

AUSTRALIAN MUSEUM SCIENTIFIC PUBLICATIONS

Livingstone, Arthur A., 1924. Studies on Australian Bryozoa. No. I. *Records of the Australian Museum* 14(3): 189–212, plates xxiii–xxvi. [26 June 1924].

doi:10.3853/j.0067-1975.14.1924.842

ISSN 0067-1975

Published by the Australian Museum, Sydney

nature culture **discover**

Australian Museum science is freely accessible online at
<http://publications.australianmuseum.net.au>
6 College Street, Sydney NSW 2010, Australia



STUDIES ON AUSTRALIAN BRYOZOA.

No. I.

By

ARTHUR A. LIVINGSTONE, Assistant in Zoology, Australian Museum.

(Plates xxiii-xxvi, and Fig. 1.)

Until a few months ago a small fleet of trawlers was maintained by the Government of New South Wales, and the collections of the Australian Museum were greatly enriched by large numbers of specimens of all marine groups which were forwarded to this institution by the State Trawling Industry. Facilities were afforded to various members of the staff to make short cruises in the steamers, and I was fortunate enough to have several opportunities of thus making collections. Among the wealth of specimens obtained, I secured a fine collection of Bryozoa, including a valuable series of the interesting *Parmularia obliqua* var. *lobata* from off Norah Head, and an equally interesting collection of the typical form from off Eden, New South Wales.

I have to acknowledge with thanks much valuable advice and criticism afforded to me by my seniors, Messrs. A. R. McCulloch and F. A. McNeill, of the Australian Museum. I am also indebted to Mr. J. A. Kershaw of the National Museum, Melbourne, for the loan of types of *Schizoporella flabellata* Maplestone, and *Lunulites patelliformis* Maplestone.

The three subjects dealt with under the above heading are separated into three sections, each provided with a separate sub-heading.

A REVISION OF THE GENUS PARMULARIA.

Genus PARMULARIA (*Busk, M.S.*) *MacGillivray*.

Parmularia MacGillivray, Proc. Roy. Soc. Victoria, xxiii, 1887, p. 211.

“Zoarium foliaceous, bilaminate, attached by a large, flexible radical tube. Zoecia oblique.” (MacGillivray.)

Two species, believed to be undescribed, are included in this hitherto monotypic genus. I have also redescribed the genotype, and have recorded some additional synonymy.

PARMULARIA OBLIQUA *MacGillivray*.

(Plate xxiii, figs. 1-2; Plate xxv, fig. 1; Plate xxvi; and Fig. 1.)

Eschara obliqua MacGillivray, Trans. Proc. Roy. Soc. Vict., ix, 2, 1868, p. 137.

Eschara reniformis Kirchenpauer, Mus. Godeffroy Cat. iv, May 1869, p. xxviii.

Parmularia obliqua Jelly, Syn. Cat. Rec. Mar. Bryozoa, 1889, p. 201 (synonymy).

Schizoporella flabellata Maplestone, Trans. Proc. Roy. Soc. Vict., (n.s.), xiv, 2, 1902, p. 68, and Rec. Austr. Mus., vii, 4, 1909, p. 268.

Parmularia obliqua and *flabellata* Maplestone, Trans. Proc. Roy. Soc. Vict., (n.s.), xxiii, 1, 1910, p. 42, pl. x.

Parmularia obliqua Maplestone, Trans. Proc. Roy. Soc. Vict., (n.s.), xxv, 2, 1913, p. 360.

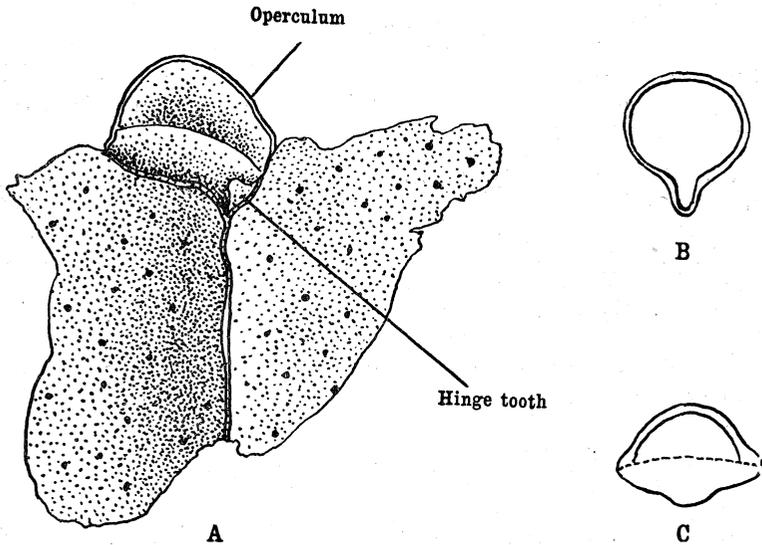


Fig. 1. *Parmularia obliqua* MacGillivray.

- A. Diagram showing the under surface of the frontal wall of an oocidium-bearing zoecium and the attachment of the operculum to the hinge tooth.
 B. Operculum of a barren zoecium.
 C. Operculum of an oocidium-bearing zoecium.

Revised description.—Zoarium with two layers of zoecia; flat, and fan or kidney-shaped. The zoecia are separated by well defined furrows along the centre of which are delicate white raised margins.

They are arranged in arched rows which extend outwards from the median base to the lateral margins in the adult forms, but their formation is somewhat variable in younger examples (see notes on variation). The frontal zoecial walls are ovate and thick, invested by a thin transparent membrane, and penetrated by a number of comparatively large pores which are sunken in shallow depressions. The basal zoecial walls are flat and minutely granular. They are provided with from two to five irregularly arranged communication pores. The distal and proximal zoecial walls are curved and roughly "S" shaped. Each is provided with from seven to nine communication pores arranged in a straight row or belt near the base and extending the whole length of the walls. The lateral zoecial walls are more or less straight, and are provided with from four to seven communication pores arranged in one or two rows near their bases. The zoecial apertures are sunken well below the level of the surrounding frontal walls. They are semi-circular distally and produced into a deep sinus proximally. There is a short blunt hinge-tooth on each side of the aperture within the proximal half. The peristome is weakly developed, and in some zoecia is barely discernible, though in others it is produced on each side of the sinus. The operculum is yellowish and chitinised, completely enclosing the aperture and the sinus. In oecia-bearing zoecia, the operculum covers both the aperture of the zoecium and the communicating entrance to the oecium.

The oecium appears as a ponderous external structure clearly visible to the naked eye. Its thick frontal wall is dome-shaped, punctured with numerous pores, and furrowed by a deep suture, within which is a raised white margin similar to those separating the zoecia. This suture is branched, dividing the whole frontal oecial wall into three or rarely four distinct portions. The basal oecial wall is thin and concave and appears to be membranous. It rests above the junction of two lateral and two proximal zoecial walls, its lowest part being well below the level of the surrounding frontal zoecial walls.

The oecia-bearing zoecia are considerably distorted, and their individual common apertures are expanded laterally. The peristomes are much more developed than is the case with barren zoecia, and their distal and proximal margins bear thin overhanging lips. On each of the frontal walls, immediately in front of the aperture, a large mucro invariably occurs, which in some cases projects over the aperture and in others is directed straight upwards; this may possess an acute or bifid extremity, or it may be somewhat flattened and tongue-shaped with a blunt or serrated extremity. All this variation of the mucro (which is present only in oecia-bearing zoecia) is to be found on a single colony before me.

Colour.—Recent examples are salmon-coloured in life, but soon fade to a drab grey or white when dried or preserved in alcohol; when viewed under the microscope they appear to be much whiter than when seen with the naked eye.

Mode of attachment.—On the base of a large dry specimen before me is a membranous filament which serves to anchor the colony to the sandy bottom on which the species is known to occur. This is about 25 mm. in length and in its dry and shrivelled condition is flattened and tape-like. One end is widened and fits into a shallow and narrow concavity at the base of the colony. The other end is provided with root-like projections. The roof of the concavity at the base of the colony is provided with a number of thin lamellæ, which either extend uninterruptedly from side to side or fuse with others at various intervals.

Synonymy and variation.—Maplestone separated his *Parmularia flabellata* from *P. obliqua* on the arrangement of the zoecia and the shape of the zoarium. These characters are subject to great variation with age, however, and cannot be relied upon to distinguish the two species.

By the courtesy of Mr. J. A. Kershaw, Curator of the National Museum, Melbourne, I have been able to examine the type of Maplestone's *S. flabellata*, which is 4 mm. long and 2.5 mm. wide; others agreeing with it in all details are preserved in the Australian Museum. I have carefully compared these specimens, including the type, with numerous other examples in the Australian Museum which agree with the description and figures of *P. obliqua*, and which I regard as referable to that species. As a result of this comparison I have come to the conclusion that *P. flabellata* is synonymous with *P. obliqua*. The dredgings secured from a depth of 40 fathoms in Oyster Bay, Tasmania, by the Commonwealth Fisheries Investigation Ship "Endeavour" are particularly rich in examples of both *P. obliqua* and *P. flabellata*, and I am able to sort out a series of specimens completely connecting the two forms. None but juvenile specimens possess the same zoecial arrangement as the type of *P. flabellata*. The small colonies exhibit a perpendicular arrangement of the zoecia as described and figured by Maplestone, and gradually assume the oblique arrangement as the adult condition approaches. Generally the shape of the zoarium differs with age from a juvenile elliptical form like Maplestone's type, to an adult fan- or kidney-shaped colony, but other variable shapes have been noticed (Pl. xxv, fig. 1). These are sometimes irregular two lobed colonies somewhat resembling the var. *lobata* form, or may be roughly triangular in outline. Such growth irregularities, however, are recognised as being by no means uncommon among the Bryozoa.

In support of the above synonymy it may be noted that Maplestone (*loc. cit.* 1910) moved his *flabellata* from *Schizoporella* to the genus *Parmularia*, even though this latter has the zoecia arranged obliquely. He therefore noted that *flabellata* "differs from *P. obliqua* in that the zoecia are perpendicularly arranged, not obliquely." This caused me to look into the matter more closely, with the above results. Further, it is interesting to note that the two colonies identified

by Maplestone as his *flabellata* from the material secured by the H.M.C.S. "Miner" (*loc. cit.* 1909) are intermediate growth stages between *P. obliqua* and *P. flabellata*. A careful study of these specimens in the Australian Museum collection shows that they are elliptical colonies, a little larger than Maplestone's type, and both possess clear indications of the commencement of an oblique zoecial arrangement.

The species has been recorded from the following localities:—Schnapper Point, Victoria (MacGillivray); Bass Strait, south eastern Australia (Kirchenpauer); Jimmy's Point, Reeves River, Victoria (fossil); 80 fathoms, 22 miles east of Port Jackson, New South Wales; Backstairs Passage, South Australia; Gulf of St. Vincent, South Australia, 14 to 24 fathoms (Maplestone).

There are additional specimens in the Australian Museum from:—Albany Passage off Cape York, Australia, 5 to 15 fathoms, collected by Messrs. C. Hedley and A. R. McCulloch, October, 1907; 3-4 miles off Eden, New South Wales, 25-30 fathoms, collected by Messrs. F. A. McNeill and A. A. Livingstone; off Gabo Island, Victoria, 100 to 200 fathoms, collected by the Commonwealth Fisheries Investigation Ship "Endeavour," 1909-14; Port Phillip Heads, Victoria; Oyster Bay, Tasmania, 40 fathoms; Spencer Gulf, South Australia, 16 fathoms, 20-8-1909, collected by the C.F.I.S. "Endeavour," 1909-14.

PARMULARIA OBLIQUA *MacGillivray*, var. LOBATA *Maplestone*.

Maplestone, Trans. Proc. Roy. Soc. Vict., (n.s.)xxv, 2, 1913, pp. 360-1, pl. xxviii, fig. 11.

The characters of this variety are well defined by Maplestone, who had specimens from King George Sound, West Australia. I regard several specimens in the Australian Museum from off Norah Head, New South Wales, 26 to 38 fathoms, as referable to the same variety. They were collected by myself while on the trawler "Goonambee" during 1921, and form the second record of the occurrence of the variety.

The specimens before me are as irregular in outline as those figured by Maplestone. They do not differ in structural details from the typical form, but superficially appear to be much more delicate and not nearly so heavily calcified. The colour of the specimens when fresh was the same salmon hue as that of the typical form, but in the dried state they have taken on a silvery appearance which I have not noticed in that species. It is a striking fact that no similarly conditioned specimens were found in the great bulk of typical *P. obliqua* material in the Australian Museum.

Localities.—King George Sound, West Australia (Maplestone); off Norah Head, New South Wales, 26 to 38 fathoms, collected by Messrs. F. A. McNeill and A. A. Livingstone, June, 1921.

PARMULARIA MACNELLI¹ *sp. nov.*

(Plate xxiv, figs. 1-2; and Plate xxv, fig. 2.)

Description.—The zoarium is elongate, roughly elliptical, and tapers towards the distal extremity; it is two-layered, flat, and extremely delicate. The zooecia are bigger than those of *P. obliqua*, and larger near the edges of the colony than in the centre. They are like those of *P. obliqua* in form and arrangement, but are much less heavily calcified, and the frontal walls are less convex. They are somewhat diamond-shaped, with their distal and proximal walls curved in the same S-shaped manner, and with their lateral walls almost straight. They are separated by distinct furrows, within which are barely discernible white raised margins. The frontal zooecial walls are covered with shallow pits punctured with pores.

The zooecial apertures are usually almost circular, being semi-circular distally and hollowed proximally, but are roundly elongate in some zooecia near the edges of the colony. No sinus is apparent. The peristome is weakly developed distally, but it is produced proximally to form an extremely thin overhanging lip, which is much better developed than in *P. obliqua*. On each side of the aperture and low down in the proximal half, is a small sharply pointed hinge-tooth.

The oecia are similar to those of *P. obliqua*, but the furrows on their surfaces are shallower, and the white raised margins within them are not so conspicuous. The apertures of the oecia-bearing zooecia, although distally adapted to accommodate the oecia, retain their general shape, and are not subject to the same degree of distortion as in *P. obliqua*.

Attachment.—There is an elongate concavity at the base of the colony for the accommodation of an anchoring tube, but it is much smaller and less developed than in colonies of *P. obliqua* of the same superficial area. The arrangement of the lamellæ, however, is the same.

Remarks.—This species is found living in the same localities as *P. obliqua*, but is a much rarer form. Consequently, having only a limited number of specimens, I cannot spare material to section for the study of internal details.

Colour.—Dried specimens are a light rusty cream in colour.

Holotype.—Described and figured from a colony 14.5 mm. long and 6 mm. wide from off Gabo Island, Victoria, 100-200 fathoms. Two additional specimens (paratypes) from the same locality are in the Australian Museum collection, together with some small fragments.

Localities.—Off Gabo Island, Victoria, 100-200 fathoms, collected by the Commonwealth Fisheries Investigation Ship "Endeavour," 1909-14.—Holotype and paratypes.

¹ Named for Mr. F. A. McNeill, Zoologist at the Australian Museum, Sydney.

East from Babel Island, Bass Strait, 65 fathoms, collected by the C.F.I.S. "Endeavour," 26th October, 1912. Fragments.

Lagoon at Masthead Island, Capricorn Group, Queensland, collected by Messrs. C. Hedley and A. R. McCulloch, October, 1904; one incomplete colony.

PARMULARIA INTEGER *sp. nov.*

(Plate xxiii, fig. 3.)

Description.—The zoarium is elongate and elliptical like the preceding species, and is two-layered and flat; like *P. obliqua* it is heavily calcified. The zooecia are small, similar in shape to those of *P. obliqua*, and arranged in similar oblique series. They are separated by shallow furrows, the margins within which are very obscure, much as in *P. macneilli*. The thickened zooecial walls are slightly ovate as in that species, and the distinct pits on their surfaces are perhaps punctured with small pores as in other members of the genus. If present, these pores are obliterated by an accumulation of silt, but as I have only a single colony I cannot risk its destruction by any attempt to clarify the frontal walls. The apertures are irregularly circular, and, as in the two allied species, are sunken below the level of the surrounding frontal walls. The peristome is only weakly developed, and barely discernible; no sign of an overhanging lip is present. On each side of the aperture and low down in the proximal half, is a minute hinge-tooth, but in some of the apertures these are worn off. Immediately outside the proximal border of the aperture is a small, sharp, mucro-like denticle which points towards the distal extremity of the zooecium. There are no ooecia present on the colony examined.

Colour.—The colony is white when dried.

Mode of Attachment.—The presence of a concavity at the base of the colony suggests that *P. integer* is attached, like the other two species of *Parmularia*, by a flexible tube. But, unlike those of its allies, the lamellæ in the concavity are only weakly developed, and the base of the opening is punctured by comparatively large pores of varying sizes.

Holotype.—Described and figured from a single colony, 5 mm. long and 3 mm. wide, which was collected by Messrs. C. Hedley and A. R. McCulloch in lagoon at Masthead Island, Capricorn Group, Queensland. It is possibly juvenile, and, although the zooecia appear to have assumed the adult characters, I have no means of determining whether the shape of the zoarium is constant or not. The specimen is housed in the Australian Museum.

Locality.—The lagoon at Masthead Island, Capricorn Group, Queensland; collected by Messrs. C. Hedley and A. R. McCulloch, October, 1904.

Affinities.—This species resembles the fossil species *Lepralia obliqua* MacGillivray² in being bilaminar, destitute of avicularia, and in the position of the aperture. But if *L. obliqua* be a true *Lepralia*, the two must be distinct, for *P. integer* has the zooecia arranged in an arched direction laterally as is characteristic of *Parmularia*; further they are not distinctly “separated by prominent raised lines” as in *L. obliqua*. Again the lower lip is not “convex upwards forming a mucro-like projection”; the mucro-like denticle referred to in my description is quite distinct and separate from the lower lip.

It may be considered that *L. obliqua* should be placed in the genus *Parmularia*, but the only character it has in common with this genus is the bilaminar formation of the zoarium. MacGillivray states that the “thyrostome [aperture] is straight or generally oblique,” but gives no information as to how the zooecia are arranged. Further, as he was responsible for the genus *Parmularia*, he doubtless had good reasons for placing *obliqua* in *Lepralia* rather than in *Parmularia*. From his description it would appear that he founded his species on fragmentary material.

Key to the species of *Parmularia*:

- A. Aperture with a sinus.
 - B. Colony lobed, kidney- or fan-shaped. *obliqua*.
- AA. Aperture without a sinus, zoarium roughly elliptical.
 - C. A mucro-like denticle immediately below proximal border of aperture. *integer*.
 - CC. No such denticle. *macneilli*.

MISCELLANEOUS NOTES.

This section has been made to accommodate notes of special interest, together with a description of a species of *Arachnopusia* believed to be new to science.

Genus PETRALIA MacGillivray.

PETRALIA JAPONICA Busk.

Lepralia japonica Busk, Challenger Rep., Zool., x, 30, 1884, p. 134, pl. xvii, fig. 5. *Id.*, Waters, Journ. Linn. Soc. Zool., xxxi, March, 1909, p. 149, pl. 13, figs. 10-12 (synonymy).

Petralia japonica Levinsen, Morph. Sys. Stud. Cheil. Bryozoa, 1909, p. 352, pl. xviii, figs. 5 a-b.

² MacGillivray—Trans. Roy. Soc. Vict., iv, 1895, p. 78.

A specimen recently collected by Mr. E. H. Rainford on the beach at Gloucester Island, Bowen Harbour, in Port Denison, Queensland, which I identify as this species, assumes the hemescharine habit, forming free and erect expansions. These branching expansions are, however, tubular and somewhat cylindrical, the individual branches ranging from 3 to 6 mm. in diameter. The specimen is a mass of these tubes all joined together, the whole measuring about three and a half to four inches across. The ooezia are well represented on the specimen secured by Mr. Rainford, and are embedded beneath the frontal walls of zooecia situated distally to the ooezia-bearing zooecia. The frontal wall of such a distal zooecium when removed reveals plainly the internal ooecium which encroaches upon half, or a little less than half of the space of the cell. Both the frontal and basal ooezial walls are perforated by a number of minute pores, but the frontal walls more so than the basal. In some specimens the zooecia are heavily calcified, the peristomes being very thick and prominent.

Levinsen and Waters have so ably dealt with this species that there is very little that I can add to their records. The following localities of specimens preserved in the Australian Museum extend the known distribution of the species as recorded by Waters.—

Localities.—Murray Island, Torres Strait; Albany Passage, North Australia, collected by Messrs. C. Hedley and A. R. McCulloch; Gloucester Island, Bowen Harbour, in Port Denison, Queensland, collected by Mr. E. H. Rainford; rock-pools at Point Cartwright, Queensland, collected by A. A. Livingstone, August 1922; rock-pools at Caloundra, Queensland, collected by A. A. Livingstone, August 1922.

Genus ESCHAROIDES *Milne-Edwards.*

Escharoides Levinsen, *Morph. Syst. Stud. Cheil. Bryozoa*, 1909, p. 317 (and synonymy).

ESCHAROIDES EXCAVATA *MacGillivray.*

Mucronella excavata MacGillivray, *Trans. Phil. Inst. Victoria*, 1859, iv, p. 166, pl. ii, fig. 4.

Mucronella præstans Hincks, *Ann. Mag. Nat. Hist.*, (5), x, 1882, p. 168, pl. vii, fig. 1. *Id.*, *Jelly, Syn. Cat. Rec. Mar. Bryozoa*, 1889, p. 195 (synonymy).

Mucronella excavata Jelly, *Syn. Cat. Rec. Mar. Bryozoa*, p. 193 (synonymy).

Mucronella præstans Maplestone, *Proc. Roy. Soc. Victoria*, xvii, 1904, p. 212. *Id.*, *Waters, Ann. Mag. Nat. Hist.* (7), xvii, 1906, p. 20.

Escharoides præstans Levinsen, *Morph. Sys. Stud. Cheil. Bryozoa*, 1909, p. 318.

Mucronella præstans Maplestone, *Rec. Austr. Mus.*, vii, 4, 1909, p. 268.

This species was first described under the name of *Mucronella excavata* by MacGillivray, and later redescribed by Hincks as *M. præstans*. MacGillivray³ in 1890 saw Hincks' error and recorded that "this species [his *excavata*] is identical with *M. præstans* described by Hincks from N.Z." Notwithstanding this, the species has been generally referred to under Hincks' name; even MacGillivray referred to it as *M. præstans* in his monograph of the Tertiary polyzoa of Victoria, which he wrote some years after pointing out Hincks' mistake. He either overlooked its identity with *M. præstans*, or considered the two as distinct. I believe he overlooked his remarks made five years before, however, and unwittingly referred to his own species (*M. excavata*) under the name of *M. præstans* Hincks. Miss Jelly in her great work adds *duplicata* and *Lepralia angela* Hutton to the synonymy of *M. præstans*, but lists this latter and *excavata* as separate species. Her remarks as to the priority of *præstans* over Waters' *duplicata* are now invalidated by the fact that the species was described by MacGillivray long before either of these two names was proposed.

The species here discussed is not the *Smittia præstans* referred to by Waters⁴, which was later queried by Levinsen as being synonymous with his *Escharoides sauroglossa* sp. nov. I may here point out that *Smittia præstans* Waters, var. was referred to by Canu and Bassler⁵ under the heading of *Romancheina præstans*⁶ var., Waters, 1889 (not Hincks). These distinguished authors evidently overlooked or do not accept Levinsen's suggested synonymy.

Genus LUNULARIA Busk, 1884.

Lunularia Canu and Bassler, Bull. U.S. Nat. Mus. No. 106, 1920, pp. 238-252.

These authors quoted above have recently dealt with the status and history of this genus, and have supplied a complete list of the known species.

LUNULARIA CAPULUS Busk.

Lunulites capulus Busk, Brit. Mus. Cat. II, 1854, p. 100, pl. cxii.

Lunularia capulus Busk, Challenger Rep. Zool., x, 30, p. 208, pl. xiv, fig. 7a.

Lunulites patelliformis Maplestone, Trans. Proc. Roy. Soc. Viet. (n.s.) xvi, 1904, p. 215, pl. xxv, figs. 6a-b.

Lunularia capulus Levinsen, Morph. Sys. Stud. Cheil. Bryozoa, 1909, p. 155.

³ MacGillivray—Trans. Roy. Soc. S. Austr., vol. xiii, 1890, p. 5.

⁴ Waters—Ann. Mag. Nat. Hist., (6), iv, 1889, p. 17.

⁵ Canu and Bassler—U.S. Nat. Mus. Bull., 106, 1920, p. 407.

⁶ Evidently a misprint for *præstans*.

Lunularia capulus and *patelliformis* Canu and Bassler, Bull. U.S. Nat. Mus. No. 106, 1920, pp. 238 and 239, text fig. 46.

Selenaria livingstonei Bretnall, Rec. Austr. Mus. xiii, 5, 1922, p. 190, text fig. 2.

Lunulites cupulus Waters, Journ. Linn. Soc., xxxiv, 1921, p. 417.

Synonymy.—A comparison of the holotype and paratypes of *S. livingstonei* in the Australian Museum with specimens of *Lunularia capulus* Busk proves that the two are identical. The diagnosis given by Bretnall is quite inadequate, as it embodies only the superficial characters, and makes no mention of the structures beneath the depressed cryptocysts of the zooecia. Further his figure of the zooecial detail is misleading in that it shows no indication of the apertures. He states that "small circular vibracular cells are situated between the zooecial rows over the entire surface," but in a partly worn paratype, and another incinerated example, the vibracular cells are elongate and somewhat elliptical and pointed towards the apex of the zoarium; they therein agree with the figure given by Busk (*loc. cit.*).

Through the kindness of Mr. J. A. Kershaw, Curator of the National Museum, Melbourne, I have been able to examine the type specimen of Maplestone's *Lunulites patelliformis*, and, after a critical examination, have no hesitation in associating it with *L. capulus* Busk, thereby proving portion of the synonymy hinted at by Waters (*loc. cit.*). According to Maplestone, the lateral walls of his *L. patelliformis* are provided with four communication pores. I have been unable to examine this character in the type without risk of serious damage to the specimen, but I find that the number and arrangement of these pores is variable in the lateral walls of zooecia of individual colonies in the Australian Museum collection. The under surface of the zoarium is also variable, both in the number of pores present and in the arrangement of the radiating ridges. Again, it is apparent that the character of the flagellæ (vibracular mandibles) undergoes considerable variation, these structures being short in some colonies, long and slender in others. The extremities are mostly trifid, but a few isolated acutely pointed flagellæ are often found on a single colony, which are similar in shape to the flagellum described and figured by Maplestone.

The only complete flagellum to be found on his type is a single club-topped example, which no doubt was once trifid, and there is every indication that its extremity is considerably worn. So far as I can ascertain, all other flagellæ are either completely worn off or are broken and damaged.

The following notes on the variation of the flagellæ of *Lunularia capulus* have been compiled after an extensive study of the specimens in the Australian Museum, together with the types of *L. patelliformis* and *S. livingstonei*. The extremities of the flagellæ on specimens from 3 to 4 miles off Eden, New South Wales, 25 to 30 fathoms, and those on the type of *S. livingstonei* are either acute or trifid, though the latter form is by far the commonest. The flagellæ are long and slender,

and appear at first sight to be almost round; when examined under a microscope however, each is seen to possess a central axis which extends along its whole length, and on each side of this axis is a flattened expansion. Although this character is but little developed in *L. capulus*, the flagellæ are somewhat similar to those of *Lunularia repandus* Maplestone⁷, and their extremities are acute or trifid in both species. Despite this and other resemblances, I think *L. repandus* possesses sufficient characters to distinguish it from its allies.

Localities.—Specimens of *Lunularia capulus* are in the Australian Museum from:—Newcastle, New South Wales, 1866; 3 to 4 miles off Eden, New South Wales, 25 to 30 fathoms, collected by Messrs. H. O. Fletcher and A. A. Livingstone, 1922; "Thetis" Expedition, Station 28,—2 to 4 miles off Manning River, New South Wales, 22 to 23 fathoms, 1898; "Thetis" Expedition, Station 49,—5 to 8 miles off Port Kembla, New South Wales, 63 to 75 fathoms, 1898.

The species has been recorded elsewhere from:—Off Cape Capricorn (MacGillivray); "Challenger" Expedition, Station 161, off Port Phillip, Victoria, 33 fathoms, sand (Busk); 26 to 38 fathoms off Norah Head, New South Wales (Bretnall); St. Vincent Gulf and Backstairs Passage, 17 to 22 fathoms; Investigator Strait, South Australia, 15 to 20 fathoms; Newcastle, New South Wales (Maplestone).

SCHIZOPORELLA ACUMINATA *Hincks*.

Schizoporella acuminata Hincks, Ann. Mag. Nat. Hist. (5) viii, 1881, p. 14, pl. ii, fig. 1.

Schizoporella jacksoniensis Busk, Challenger Rept. Zool. x, 30, 1884, p. 164, pl. xix, figs. 3, 3a-b.

Schizoporella jacksoniensis Whitelegge, Journ. Proc. Roy. Soc. N.S. Wales, xxiii, 1889, p. 125.

Schizoporella jacksoniensis Jelly, Syn. Cat. Rec. Mar. Bryozoa, 1889, p. 299 (synonymy).

Schizoporella acuminata Jelly, Syn. Cat. Rec. Mar. Bryozoa, 1889, p. 221.

Schizoporella acuminata Hincks, Ann. Mag. Nat. Hist. (6) viii, 1891, p. 477.

Schizoporella acuminata Maplestone, Proc. Roy. Soc. Vict. (n.s.), xvii, 1, 1904, p. 206.

This species was first described by Hincks from a specimen from Bass Strait. Three years later Busk described the same species under another name, from material secured by the "Challenger" off Port Jackson, New South Wales.

⁷ Maplestone—Trans. Proc. Roy. Soc. Vict (n.s.), xvi, 1904; p. 216, pl. xxv, fig. 7 a-c; and Waters Journ. Linn. Soc., vol. 34, No. 229, 1921, p. 417.

Material in the Australian Museum was dredged by the "Thetis" at Station 44 (5.6 miles off Coogee, New South Wales, 49-50 fathoms; fine sand, 1898), only a few miles away from the locality of the type of *Schizoporella jacksoniensis* Busk. These specimens agree with Busk's description and figures, and like his specimens were found encrusting the stem of a hydroid or alcyonarian. These specimens further agree with Hincks' description of *S. acuminata* in all characters except the structure of the cell wall. According to him, there is an "acuminate suberect extension of the cell-wall behind the orifice, the apex or peak of which is slightly bent forward, and occupied by a smooth somewhat nodular prominence." But, after examining specimens in the Australian Museum, I agree with Waters that this is not a constant character.

The oocidia of *S. jacksoniensis* are the same as those of *S. acuminata*. I find some variation in the occurrence of the avicularia, which may be entirely absent on some zooecia; in others they are represented by one on one side of, or a little below the aperture and directed upwards, or else by one on each side, which may be on the same level as, or a little below the aperture.

The species has been recorded from the following localities:—Off Curtis Island, Bass Strait, not more than 40 fathoms (Hincks, type locality); "Challenger" Expedition, Station 163b, off Port Jackson, New South Wales, 35 fathoms, hard ground (Busk); Bairnsdale, Gippsland, Victoria, fossil; Mount Gambier, South Australia, fossil (Waters).

There are specimens in the Australian Museum from:—"Thetis" Expedition, Station 44, 5.6 miles off Coogee, New South Wales, 49-50 fathoms, fine sand, 1898; Port Phillip, Victoria; "Miner" Expedition, 22 miles east of Port Jackson, New South Wales, 80 fathoms (these specimens were found in a small box, together with specimens of *Schizoporella cecilia*, which were identified as such by Maplestone). Off Point Plomer, New South Wales, 50 fathoms, dredged by Mr. C. Hedley, 14-10-1918; Muddy Creek, Victoria, fossil, presented by Rev. T. Porter, 1904.

SCHIZOPORELLA CONVEXA MacGillivray.

Schizoporella convexa MacGillivray, Trans. Roy. Soc. Victoria, iv, 1895, p. 85, pl. xi, fig. 21.

Schizoporella convexa Maplestone, Trans. Roy. Soc. Victoria, (n.s.) xiv, 2, p. 66, pl. vi, fig. 4, (not pl. vii as stated).

This species was described by MacGillivray as a fossil from the Tertiary deposits at Muddy Creek, Victoria, Maplestone later recognised it from the Mitchell River deposits, Victoria, and described and figured the oocidia.

Variation.—A few fragmentary specimens of this species were obtained by the "Thetis," which were found completely encrusting a piece of weed, and some zooecia of which possess avicularia. These occur singly, either on the right or left of each aperture, and are directed laterally. Sometimes the avicularium is situated on the proximal half of the frontal zooecial wall, in which cases it is directed proximally. The mandibles are fairly large and duck-bill shaped. The avicularian chambers are deep.

The oecia are like those described and figured by Maplestone but his distal "cross-ribbed depressed area" is punctured with large elongated pores in my specimens. The basal wall of an oecium possesses small pores.

Distribution.—Muddy Creek, Victoria, Tertiary (MacGill., type locality); Mitchell River, Victoria, Tertiary (Maplestone).

There are specimens in the Australian Museum from:—"Thetis" Expedition, Station 44, 5-6 miles off Coogee, New South Wales, 49-50 fathoms, fine sand (recent); "Thetis" Expedition, Station 48, 7-8 miles off Wollongong, New South Wales, 55-56 fathoms, sand and mud to rock (recent).

Genus ARACHNOPUSIA *Jullien*, char. emend.

Arachnopusia Levinsen, Morph. Syst. Stud. Cheil. Bryozoa, 1909, p. 160.

ARACHNOPUSIA AJAX *sp. nov.*

(Plate xxiv, fig. 3.)

Description.—Zoarium encrusting, very thick and stout. The zooecia are broadly ovate, and under a high power microscope appear to be very uneven in height; this may be accounted for by the fact that the colony has accommodated itself to the irregularities of the surface it is encrusting. They are separated by thick, stout and slightly raised margins. The aperture, which is broader than long, is semiorbicular in shape, arched above and straight below, and protected by a stout operculum. There are generally three, stout, projecting hollow spines, situated directly above the aperture. A rod-like chitinous opercular valve is situated on the outside edge of the proximal border of the peristome, and a little to one side of the median line. In many cases its total length is about three times the height of the aperture. Peristome well developed. Frontal wall punctured by a number of large irregularly rounded pores, the average number to each zooecium being about twenty-eight. The avicularia have triangular mandibles, and are irregularly scattered along the wide raised margins of the zooecia; they are generally very plentiful in the vicinity of the peristome. There are no avicularia on the frontal wall. Oecia are not present on the specimen.

Locality.—Off Botany Bay, New South Wales, 400 fathoms (one small fragment).

It is near *Arachnopusia monoceros* (Busk), but differs from it in the following features:—The peristome on the lower lip is without even indications of being raised into a central pointed process or mucro. The zooecia are about twice as large as those of *A. monoceros*, and are distinctly separated by wide raised margins, along which are scattered the avicularia. The opercular valve does not emerge from within the peristome as it does in *A. monoceros*.

ARACHNOPUSIA MONOCEROS *Busk*.

Lepralia monoceros Busk, Brit. Mus. Cat. ii, 1854. p. 72.

Cribrilina monoceros MacGillivray, Prod. Zool. Victoria, xx, p. 319, pl. 187, fig. 6. *Id.*, Jelly, Syn. Cat. Rec. Mar. Bryozoa, p. 67 (synonymy).

Hiantopora perforata Maplestone, Rec. Austr. Mus. vii, 4, 1909, p. 271, pl. lxxviii, fig. 9.

Arachnopusia monoceros Levinsen, Morph. Sys. Stud. Cheil. Bryozoa, 1909, p. 160. *Id.*, Canu and Bassler, U.S. Nat. Mus., Bull. 106, 1920, p. 312, fig. 86 A-J.

Synonymy.—This well-known species was redescribed as *Hiantopora perforata* by Maplestone (*loc. cit.*) in his report upon the results of the deep sea investigations of the H.M.C.S. "Miner." The type specimen of *H. perforata* is housed in the Australian Museum, and has been examined and compared with specimens identified as *Cribrilina monoceros* by earlier workers in this institution, as well as with descriptions and figures given by various authors. As a result of this I conclude that the two species are identical. It may be noted that Levinsen (*loc. cit.*) in his great work on the cheilostomatous bryozoa pointed out that there appeared to be a number of different forms confused under the name *Arachnopusia monoceros*, but I arrive at the conclusion that the forms which appear to differ so greatly from *A. monoceros* are only growth stages of that species.

Maplestone's type is a "dead" specimen, being worn and partially encrusted with dry ooze and sand, but the characters are nevertheless fairly clear and distinct. In Maplestone's description of *H. perforata* he states "The pores on the surface of the zooecia are not always open; many are closed with a calcareous layer which in some bears a small perforation." Having examined his type specimen, I conclude that the so-called calcareous layers are merely dried ooze and fine sandy material encrusted around the inner edge of the lacunæ (pores). The small perforation in the so-called calcareous layer is evidently the central portion or middle of the lacunæ which is not encrusted with the dried ooze, for the centre is always first to fall away naturally from such structures as these when the whole is dry.

The lacunæ in the type specimen are not semilunar, but somewhat irregular in shape, and the majority do not appear to possess the internal denticule. Such lacunæ are figured by Busk in the British Museum catalogue for his *L. monoceros*. My experience of the lacunæ in this species is that they vary, some being semilunar with the internal denticule, while others are round or irregular in outline, both forms occurring in the one colony.

Maplestone states that the "thyrostomes are very irregular in shape owing to the presence sometimes of more than one mucro." His type specimen shows only one mucro on the proximal border of the aperture, never two. Apparently he did not realise that each mucro was surmounted by an avicularium (which is the case on the type specimen) and that it was the concavity made for the reception of this avicularium that created the two points at the apex of the mucro. It must have been the bifid extremity of the mucro caused by the avicularian cavity that caused Maplestone to believe that there were sometimes more than one mucro present. This is the only explanation I can offer to account for his remark. He further states that some zoecia possess only one mucro. In such examples as can be found on the type, the mucro is worn down, almost obliterating all traces of the avicularium. It must have been these that he took for single mucros.

The "lateral processes" at the basal end of the avicularian cavities described by Maplestone are really only the remains of the central cross-bar which reaches from one side of the avicularian cavity to the other. I have found one complete cross-bar in an avicularian cavity on the type specimen of *Hiantopora perforata*.

A SYNOPSIS OF THE RECENT AUSTRALIAN SPECIES OF *Arachnopusia*.

Arachnopusia monoceros Busk.—Opercular valve on one side within the peristome. Mucro situated on the proximal lip of the peristome but barely discernable in young specimens. Three small spines, sometimes furcate, situated above the aperture. Zoecia not distinctly separated.

Arachnopusia acanthoceros MacGillivray.—Mucro absent. Lower lip straight. Opercular valve usually large and branched or prickly, and situated immediately below the lower lip to one side of the median line. Zoecia not distinctly separated.

Arachnopusia ajax sp. nov.—Mucro absent. Lower lip straight. Opercular valve destitute of prickles or branches, situated immediately outside the aperture, and upon the lower lip to one side of the medial line. Zoecia distinctly separated by broad raised margins, along which are scattered numerous avicularia.

ON THE GENERA AND SPECIES OF THE CONESCHARELLINIDÆ.

Literature dealing with the recent species and genera of this family, and particularly of *Conescharellina*, is in such a state as to make definite specific determinations exceedingly difficult. The admirable work of Levinsen on the family is unfortunately incomplete as he deals with only one or two species of each genus. Whitelegge recognised the affinity of various species allocated to other genera and associated them under the name *Bipora*. In 1921, Waters published a report upon the relationships of the *Selenaridæ* and the *Conescharellinidæ* in which much is added to our meagre knowledge of these families. Much work remains to be done on the species before a more substantial classification can be proposed. With this end in view I aim to deal here for the most part with a consideration of the status of some Australian species, particularly those named by Maplestone, which, since their description, have remained in total obscurity. Having compared the collection of representatives of the family in the Australian Museum with published works by various authors on the subject, I am able to submit the following notes as a contribution towards our knowledge of the species, and particularly of the genus *Conescharellina*.

Types of Bryozoa described by Haswell.—The only Bryozoa material from Holborn Island, Queensland, now in the Australian Museum, is that on which Haswell⁸ based the major portion of his report. It was collected by him while he was the guest of Dr. Coppinger on board the H.M.S. "Alert."

Mr. Whitelegge informs me that Prof. Haswell did not label his types, or any other specimens with any information other than the locality. Small fragments of the species described were placed by Haswell in small glass phials and were later mounted on slides by Whitelegge, who identified them by means of Haswell's report on the Holborn Island and Port Denison material. These must be accepted as the types of Haswell's species.

Levinsen's definitions of the genera in this family have been adopted.

Bretnall⁹ stated that a new species of *Bipora* was secured in a collection made off Norah Head, New South Wales, and added that the description was being dealt with elsewhere. This description was not published, however, and the form he thought to be new proves to be *Parmularia obliqua* MacGillivray.

*Genus CONESCHARELLINA D'Orbigny.*CONESCHARELLINA ANGULOPORA *Tenison-Woods.*

Lunulites angulopora Ten.-Woods, Trans. Roy. Soc. S. Austr., iii, 1879-80, p. 7, pl. i, figs. 3a-c.

⁸ Haswell—Proc. Linn. Soc. N.S.W., v, 1, August, 1880, p. 33.

⁹ Bretnall—Rec. Austr. Mus., xiii, 5, 1922, p. 189.

Lunulites incisa Hincks, Ann. Mag. Nat. Hist., (5), viii, 1881, p. 127, pl. vi, figs. 1-3.

Conescharellina conica Haswell, Proc. Linn. Soc. N.S.W., v. i, 1880, p. 42, pl. iii, figs. 7-8.

Bipora magniarmata Maplestone, Rec. Austr. Mus., vii, 4, 1909, p. 269, pl. lxxv, figs. 3a-b.

Bipora biarmata Maplestone, Rec. Austr. Mus., vii, 4, 1909, p. 268, pl. lxxv, figs. 1a-b.

Conescharellina conica Waters, Journ. Linn. Soc., xxxiv, 1921, p. 423.

The fact that the descriptions of the first three names quoted above were published almost at the same time has led to considerable confusion regarding the identity of the above species. Further, some of the names were founded on characters which, though seemingly distinct and constant, are nevertheless variable and inconstant. This variation confused Maplestone when he described two new forms of *Bipora* obtained by the H.M.C.S. "Miner" during her activities off Port Jackson, New South Wales. These two forms I include in the synonymy of *C. angulopora*.

The following notes are based upon an examination of a large series of specimens in the collection of the Australian Museum.

Variation.—Waters¹⁰ referred to an important avicularian character and stated that "on the cross-bar, besides the central ligula, there is a smaller one on each side." In a series of specimens I find that these smaller ligulæ are sometimes present and sometimes absent on avicularia of single colonies. The central ligula, though, is constant. The presence or absence of these smaller ligulæ, therefore, should not be considered as a character of any specific value. The shape of the avicularia is also subject to slight variation. The mandibles and the mandibular chambers may be obtusely pointed or slightly rounded at the extremity. Their position on the colony is evidently constant, they being arranged in distinct lines or series between the zooecia, but they may point in various directions. This fact is also noted by Hincks in his description of *L. incisa*. The general shape of the colony is by no means constant, but the conical formation is always present. It may be acutely conical in young specimens (as in the types of *Bipora biarmata* Maplestone) and more broadly conical in the older forms. A specimen from off Norah Head, New South Wales, measures 6 mm. across the base, and 5 mm. from the base to the apex. Another from Holborn Island, Queensland, a cotype of Haswell's *C. conica*, measures 2.2 mm. across the base and 4 mm. from the base to the apex. These figures clearly show the colonies to vary to a considerable extent as regards the possession of a constant proportionate size. The undersurfaces of Haswell's cotypes of *C. conica* from Holborn Island, Queensland, are very variable, and could not be used as a constant specific character, as proved below in the notes on synonymy. The variation is, I believe, due to wear.

¹⁰ Waters—Ann. Mag. Nat. Hist., (5), xx, 1887, p. 199, pl. vi, fig. 26.

Synonymy.—Although Canu and Bassler¹¹ separate *C. angulopora* and *C. incisa*, and Waters¹² separates the former from *C. conica*, I am unable to find any seemingly reliable and constant characters to distinguish them. I therefore follow Whitelegge¹³ in regarding the three as synonymous. Waters¹⁴ was not sure of the status of *C. incisa* and "*Lunulites*" *angulopora*, for he expresses doubt by stating that these two forms may be identical, but in 1921 (*loc. cit.*) he unites them. In separating *C. angulopora* and *C. conica* in the last-mentioned paper he lays stress upon the character of the under surface of the colony to distinguish between the two. For *C. angulopora* Waters records that "the basal wall of the cancelli has a large central perforation with smaller ones around it." I have found this character, however, in some of Haswell's cotypes of *C. conica*, as well as the avicularian cross-bar in each of the central perforations in the basal walls of the cancelli.

In separating the two last-named species Waters has split the synonymy as given by Jelly¹⁵ but makes no reference to this fact. Jelly included *C. conica* in the synonymy of *C. incisa* and separated the two from "*Lunulites*" *angulopora*. She saw fit to note under "*L.*" *angulopora*, however, that Whitelegge unites the three.

An examination of the type of *Bipora biarmata* Maplestone, which is housed in the Australian Museum, led me to regard it at first as a valid species. It is very small and possesses acute and roundly pointed avicularia arranged in rows or series between the zooecia, each in turn pointing opposite ways and in a horizontal direction. This character is not constant in other specimens, however, and although the types may appear somewhat different at a glance, when its other characters are compared with those of *C. angulopora*, the similarity of the two is apparent. As there are no definite and constant specific characters that may be used to differentiate these species, I must unite them by placing *B. biarmata* in the synonymy of *C. angulopora*.

Bipora magniarmata was described by Maplestone along with *B. biarmata* from the collection secured by the "Miner." Maplestone used the size and number of avicularia, together with the shape and apical angle of the zoarium, to differentiate the species. It has already been pointed out that these characters are unreliable, and, as the remaining characters of *B. magniarmata* are identical with those of *C. angulopora*, one must regard it as a synonym of this latter species. An examination of the type slide of *B. magniarmata*, which is in the Australian Museum, proves Maplestone's figure and description to be a little inaccurate. The figure alone would not lead one to suppose it had been drawn from a specimen identical with *C. angulopora*, but the type is certainly this species, and the figure given by Maplestone is at fault. The ligulate operculum, as Maplestone calls it, is similar to

¹¹ Canu and Bassler—U.S. Nat. Mus., Bull. 106, 1920, p. 630.

¹² Waters—Journ. Linn. Soc., xxxiv, 1921, pp. 422-3.

¹³ Whitelegge—Proc. Linn. Soc. N.S.W., (2), ii, June, 1887, pp. 343-4.

¹⁴ Waters—Ann. Mag. Nat. Hist., (5), xx, 1887, p. 199.

¹⁵ Jelly—Syn. Cat. Rec. Mar. Bryozoa, 1889, pp. 64 and 140.

that described by Levinsen¹⁶ for *C. angulopora*. The avicularia are no doubt drawn from a fresh colony (one of which is on the type slide) as it does not illustrate the cross-bar and the attached ligulæ, which would be seen on a worn or incinerated example. On the type slide there is such a worn specimen, mounted no doubt by Maplestone himself, yet no figure is drawn from it, and no mention made of the characters exhibited by it in his description. This worn specimen clearly shows the main characters of *C. angulopora*. Further, Maplestone states that there is "no indication of a sinus in the lower lip, probably hidden by the operculum." Each aperture on a colony on the type slide clearly reveals a sinus in the lower lip when the operculum is removed.

Genus BIPORA Whitelegge.

Bipora Whitelegge, Proc. Linn. Soc. N.S.W., (2), ii, 1887, p. 340.
Levinsen, Morph. Sys. Stud. Cheil. Bryozoa, 1909, p. 311.

Zeuglopora Maplestone, Rec. Austr. Mus., vii, 4, 1909, p. 272.

Synonymy.—As noted in the following pages I am unable to find characters to distinguish the genotype of *Zeuglopora (lanceolata)* Maplestone from *Bipora* as defined by Levinsen.

Genotype.—In consideration of Levinsen's revision of Whitelegge's definition of the genus *Bipora* in 1909, Canu and Bassler (*loc. cit.*) have cited *Bipora umbonata* (Haswell) as the genotype.

BIPORA LANCEOLATA Maplestone.

Zeuglopora lanceolata Maplestone, Rec. Austr. Mus., vii, 4, 1909, p. 272, pl. lxxviii, fig. 11.

Although Maplestone created a new genus for the reception of this species, I think it is properly referable to *Bipora* Whitelegge. I have examined Maplestone's type and cotype, which are in the Australian Museum, and find that they agree in every detail with Levinsen's amended definition of *Bipora*.

The lunœcia, which evidently escaped Maplestone's notice, are situated at one end and on the side of the cotype colony. The type colony is a permanent mount, and I cannot examine the edges for lunœcia as well. None occur on the flat surfaces of the cotype, nor on the one flat visible surface on the type colony. This species is closely allied to *Bipora umbonata*. Every character pertaining to the aperture, the zoecial structure (except the crenulated edges), the mamilliform nodules, and the avicularia are apparently identical in the two. The only differences are in the possession of crenulated edges on the zoarium, and in the aperture's being provided with "a raised semi-elliptical ridge on the proximal margin, and extending about half-way up the sides," as described by Maplestone. I am not inclined to place

¹⁶ Levinsen—Morph. Sys. Stud. Cheil. Bryozoa, 1909, p. 311.

too much reliance upon the former character, as the zoaria of these flat forms seem to vary so much, and exactly what specific value the "crenulated edges" of the zoarium have, I am not in a position to say. The one distinctive feature, as noted by Maplestone, is the possession of a calcareous plate on each side of the aperture, which together form the greater part of the peristome, and upon which Maplestone bases the new genus *Zeuglopora*. The peristome may be compared with that of *Conescharellina angulopora* T.-Wds., which it much resembles.

It is noteworthy that Maplestone sorted out from the "Miner" Expedition material two specimens as *Bipora* "*mamillata*" and "*Zeuglopora*" *lanceolata*, though he did not recognise their similarity.

As Maplestone overlooked many characters in this species, I think it advisable to redescribe it from the single specimen I can handle, the cotype, using Maplestone's phraseology. The description must be incomplete, however, as I have only the one specimen, and none to make sections from to ascertain the internal characters. When these latter are worked out, perhaps other features will be found distinguishing *B. lanceolata* more fully from *B. umbonata*.

Description.—The zoarium is flat and two-layered, lanceolate, with crenulated edges. The zooecia are immersed and undefined. The frontal zooecia walls possess numerous scattered mamillations, between which are situated small round or roundly oval avicularia. Each avicularium possesses a small thin cross-bar without ligulæ. Lunoecia occur sparingly on the edges of the colony. The true aperture is rounded distally and provided with a well-defined sinus proximally. The sinus, like that of *B. umbonata*, is difficult to see from the front, as it is hidden to some extent by the peristome. Situated immediately outside the distal border of the aperture is a well-defined pore as in *B. umbonata*. The peristome is formed by two large calcareous plates, which are situated one on each side of the aperture and continue round the aperture only as a small raised margin on the distal and proximal borders. The peristome at the sides (the calcareous plates) is produced into a sharp point. The crenulated edges of the zoarium, as Maplestone says, is seen to be due to the projection of the lateral zooecia.

Genus BIPORA *Whitelegge*.

BIPORA UMBONATA *Haswell*.

Eschara umbonata Haswell, Proc. Linn. Soc. N.S.W., v, 1, 1880, p. 41, pl. 2, figs. 5-6.

Bipora umbonata Whitelegge, Proc. Linn. Soc. N.S.W. (2), ii, 1887, p. 345.

Bipora mamillata Maplestone, Rec. Austr. Mus. vii, 4, 1909, p. 270, pl. lxxvii, fig. 7.

Bipora umbonata Canu and Bassler, U.S. Nat. Mus. Bull. 106, 1920, p. 631, text fig. 193.

Conescharellina mamillata Bretnall, Rec. Austr. Mus., xiii, 5, 1922, p. 191.

When describing *B. mamillata*, Maplestone concluded by admitting that it is "very near *B. (Eschara) umbonata* Haswell." The types of Maplestone's *B. mamillata*, and a series of cotypes¹⁷ of *B. umbonata* Haswell from Holborn Island, Queensland, are in the Australian Museum, and, having critically compared them, I am convinced that they are referable to the one species. Both species have similarly shaped apertures, except for slight variations such as are exhibited in those of individual colonies, and exhibit no characters to distinguish the two species satisfactorily. Maplestone's type clearly shows the anterior pore situated immediately above the distal border of the aperture as well as a sinus in the proximal border. Whitelegge states that this sinus is very hard to see in *B. umbonata*, as it is hidden, together with the true aperture by the peristome. This is correct, but, after careful manipulation of the specimen on its edges under the microscope, I have been able to distinguish the sinus perfectly.

Attention is here drawn to an error made by Bretnall (*loc. cit.*) in placing the species *Bipora mamillata* Maplestone, now *B. umbonata*, in the genus *Conescharellina*. According to Levinsen's definition of *Conescharellina* its representatives must be conical in the shape of the zoarium, whereas Maplestone's type is a true *Bipora* as it is distinctly flat, not conical. The species cannot therefore be left in the genus *Conescharellina*.

On only one specimen of a large series at my disposal have I been able to trace lunocelia. This is the largest example that I have seen, and the lunocelia appear to be situated mostly near the edges of the colony. Whitelegge stated that he was unable to trace them. Canu and Bassler also place this species in the genus *Bipora* and designate it as the genotype.

Bipora umbonata has been recorded by different authors from the following localities:—Holborn Island, Queensland, 20 fathoms (Haswell, type locality); 80 fathoms, 22 miles east of Port Jackson, New South Wales, dredged by the H.M.C.S. "Miner" (Maplestone, type locality of *B. mamillata*).

Other specimens of the species in the Australian Museum are from:—Albany Passage, north-east Australia, 5-15 fathoms, collected by Messrs. C. Hedley and A. R. McCulloch; Albany Island, 4-14 fathoms, north-east Australia, collected by Messrs. C. Hedley and A. R. McCulloch; Port Denison, Queensland, "Thetis" Expedition, Station 13, 5½-7½ miles off Cape Three Points, New South Wales, 41-50 fathoms, sticky mud and shell; 3-4 miles off Edden, New South Wales, 25-30 fathoms, collected by Messrs. H. O. Fletcher and A. A. Livingstone, 1922.

¹⁷ See note on Haswell's types and cotypes on p. 205.

BIPORA FLABELLARIS *Levinsen*.

Bipora flabellaris Levinsen, Morph. Sys. Stud. Cheil. Bryozoa, 1909, p. 312.

Conescharellina flabellaris Waters, Journ. Linn. Soc., xxxiv, 1921, p. 421 (and synonymy).

In Levinsen's revision of the genera of the *Conescharellinidæ* he proposes the above name for a species allied to *Flabellipora elegans*, from Port Jackson, New South Wales, but differing from it by the possession of lunoezia. He further suggests that this new form should be placed in the genus *Bipora*. All the specimens of this species in the collection of the Australian Museum bear these lunoezia.

Synopsis of the Species of the Genus Bipora.

Bipora umbonata (Haswell).—Zoarium leaf-shaped or trilobed, with two layers of zooecia. Distinguished by the mamilliform appearance of the frontal zooecial walls.

Bipora lanceolata (Maplestone).—Zoarium lanceolate with crenulated edges; two-layered and flat. Frontal zooecial walls mamilliform in appearance. General zooecial characters as for *B. umbonata*, but distinguished by the presence of two calcareous plates at the sides of the aperture, which together form the greater part of the peristome.

Bipora flabellaris (Levinsen).—Zoarium flat and fan-shaped, with two layers of zooecia. Lunoezia and avicularia present. This species can be distinguished from the two above by the absence of the mamilliform nodules on the frontal zooecial walls.

Synopsis of the Species of the Genus Flabellipora.

Flabellipora elegans D'Orbigny.—General characters as for *B. flabellaris* but distinguished by the absence of lunoezia.

Note.—The classification of this species is, to my mind, extremely unsatisfactory.

Synopsis of the Species of the Genus Conescharellina.

Conescharellina philippinensis (Busk). — Zoarium depressed, conical. Zooecial aperture elongate, deeply sunk, and with a wide sinus in the lower border. Peristomial orifice ovate, margin faintly produced. A circular pore situated immediately proximal to the aperture. Lunoezia present. Ooecia external, globose. Circular avicularia.

C. cancellata (Busk).—Zoarium conical, internally cancellated. Aperture almost circular and with a wide sinus below. A raised peristome and a pore immediately outside its distal border. Sub-circular, or nearly circular avicularia. Ooecia external.

C. crassa (Ten.-Woods).—Similar to *C. depressa* but differing in having the aperture pyriform, peristome raised, with irregularly disposed pores outside it. Pore above aperture exceedingly large.

C. depressa (Haswell).—Zoarium depressed, conical, or biconvex. Aperture ovate, rounded above and with a wide sinus below. Sometimes a minute denticle on each side of the sinus. Peristome produced triangularly at the sides, and suddenly depressed at the distal and proximal ends of the aperture. A small pore immediately outside the distal border of the peristome. Lunoecia occur sparingly. Triangularly rounded avicularia.

C. angulopora (Ten.-Woods). Zoarium top-shaped. Aperture elongate and oval. A small pore is present above the aperture. Two triangular hinge-teeth in the proximal margin forming a sinus. Peristome formed by two thick calcareous plates projecting sideways and outwards prominently. Round and triangular avicularia. Lunoecia occur sparingly.

C. multiarmata (Maplestone).—Zoarium acutely conical. Aperture irregularly elliptical with a sinus in the proximal margin. Peristome unequally thickened and sometimes surmounted by an avicularium. Exceedingly minute oval avicularia on the surface of the colony in the vicinity of the apertures.

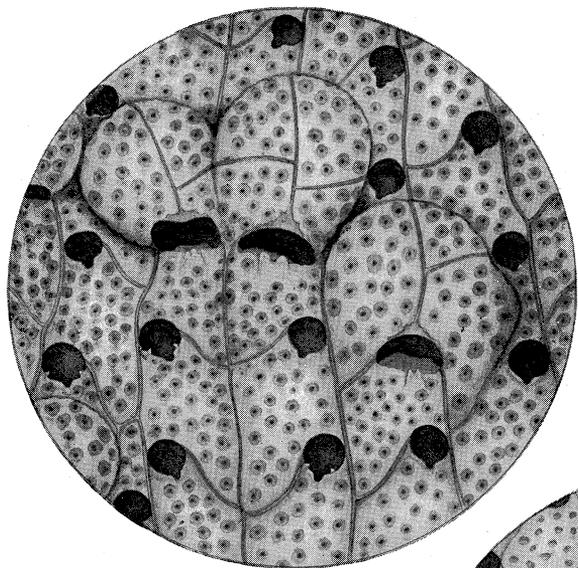
C. ampulla (Maplestone).—Zoarium roundly conical. Zooecia flask-shaped, with long tubular peristomes. Circular avicularia. Juvenile specimens star-shaped.

C. eburnea (Maplestone).—General characters as for *C. cancellata* but differing in that the avicularia are extremely minute, few in number, arranged in pairs above each aperture.

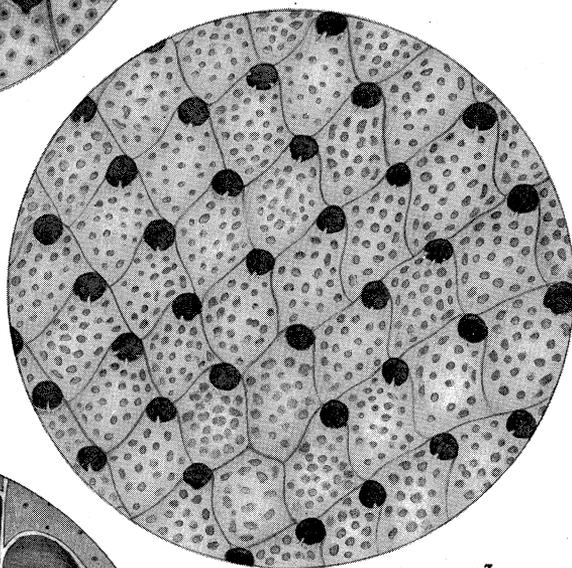
EXPLANATION OF PLATE XXIII.

- Fig. 1. *Parmularia obliqua* MacGillivray. Ooecial detail of an incinerated portion of a colony taken from 3 to 4 miles off Eden, New South Wales, 25 to 30 fathoms.
- „ 2. *Parmularia obliqua* MacGillivray. Section showing the common basal wall and communication pores, together with the basal walls of two ooecia. From a colony taken at the same locality as above.
- „ 3. *Parmularia integer* Livingstone. The zooecial detail of the holotype.
-

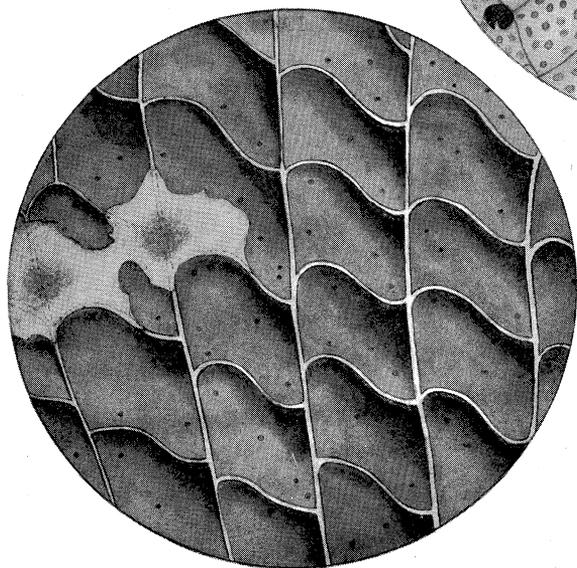
N.B.—Figures other than photographs have been prepared with the aid of a camera lucida, and, as the same magnification was used throughout, the comparative size of zooecia of the different species will readily be seen.



1



3

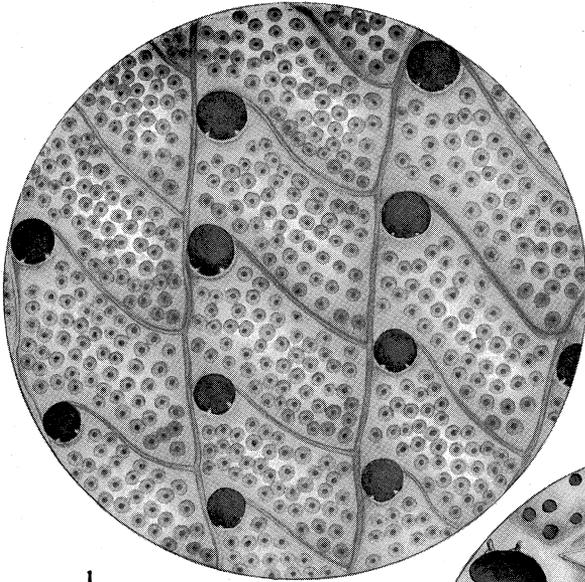


2

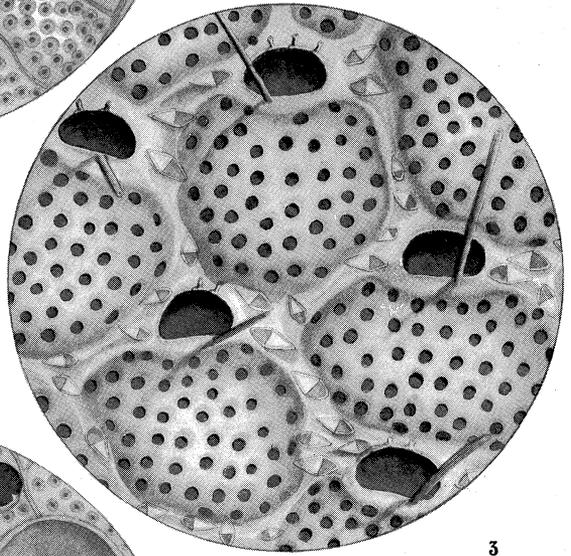
G. P. WHITLEY, del.

EXPLANATION OF PLATE XXIV.

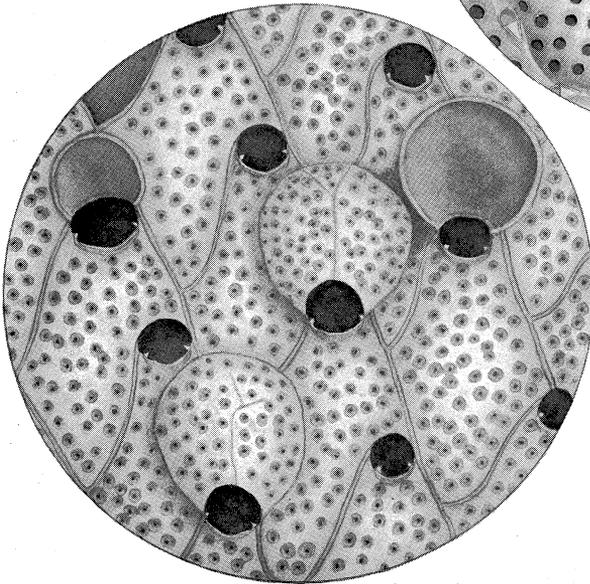
- Fig. 1. *Parmularia macneilli* Livingstone. The zooeccial detail of the holotype.
- „ 2. *Parmularia macneilli* Livingstone. The ooeccial detail of the holotype.
- „ 3. *Arachnopusia ajax* Livingstone. The zooeccial detail of the holotype.



1



3



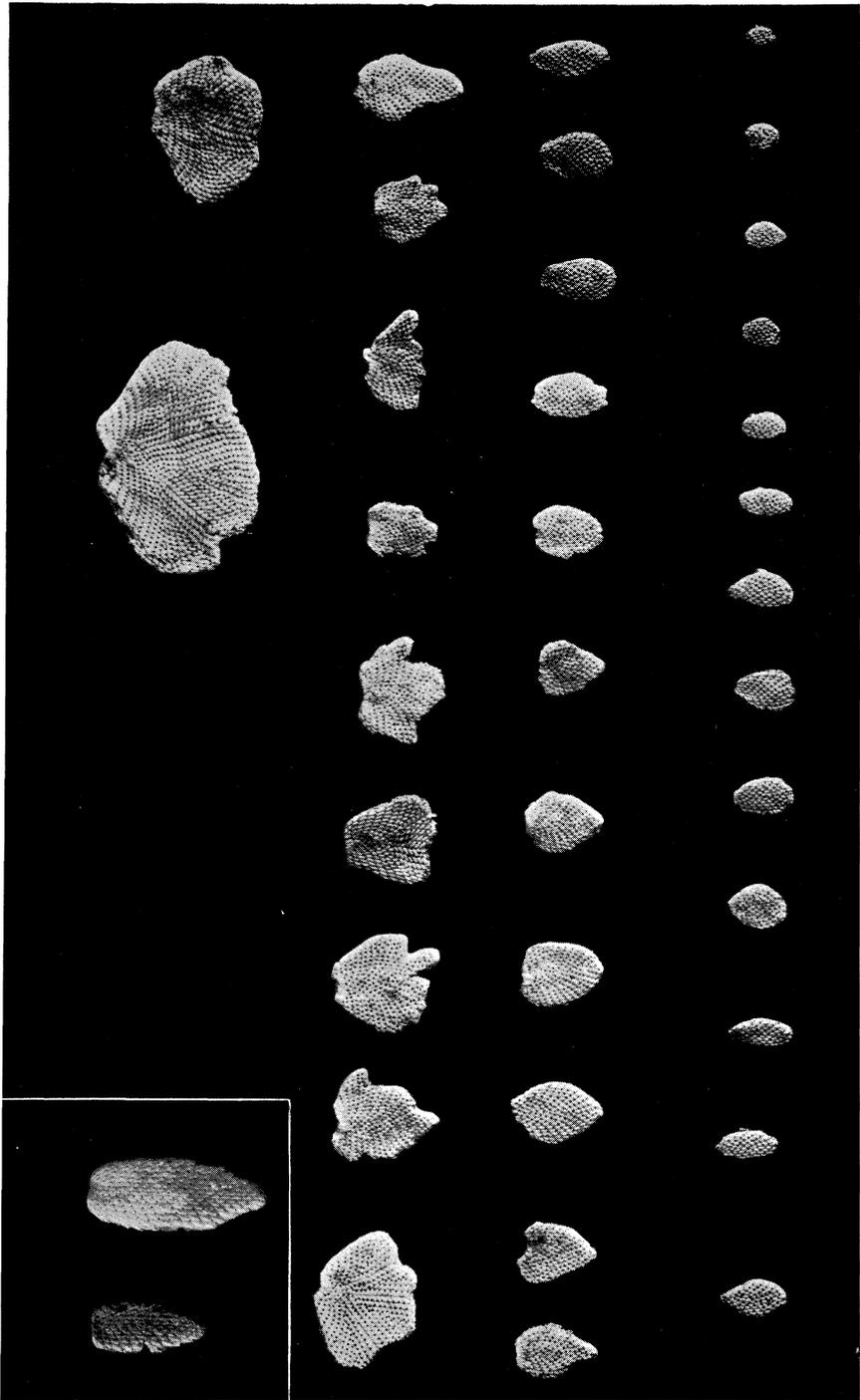
2

G. P. WHITLEY, del.

EXPLANATION OF PLATE XXV.

Parmularia obliqua. A series of complete colonies from Oyster Bay, Tasmania, 40 fathoms, illustrating the variation in size and growth, together with the development of the arched series of zooecia. The smallest specimen is 2.5 mm. long and 1.5 mm. wide, while the largest measures 19 mm. in length and 13 mm. in width. The fifth colony in the series is about the same size and shape as Maplestone's type of *S. flabellata*.

Inset.—*Parmularia macneilli* Livingstone. Showing the shape of the holotype colony together with a smaller paratype.



G. C. CLUTTON, photo.

EXPLANATION OF PLATE XXVI.

Parmularia obliqua. A series of six large colonies from 3 to 4 miles off Eden, New South Wales, 25 to 30 fathoms, illustrating the fan or kidney shape of the typical adult form. These range in size from 15 mm. by 10 mm. to 28 mm. by 15 mm.



G. C. CLUTTON, photo.