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STUDIES ON AUSTRALIAN BRYOZOA.*

No. 3.

By

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(Plates v-viii, figure, and map)

Report upon the Bryozoa collected on the Great Barrier Reef, Queensland, in 1925, by W. E. J. Paradice, Lieutenant Surgeon on H.M.A.S. "Geranium."

Introduction.

The collection forming the basis of this report was secured on the Great Barrier Reef, Queensland, by Lieutenant Surgeon W. E. J. Paradice, R.A.N., during the survey operations of H.M.A.S. "Geranium." The material is mostly from deep water off various islands, shoals, and reefs mentioned herein. Dredges and rope tangles were used with advantage in certain places, but owing to the coral obstructions much valuable material was undoubtedly missed.

In all twenty-eight species and varieties were taken and this number compares favourably with that secured by previous expeditions to the Great Barrier Reef and north Australia.

Our knowledge of the bryozoa inhabitating the waters of the Torrid Zone is not so far advanced as it is of those forms inhabiting other parts of the globe. This is more apparent when we compare the work done upon the Victorian and New South Wales bryozoa with that on Queensland, Northern Territory, and north west Australian forms. Comparatively speaking our knowledge of tropical species has been compiled only of recent years, earlier papers being few and scattered. Waters[1] has given a helpful list of papers "specially dealing with the tropical forms," and to the number of works on this list the following papers on tropical and subtropical species may well be added, besides numerous papers by Okada and Yanagi in "Annotationes Zoologicae Japonensis" for recent years.—

Waters, A. W., Tubucellaria: its Species and Ovicells. *Journ. Linn. Soc., Zool.*, xxx, 1907, p. 126.

Maplestone, C. M., Polyzoa from the Gilbert Islands. *Proc. Roy. Soc. Vict* (n.s.), xxi, pt. ii, 1908 (1909), p. 410.

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*For No. 1, see "Records," vol. xiv, No. 3, p. 189.

[1]Waters—Journ. Linn. Soc., Zool., xxxi, 1909, pp. 124-5.

Calvet, L., Bryozoa from The Malay Archipelago. *Rev. Suisse Zool.*, xiv, 1909, p. 617.

Waters, A. W., Reports on the Marine Biology of the Sudanese Red Sea, xv., The Bryozoa, pt, ii, Cyclostomata, Ctenostomata, and Endoprocta. *Journ. Linn. Soc., Zool.*, xxxi, 1910, p. 231.

Thornely, Miss L. R., The Marine Polyzoa of the Indian Ocean, from H.M.S. " Sealark." *Trans. Linn. Soc.*, (2), xv, 1912-13, p. 137.

Waters, A. W., The Marine Fauna of British East Africa and Zanzibar (Cheilostomata). *Proc. Zool. Soc.*, 1913, pt. iii, p. 458.

Thornely, Miss L. R., Polyzoa of Okhamandal in *Hornell—Report to the Government of Baroda on the Marine Zoology of Okhamandal in Kattiawar*, pt. ii, 1916, p. 157.

Waters, A. W., Some Collections of the Littoral Marine Fauna of the Cape Verde Islands. *Journ, Linn. Soc., Zool.*, xxxiv, 1918, p. 1. (further references on p. 2).

Marcus, E., The Natural History of Juan Fernandez and Easter Island, iii, Upsala, 1920, p. 93.

Robertson, Miss A., Bryozoa from the Bay of Bengal and other eastern Seas. *Rec. Ind. Museum*, xxii, 1, 1921, p. 33.

Marcus, E., Indo-pacifische Bryozoen aus dem Riksmuseum in Stockholm. *Arkiv for Zool., Stockholm*, xiv, 7, 1921, p. 1.

Marcus, E.,[2] Sudafricanische Bryozoen aus dem Sammlung des Gothenburger Museums, nebst 1, westafricanische species. Gotheborg, 1922 (*fide* O'Donoghue, 1924).

O'Donoghue, Chas. H., Bryozoa Collected by the S.S. " Pickle." *Union of S. Africa Fisheries and Marine Biol. Survey, Rept. No.* 3, 1922 (1924).

Marcus, E.,[2] Bryozoa from Aru Islands. *Abh. Senck. Ges. Frankfurt A.M.*, xxxv., 1923, p. 421 (*fide* Zool. Record, 1923).

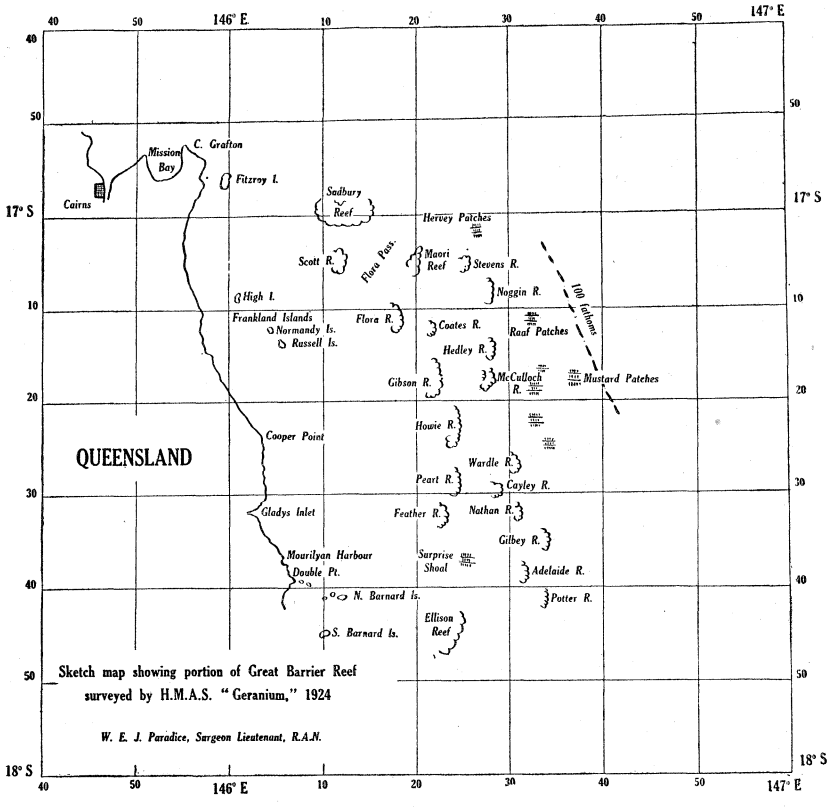
Harmer, S. F., On Cellularine and other Polyzoa. *Journ. Linn. Soc., Zool.*, xxxv, 1923, p. 293.

Many remarkable facts were discovered or confirmed during the examination of the specimens, particularly those relating to the distribution and modification in characters of various species. In reference to distribution the report will show that many Indian and South African species also inhabit the waters of the Great Barrier Reef, a fact that points to a conclusion that the tropical forms represent a more or less comprehensive group.

In many tropicopolitan species the avicularia attain great dimensions ; indeed they are much larger and more formidable than those found on

[2]These papers are not available to me.

species inhabiting the temperate waters of the Australian Continent. One particular type of avicularium has caused much surprise not only to myself but to Mr. Thos. Whitelegge and Rev. Dr. Thos. Porter, both of whom have studied Australian bryozoa for many years. These two



gentlemen agree with me that an avicularium is formed from a modified operculum on certain zooecia of a specimen of *Lepralia* (*Schizoporella*) *quadlingi* (Haswell). I have relegated this species to the genus *Parmularia* and a full account of it is written in the report under the name *Parmularia quadlingi* (Haswell).

Several forms in the collection agree with described species save for characters mainly pertaining to the avicularia. I have, in such cases, created new varieties which can easily be separated from the typical forms, but one specimen (*Lepralia tuberculata* Phillips, *var. avicularis var. nov.*) may be later elevated to specific rank.

In addition to the material secured by Dr. Paradice in the localities shown on the chart, I have, for the sake of convenience, added at the end of the paper another species to the list, *Petralia chuakensis* Waters, from New Guinea.

Before concluding the introductory notes I must express my gratitude to Dr. Paradice for the trouble he has taken in preparing a chart of the area over which he collected, and for the setting out thereon the relative positions of the reefs and shoals together with their combined relationship to the mainland.

The entire collection has been presented to the Trustees of the Australian Museum.

A list of the species is as follows.—
(?*Membranipora*) *armata* (Haswell).
Selenaria punctata Tenison-Woods.
Steganoporella magnilabris (Busk).
Schizoporella incrassata Hincks.
Schizoporella viridis Thornely *var. thornelyi var. nov.*
Schizoporella unicornis (Johnston).
Schizoporella nivea Busk.
Parmularia quadlingi (Haswell).
Haswellia australiensis (Haswell).
Tubucellaria cereoides var. chuakensis Waters.
Smittina rostriformis (Kirkpatrick).
Smittina trispinosa (Johnston).
Smittina nitida (Verrill).
(?*Phylactella*) *paradicei sp. nov.*
Porella areolata (Kirkpatrick).
Porella fissurata (Ortmann).
(?*Lepralia*) *porcellana* Busk *var. normani var. nov.*
Lepralia tuberculata Phillips *var. avicularis var. nov.*
Lepralia feegeensis Busk.
Lepralia lateralis MacGillivray.
Petralia vultur Hincks.
Petralia vultur Hincks *var. serrata var. nov.*
Petralia vultur Hincks *var. bennetti var. nov.*
Escharoides sauroglossa Levinsen.
Holoporella pigmentaria Waters.
Holoporella aperta (Hincks).
Bipora umbonata (Haswell).
Microporella malusii (Audouin).
Retepora monilifera form umbonata MacGillivray.

ADDITIONAL.

Petralia chuakensis Waters.

(?MEMBRANIPORA) ARMATA *Haswell.*

Biflustra armata Haswell, Proc. Linn. Soc. N.S. Wales, v, 1880, p. 38, pl. I, fig. 7.

?*Membranipora armata* Waters, Proc. Zool. Soc., ii, 1913, p. 486.

Locality.—A solitary specimen dredged in 8 fathoms, Ellison Reef, Great Barrier Reef, Queensland.

SELENARIA PUNCTATA *Tenison-Woods.*

Selenaria punctata Tenison-Woods, Trans. Roy. Soc. S. Australia, iii, 1879-80 (1880), p. 9, pl. ii, fig. 8a-c.

Selenaria punctata Jelly, Syn. Cat. Rec. Mar. Bryozoa, 1889, p. 245 (synonymy).

Selenaria punctata Waters. Journ. Linn. Soc., Zool., xxxiv, 1921, p. 416. (and synonymy).

This species is not uncommon off the eastern and north-eastern coasts of the Australian continent, and it is represented in the collection by a single specimen.

It has been my good fortune to have the opportunity of accompanying trawlers operating off various points of the coast of New South Wales, where I have, at times, found the species particularly abundant.

Synonymy.—The type of Haswell's *S. fenestrata*, a species which both Jelly and Waters (*loc. cit.*) place in the synonymy of *S. punctata*, is not in the Australian Museum and cannot be compared to prove the synonymy. It is apparent, however, that Waters has had the necessary specimens to confirm the synonymy first given by Miss Jelly, and it appears that he further adds *S. magnipunctata* Maplestone to the list. This procedure is, in my opinion, perfectly justifiable, for the mere sizes of zoaria are considered negligible so far as specific characters are concerned.

Locality.—Taken from coral reef in 8 fathoms, Ellison Reef, Great Barrier Reef, Queensland.

STEGANOPORELLA MAGNILABRIS (*Busk*).

Membranipora magnilabris (Busk), Brit. Mus. Cat. Mar. Polyzoa, 1854, p. 62, pl. lxv, fig. 4. (In the explanation of plate called *M. grandis*).

Steganoporella magnilabris Harmer, Quart. Journ. Micr. Sci., xliii, 2, 1900 (n.s),p. 279, pls. xii and xiii, figs. 10, 31, 44-46 (and synonymy).

Locality.—8 fathoms, Ellison Reef, Great Barrier Reef, Queensland.

SCHIZOPORELLA INCRASSATA *Hincks.*

Schizoporella incrassata Hincks, Ann. Mag. Nat. Hist. (5), ix, 1882, p. 124, pl. v, figs. 1-1a.

Schizoporella incrassata Thornely, Rept. on the Pearl Oyster Fisheries of Gulf of Manaar, pt. iv, 1905, p. 117.

Only fragmentary colonies of this species were secured in the collection. The specific characters agree well with the description and figures

given by Hincks (*loc. cit.*) and any variations exhibited by the specimens before me have been amply described by Miss Thornely (*loc. cit.*).

Locality.—28 fathoms over Surprise Shoal, Cairns-Townsville "Section,"

Great Barrier Reef, Queensland.

8 fathoms Ellison Reef, Great Barrier Reef, Queensland.

SCHIZOPORELLA VIRIDIS *Thornely* var. THORNELYI[3] *var. nov.*

(Pl. viii, figs. 8-9.)

Schizoporella viridis Thornely, Rept. of the Pearl Oyster Fisheries of the Gulf of Manaar, pt. iv, 1905, p. 116, p.l fig. 3 (type).

Schizoporella viridis Waters, Journ. Linn. Soc., Zool., xxxi, 1909, p. 147, pl. 13, figs. 1-8 (type).

Schizoporella viridis Marcus, Arkiv för Zoologi, xiv, 7, 1921, p. 17 (in separate) (type).

Specimens in the collection possess most characters of the species, but differ from the typical form in characters pertaining to the avicularia and the large lateral umbos. These latter structures are considered negligible by Waters (*loc. cit.*) as constant specific characters, but I consider the marked difference in the shape of the avicularia would warrant the creation of a new variety.

Description.—As previously remarked, the general characters are the same as for the typical species, but the variety can be distinguished by the smaller and blunter avicularium on the side of the aperture, and by the large duck-bill-shaped vicarious avicularia as opposed to the long and pointed vicarious avicularia on the typical species. This duck-bill-shaped avicularium on the variety occupies a separate avicularium cell, like the pointed avicularium on the typical species.

Affinities.—The variety approaches *S. ampla* Kirkpatrick[4] in the shape of the avicularia, but differs from that species in the shape of the apertures. Kirkpatrick emphasises the fact that the aperture of *S. ampla* is "characteristic of *Gemellipora*," whereas the aperture of the typical *S. viridis* and the var. *thornelyi* is different and cannot in any way be confused with that of *S. ampla*. Further, the walls of *S. viridis* var. *thornelyi* are rugged and distinctly pitted whereas those of *S. ampla* are described as being "smooth."

The opercula of *S. viridis* (Pl. viii, fig. 10) and the *var thornelyi* have been figured; firstly, to show what little difference exists between them,

[3]Named for Miss L.R. Thornely, the author of the species.

[4]Kirkpatrick—Ann Mag. Nat. Hist. (6), I, 1888, p. 76, pl. 7, fig. 4.

and secondly, to show the difference between the operculum of *S. viridis* as I see it, and as Waters (*loc. cit.*, 1909) sees it. This author's illustration of the operculum seems to coincide with the aperture of *S. ampla* rather than of the species it is associated with.

Locality.—8 fathoms, Ellison Reef, Great Barrier Reef, Queensland. (Figure of operculum of typical form drawn from a specimen collected at Dauco Island,Great Barrier Reef, near Port Moresby, New Guinea, by the late Allan R. McCulloch.)

Schizoporella unicornis (*Johnston*).

Lepralia unicornis Johnston, Brit. Zooph., 2nd edit., 1847, p. 320, pl. lvii, fig. 1.

Schizoporella unicornis Waters, Journ. Linn. Soc., Zool., xxxi, 1909, p. 143, pl. xii, figs. 12, 13 (and synonymy).

Locality.—Encrusting coral between 17° and 19° S. Latitude, Great Barrier Reef, Queensland.

Schizoporella nivea *Busk.*

Schizoporella nivea Busk, Challenger Rep., Zool., x, pt. xxx, 1884, p. 163, pl. xvii, fig. 1.

Schizoporella nivea Waters, Proc. Zool. Soc., ii, 1913, p. 502, pl. lxx, figs. 1-3, 7-9 ; pl. lxxiii, fig. 16 and text fig. 80.

Specimens of the species before me have assumed the hemescharan form, each having a central axis of stick-like marine growth running through the colony. The older colonies can easily be recognised by their heavy calcification, which renders them a conspicuous white or cream colour.

Localities.—On coral, from 28 fathoms, over Gibson Reef, Great Barrier Reef, Queensland; 28 fathoms over Surprise Shoal, Cairns-Townsville "Section," Great Barrier Reef, Queensland ; 8 fathoms, Ellison Reef, Great Barrier Reef, Queensland.

Parmularia quadlingi (*Haswell*).

(Pl. vi, figs. 1-2.)

Lepralia (*Schizoporella*) *quadlingi* Haswell, Proc. Linn. Soc. N.S. Wales, v, 1880, p. 39, pl. ii, fig. 2.

No further mention of this peculiar species can be traced since Haswell dredged it in 20 fathoms off Holborn Island, Queensland.

The type specimen is in the Australian Museum collection and is seen to be a fragment of an incomplete colony when compared with the material before me. I have no doubt as to the identification being correct.

The species is obviously a representative of the genus *Parmularia*, to which I have given recognition in a previous paper.[5] Its characters agree in every detail with the description given, and, in addition, it has peculiar avicularia which are entirely unknown in any of the present species of the genus.

These peculiar avicularia each represent an elongated operculum, so that the covering of the zooecial aperture in some zooecia plays the dual role of avicularium mandible and operculum. Such avicularia are not seen on Haswell's type specimen.

Description.—As in other members of the genus the zoarium is composed of two layers of zooecia and is trilobed in shape (see Pl. v, fig. 6). The zooecia are ovate, well defined, and covered by a thin transparent membrane. As in *P. obliqua*, they are arranged in arched rows which extend outwards from a median base to the lateral margins in the adult forms, but their formation is slightly variable in young examples.

The frontal zooecial walls are thick and strong, and, as in the other representatives of the genus are well calcified. The frontal zooecial walls are perforated by a number of small pores which are not unlike those seen in *P. obliqua*. The distal and proximal zooecial walls are roughly " S " shaped, and the lateral zooecial walls are, as in the other species, nearly straight.

The zooecial apertures are sunk below the level of the surrounding frontal walls, are elliptical in shape and in each of their proximal borders is a well defined sinus. Extending inwards from the proximal border of the aperture is a calcareous lip which is hollowed out to accommodate the sinus. Zooecial apertures in which the opercula have developed into avicularia, are seen to be somewhat distorted when compared with the normal apertures. They are markedly elongate, though they have, like the normal apertures, a sinus in each of their proximal borders. The aperture is divided into two chambers ; the proximal one leads to the interior of the zooecium and through it the animal communicates with the exterior. The other chamber is situated distally and is merely shallow and cup-like ; it has no visible means of communication with the interior of the colony and its only entrance, or means or communication with the exterior, is by means of the common aperture.

The ooecium is, as in *P. obliqua*, large and dome-shaped, and possesses dividing sutures or furrows which are of the same nature as those dividing the zooecia. The opening of the ooecium is covered by the operculum of the zooecial aperture. Running around the distal border of the ooecial aperture is a continuation of the lip seen in the proximal borders of some of the zooecial apertures. The ooecium is punctured in the same manner as the frontal zooecial walls and the pores are covered by a thin transparent membrane. The normal operculum is weakly chitinised and fits the aperture and the sinus perfectly. In some zooecia the operculum is elongated to form an avicularium and, like the normal operculum, is weakly

[5]Livingstone—Rec. Austr. Mus., xiv, 3, 1924, p. 189.

chitinised. It is supported by two sclerites which extend almost the whole length of the avicularium. These sclerites join in a blunt point distally, and again unite proximally to form a rounded proximal border to the whole structure (see Pl. vi, fig. 1).

Colour.—The colonies are white when dried.

Mode of attachment.—The colony is attached, apparently to the sea floor or some object thereon, by means of a long, delicate, and semi-transparent filament, which is inserted into an elongated concavity on the base of the colony. This method is adopted by all the known species of the genus.

Variation.—In young specimens the zooecia are somewhat irregularly spaced, but on the whole, they adhere to the true *Parmularia* principle of forming arched rows running from a median basal point. Their structure in general is barely altered by their immaturity save for the shape of the zoarium. Juvenile specimens are entirely destitute of avicularia and ooecia, and it would appear that these latter structures occur only on some zooecia of larger and more mature colonies.

Locality.—28 fathoms over Gibson Reef, Great Barrier Reef, Queensland.

HASWELLIA AUSTRALIENSIS (*Haswell*).

Myriozoum australiense Haswell, Proc. Linn. Soc. N.S. Wales, v, 1, 1880, p. 43, pl. iii, figs. 9-11.

Haswellia australiensis Waters, Proc. Zool. Soc., ii, 1913, p. 511 (and synonymy).

Localities.—28 fathoms over Gibson Reef; between 17° and 19° S. lat. Great Barrier Reef, Queensland.

TUBUCELLARIA CEREOIDES var. CHUAKENSIS *Waters.*

Tubucellaria cereoides var. *chuakensis* Waters, Journ. Linn. Soc., Zool., xxx, 1907, p. 130, pl. xv, figs. 10, 13, 18-19; pl. xvi, figs. 20-25. *Id.*, Proc. Zool. Soc., ii, 1913, p. 512 (and synonymy).

The variety is represented in the collection by a complete and branching tree-like colony 45 mm. high and about the same breadth.

Locality.—Feather Reef, Great Barrier Reef, Queensland.

SMITTINA ROSTRIFORMIS (*Kirkpatrick*)

Smittia rostriformis Kirkpatrick, Ann. Mag. Nat. Hist. (6), 1, 1888, p. 80, pl. viii, fig. 7. *Id.*, Ann. Mag. Nat. Hist. (6), v, 1890, p. 21.

Smittia rostriformis Thornely, Rept. Pearl Oyster Fisheries of Gulf of Manaar, pt. iv, 1905, p. 123.

The species varies to some extent from the descriptions and figures given by Kirkpatrick (*loc. cit.*) and, although the specimens in the collection possess the same shaped avicularia, they may be placed in various positions other than those figured. The avicularium shown above the aperture in the figure of the species may be anywhere around the apertures of the zooecia on a single colony. The two lateral avicularia are fairly constant in position though there may be at times only one present on one zooecium. It is situated far up towards the aperture, and in some cases alongside the aperture, and pointing in a lateral direction. The avicularian cavities are described and figured as serrate, but I have not found this character. The peristome is figured as being well developed, vertical, and deficient in front. I find that these characters apply well to the peristomes on some zooecia whilst in others a deficiency occurs distally as well as proximally.

Spines and ooecia are absent on specimens in the collection.

Locality.—28 fathoms over Surprise Shoal, Cairns-Townsville "Section," Great Barrier Reef, Queensland.

SMITTINA TRISPINOSA (*Johnston*).

Discopora trispinosa Johnston, Ed. Phil. Journ., xiii, p. 322.
Smittia trispinosa Hincks, British Mar. Poly., 1880, p. 353, pl. lxix, figs. 1-8.

Colonies of this widely distributed species were found encrusting fronds of coral. The specimens are true to type save for the peristomes, which are produced more in front than is shown in Hincks' (*loc. cit.*) figures.

Locality.—Encrusting coral from 8 fathoms, Ellison Reef, Great Barrier Reef, Queensland.

SMITTINA NITIDA (*Verrill*).

Discopora nitida Verrill, Amer. Journ. Sci., ix, 1875, p. 415, pl. 7., fig. 3.

Smittia nitida Jelly, Syn. Cat. Rec. Mar. Bryozoa, 1889, p. 249-50 (and synonymy).

Smittia nitida Waters, Journ. Linn. Soc., Zool., xxxi, 1909, p. 173, pl. xvii, figs. 19-20.

Only fragmentary specimens of this species were secured.

Locality.—28 fathoms over Surprise Shoal, Cairns-Townsville "Section"; East of Great Palm Island, 6 fathoms, Great Barrier Reef, Queensland.

(?PHYLACTELLA) PARADICEI[6] *sp. nov.*

(Pl. vii and figure 1.)

Description.—The zoarium is encrusting, and owing to the high produced peristomes appears to the unaided eye to be very prickly. The zooecia are ovate in front though somewhat irregular in shape. The frontal walls are dotted with numerous large granules, and at their edges are punctured with large conspicuous pores.

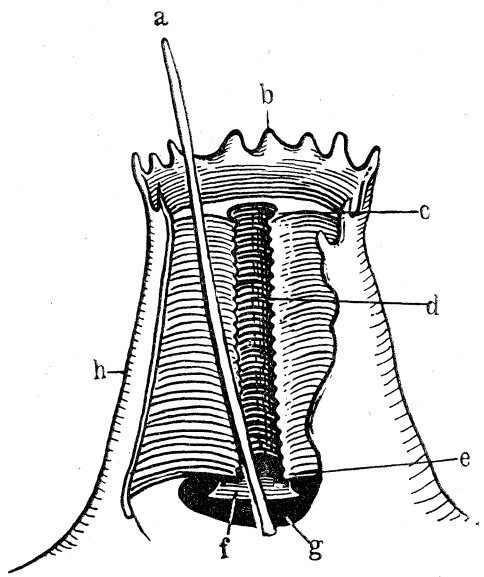


Fig. 1.

Diagrammatic view of the peristome and associated structures of (? *Phylactella*) *paradicei* sp. nov. looking through the distal peristomial deficiency from behind.

(*a*) the solitary hollow spine situated distally to the zooecial aperture and continuing upwards through, and parallel with the deficiency in the peristome.
(*b*) serrated border of the peristomial aperture.
(*c*) one end of the peristomial canal.
(*d*) peristomial canal.
(*e*) lower end of the peristomial canal which ends as a sinus in the zooecial aperture.
(*f*) denticle, occurring as a downwardly projecting continuation of the undersurface of the frontal zooecial wall; is situated directly beneath the sinus in the zooecial aperture.
(*g*) zooecial aperture.
(*h*) lateral peristomial wall.

The avicularia are of two kinds. One type appears as a duck-billed-shape or spatulate avicularium, depressed in the middle or on the edges of the frontal zooecial wall. It is very long and in some cases reaches from the base of the peristome to the proximal edge of the frontal zooecial wall. It invariably faces proximally or laterally and always opens away from the direction of the zooecial aperture. A central cross-bar

[6]Named for Surg. Lieut. W. E. J. Paradice, R.A.N., of H.M.A.S. "Geranium."

is seen in a hollow at one end but a ligula is absent. A small pore is generally present just below the hollow and its central cross-bar. The mandible of this spatulate avicularium is remarkable for its poorly chitinised nature; if allowed to dry it will shrivel up and become considerably distorted. The other type of avicularium is always seen on an eminence about half-way up on one side of the peristome. The avicularian cavity is complete and deep; the mandible is moderately chitinised and does not lose its shape and size when dried as does the duck-bill-shaped mandible described above.

The peristome is remarkable for its characters which are illustrated in the accompanying figure. A single spine arises from the distal edge of the zooecial aperture and continues upwards through and parallel with a distal deficiency in the peristome. The peristomial aperture is round and its border is roughly serrated. Within the peristome is a tooth-edged canal which runs from near the top of the peristome down the zooecial aperture where it ends as a sinus in the proximal border of the zooecial aperture. The same structure can also be explained as being a continuation of the sinus as a serrate edged canal ending near the top of the peristome. The zooecial aperture is semi-ovate distally, and hollowed proximally, with a sinus (continued as a canal into the peristome) in its proximal border. A single denticle occurs just below the sinus as a downwardly projecting continuation of the frontal zooecial wall on the inside. It is sharply pointed at the angles of the free extremity, and in some cases is about half as large as the zooecial aperture.

The ooecia which appear to be characteristic of the genus, are situated distally to the zooecial aperture, and communicate with the exterior by a small opening into the peristomial deficiency. They are not very conspicuous but can be recognised as globose structures punctured with small pores. At their junction with the frontal walls of distal zooecia there is an inconspicuous furrow. When the top of an ooecium is removed two ridges are seen on the basal wall running from the proximal to the distal end as shown in Pl. vii, fig. 1. Described and figured from an incinerated colony.

Colour.—The colony is of a dull yellow hue in its dried condition.

Affinities.—A species that may be confused with this form is *Smittia tropica* Waters[7] but the following characters may be used to differentiate the two species.

(?*Phylactella*) *paradicei* has only one solitary spine above the zooecial aperture, *Smittia tropica* has two. In the former species the frontal walls of the zooecia generally end distally in tall peristomes, while in the latter species the frontal zooecial walls end distally in rounded corners, the peristomes arising separately. Within the peristome of *S. tropica* are two internal ridges apparently not serrate, while in (?*P.*) *paradicei* these two ridges form a canal with serrate edges. No external indications of ridges or a canal are seen on the outside of the peristome of (?*P.*) *para-*

[7]Waters—Journ. Linn. Soc., Zool., xxxi, 1909, p. 174, pl. xvii, figs. 10-14.

dicei, but in *S. tropica* prominent bulges or corrugations serve as external signs of internal ridges.

Locality.—Encrusting a coral in 8 fathoms, Ellison Reef, Great Barrier Reef, Queensland.

PORELLA AREOLATA (*Kirkpatrick*).

(Pl. viii, figs. 2-4).

Lepralia occulosa var. *areolata* Kirkpatrick, Sci. Proc. Roy. Dublin Soc., vi, 10, p. 618, pl. xvi, fig. 7.

The species before me is undoubtedly the form described by Kirkpatrick as a new variety of *L. occulosa*. No mention of avicularia occurs in this author's description, though he figures one set in the proximal border of the zooecial aperture.

Description.—Zoarium bilaminate, forming encrusting masses or assuming a free-branching condition. The zooecia, which are distinctly separated by raised margins, are ovate and somewhat diamond-shaped. The zooecia are heavily calcified and covered by a thin membrane. The middle of the frontal zooecial wall is slightly elevated above the surrounding areas. In some zooecia the frontal walls are punctured with small pores, while in others areolae run from the edges of the frontal walls to the central umbonate areas.

The aperture is slightly elliptical distally but proximally is rounded off abruptly. It is sunk below the level of the surrounding frontal walls and bounded by a well developed peristome. Within the proximal border of the peristome, and a little to one side, is a small avicularium with a semi-circular mandible.

In some zooecia this avicularium attains comparatively great dimensions, and when in this condition is always found on a mucronate projection immediately below the zooecial aperture. Besides the avicularium in the peristome there is another type occurring on the frontal walls. It is of considerable size and occupies, as in *Lepralia occulosa*, a separate avicularian chamber between the zooecia. The mandibles of these avicularia are duck-bill-shaped. The operculum is well chitinised and is the same shape as the zooecial aperture.

The ooecia are inconspicuous as regards their size, but can be readily recognised by the " calcareous reticulum " as Kirkpatrick (*loc. cit.*) describes it. At first, the ooecium is like a shallow cup on the frontal wall of the zooecium situated distally to the ooecium-bearing zooecium. The sides grow until they have met distally, but proximally a fissure occurs covered by a thin membrane. This membrane is the foundation of the spider's-web-like structure that later comes to occupy the area. The frontal part of the ooecium now bears a marked resemblance to the frontal walls of *Hiantopora ferox*.

Colour.—The colony is white in a dried condition.

Variation.—The species does not vary to any great extent, and on the whole adheres to the principal characters.

Affinities.—Nothwithstanding its close proximity to *Lepralia occulosa* it appears to me to be a distinct species of the genus *Porella*. Consequently I have elevated it to a specific rank and placed it in what I consider a more appropriate resting place.

Locality.—Among coral at High Island, Great Barrier Reef, Queensland.

PORELLA FISSURATA *Ortmann.*

(Pl. viii, figs. 5-7.)

Porella fissurata Ortmann, Archiv für Naturg., lvi, i, 1890, p. 41, pl. iii, fig. 14.

It is with much hesitation that I separate the above species from *P. areolata* but in the absence of sufficient material my investigations must end here. Their structure is almost identical, yet I provisionally distinguish *Porella fissurata* from *P. areolata* on the following characters wnich may, in the future, be found useless. In *fissurata* the avicularium within the peristome is generally a little larger than that seen in *areolata*, but in this latter species large avicularia are sometimes met with. The small round avicularia on the frontal walls of *fissurata* are more numerous than on *areolata*. Both species have special avicularia which occupy separate cells or chambers. The mandibles of these avicularia are duck-bill-shaped, but the ones found on *fissurata* are smaller than those seen on *areolata*. In *fissurata* the ooecia are not areolated in front as in *areolata* and have only a narrow fissure. The figured operculum of *P. fissurata* does not appear to be so elliptical as that of *areolata*.

Locality.—28 fathoms over Surprise Shoal, Cairns - Townsville "Section," Great Barrier Reef, Queensland.

(?LEPRALIA) PORCELLANA *Busk* var. NORMANI *var. nov.*

(Pl. viii, fig. 1.)

Lepralia porcellana Busk, Quart. Journ. Micro. Sci., viii, 1860, p. 283, pl. xxxi, fig. 3 (type).

Lepralia porcellana Norman, Journ. Linn. Soc., Zool., xxx, 1909, p. 305, pl. xl, figs. 1-2 (type).

For the release of the type species from obscurity we are indebted to Canon A. M. Norman. This author has identified the species with *L. cleidostoma* Smitt, using Busk's original specimen. As a result of his

examination he has placed the latter species in the synonymy of the former. Waters, however, in his paper on the Zanzibar collections[8] does not follow Norman, and states that " as it has been impossible to recognise it [Busk's *L. porcellana*] from Busk's figures the name *cleidostoma* must stand."

The specimen before me is typical of Busk's description and Norman's figure save for the avicularia. On the present specimen these appendages are much longer and broader at the base than those figured by Norman. Indeed they are more like those figures by Miss Thornely[9] for *Gemellepora protrusa*.

On young zooecia one to three spines are seen above the zooecial aperture, but these are very delicate and no doubt this fact is responsible for their scarcity on the specimens in the collection.

Locality.—28 fathoms over Surprise Shoal, Cairns-Townsville "Section," Great Barrier Reef, Queensland.

LEPRALIA TUBERCULATA *Phillips* var. AVICULARIS *var. nov.*

(Pl. v, figs. 1-3.)

Lepralia tuberculata Phillips, Willey's Zool. Results, pt. iv, 1900, p. 446, pl. xliii, fig. 8 (type).

Description.—Zoarium encrusting. Zooecia white and shiny. The frontal zooecial walls are coarsely granular, and punctured at their lateral borders by rows of pores. Occasionally the middle of the frontal walls are punctured as well. Aperture coarctate as in the typical form. On the distal border of the aperture there are 5-7 strong well developed spines.

In the typical form there is, on each side of the zooecium, an avicularium, the mandibles of which are blunt and spatulate. The figures of the typical species show them to be either pointed or slightly duck-bill-shaped. In the new variety these avicularia are present, but they differ from those figured for the typical form in being spoon-shaped. Commencing at the fixed end of the avicularian mandible one sees that they are thin, tapering slightly towards the free extremity, where they widen out suddenly and assume a spoon shape.

In the typical form there are, I presume, " numerous large vicarious avicularia with duck-bill-shaped mandibles " on the surface of the zooecia but the author does not seem to make their whereabouts quite clear. In the present variety small avicularia occur on eminences on the zooecia, but their mandibles are roughly triangular and not duck-bill-shaped.

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[8]Waters—Proc. Zool. Soc., ii, 1913, p. 517.

[9]Thornely—Rept. on the Pearl Oyster Fisheries of Gulf of Manaar, pt. iv, 1905 p. 119.

Locality. — 28 fathoms over Surprise Shoal, Cairns - Townsville "Section," Great Barrier Reef, Queensland.

LEPRALIA FEEGEENSIS *Busk.*

Lepralia feegeensis Busk, Chall. Rep. Zool., x, 1884, pt. xxx, p. 144, pl. xxii, fig. 9.

Lepralia feegeensis Waters, Proc. Zool. Soc., ii, 1913, p. 514, pl. lxx, figs. 21-22 (and synonymy).

Lepralia feegeensis is a well known tropical species and is found in fair considerable abundance on the N. Queensland coast. Specimens in the present collection are typical of those secured elsewhere.

Synonymy.—Although Levinsen[10] erected the genus *Hippopodina* for the reception of this species I agree with Waters, for the present anyway, in dropping the proposed genus and retaining *Lepralia* as its rightful genus. Sudden changes such as Levinsen proposes may or may not be acceptable, according to the species concerned, and for this reason I hesitate to use the new name until further proof of its soundness is put forward.

Locality.—28 fathoms over Surprise Shoal, Cairns-Townsville "Section," Great Barrier Reef, Queensland.

LEPRALIA LATERALIS *MacGillivray.*

Lepralia lateralis MacGillivray, Proc. Roy. Soc. Vict., iii, (n.s.), 1891, p. 80, pl. x, fig. 3.

?*Lepralia calyciformis* Phillips, in Willey's Zool. Results, pt. iv, 1900, p. 446, pl. xliii, figs. 9-9a.

A co-type of the above species has recently been presented to the Australian Museum by the original collector, Mr. W. H. Wooster. It is only a minute fragment, yet sufficient to determine satisfactorily a specimen of the species in the Paradice collection.

The only variation is that the avicularia are more numerous and scattered at random over the surface of the zooecial walls, than in the co-type or as described by MacGillivray.

This species appears to be closely allied to, if not identical with, *L. calyciformis* Philipps (*loc. cit.*)

Locality.—28 fathoms over Surprise Shoal, Cairns-Townsville "Section," Great Barrier Reef, Queensland.

[10]Levinsen—Morph. Sys. Stud. Cheil, Bry., 1909, p. 353, pl. xxiv, figs. 3a-b.

PETRALIA VULTUR (*Hincks*).

Mucronella vultur Hincks, Ann. Mag. Nat. Hist. (5), x, 1882, p. 98, pl. viii, fig. 2.

Although there are no representatives of the typical form in the collection, two varieties can be distinguished, one of which may be identical with that secured in the collection from the Gulf of Manaar and described by Miss Thornely under the heading of the typical form. The other new form is described as a variety (*bennetti*) in the following pages.

Judging from Miss A. Robertson's remarks on this species it would appear that there are several more varieties to be described, but, owing to the unfortunate decease of this author, they will, no doubt, be left undescribed for some time.

PETRALIA VULTUR (*Hincks*) var. SERRATA *var. nov.*

(Pl. vi, figs. 7-10.)

?*Mucronella vultur* Thornely (non Hincks), Rept. Pearl Oyster Fisheries of Gulf of Manaar, pt. iv, 1905, p. 124-5.

The species described by Miss Thornely as *M. vultur* Hincks seems to be represented in the present collection by several unilaminate colonies. Many of the characteristic departures from the typical form set out by Miss Thornely are seen in the specimens before me and are of such a nature as to warrant the creation of a new variety.

Description.—General characters as for the typical form, but the variety can be recognised by its massive appearance, the short and broad zooecia, and the duck-bill-shaped mandible on the avicularium situated on the side of the mucro. The mandible of this avicularium is very broad, contracted slightly at its middle, then widens out and becomes rounded at its free extremity. The edges of the mandibles are, as Waters[11] says, serrate especially at their free extremities. Besides avicularia on the mucros, there are avicularia upon the frontal zooecial walls which are elongate, tapering slightly towards their free extremities where they widen and end as round blunt points. They are much longer than those seen on var. *armata*, Waters (*loc. cit.*) 1913, judging from the figures of this latter. Two smaller avicularia occur on each zooecium and are generally seen in the vicinity of the aperture, usually one on each side. They are, however, very minute. Spines above the aperture vary from 5-8 in number.

Locality.—28 fathoms over Surprise Shoal, Cairns-Townsville "Section"; Great Barrier Reef, Queensland.

[11]Waters—Proc. Zool. Soc., ii, 1913, p. 519.

PETRALIA VULTUR (*Hincks*) var. BENNETTI[12] *var. nov.*

(Pl.vi., figs. 3–6.)

Description.—The zoarium is very large; encrusting. Zooecia huge and conspicuous. They are roundedly hexagonal in shape and markedly ovate in front. The characters pertaining to the zooecial aperture are the same as for the typical species, but instead of six spines above the aperture there are 7-9 (generally 8) well developed spines above the aperture of the variety. The frontal zooecial walls are, as in the typical form, punctured with pores, but those on the variety are larger than the ones seen on the typical species. Mucro poorly developed and only about half the size of that of the typical form. On the side of the mucro there is a small avicularium, the mandible of which is almost semi-circular. This mandible is not so elongate as, and is less than half the size of the avicularian mandible on the mucro of var. *serrata*. Another form of avicularium occurs on the frontal zooecial walls of many zooecia and is very large and formidable. The mandible is long, tapering towards the free extremity, where it ends in a sharp point. The avicularian cavity is as long as the mandible; it is slightly curved downwards and the cavity is deep. The edges of this avicularian cavity are conspicuously serrate.

Affinities.—The variety is distinct and cannot be confused with any other known variety of the typical species. The possession of 7-9 spines above the zooecial aperture, together with the large avicularia and its serrate-edged cavity alone suffice as means of recognition.

Colour.—The colour of dried colonies is dull cream.

Locality.—Encrusting coral, 8 fathoms, Ellison Reef, Great Barrier Reef, Queensland.

ESCHAROIDES SAUROGLOSSA *Levinsen.*

Escharoides sauroglossa Levinsen, Morph. Syst. Stud. Cheil. Bryozoa, 1909, p. 319, pl. xvii, figs. 6a-f, in text (5a-f in explanation of plates).

A small single fragment in the collection is typical of the form described by Levinsen. The only exceptional features to be noted are that there may be five spines present above the aperture instead of four and that the edges of the avicularian cavities are toothed or serrate as opposed to the smooth edges figured by Levinsen.

Affinities.—The species is allied to *Smittia adeonelloides* Ortmann, which is figured as having sharply pointed avicularia, but can be recognised and separated from this form by the possession of rounded avicularia.

Locality.—8 fathoms, Ellison Reef, Great Barrier Reef, Queensland.

[12]Named for Commander H. T. Bennett, R.A.N., D.S.O., H.M.A.S. "Geranium."

HOLOPORELLA PIGMENTARIA *Waters*.

Holoporella pigmentaria Waters, Journ. Linn. Soc., Zool., xxxi, 1909, p. 163, pl. xv, figs. 16-19 ; pl. xvi, figs. 9-16 ; pl. xvii, figs. 22-23.

The dull dark sepia colour of the dried colonies assists greatly in distinguishing the species.

Locality.—Encrusting coral from 8 fathoms, Ellison Reef, Great Barrier Reef, Queensland.

HOLOPORELLA APERTA (*Hincks*).

Schizoporella aperta Hincks, Ann. Mag. Nat. Hist. (5), ix, 1882, p. 126, pl. v, fig. 3.

Schizmopora cucullata Maplestone, Proc. Roy. Soc. Vict., (n.s.), xvii, pt. ii, 1905, p. 389, pl. xxix, figs. 7-8.

Schizoporella aperta Thornely, Rept. Pearl Oyster Fisheries Gulf of Manaar, pt. iv, 1905, p. 114.

Holoporella aperta Waters, Journ. Linn. Soc., Zool., xxxi, 1909, p. 161. pl. xviii, figs. 20-23 (and synonmy).

Holoporella aperta Waters, Proc. Zool. Soc., ii, pt. iii, 1913, p. 522.

Holoporella aperta Robertson, Rec. Ind. Mus., xxii, 1, 1921, p. 61.

The specimens before me are similar to those described by Miss Thornely (*loc. cit.*) in having spines above the zooecial apertures.

All other characters of the species are clearly seen and no variation can be determined.

Synonymy.—The species carries, like many other species, a heavy burden of synonymy and I follow Waters (*loc. cit.*) in the synonymy of *H. aperta*. One species however, is queried by Waters as a synonym, namely *Schizmopora cucullata* Maplestone from Lord Howe Island.

The material on which Maplestone based his paper " Lord Howe Island Polyzoa " was entrusted to him by the Rev. Dr. Thos. Porter who collected the specimens at Lord Howe Island. Many unnamed duplicate specimens were afterwards presented to the Australian Museum by Dr. Porter, among which were three well perserved specimens which I identify as *S. cucullata*.

The appearance of this species as a probably synonym of *H. aperta* has caused me to examine these unlabelled co-type specimens of *S. cucullata* and to compare them with the specimens of *H. aperta* from the Barrier Reef, and the description and figure given by Hincks (*loc. cit,*) I find that *S. cucullata* agrees in every detail described by Hincks save for the occurrence of spines above the zooecial aperture ; these however, have been found on *H. aperta* by Miss Thornely and also occur on specimens

from the Barrier Reef. This exception, then, is of no consequence. The description and figure of *S. cucullata* does not embrace all the details of *H. aperta*, but after a comparison of incinerated specimens I confirm the synonymy queried by Waters.

Locality.—8 fathoms, Ellison Reef, Great Barrier Reef, Queensland.

BIPORA UMBONATA (*Haswell*).

(Pl. v, figs. 4-5.)

Eschara umbonata Haswell, Proc. Linn. Soc. N.S. Wales, v, 1880, p. 41, pl. ii, figs. 5-6.

?*Schizoporella quadravicularis* Okada, Annot. Zool. Jap., x, 22, 1923, p. 230, pl. figs. 3-5.

Bipora umbonata Livingstone, Rec. Austr. Mus., xiv, 3, 1924, p. 209 (and synonymy).

This temperate and tropical species is represented in the collection by a single small fragment. It is true to type, there being no variation whatever. *Schizoporella quadravicularis* Okada (*loc. cit.*) appears to be this species and even if it does not prove to be this form it possesses characters which would associate it with *Bipora*.

Locality.—28 fathoms over Gibson Reef, Great Barrier Reef, Queensland.

MICROPORELLA MALUSII (*Audouin*).

Cellepora malusii Audouin, Expl. i, p. 239 ; Savigny, Egypt, pl. 8, fig. 8. (*fide* Hincks, Brit. Mar. Polyzoa, 1880, p. 211).

Lepralia malusii Busk, Brit. Mus. Cat. Mar. Poly., pt. ii, 1854, p. 83, pl. ciii, figs. 1-4.

Microporella malusii Jelly, Syn. Cat. Rec. Mar. Bryozoa, 1889, p. 186-7 (and synonymy).

This cosmopolitan species is very abundant in Queensland waters generally, and was secured in the collection in the form of delicate leaf-like colonies. It is not heavily calcified like the form found in New South Wales waters, and appears to the unaided eye to be a *Flustra*.

Locality.—7 to 15 fathoms, Ellison Reef, Great Barrier Reef, Queensland,

RETEPORA MONILIFERA form UMBONATA *MacGillivray.*

Retepora monilifera form *umbonata* MacGillivray, McCoy's Prod. Zool. Victoria, dec. x, 1885, p. 23, pl. xcvii, figs. 1-3.

Locality.—28 fathoms over Surprise Shoal, Cairns-Townsville "Section," Great Barrier Reef, Queensland.

Genus PETRALIA *MacGillivray.*

PETRALIA CHUAKENSIS *Waters.*

Petralia chuakensis Waters, Proc. Zool. Soc., 1913, p. 518, pl. lxx, figs. 10-14.

No record of this well defined species has been published since it was first described from specimens collected in three fathoms at Chuaka, Zanzibar. Specimens agreeing with Water's description and figures have been collected for the Australian Museum at Daru Island, in Torres Strait, New Guinea.

Affinities.—Although Waters considered his species *chuakensis* had much in common with *P. dorsiporosa* from Torres Strait, he thought there were sufficient differences between them to justify the establishment of the new specific name. I believe them to be quite distinct.

It may be noted here that *dorsiporosa* is much more closely related to *japonica* than *chuakensis*.

Locality.—Daru Island, in Torres Strait, south-western Papua; collected by the late Allan R. McCulloch, 5th November, 1922. According to Mr. McCulloch's diary, all natural history specimens from Daru were collected on a mud flat alongside the jetty. Though largely consisting of soft silt, it included a platform of mud-stone or hardened mud, which was covered at low water, and upon which were many crabs and other invertebrates.

EXPLANATION OF PLATE V.

Fig. 1. Zooecial detail of *Lepralia tuberculata* Philipps var. *avicularis* Livingstone. The large avicularia are depicted in some cases as being closed, and in others, open. The shallow avicularian cavities can be seen when the avicularium is open and are shown on the illustration by darkened areas very much like the avicularia themselves.

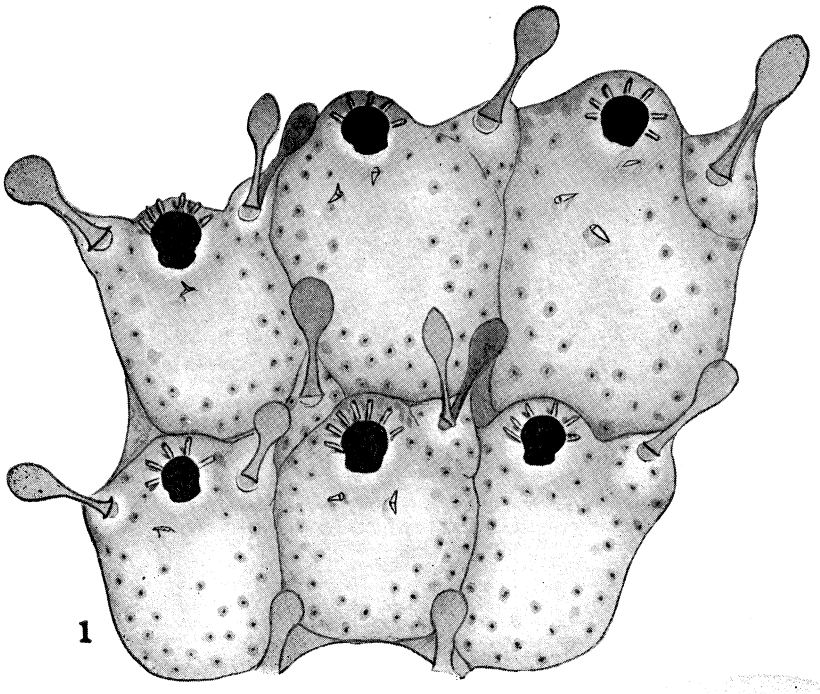
,, 2. Two differently shaped avicularia taken from a colony of *Lepralia tuberculata* Phillips var. *avicularis* Livingstone.

,, 3. Operculum of *Lepralia tuberculata* Phillipps var. *avicularia* Livingstone.

,, 4. Colony of *Bipora umbonata* Haswell. Drawn from a specimen from Holborn Island, 20 fathoms (type locality).

,, 5. Zooecial detail of *Bipora umbonata* Haswell.

,, 6. Portion of colony of *Parmularia quadlingi* Haswell with anchoring filament. The dotted continuation of the outline aims to illustrate what the colony would probably look like if complete.



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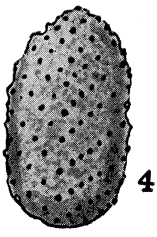

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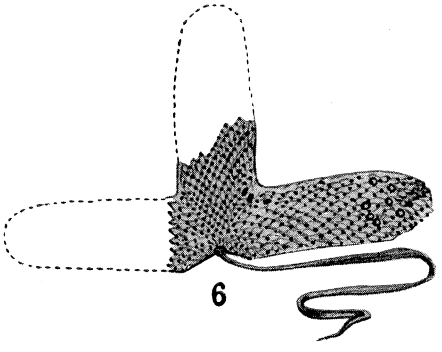

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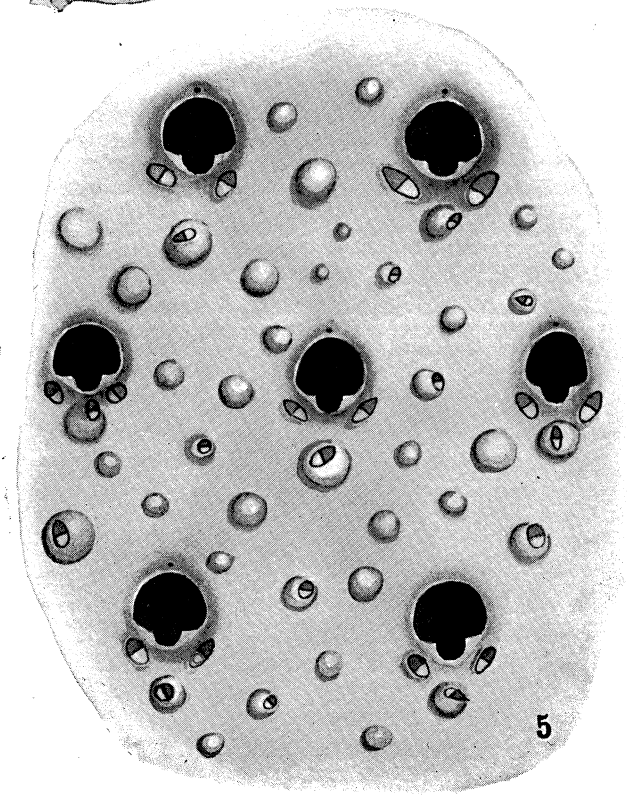

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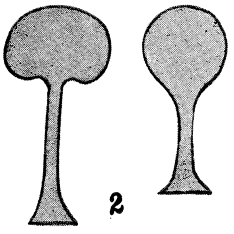

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EXPLANATION OF PLATE VI.

Fig. 1. Zooecial detail of *Parmularia quadlingi* Haswell showing ooecia and the peculiar avicularium in the zooecial aperture.

„ 2. Enlarged view of a zooecial aperture of *Parmularia quadlingi* Haswell in which there has been an avicularium.

„ 3. Enlarged view of the proximal portion of a zooecium of *Petralia vultur* Hincks var. *bennetti* Livingstone showing the aperture and associated characters.

„ 4. Zooecial detail of *Petralia vultur* Hincks var. *bennetti* Livingstone.

„ 5. Large zooecial avicularium of *Petralia vultur* Hincks var. *bennetti* Livingstone.

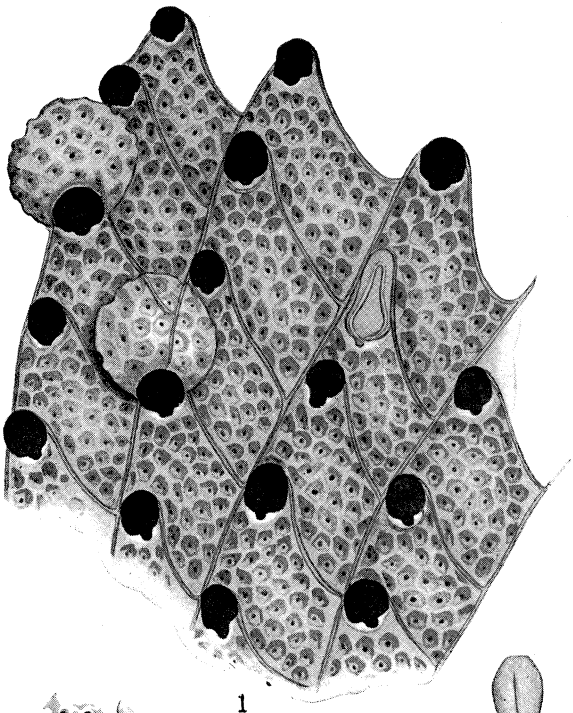
„ 6. Small avicularium from mucro of *Petralia vultur* Hincks var. *bennetti* Livingstone.

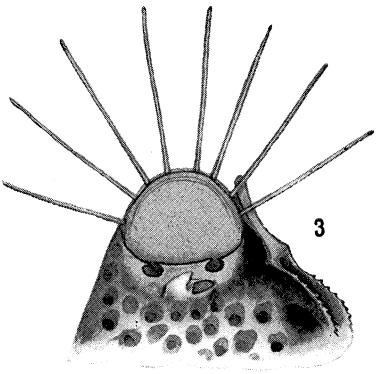
„ 7. Zooecial detail of *Petralia vultur* Hincks var. *serrata* Livingstone.

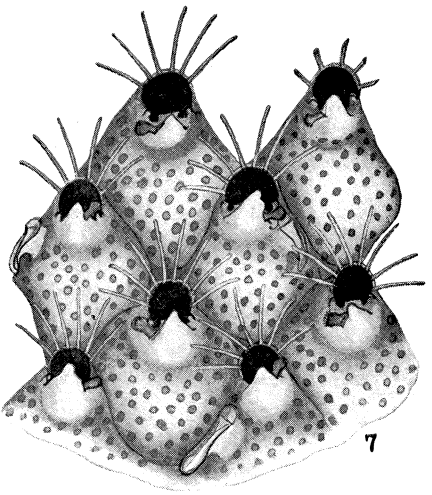
„ 8. Enlarged view of the proximal portion of a zooecium of *Petralia vultur* Hincks var. *serrata* Livingstone showing the aperture and associated characters.

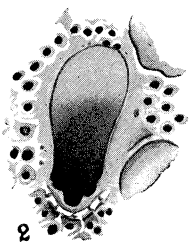
„ 9. Large zooecial avicularium of *Petralia vultur* Hincks var. *serrata* Livingstone.

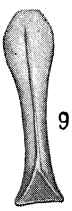
„ 10. Small avicularium from mucro of *Petralia vultur* Hincks var. *serrata* Livingstone.

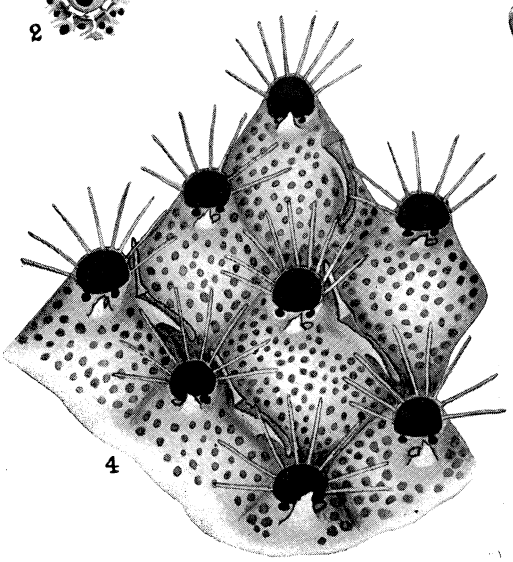


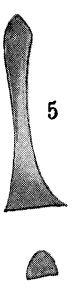


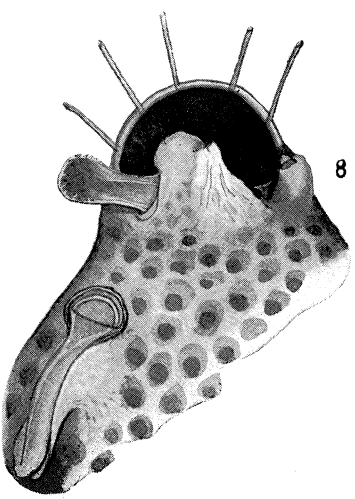












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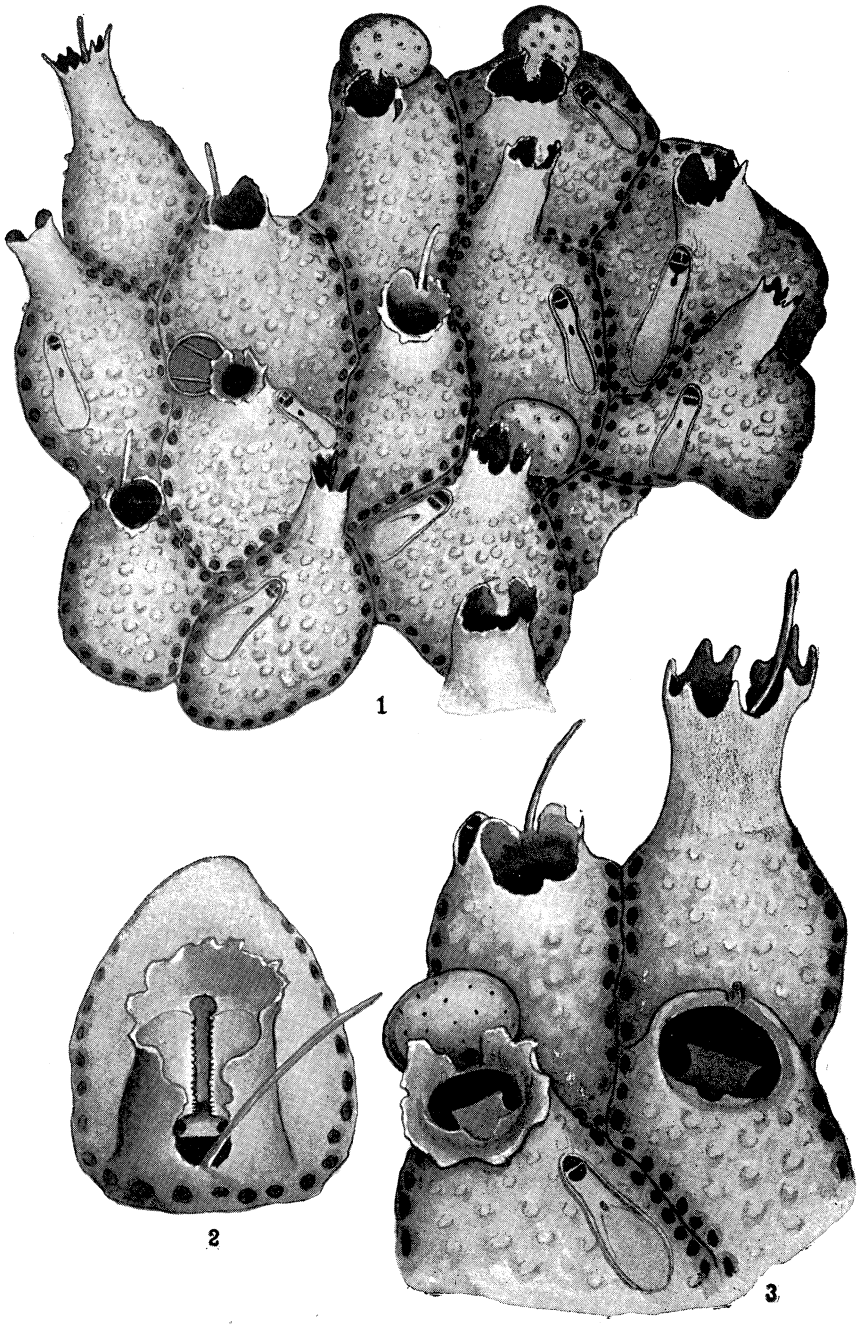
EXPLANATION OF PLATE VII.

(*?Phylactella*) *paradicei* Livingstone.

Fig. 1. Zooecial detail.

,, 2. Peristomial detail.

,, 3. Illustration of four zooecia which show the shape of the zooecial apertures and the denticles.



G. P. WHITLEY, del.

EXPLANATION OF PLATE VIII.

Fig. 1. Zooecial detail of (*?Lepralia*) *porcellana* Busk var. *normani* Livingstone.

,, 2. Zooecial detail of *Porella areolata* Kirkpatrick.

,, 3. Operculum of *Porella areolata* Kirkpatrick.

,, 4. Large independent avicularium of *Porella areolata* Kirkpatrick.

,, 5. Zooecial detail of *Porella fissurata* Ortmann.

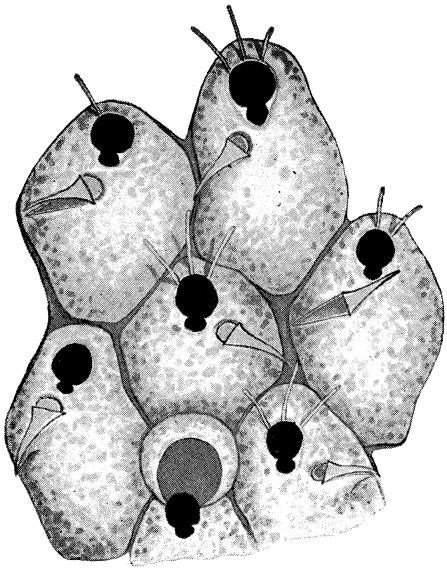
,, 6. Portion of a colony of *Porella fissurata* Ortmann showing how the large independent avicularia are grouped together in some places.

,, 7. Operculum of *Porella fissurata* Ortmann.

,, 8. Zooecial detail of *Schizoporella viridis* Thornely var. *thornelyi* Livingstone.

,, 9. Operculum of *Scaizoporella viridis* Thornely var. *thornelyi* Livingstone.

,, 10. Operculum of the typical *Schizoporella viridis* Thornely. Drawn from a specimen from Dauco Island, Great Barrier Reef near Port Moresby, New Guinea.



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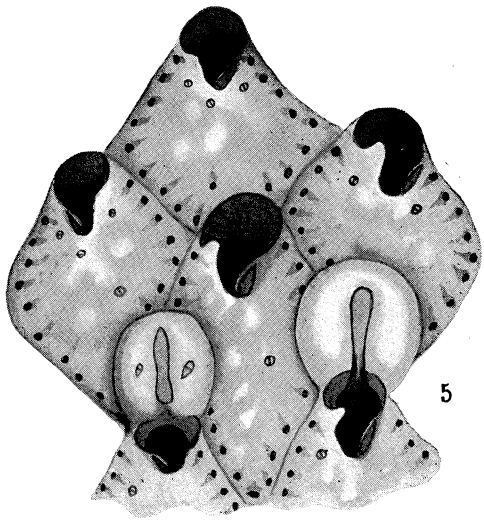

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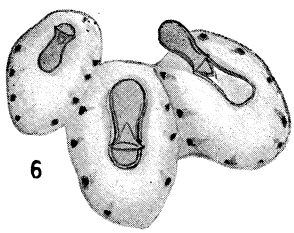

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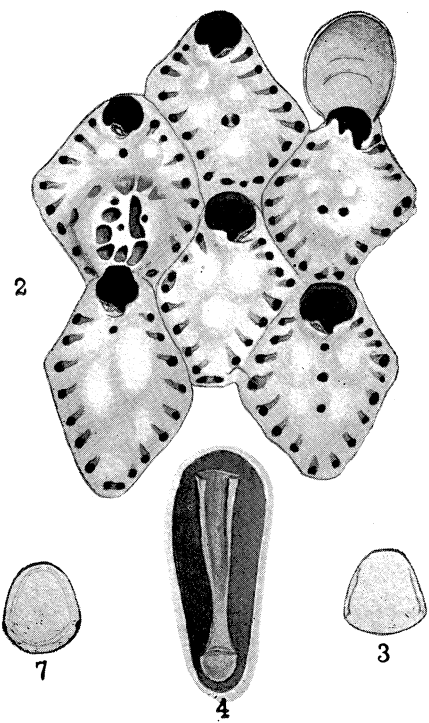

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G. P. WHITLEY, del.