MADREPORARIA FROM THE AUSTRALIAN AND NEW ZEALAND COASTS.

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PLATES V. AND VI.

The following corals have been submitted to me for description:—From South Australia, by Dr. Jos. Verco and the late Professor Tate; from New South Wales, by Messrs. Hedley and Petterd; and from New Zealand by Mr. Henry Suter. They are arranged in 15 species and as many genera. Nine species prove to be new, three were described by Moseley from the "Challenger" dredgings, two are corals described by Ten. Woods from the coast of New South Wales, and one is a varietal form of a tertiary fossil.

TURBINOLIDÆ.

GENUS FLABELLUM, Lesson.

Flabellum australe, Moseley, Report on Corals, 1881, pp. 173-4, pl. vii., figs. 4, 5.

This coral was dredged at 120 fathoms off Twofold Bay by the "Challenger" Expedition, when eleven specimens were obtained. Lately it has been dredged in very large numbers 20 miles north-east of Port Jackson, by Messrs. Hedley and Petterd, at a depth of 250 fathoms. It has also been dredged by Dr. Verco at 90, 120, and 130 fathoms off Cape Jaffa, and at 110, 150, and 200 fathoms off Beachport.

The specimens are generally of large size, but none reach the dimensions of Moseley's largest example, viz., 57 mm. high and 65 mm. broad. The largest sent to me is 38 mm. high and 44 mm. broad.

GENUS SPHENOTROCHUS, Milne-Edwards and Haime.

Sphenotrochus emarciatus, Duncan; var. **perexigua,** *nov.*

A fossil coral from the Australian tertiaries was described by Duncan in 1865 under the name of *Sphenotrochus emarciatus.** Two years later this author re-described the same coral, and in exactly the same words, but with a new specific name, viz., *S. excisus.*† As he gave no reason for the change, and I know of none, the older name is here restored. The

* Ann. and Mag. Nat. Hist. vol. xvi., p. 2, pl. viii., fig. 2.

† Q.J.G.S., vol. xxvi., p. 298, pl. xix., fig. 86.

fossil coral is very abundant in the eocene beds of almost all localities, and is also sparingly found in the Gippsland miocene. A coral from Dr. Verco's later dredgings off the South Australian coast exactly resembles in outward appearance the common tertiary fossil, the only difference being that its calice is narrower in proportion to its length. I think it may rank as a variety, but certainly no more. The major and minor axes of the calice are as 180 to 100. In the fossil the relative proportion of the axes is as 150 to 100, and in an exceptionally compressed specimen as 166 to 100. Duncan gives the ratio of the longer to the shorter axis in the fossil as 2 to 1, but he is certainly wrong.

In all, nine specimens of the recent coral were obtained, and the calices show the same number of septa, and the same confused appearance of the columella, that Duncan mentions in regard to the fossil.

Height, 6 mm.; length of calice, 4·5 mm.; breadth of calice, 2·5 mm.

Dredged east of Neptune Island at 45 fathoms; at 90 and 130 fathoms off Cape Jaffa; and at 49 and 150 fathoms off Beachport.

Genus Trematotrochus, Tenison Woods.

Trematotrochus Hedleyi, *spec. nov.* Pl. v., figs. 1*a*, *b*.

This is a *Trematotrochus* of the same type as the fossil one first described by Woods, viz., *T. fenestratus*, but is broader and less pointed at the base; the perforations in the wall are also larger. If any doubt still lingered as to the complete perforation of the wall in this type of *Trematotrochus*, it would be dispelled by looking at the examples now described, since, when viewed against the light, the openings show almost as distinctly inside the calice as on the outside of the wall.

The corallum is conical, and tapers by a double curve to the rounded base. At the actual margin it is slightly constricted, and broadens out just below to its greatest circumference. The calice is circular and shallow.

The septa are in six systems, with three cycles. The first and second orders are exsert, sparingly granular, equal, and extend to the columella; they are stout compared with the tertiaries, which, like those of its fossil analogue, *T. fenestratus*, are extremely thin and reach but a very short distance in the calice. There is a distinct columella, which is papillary superiorly, but becomes solid below, where the larger septa fuse with it.

The costæ, which correspond with the septa, are stout and equal, those of the third order being quite as large as the

rest. They are formed of a series of large, loosely-joined, flattened granules. The primaries and secondaries reach the base, and the tertiaries nearly so. The intercostal spaces are large and are crossed at regular intervals by very thin bars, which form the fenestrated ornament characteristic of the genus.

Height, 5·5 mm.; diameter of calice, 3·5 mm.

Dredged by Messrs. Hedley and Petterd, 20 miles north-east of Port Jackson, at a depth of 250 fathoms. Five examples were obtained, two of which are perfect, though their mural perforations are clogged by sediment. The drawing of the corallum is from a third specimen, one-half of which is well preserved, and the other half imperfect; the two remaining examples are fragmentary.

The calice of *T. Hedleyi* almost exactly reproduces that of *T. fenestratus*, the common eocene coral, but in the shape of the corallum the two species differ widely, the former being somewhat barrel-shaped, while the latter is long and has a pointed base. *T. Clarkii*, the miocene *Trematotrochus*, is also barrel-shaped, but its calice shows an additional cycle of septa. The other species of the genus, both fossil and recent, which have been described, differ more markedly from the present one.

Genus Trochocyathus, Milne-Edwards and Haime.

Trochocyathus Petterdi, *spec. nov.* Pl. v., figs. 2*a*, *b*.

The corallum is small and curved. It is divided into two approximately equal portions, the upper of which tapers very gently downwards to the commencement of the lower half, when it suddenly contracts and then terminates in a narrow bluntly-pointed base. The calice is circular, shallow, and crowded with septa. At first sight it appears to be divided into 15 equal parts by as many principal septa, with three others of higher order in each division. A close examination, however, shows that there are in reality six systems, of which only one is perfect, *i.e.*, with its full complement of tertiaries; another has one tertiary only, while in the remaining four these septa are entirely wanting. The quaternaries and quinaries are regularly developed between the fifteen principal septa. The total number of septa is thus 60. Those of the fourth and fifth orders are equal in thickness, but much smaller than the rest. All the septa are wavy, and the quaternaries especially so. Their margins are entire, and their sides are studded with rows of strong, bluntly-pointed granules. Irregularly shaped pali are placed in front of the secondaries and tertiaries, which are rather shorter than the primaries.

The columella occupies much space, and consists of numerous papilli, which, though irregular in shape, are on the whole more rounded than the pali.

The costæ correspond to the septa, and are formed of closely-packed, flattened granules, bearing horizontal spines which project into the narrow intercostal spaces. They descend perpendicularly on the wall, until they bend round with the curvature of the inferior portion of the corallum. The principal costæ are slightly larger than those of higher order. The latter sometimes unite on the wall, and then continue to the extremity of the base as a single broad costa, or all three of those lying between the principal costæ may broaden out independently. The specimens show considerable variation in the arrangement of the costæ on the basal portion of the corallum. The base itself is peculiar. It really extends from the commencement of the convex curve of the corallum, and is formed of three or four costæ, which are much broader than any of those on the wall proper. There is no epitheca.

Height of corallum, 4·5 mm.; diameter of calice, 4 mm. The coralla are not quite uniform in shape, the curvature being occasionally less than in the type, while the base again may be more sharply pointed.

Dredged by Messrs. Hedley and Petterd 20 miles north-east of Port Jackson, at a depth of 250 fathoms. Nine specimens were obtained, of which the type is perfect, and the others in tolerable order.

Genus Deltocyathus, Milne-Edwards and Haime.

Deltocyathus rotæformis, Tenison Woods, Linn. Soc. N.S.W., vol. II., pp. 306-7, pl. v., fig. 2.

The description and drawings of this coral given by Tenison Woods are correct. His examples, six in number, were dredged off Port Stephens by the late W. Macleay, at a depth of 71 fathoms. After the lapse of many years, it has now been dredged by Messrs. Hedley and Petterd, at 250 fathoms, 20 miles north-east of Port Jackson (11 examples); and also by Dr. Verco, at 104 fathoms, 35 miles south-west of Neptune Island, South Australia (147 examples). The latter gentleman also found the coral in considerable numbers and at varying depths, up to 200 fathoms, off Cape Jaffa and Beachport. Two of the New South Wales specimens are slightly larger than any from South Australia.

The alternation of the costæ with the septa is a remarkable feature of the species, and serves to distinguish it from all others in the genus.

Genus Kionotrochus, *nov.*

A Turbinolian coral, having a rounded free base, and an

essential styliform columella. Septa arranged in a series of deltas. Wall entire and with prominent granular costæ. Pali absent. No epitheca.

The relations of the genus are with *Deltocyathus*, but there are no pali. It is allied also to *Turbinolia* by its styliform columella, but departs from that genus by its shape, by the arrangement of the septa, and by the absence of intercostal fossettes.

Kionotrochus Suteri, *spec. nov.* Pl. v., figs. 5*a*, *b*.

The numerous examples of this small coral are not quite uniform in outline. The majority are short, and approximately hemispherical in shape, like the example figured, but a few are slightly taller; others again are low, almost discoid forms.

In adults the corallum is free, with a rounded convex base, which shows a very small scar of former attachment at its centre. Very young individuals are fixed generally to shell fragments, and the corallum then has a flatly adherent base and a perpendicular wall. The gradations from such forms to those with a free rounded base is clearly traceable amongst the smaller specimens. The scar of former attachment becomes less and less conspicuous as the corallum increases in size.

The calice is circular and widely open. The septa are exsert and in six systems, with three cycles. They are slightly serrated at the margin, and their sides are beset with numerous strong, bluntly-pointed granules. The primaries are longer and stouter than the secondaries, and these again than the tertiaries. The latter curve round and join the secondaries near the columella, but so deep down that in a fresh, well-preserved specimen the junction is quite inconspicuous. In worn examples, however, the deltoid combinations, formed by the union of these septa, become well marked.

The columella is prominent, and in perfect specimens consists of an irregular pillar, having buttress-like supports and a central styliform projection. It is connected inferiorly with the primary and secondary septa by slender processes; in much-worn specimens the columella presents a fascicular appearance.

The costæ are continuations of the septa, but are stouter. They are highly granular, and form 24 equal, strongly-projecting ribs on the exterior of the corallum. The first two orders continue to the centre of the base, near which the tertiaries unite with the secondaries. In the intercostal spaces, which are very narrow, the wall of the corallum is thin, smooth, and entire.

Height, 3·5 mm.; diameter of calice, 4 mm.

This interesting coral was dredged at a depth of 110 fathoms by Mr. Henry Suter and Mr. Charles Hedley about 15 miles outside Great Barrier Island, New Zealand. It is evidently very abundant, as a large number of specimens have been sent to me. About 20 of them are full-grown and tolerably perfect; 20 others are also adult, but worn; in addition, there are more than 30 of the juvenile discoid forms previously mentioned, a few of which are still attached to minute shell fragments.

Genus Paracyathus, Milne-Edwards and Haime.

Paracyathus vittatus, *spec. nov* Pl. v., figs. 3*a*, *b*.

The only example of this small coral is attached by its entire base to a fragment of shell. It was dredged some years ago by Dr. Verco, at a depth of 17 fathoms off Point Marsden, Kangaroo Island.

The corallum is low and almost cylindrical in shape, with a slight constriction just above the broadly adherent base. The main portion of the wall is covered by a stout, rough epitheca, but near the summit this terminates abruptly, and a narrow band of well-marked costæ succeeds, surrounding the margin of the corallum. At the actual junction of the epitheca and costal band the latter slightly overlaps, and its lower edge forms a distinct, sharply-defined rim.

The calice is shallow and elliptical, its major and minor axes being as 100 to 88. The septa are in six systems, with four cycles. The first two orders are exsert and equal, the tertiaries are both smaller and shorter, while the quaternaries are extremely slender, and barely project into the calice. All extend as costæ beyond the wall, retaining their relative size, but those of the fourth order, though still slender, are prolonged, and become a prominent feature of the costal band. All orders of septa are beset with long and stout granules, placed at right angles to their sides; the edges have thus a dentate appearance, though their upper surfaces are in reality plain. The costæ are also granular, but less so than the septa. Pali in more than one crown are placed before the primary and secondary septa, and separated from them by a deep and wide notch. They are of irregular shape, lobed, and sparingly granular.

There is a strong fascicular columella, with occasional nodules on its surface.

Height of corallum, 3·5 mm.; depth of costal band, 1 mm.; diameters of calice, 4 mm. and 3·5 mm.

Genus Caryophyllia, Lamarck.

Caryophyllia planilamellata, *spec. nov.* Pl. vi., figs. 4*a*, *b*.

This is the first *Caryophyllia* discovered in Australian waters. It is true that Milne-Edwards and Haime recorded one such species, viz., *C. Australis**, but, as shown by Brüggemann,† it certainly does not belong to the genus. The present species has been lately dredged in great numbers by Dr. Verco in the South-East of South Australia. Many of the specimens are very fine, and were dredged up alive.

The corallum is conico-cylindrical and more or less curved. It does not taper much till the commencement of the curve, when it diminishes rapidly. The specimens vary a good deal in outline, some being lengthened out and much twisted inferiorly, while others are both shortly and regularly curved. As a rule there is a small pedicellate base, though some examples, especially those with a long distorted basal curve, terminate in a bluntly-rounded point. Several coralla are still attached to shells, or other foreign substances, and in one instance a long slender corallum is adherent by its base to the side of a larger one.

The wall is covered with a fine, glistening, granular epitheca, with the costæ, which correspond with the septa faintly traceable beneath it. There is besides a tendency to the development of occasional knobs or protuberances on the wall. Many of the specimens also show numerous serpulæ, etc., on their surface.

The calice is shallow, widely open, and elliptical; the ratio of its axes is about as 100 to 88. In the type calice there are 10 primary and 10 secondary septa of approximately equal length, 18 tertiary much shorter, and 38 still smaller quaternaries. Prominent, upright, and regularly-shaped pali are placed before the tertiaries. As there are only 18 tertiaries in this calice, two half-systems being without them, the pali are also 18 instead of 20. Another calice shows exactly the same arrangement. In a third example I counted 19, and in a fourth 20 pali. The number of septa in the calices of adult forms, like those quoted, does not, therefore, differ greatly, the systems being normally 10 and the number of cycles 4. Both pali and septa are straight, moderately thin lamellæ; they agree also in being quite plain, *i.e.*, free from either spines or granules. Deep down, the pali are connected with the tertiary septa by a straight, thin, lengthened process; in other words, the pali are continuous with the tertiary septa, a deeply-cut notch marking the junction of the two structures.

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* Ann. Sci. Nat., Ser. 3, Zool., vol. x., p. 320, pl. viii., fig. 2.

† Ann. Nat. Hist., vol. xx., p. 310.

There is a prominent columella consisting of seven or eight twisted ribbon-like laminæ arranged longitudinally in the fossa. The pali are connected with it by stoutish processes.

The specimens vary in size as well as in outline; the largest is 47 mm. in height, without counting the curve, and its calice is 26 mm. by 23 mm. in diameter. The type calice is 18 mm. long and 16 mm. broad. The majority of the adult examples are about 30 mm. in length.

Dredged off Cape Jaffa at from 120 to 300 fathoms, and off Beachport at 110 fathoms.

The only species with which *C. planilamellata* needs to be compared is *C. communis*, which was described by Moseley in the "Challenger" reports. His specimens came from theNorthern Hemisphere, with the exception of a single broken one, which is recorded from the Cape of Good Hope.

I have not seen any examples of *C. communis*, but Moseley's drawings show a species with spined or granulated pali, whereas in the Australian species these structures are perfectly plain. Again, the latter has normally a pedicellate base, and in some instances is still attached, while C. *communis* is said to be constantly free and without sign of former adherence.

In 1878 Tenison Woods described a curious little coral which was dredged off Port Jackson under the name of *Dunocyathus parasiticus*, the genus being new, and founded on that species alone. Duncan proposed to absorb the genus, considering that the solitary specimen of such a very small coral was not of sufficient value.* Very numerous specimens have now been obtained, and though they do not fully support Woods's diagnosis, the genus, slightly modified, may be conveniently retained. Instead of being immersed, the corallum generally rises for some distance above the polyzoon to which it is attached, and then shows distinct costæ. The septa are very deeply notched at their columella ends, and their central tooth-like projections may be fairly classed as pali. The coral has the habit of a Turbinolian, though a slight amount of endotheca is noticeable in some examples.

Genus Dunocyathus, Ten. Woods (emend.).

Corallum simple, parasitic, rarely immersed, but usually rising to some height above the polyzoon to which it is invariably attached. Septa dentate; costæ prominent; one row of pali. No epitheca.

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* Revision of the Madreporaria, p. 25.

Dunocyathus parasiticus, Tenison Woods, Proc. Linn. Soc. N.S.W., vol. II., p. 305, pl. v., fig. 4.

The description of the species by Woods is in the main correct, but needs the following additions. The specimens are attached to a polyzoon, which is always of the same species, viz., *Bipora cancellata*, Busk. A few individuals are immersed, but the great majority rise above the polyzoon, and show broad prominent costæ on the wall. These do not correspond with the septa, but occupy the alternate spaces between them. The third cycle of septa consists of very short, thin lamellæ.

A large number of examples were dredged by Dr. Verco, 35 miles S.W. of Neptune Island, at 104 fathoms, and off Cape Jaffa, at 90 fathoms. The species was also found, but not so plentifully, at 130 fathoms off Cape Jaffa, and from 110 to 200 fathoms off Beachport. A single example was sent to me by Mr. Hedley, who dredged it at 250 fathoms off Port Jackson. Woods's type, it will be remembered, came from that locality, but at a depth of only 45 fathoms.

Genus Ceratotrochus, Milne-Edwards and Haime.

Ceratotrochus recidivus, *spec nov.* Plate vi., figs. 1*a*, *b*; 2*a*, *b*, *c*.

Numerous examples of this coral were dredged by Dr. Verco, and all exhibit a remarkable peculiarity, viz., that each is invariably attached to the interior surface of a fragment of a similar corallite. A typical and fairly tall corallum is attached to an earlier fragmentary one in a manner which indicates budding from a parent calice. A few short septal laminæ are still visible where the base of the new corallite fuses with the margin of the old wall (pl. vi., fig. 2*a*). Another example in the collection has its wall split longitudinally into four nearly equal portions; these are still loosely held together, and enclose an elliptical calice, which at its margin shows a very thin inner wall separate from the outer one (pl. vi., fig. 2*b*). A third specimen is further advanced, the old wall being now represented by semi-detached fragments only, above which a young corallum rises. The calice, which is also elliptical, is well developed, and has its full complement of septa. Many detached wall fragments, showing the remains of septa on their internal surfaces, are also mingled with the dredged material sent to me.

I think it is evident from the specimens that growth from a parent calice, due to internal budding, has taken place. Usually this appears to be single, but examples occur where two coralla are fixed to the same fragment. Sometimes these are independent of each other, or they may be partly joined

at their sides (pl. vi., fig. 2*c*). It must be especially noted that there has been no external budding, since in every case the new coralla are attached to the internal surfaces of wall fragments. The mode of growth in this species is, therefore, quite distinct from that observed in *Parasmilia fecunda*, Pourtalès,* or in *Balanophyllia rediviva*, Moseley.†

The coralla vary greatly in size, some being quite minute; still these are attached to wall fragments just as in the case of the larger individuals. It should be noted also that, though there are several highly elliptical calices amongst the material, the majority are circular or nearly so.

The following description of the corallum and calice in this species applies to two of the largest examples in the collection, the corallum of one and the calice of the other being referred to (pl. vi., figs. 1*a*, *b*).

Corallum long, tapering, slightly curved, and adherent at its base to the internal surface of a small fragment of the wall of the parent corallite. This fragment still bears indistinct remains of the old septa.

The calice is almost circular and deep. There are 36 septa, which are apparently arranged in seven systems, most of which are defective. The number of cycles is four; the first and second orders are approximately equal, the third smaller, and the fourth very short. The calice of the corallum figured contains 42 septa, but in it the same arrangement into seven unequal systems holds. An irregular septal development is, in fact, observed in all the examples, even the youngest. The septa are arched, slightly exsert, and minutely granular on their sides.

Deep down in the central fossa the columella consists of a few, usually five or six, pointed projections. There are faint indications of costæ, corresponding with the septa, on the wall, which is thin, covered with a glistening, brownish epitheca, and rises just above the calicular margin.

The species is a *Ceratotrochus*, of the same type as *C. typus*, var. *Australiensis*, which Duncan described from the tertiary beds of Victoria.

Height from margin of wall to attached base, 17 mm.; diameter of calice, 7 mm. There are only three specimens of this size, the remainder being much smaller.

All were dredged by Dr. Verco at 90 fathoms off C. Jaffa, and at 104 fathoms, 35 miles S.W. of Neptune Island, South Australia.

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* Deep-sea Corals, p. 21, pls. i., iii., vi.

† Report on Corals, pp. 193,4, pl. xv., figs. 10-12.

ASTRÆIDÆ.

Genus Homophyllia, Brüggemann.

Homophyllia incrustans, *spec. nov.* Pl. vi., figs. 3*a*, *b*.

This very small solitary coral is incrusting on the surface of a valve of *Chione roborata*. It presents the appearance of being moored to the shell by its very slender costæ, which, as prolongations of the septa, project beyond the wall. The latter is extremely short, and so much concealed by the projecting costæ that a close scrutiny is required to determine its presence. There is a delicate epitheca, which is not continued on the costæ.

The calice is sub-circular and convex, with a slight depression at the centre. The septa are stout, and vary in size according to order. They are in six systems, with four cycles. The primaries are free, and the remaining orders form six deltoid combinations. The secondaries are joined near the columella by the tertiaries, and the latter again fork near the wall to form the quarternaries. In the centre of each loop, thus formed, a thin septum represents the continuation of the tertiaries. The septa are dentated, and strongly spined. The columella is small and inconspicuous; it appears to be formed of two or three flat and lobed papilli.

A scanty endotheca is visible between some of the septa.

Height, about ·5 mm.; diameters of calice, 4·5 mm. and 4 mm.

A single specimen only of this diminutive coral is known. It was dredged in St. Vincent Gulf, and was handed to me by the late Professor Tate many years ago. I place it provisionally in the genus *Homophyllia*.

FUNGIDÆ.

Genus Bathyactis, Moseley.

Bathyactis symmetrica, Pourtalès, *sp.*

Fungia symmetrica, Pourtalès, Deep-Sea Corals, 1871, p. 46, pl. vii., figs. 5, 6.

Bathyactis symmetrica, Moseley, "Challenger" Reports, vol. II., 1881, pp. 186, etc., pl. x., figs. 1-13.

Numerous examples of this well-known coral were dredged by Dr. Verco at 104 fathoms 35 miles S.W. of Neptune Island, but all are fractured. A single whole example was, however, obtained off Cape Jaffa, at a depth of 130 fathoms. This is 7 mm. in diameter.

The species has been very fully described by Moseley, who reports that it was dredged by the Challenger Expedition at depths varying from 30 fathoms up to 2,900 fathoms, and in all parts of the world. Amongst other localities mentioned, specimens were obtained between Kerguelen Island and Melbourne, but at a great depth.

EUPSAMMIDÆ.

Genus Leptopenus, Moseley.

Leptopenus discus (?), Moseley.

Leptopenus discus, Moseley, "Challenger" Reports, vol. II., pp. 205-8, pl. xiv., figs. 1-4; pl. xvi., figs. 1-7.

A number of coral fragments placed in my hands by Dr. Verco and by Messrs. Hedley and Petterd belong certainly to the above remarkable genus, but their identification with the species named must be regarded as provisional. Though there is not a single perfect example present, every segment shows the lace-like pattern of the septa, costæ, and wall, which is characteristic of the genus. The majority of the fragments represent from one-fourth to one-sixth of the whole disc, which has been broken radially from the centre to the circumference, and in the line of either the free primary or secondary septa. The bifurcation of the predominant tertiaries is conspicuous in every fragment, whether large or small. The only noticeable difference between Moseley's examples and the Australian ones is in the length of the costal spines. In the former they are long, but in the latter quite short.

The segments show a coral somewhat smaller than Moseley's species and about 15 mm. in diameter. The extreme diameter of the "Challenger" examples is given as 25 mm., including, of course, the long spines.

Possibly the Australian coral may be new, but this can only be decided by an examination of entire specimens.

In all 24 fragments were dredged, viz., by Dr. Verco, off Cape Jaffa, at 90 fathoms; off Beachport, from 100 to 200 fathoms, and 35 miles S.W. of Neptune Island, at 104 fathoms. Messrs. Hedley and Petterd dredged a few segments of the same coral 20 miles from Port Jackson, at a depth of 250 fathoms. The examples described by Moseley were all found in the Southern Hemisphere, but at much greater depths, viz., from 1,600 to 1,950 fathoms. The nearest locality is in the Southern Indian Ocean, lat. 46° 16′ S., long. 48° 27′ E.

Genus Notophyllia, Dennant.

This genus, founded in 1899 to receive three species of tertiary fossils, is, I now find, represented also by a recent coral in which the generic characters are well marked. The close connection, to which attention has before been called, between the Australian corals of the present day and those found fossil in adjacent tertiary beds is thereby again strongly illustrated.

Notophyllia recta, *spec. nov.* Pl. v., figs. 4*a*, *b*.

Corallum small, short, and compressed. The base is wedge-shaped, and much like that of *N. gracilis*, mihi. There is no epitheca, and the wall is highly vesicular and porous. A series of fine granular lines, longitudinally arranged, and placed between the septa, enclose the vesicular portions of the wall. The wedge-shaped base is also markedly granular and porous.

The calice is moderately deep and very elliptical, the ratio of the long and short axes being as 2 to 1. The columella is straight, lamellar, and granular; together with the septa at the ends of the longitudinal axis it divides the calice into two halves. On each side of the end septa there are three smaller ones, or 12 for the whole calice, but they are not quite equal, those adjoining the full-sized end septa being the smallest. In all there are 26 septa, viz., 13 in each half of the calice, and, except the small ones just mentioned, they are long and sub-equal. All are thin, straight, and granulated like the columella. Their central margins are free for some distance, but lower down they are continued by short processes which reach the columella. Occasional pores are visible on their sides, quite close to the wall.

Height, 2mm. to 3 mm.; length of calice, 5 mm.; breadth of do., 2·5 mm.

The three examples from which the description of this species is written were dredged by Messrs. Hedley and Petterd at 250 fathoms 20 miles N.E. of Port Jackson. Two much-worn corals, one of which is double the size of those quoted, may possibly represent the same species; these were obtained by Dr. Verco off Cape Jaffa at a depth of 130 fathoms.

The present coral differs in many important points from *N. gracilis*, its nearest fossil congener. The latter is larger and has a distinctly different columella, while its septa vary more in size, and are arranged in six well-marked systems.

Genus Dendrophyllia, Milne-Edwards and Haime.

Dendrophyllia atrata, *spec. nov.* Pl. vi., figs. 5*a*, *b*.

Numerous specimens of this coral have been dredged, and from various stations in St. Vincent's Gulf, etc., but all at shallow depths. There are a few bush-shaped colonies like the one figured, but several examples are solitary and adherent to shells or polyzoal fragments. That the species increases by budding is, however, demonstrated by the composite clumps, the gemmation being both lateral and subbasal. As a rule, the solitary individuals are small, and they probably represent buds which have become detached from the

parent corallum or clump. In the latter the separate corallites rise at various angles from the base or parent corallum, and are short and cylindrical. A much-worn corallum bears several lateral buds which arise at right angles to its side, and in the case of one of them quite close to the calicular margin. Another specimen consists of two low corallites placed at an angle of 45°, and arising from a common basal expansion. A third interesting example is formed of a large individual adherent to a shell fragment with a smaller one growing from it close to its base, and at a similar angle to the last. A distinctly porous cœnenchyma is visible at the base of many of the specimens.

Broad, equal costæ stand out prominently on the wall of the corallites, especially close to the calices, but the basal expansion and also the lower part of the corallites become covered with a fine but granular epitheca. The costæ themselves are markedly granular; in the narrow spaces between them the wall is very thin and porous.

Exteriorly the corallites are light-coloured, but the interior of the calices is almost invariably dark-brown or almost black. On the type mass all the calices are dark-coloured, and, being very deep, are somewhat difficult to read, but a drawing is given of the calice of a perfect but solitary specimen which happens to be light in colour.

The septa are in six systems with four cycles. The primaries are free, the secondaries are joined by the tertiaries not far from the columella, and the quaternaries again unite with the tertiaries nearer the wall; there are thus six well-marked deltoid combinations in the calice. Adult specimens usually have the systems complete, but in younger calices the quaternaries are not fully developed. Thus the figured calice, which is perhaps not quite adult, has three systems complete and three incomplete; in the latter the quarternaries are wanting in one half of each system. The primaries are stout and the remaining septa diminish slightly in size according to order. All the septa are strongly spined, and so deeply dentated as to be superficially divided into a series of longitudinal segments. At the bottom of the fossa a considerable space is occupied by the columella, which consists of many papilli resembling in shape the inner ends of the dentate septa.

The bush-shaped colony figured, which is the finest specimen in the collection, has a height of 17 mm. from base to summit; it is 24 mm. long and 15 mm. broad. Its separate corallites have a diameter of 7 mm. and are about 5 mm. high. The calice chosen for illustration has a diameter of 5·5 mm.; its corallum is 3 mm. high.

The specimens were dredged in St. Vincent's Gulf, Investigator Straits, and Backstairs Passage, at depths ranging from 14 to 22 fathoms.

EXPLANATION OF PLATES.

Plate V.

1. *Trematotrochus Hedleyi*—*a*, corallum, magnified 6 diam.; *b*, calice of another example, magnified 8 diam.
2. *Trochocyathus Petterdi*—*a*, corallum, magnified 6 diam.; *b*, calice of same, magnified 10 diam.
3. *Paracyathus vittatus*—*a*, corallum with portion of shell to which it is attached, magnified 4 diam.; *b*, calice of same, magnified 10 diam.
4. *Notophyllia recta*—*a*, corallum, magnified 4 diam.; *b*, calice of another example, magnified 6 diam.
5. *Kionotrochus Suteri*—*a*, corallum, magnified 6 diam.; *b*, calice of same, magnified 8 diam.

Plate VI.

1. *Ceratotrochus recidivus*—*a*, corallum of a large example attached by its base to a wall fragment, magnified 2 diam.; *b*, calice of another example of equal size, magnified 4 diam.
2. *Ceratotrochus recidivus*—Three examples showing development of coralla, all magnified 2 diam.; *a*, with base immersed in the remains of an earlier corallum; *b*, with corallum split into 4 portions and calice elongated; *c*, two young coralla, joined by their sides, and attached at the base to the same wall fragment.
3. *Homophyllia incrustans*—*a*, calice and portion of shell which it incrusts, magnified 4 diam.; *b*, portion of calice showing one system of septa, magnified 12 diam.
4. *Caryophyllia planilamellata*—*a*, corallum, magnified $1\frac{1}{4}$ diam.; *b*, calice of same, magnified $2\frac{1}{2}$ diam.
5. *Dendrophyllia atrata*—*a*, corallum, magnified $1\frac{1}{2}$ diam.; *b*, calice of separate individual, magnified 6 diam.