it is very minute, but in *S. Cecilii* is much more pronounced. It does not seem that this appendage is movable, but that an integument is attached both to it and to the proximal edge of the operculum. In neither have I been able to find the minute fasciculus of muscular fibres at the lower part of the appendage to which Mr. Busk refers, and such a structure would be very inexplicable.

Loc. Living: Victoria (*MacG.*); off Inaccessible Island, Tristan d'Acunha (*Chall. Exp.*); Napier (*Miss J.*). Fossil: Waipukurau.

61. SCHIZOPORELLA AURICULATA, Hass.

Loc. Living: European and Australian seas. Fossil, Pliocene: Bruccoli (Sicily); Reggio (Calabria); Mount Gambier and Bairnsdale (Australia); Napier and Tommy Gully (New Zealand).

62. SCHIZOPORELLA RIDLEYI, MacG.

Schizoporella marsupium, Ridley, Zool. Coll. made by H.M.S. 'Alert,' Proc. Zool. Soc. 1881, p. 48, pl. vi. fig. 6.

Schizoporella Ridleyi, MacGillivray, Trans. Roy. Soc. of Victoria, vol. xix. p. 191, pl. i. fig. 1.

This is a very small species, with the aperture only 0·6 millim. wide. In the fossil the prominent suboral avicularia cover a large part of the zoœcium.

This seems to be closely allied to *S. auriculata*, but is smaller. Mr. Hincks (Ann. & Mag. N. Hist. ser. 5, vol. xiii. p. 25) thinks that this is identical with *S.* (*Escharina*) *simplex*, d'Orb.; but Mr. Quelch, who has since examined original specimens of *S. Ridleyi*, combats this (Ann. & Mag. N. Hist. ser. 5, vol. xiii. p. 215). I am not quite convinced that this should not be united with *S. simplex*, d'Orb.; but as there is a doubt, it will be best to retain the other name.

Loc. Living: Elizabeth Island, 6 fath. (*R.*); Victoria (*MacG.*). Fossil: Waipukurau; Napier (?).

63. SCHIZOPORELLA MARSUPIFERA, Busk.

Schizoporella marsupifera, Busk, 'Challenger' Report on the Polyzoa, pt. xxx. p. 165, pl. xxii. fig. 14.

Schizoporella lineolifera, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. xvii. p. 267, pl. ix. fig 10.

Loc. Living: Marion Island, 50–75 fath.; Station 167, off New Zealand, 150 fath. (*B.*); Adriatic (*H.*); Port Jackson, Sydney (*A. W.*). Fossil: Waipukurau.

64. SCHIZOPORELLA BIAPERTA, Mich.

Eschara biaperta, Mich. Icon. Zooph. p. 330, pl. lxxix. fig. 3 (see Hincks, Brit. Mar. Poly. p. 255, pl. xl. figs. 7–9); Waters, Ann. & Mag. Nat. Hist. ser. 5, vol. iii. p. 37, pl. xi. figs. 1 & 2.

Loc. Living: European seas, Florida, Madeira, Tartary, Columbia, New Zealand (*A. W. W. coll.*), Bass's Straits. Fossil: Doué (Miocene); Crag; Pliocene of Italy and Sicily; Waipukurau.

65. SCHIZOPORELLA CRIBRILIFERA, Hincks.

Schizoporella cribrilifera, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. xv. p. 250, pl. viii. fig. 5.

The fossil from the Petane marls is adnate, with the cells irregular, as in *Cellepora*, and the aperture deep down, of the same size and shape as in the recent species, but apparently without avicularia.

Loc. Living: New Zealand. Fossil: Petane marls.

66. SCHIZOPORELLA CLAVULA, Manz.

Lepralia clavula, Manzoni, Bry. Foss. Ital. cont. 3*a*, p. 8, pl. ii. fig. 9.

In the fossil from Waipukurau there are six spines above the aperture, and the ovicell is small, erect, somewhat elongate. At one or both sides of the aperture there is a narrow avicularium directed distally, following the border of the aperture, and usually curved. The surface has probably been papillated, but that cannot be made out with certainty.

Loc. Fossil: Turin (Miocene); Waipukurau.

67. SCHIZOPORELLA CONSERVATA, Waters. (Pl. VII. fig. 21.)

Schizoporella conservata, Waters, Quart. Journ. Geol. Soc. vol. xxxvii. p. 340, pl. xviii. fig. 81, and Q. J. G. S. vol. xxxviii. p. 273, pl. vii. fig. 7; Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. x. p. 96, pl. vii. fig. 2, and vol. xiv. p. 281.

Schizoporella insignis, MacGillivray (non Hincks), Trans. Roy. Soc. Vict. vol. xix. p. 132, pl. ii. fig. 11.

I could not for some time decide whether the fossils from Curdies Creek and Mount Gambier, the recent forms from near Melbourne, and the fossil from Napier should be united under the same species,

seeing that while certain important characters show that they are closely allied, in other points there are differences which may be varietal. The oral aperture of the New-Zealand fossil has a narrow sinus and is 0·2 millim. wide, which is larger than in the Australian fossils, but not so large as in the recent examples, in which it is 0·32 millim. wide and has a much larger and rounder sinus.

In both the recent specimens and the New-Zealand fossil the ovicell is more concealed than in the fossil first described, and in both there is a row of pores round the flat central part inside the ridge. In fact, in one specimen from Napier the ovicell is quite on a level with the zoœcium, and only the ridge and row of pores is visible. These pores are not mentioned by Mr. Hincks in his description, but occur in a recent specimen from Port Western. In the Napier fossil the avicularia are smaller and more raised than in the others, and there is usually only one avicularium to a zoœcium; the centre of the zoœcium is plain with large pores round it, whereas in the recent examples there is no plain portion, but there is in one a ridge up the centre as first described. The ovicell of the New-Zealand fossil is so much concealed that I am not sure whether there have been radiating lines on its walls.

The affinities and differences of these three varieties, separated as they are in time and locality, are very interesting.

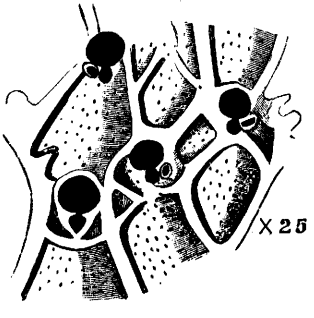
Loc. Living: Port Phillip, Port Phillip Heads, and Port Western (Adelaide). Fossil: Curdies Creek (S.W. Australia), Mount Gambier (S. Australia), and Napier (New Zealand).

68. Schizoporella obliqua, (?) MacG. (Woodcut, fig. 2.)

Eschara obliqua, MacGillivray, Austr. Polyz., Trans. Roy. Soc. Vict. vol. ix. p. 137 (1868); Zool. Vict. decade v. p. 39, pl. xlviii. fig. 1.

An adnate specimen, from Waipukurau Gorge, has zoœcia sur-

Fig. 2.—Schizoporella obliqua (?), *MagG.*, *from Waipukurau, New Zealand.*



rounded by raised smooth lines, and also frequently a raised line across, or partly across, the zoœcium below the aperture, and there

is sometimes at the side of the sinus a small suboral avicularium, so that the fossil differs in these two particulars from the typical *S. obliqua*. The sinus is very distinct, and the aperture almost meets above it.

69. SCHIZOPORELLA CINCTIPORA, Hincks, var. PERSONATA, nov. (Pl. VIII. fig. 28.)

Zoarium adnate. Zoœcia ovate, not much raised, divided by slightly raised lines; surface reticulate, with large pores. Oral aperture rounded above, longer than broad, with a distinct sinus on the proximal edge; on each side, below the aperture, on the border of the zoœcia, an elongate protuberance; between these, below the aperture, a small rounded avicularium. This differs from the recent forms in having the two lateral bosses. Since describing and figuring the first specimens, I have had another from Waipukurau Gorge, with ovicells, submitted to me. The two lateral bosses, in fully developed ovicelligerous cells, meet in front and form a bridge, as in *Smittia jacobensis*, *S. Landsborovii*, var. *personata*, *Microporella polystomella*, and *Schizoporella polymorpha*, B. In the Waipukurau fossils there are no avicularia. Miss Jelly has a specimen of this variety, recent, from New Zealand, growing in a cylindrical shape.

Loc. Living: New Zealand. Fossil: Petane marls and Waipukurau.

70. SCHIZOPORELLA TUBEROSA, Rss., var. ANGUSTATA, nov. (Pl. VIII. fig. 26.)

Type: *Eschara tuberosa*, Rss. Die Foram. Anth. und Bry. des d. Septarienthones, Denkschr. Ak. Wissensch. Wien, vol. xxv. p. 188, pl. vi. figs. 9, 10, pl. viii. fig. 1.

Schizoporella biturrita, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. xiv. p. 280, pl. ix. fig. 8.

This occurs fossil from Waipukurau, with a tubular zoarium, in the Hemeschara-stage. Zoœcia indistinct, with few large pores. Oral aperture clithridiate, with a large broad triangular avicularium above the aperture on each side directed towards the aperture. Oral aperture 0·17 millim. wide, 0·21 millim. long.

In mode of growth and general characters this resembles a recent *Schizoporella tuberosa* from the Semaphore, Adelaide, with a large triangular avicularium, which is often much raised, above the aperture on each side, and with a large broad raised ovicell; but in this the aperture is much larger and the sinus is broadly emarginate (see fig. 29).

In the fossil we are reminded of *Lunulites incisa*, H. (*conica*, MacG.), and *Schizoporella biaperta*. The typical *L. tuberosa* also occurs recent in Botany Bay, N.S.W., in the Lepralia-stage. Mr. Hincks describes it from Port Phillip Heads in a bilaminate stage.

I have not seen any from Australia or New Zealand with the avicularia inarching, *i. e.* in the *personata*-stage, as in Busk's *Gephyrophora polymorpha*.

71. SCHIZOPORELLA HYALINA, L. (Pl. VIII. figs. 42, 43.)

For synonyms, see Hincks, Brit. Mar. Polyzoa, p. 271, and add:—
Eschara annularis, Moll, Seerinde, p. 39, fig. 4.

I cannot agree with Mr. Busk in uniting this with *Chorizopora*, which has the proximal edge of the operculum straight, whereas in the ordinary zoœcia of *S. hyalina* there is a wide sinus, and it is only in the fertile cells that the proximal edge is nearly straight (see figs. 42, 43). Mr. Busk identified what we now know as *Chorizopora Brongniartii*, Aud., with Savigny's figure of *Flustra Brongniartii*; and as this has been generally accepted it would not be advisable now to change the name, though I quite agree with Mr. Busk in doubting whether Savigny's figure was meant to represent the species.

Loc. Living: Cosmopolitan. Fossil: English Crag; Waipukurau and Tommy Gully, Trig's Station (New Zealand).

72. CELLEPORA ALBIROSTRIS, Sm.

Cellepora albirostris, Waters, Quart. Journ. Geol. Soc. vol. xli. p. 304.

A specimen from Shakespeare Cliff has a free globular form, about 6 millim. in diameter; two specimens from Napier are adnate on shell, while another is a large solid branching form. In none is the preservation very satisfactory, and no spines are seen, so that perhaps they should be called var. *hastigera*, B. The proximal edge of the oral aperture is more curved than in my recent specimens, and in this respect more resembles var. *hastigera*.

Loc. Living: Florida, 25–35 fath.; Sydney (*Sm.*); Shark Island, 8 fath. (*A. W.*); Heard Island, 75 fath. (*B.*); Adelaide (*A. W.*). Fossil: River Murray (Australia), Napier and Wanganui (New Zealand).

73. CELLEPORA TRIDENTICULATA, Busk.

Cellepora tridenticulata, Busk, Journ. Linn. Soc. vol. xv. p. 347; 'Challenger' Rep. on Polyzoa, p. 198, pl. xxix. fig. 3, pl. xxxv. fig. 17; Waters, Quart. Journ. Geol. Soc. vol. xli. p. 306.

The fossil from Waipukurau is adnate, and shows the attachment of the two spines very clearly.

Loc. Living: Cape York; Adelaide. Fossil: Aldinga; River-Murray Cliffs; Yorke's Peninsula (Australia); Waipukurau (New Zealand).

74. CELLEPORA CORONOPUS, S. Wood.

For synonyms, see Waters, Quart. Journ. Geol. Soc. vol. xli. p. 302.

A specimen from Napier occurs in a thick solid branching form. The minute characters are made out with difficulty.

75. CELLEPORA COSTATA, MacG.

Cellepora costata, MacGillivray, Trans. R. Soc. Vict. vol. ix. 1869, p. 136; Waters, Quart. Journ. Geol. Soc. vol. xli. p. 303.

Cellepora globularis, Bronn, Leth. Geogn. ii. p. 877, pl. xxxv.

fig. 15, *a*, *b*; Reuss, Foss. Polyp. des W. Tertiärbeckens, p. 76 pl. ix. figs. 11–15; Reuss, Foss. Fauna St. von Wieliczka, p. 94; Manzoni, Bri. foss. del Mioc. d'Aust. ed Ungh. p. 51, pl. i. fig. 2.

Cellepora retusa, Manzoni, Bri. del plioc. ant. di Castrocaro, p. 35, pl. v. fig. 59.

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

Cellepora rota, MacGillivray, New or Little-known Polyzoa, pt. viii. p. 11, pl. iii. fig. 6.

There are two adnate convex zoaria, fossil, from Napier, about 12 millim. in diameter. In most zoœcia the aperture is unarmed, though in a good many there is an avicularium at one side, and these cells exactly correspond with Manzoni's figure of *Cellepora globularis* (I Bri. Mioc. Aust. Ung. p. 51, pl. i. fig. 2); there are, however, a few zoœcia with an oral avicularium at each side.

In some specimens of what I may call the typical *Cellepora globularis*, which I collected from the Miocene of Nussdorf, near Vienna, there are nearly always two lateral oral avicularia, but a few zoœcia have only one, thus again corresponding with Manzoni's figure. When these Nussdorf specimens have the two avicularia, the appearance is just the same as in some cells of *C. retusa*, var. *caminata*, W., which, however, more frequently has three avicularia. We are thus able to trace the unbroken connexion between the New Zealand fossils, in which the aperture is nearly always unarmed, and the recent Naples form, in which there are usually three very prominent oral avicularia. In all cases the oral aperture is deep down in the peristome.

I have a recent specimen from Port Phillip Heads with long branches, seldom with oral avicularia, but when they occur the mandibles are semicircular. I had not at all recognized the similarity until I prepared out the opercula, which are characteristic and correspond with the Naples specimens. The apertures are larger than those of the fossils, which measure about 0·08 millim. In this Port-Phillip-Heads species there are large spatulate avicularia.

The connexion was thus independently traced up in the fossils by means of the oral avicularia, and in the recent forms by the opercula and other chitinous organs.

I have been in doubt as to whether this should be called *C. costata* or *globularis*; but as it is by means of direct comparison of typical specimens rather than by the descriptions that I have worked up the synonymy, the name *costata* is retained.

Loc. Living: Wilson Promontory and Queenscliff, Victoria (*MacG.*); Port Phillip Heads (*MacG. & A. W. W.*); Glenelg, S. Australia (*A. W. W.*); Naples (*W.*). Fossil: Nussdorf (*A. W. W.*) and numerous other Miocene localities of Austria and Hungary (*Reuss & Manz.*); Pliocene of Italy (*Manz. & W.*); Adelaide, Australia; Napier, New Zealand.

76. Cellepora decepta, sp. nov. (Pl. VIII. fig. 33.)

There are two unsatisfactorily preserved specimens from Napier.

The lower edge of the aperture is straight, the upper rounded (0·1 millim. wide). There is an avicularium below the oral aperture, and the avicularian chamber is much raised, so that the appearance of these is sometimes almost like ovicells. The ovicells are usually much concealed. Vicarious avicularia elongate, spatulate, scattered all over the colony. This is related to *C. pertusa* and *C. fossa*.

CELLEPORA.

There is a cylindrical *Cellepora* from Napier with zoœcia irregularly placed; the oral aperture subrotundate with a wide sinus. There are numerous avicularia scattered about, some are very large, being the length of three or four zoœcia; the mandibular space is acute. It is distinguished from *C. yarraensis*, Waters, by the shape of the aperture.

77. RHYNCHOPORA LONGIROSTRIS, Hincks. (Pl. VII. fig. 22.)

Rhynchopora longirostris, Hincks, Ann. & Mag. Nat. Hist. ser. 5, vol. viii. p. 66, pl. iv. figs. 7, 8.

Fossil, from Napier, adnate. Zoœcia elongate, rising towards the mouth with a very long raised avicularian rostrum. On some zoœcia there is a very narrow avicularium attached to the rostrum, with the mandible directed towards the proximal part of the zoœcium. The oral aperture is suborbicular, with a wide round sinus.

Rhynchopora bispinosa is a most variable species, and when it has been properly worked up will probably have the longest list of synonyms of any Bryozoon, and my first impression was that the fossil belonged to that species. Being unable, however, to find any denticles, and all the cells being equal in size without the peristome rising on either side, I referred the fossil to *Schizoporella*; but receiving a recent specimen from Port Phillip, Australia, in which the long rostrum was well developed, with a lanceolate avicularium to almost every cell, and a slight elevation of the peristome on each side, the species was again brought back to *Rhynchopora*. In the recent form I am able to see in one or two zoœcia a small denticle, but cannot find one in most. This seems to be allied to *Cellepora longirostris*, MacG., and *Schizoporella cryptostoma*, MacG.

Loc. Living: Curtis Island (*H.*); Port Phillip (*W.*). Fossil: Napier.

78. LUNULITES PETALOIDES, d'Orb.

Lunulites petaloides, d'Orb., Waters, Quart. Journ. Geol. Soc. vol. xxxix. p. 442, pl. xii. fig. 11 *a*, *b*, *c*.

There are several specimens from Shakespeare Cliff, Wanganui, and in these the number of vibracula is very variable; they are often placed regularly for two or three rows, and in the rest of the colony scattered irregularly. The aperture is 0·4 millim. wide.

I do not see any reason for changing the generic name which has now been used for so long and is so generally recognized, nor is any advantage apparent in the alteration to *Lunaria* proposed by

Mr. Busk, and no one, however eminent, has authority to alter a well-established name. The genus, however, can only be looked upon as provisional, since it is almost entirely based on the mode of growth. This I have already shown to be unsatisfactory, and within the last few weeks have received from New South Wales a recent specimen of *Flabellopora elegans*, d'Orb., which is either *Lunulites cancellatus*, Busk, or very closely allied to it. This grows in an irregular subcrescentic form with two layers of zoœcia separated by a cellular structure formed of avicularian cells.

Loc. Fossil: European Cretaceous, Miocene and Pliocene; Mt. Gambier, Muddy Creek, Bird Rock (Australia); Napier and Wanganui (New Zealand).

Besides the species discussed, there are some specimens of *Retepora* from near Napier, and a *Caberea* from Waipukurau which may be the *C. crassimarginata* of Busk.

EXPLANATION OF PLATES VI.–VIII.

Plate VI.

Fig. 1. *Membranipora Lacroixii*, Aud., var. *grandis*. From Napier.
2. —— *annulus*, Manz.
3. —— *monostachys*. From Napier.
4. —— *Dumerilii*, Aud. From Waipukurau.
5. —— *annulus*, Manz. From the same specimen as fig. 2.
6. —— *monostachys*. From the same specimen as fig. 3. From Napier.
7. —— *nobilis*, Rss. From Petane.
8. *Monoporella disjuncta*, Manz. From Napier.
9. *Membranipora annulus*, Manz.
10. —— *nobilis*, Rss., with cells like *ovalis*. From Napier.
11. *Monoporella waipukurensis*, sp. nov. From Waipukurau.
12. *Membranipora occultata*, sp. nov., fossil. From Napier.
13. —— ——, recent.
[14. Cancelled.]

Plate VII.

Fig. 15. *Monoporella crassatina*, Waters. Whakati.
16. *Lepralia rectilineata*, Hincks. From Waipukurau.
17. —— *rostrigera*, Sm. From Napier.
18. *Membraniporella nitida*, J. From Waipukurau.
19. *Lepralia semiluna*, var. *simplex*, nov. From Napier.
20. *Mucronella firmata*, sp. nov. From Waipukurau.
21. *Schizoporella conservata*, Waters. Napier.
22. *Rhynchopora longirostris*, Hincks. From Napier.
23. *Porina grandipora*, sp. nov. From Napier.
24. *Mucronella alvareziana*, B., × 25. From Waipukurau.
25. —— ——, × 85. Ditto.

Plate VIII.

Fig. 26. *Schizoporella tuberosa*, Rss., var. *angustata*. From Napier.
27. *Micropora variperforata*, sp. nov.
28. *Schizoporella cinctipora*, H., var. *personata*. From Petane.
29. —— *tuberosa*, Rss., recent. From Napier.
30. *Mucronella tricuspis*, Hincks, var. *waipukurensis*; front of cells broken down.
31. *Mucronella porosa*, H., var. *minima*. From Petane.
32. *Membranipora spinosa*, Q. & G. From Napier.
33. *Cellepora decepta*, sp. nov. From Napier.

Fig. 34. Operculum of *Lepralia rectilineata*, × 85.
35. Mandible of *Lepralia rectilineata*, × 250.
36. —— —— ——, × 85.
37. Operculum of *Lepralia Poissonii*, Aud., × 170.
38. —— —— *adpressa*, B., × 170.
39. *Monoporella capensis*, var. *dentata*. From Napier.
40. Operculum of *Membranipora occultata*, sp. nov., × 250.
41. Operculum of *Schizoporella circinata*, MacG., × 170.
42 & 43. Opercula of *Schizoporella hyalina*, L., × 170.