DESCRIPTION OF SIX SPECIES OF CORALS, FROM THE PALÆOZOIC FORMATION OF VAN DIEMEN'S LAND.

By W. LONSDALE, Esq., F.G.S.

1. Stenopora Tasmaniensis, sp. n.*

Branched, branches cylindrical, variously inclined or contorted; tubes more or less divergent; mouths oval, divisional ridges strongly tuberculated; indications of successive narrowing in each tube, 1—2.

This coral, in its general mode of growth, resembles *Calamopora* (*Stenopora*?) *tumida*, (Mr. Phillips, Geol. Yorkshire, Part II. Pl. 1, fig. 62), but in the form of the mouth and other structural details, the differences are very great. *Stenopora Tasmaniensis* attains considerable dimensions, one specimen being 4½ inches in length, and half an inch in diameter.

The branches have individually great uniformity in their circumference, but they differ with respect to each other in the same specimen; and there is no definite method of subdivision or direction of growth. The extremities are occasionally hollow; and one specimen, about 1½ inches in length, and half an inch in breadth, is crushed completely flat. The tubes, in the best exposed cases, have considerable length, springing almost solely from the axis of the branch, and diverging very gently till they nearly reach the circumference, where they bend outwards. In the body of the branch,

* Though the characters of this genus are unpublished, it has been thought advisable not to give them fully in this notice, a very few species only having been examined. The coral is essentially composed of simple tubes, variously aggregated and radiating outwards. The mouth is round or oblong, and surrounded by projecting walls, having along the crest a row of tubercles. The mouth originally oval is gradually narrowed (στενός) by a band projecting from the inner wall of the tube, and is finally closed.

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the tubes are angular from lateral interference; but, on approaching the outer surface, they become oval in consequence of the interspaces produced by the greater divergence. Their diameter is very uniform throughout, with the exception of the narrowings near the terminations of the full-grown tubes. The walls in the interior of the branches were apparently very thin, but there is a relatively considerable thickness of matter at the circumference. No traces of transverse diaphragms have been noticed within the tubes.

Cases illustrative of the changes to maturity and final obliteration in the oval termination of the tubes are rare, but the following have been observed. Where the mouth becomes free and oval, the walls are thin and sharp, and perpendicular within the tube. In some cases they are in contact; but, in others, they are separated by grooves of variable dimensions, in which very minute foramina or pores may be detected. As the mouth approaches towards maturity, the grooves are more or less filled up, and the walls thicken, a row of very minute tubercles being discoverable along the crest. At this stage, the inner side of the tube ceases to be vertical, being lined by a very narrow inclined band. The mature mouths are separated by a bold ridge, generally simple, but not unfrequently divided by a groove; the double as well as the single ridge being surmounted by a row of prominent tubercles almost in contact with each other. Only one example of the filling up of the mouths has been observed, but it affords satisfactory evidence of a gradual expansion of the inner band, before alluded to, and a final meeting in the centre. In this extreme state, there is a general blending of details, but the tubercles are for the most part distinct.

In this species, proofs of a narrowing of the mouth previously to the formation of the perfect tube, and the final contraction, are not very prominently exhibited in the long cylindrical straight branches; but near the point where the tubes bent outwards, there is an annular indentation, which may be traced successively from cast to cast in a lineal direction, parallel to the surface; and between the prominent narrowing and the perfect surface, the walls of the tubes were slightly rugose. In another short branch, believed to belong to this species, but in which the tubes diverged outwards very rapidly, the narrowing is strongly marked, but not to an equal extent throughout the specimen.

The matrix, in which the fossil is imbedded, is a coarse calcareous shale, or a gray limestone; and in which occur also *Fenestella internata*, &c.

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2. STENOPORA OVATA, sp. n.

Branched, branches oval; tubes relatively short, divergence great; mouths round; contractions or irregularities of growth numerous.

The characters of this species have been very imperfectly ascertained. The branches are not uniformly oval, even in apparently the same fragment. The tubes diverged rapidly along the line of the major axis, and had but a very limited vertical growth. Their casts exhibit a rapid succession of irregularities of development. The mouths, as far as they can be determined, were round or slightly oval, and the dividing, tuberculated ridges sharp; but in consequence of the outer surface not being exposed, their perfect characters, and the changes incidental upon growth, could not be ascertained.

The coral is imbedded in a dark gray limestone.

1. FENESTELLA AMPLA, sp. n.

Cup-shaped; celluliferous surface internal; branches dichotimous, broad, flat, thin; meshes oval; rows of cells numerous, rarely limited to two, alternate; transverse connecting processes sometimes cellular; inner layer of non-cellular surface very fibrous; external layer very granular, non-fibrous; gemmuliferous vesicle? small.

Some of the casts of this coral have a general resemblance to *Fenestella polyporata*, as represented in Captain Portlock's Report on the Geology of Londonderry, Pl. XXII. A. fig. 1 a, 1 d; but there is no agreement between the Van Diemen's Land fossil, and the structure of that species as given in Pl. XXII. figure 3. of the same work, or in Mr. Phillips' original figures, Geology of Yorkshire, Part 2, Pl. I. figures 19, 20. A general resemblance also exists between *Fenestella ampla* and a coral obtained by Mr. Murchison from the carboniferous limestone of Kossatchi Datchi, on the eastern flank of the Ural mountains, but there is again a marked difference in structural details.

Fenestella ampla attained considerable dimensions, fragments apparently of one specimen covering an area of 4½ inches by 3 inches; and it displays considerable massiveness of outline, the branches at the points where they dichotimose often exceeding the tenth of an inch in breadth.

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In the general aspect of the coral a considerable uniformity prevails, but the branches vary in breadth, swelling out greatly near the bifurcations; nevertheless, there is no marked difference of character between the base and the upper part of the cup, even in the number of the rows of cells.

In the best state of the cellular surface, which has been noticed, the mouths of the cells are relatively large, round or oval, and are defined by a slightly raised margin; and an undulating, thread-like ridge winds between them, dividing the interspaces into lozenge-shaped areas. The rows of cells, immediately preceding the bifurcation, sometimes amount to ten, and after the separation generally exceed two. The mouths of the lateral rows project into the meshes; and the transverse connecting processes are sometimes cellular. The interspaces between the mouths, as well as the undulating ridges, are granular, or very minutely tuberculated. Internally, the cells exhibit the usual oblique arrangement, overlying each other, and terminating abruptly against the dorsal part of the branch. The perfect casts of the cellular surface give the reverse of the characters just noticed, but more generally the impressions display scarcely a trace of any other structure than longitudinal rows of circular mouths.

On the inner layer of the non-cellular surface, twenty well-marked parallel fibres, with intermediate narrow grooves or corresponding casts, may sometimes be detected, and the number is always considerable. The mode of preservation did not permit the true nature of the fibres to be discovered, but in consequence of what has been noticed in other species, it is inferred that they are tubular. Their range is considerable, but in the specimen, which exhibits their structure most fully, they are frequently cut off by circular foramina. Their perfect surface is minutely granular. The outer layer, or back of the branches, is composed of an uniform crust without any indications of fibres, but covered with numerous microscopic papillæ, and corresponding pores penetrating the substance of the layer.

The only indications of gemmuliferous vesicles, are small circular pits occasionally situated over the mouth, and agreeing in position with the vesicles, which in other cellular genera, have been considered as gemmuliferous. In the Russian specimen before alluded to, casts of similar pits are very uniformly distributed between the casts of the mouths.

The youngest state of the coral has not been noticed, nor have

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any marked changes incident upon age, except the gradual thickening of the non-cellular surface, by the coating over of the fibrous layer.

The matrix of the specimens is a dark grey splintery or an earthy limestone.

2. Fenestella internata, sp. n.

Cup-shaped; celluliferous surface internal; branches, dichotimous, compressed, breadth variable; meshes oblong, narrow; rows of cells 2—5, *divided by longitudinal ridges; transverse connecting processes short without cells; non-cellular surface, inner layer, sharply fibrous, outer layer, minutely granular.*

By the delicacy of its structure, this species is easily distinguishable from *Fin. ampla;* and in the rows of cells varying from two to five, as well as in their mode of development, there are further well-marked differences. It appears to have attained considerable dimensions, fragments having been noticed an inch and a-half in length and an inch in breadth.

The branches vary in width, swelling out gradually towards the bifurcations, but without any alteration in the form or size of the meshes; and as far as the state of the specimens will permit an opinion to be formed, no marked changes occurred during the development of the cup, except one about to be noticed. On the celluliferous surface of the branches, considerable, but uniform, alterations take place between the successive bifurcations. For a short distance above the point of separation, the branch is narrow and angular, and traversed along the centre by a ridge, and there is only one row of cellular mouths on each side. As the branch grew, the ridge widened, and ultimately became celluliferous, a row of mouths springing from its place (*internata*). The three ranges of cellular openings are, in this state of the branch, separated by two ridges, and these, as the development advanced, again widened and became cellular, the five rows being divided by four ridges. This appears to be the extreme stage of growth, another bifurcation taking place immediately after. In the earliest formed part of the cup only two or three rows of mouths prevail; and where the number is greater, a certain amount of irregularity in the linear arrangement is perceptible, resulting from the lateral expansion of the branch.

In the best preserved specimens, the mouths are relatively large, round or oval, and the margin is slightly raised. In the middle rows they are parallel or nearly parallel, and in the direction of the

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axis of the branch; but in the side rows they are often obliquely placed, inclining towards the meshes. In these nearly perfect specimens the dividing ridges are thread-like and slightly waved, but there is no trace of the lozenge-shaped compartments so distinctly exhibited in *Fenestella ampla*. The interspaces between the mouths are flat or slightly convex. In specimens less finely preserved, or deprived of the original surface, the mouths are not uniform in outline, and have no projecting margin. The dividing ridges are also relatively broader; and the whole surface, including the transverse connecting processes, is granular or minutely tuberculated.

The inner layer of the non-cellular surface is sharply fibrous, and the same structure may be more or less clearly detected in the transverse, connecting processes. The number of fibres on the branches do not apparently exceed twelve, and they are in general less numerous. Their range is considerable, additional ones being interpolated as the branch widens; and their surface is minutely tuberculated. No separate, circular foramina were noticed. The outer layer is uniformly granular, where completed, but every intermediate state from the sharply fibrous may be traced on the same specimen.

No distinct proofs of gemmuliferous vesicles have been observed, but in a specimen, which is believed to exhibit impressions of this species, there are occasionally to be detected, near the mouths, hemispherical casts, perfectly rounded on the surface, and evidently unconnected immediately with the interior of the cells, and which it is presumed may represent those vesicles. *Fenestella internata* appears to be an abundant fossil, one slab nearly eight inches long and six wide, being covered on both sides with fragments of it, and numerous smaller specimens occur in the collection. The matrix is chiefly a coarse gray calcareous shale, but it is sometimes a splintery limestone, or a hard ferruginous or light-coloured clay-stone.

3. Fenestella fossula, sp. n.

Cup-shaped, celluliferous surface internal; branches dichotimous slender; meshes oval; rows of cells, two; transverse processes non-cellular; inner layer of non-celluliferous surface minutely fibrous; external layer smooth or granular.

In general aspect and structural details, this species bears a great resemblance to *Fenestella flustracea* of the magnesian limestone of England, (*Retepora flustracea*, Geol. Trans., 2nd Series, Vol. III.

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l. XII. f. 8), but it differs from it in the peculiar character xhibited in the cast of the celluliferous surface, the nature of which ill be given in noticing that surface.

The principal specimen is a nearly perfect cup 1½ inches in height, nd about two inches across the widest, compressed part. There re no marked variations of character, but occasionally, irregularities of growth, due, apparently, to accidents during progressive levelopment.

The following details have been obtained from casts, no perfect surface having been noticed.—The branches had great uniformity of dimensions, swelling but very slightly at the distant points of bifurcation, and their thickness was apparently nearly equal to their breadth. The cast of the cellular surface is traversed along the centre by a sharp narrow trench (*fossula*), with nearly vertical sides, the distinguishing character between this species and *Fen. flustracea*. The cylindrical casts of the mouths, or the interior of the cells, are arranged in a single row on each side of the trench, and no increase of number is clearly perceptible at the bifurcations. Along the centre of the trench is a row of indentations or minute conical pits, a character noticeable in other species, particularly in *Fen. flustracea*. They are plainly not casts of cellular openings, but of relatively large papillæ. Traces of such projections have aso been noticed in several other instances.

The mouths of the cells, in the minute fragment which has been obtained exhibiting them, are large, round, slightly projecting, and not very distant, and in the same atom is an imperfect keel. The remains of the non-cellular surface exhibit no characters requiring notice, but indications of a striated and smooth layer have been observed.

The two specimens which afforded these structural details have a matrix of dark-coloured, hard limestone.

Hemitrypa sexangula, sp. n.

Net-work fine, hexagonal; meshes round in double rows.

The coral to which the above inefficient characters are applied, is imbedded in the shaly surface of a dark, hard limestone. It is about an inch in breadth and half an inch in height, and consists of two layers of net-work,—one presenting quadrangular meshes, and the other hexagonal, with a round, inner area; and over a considerable part of the specimen, the quadrangular network has been

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removed, whereby the connexion of the two structures is perfectly exposed.

This fossil is believed to agree completely in its essential generic characters with those of Hemitrypa (Pal. Foss. Cornwall, p. 27), but its state of preservation, and some facilities afforded by it for determining structural details, have led to an inference respecting its nature somewhat different from that given in the work just quoted.

The inner surface of *Hemitrypa oculata* (*loc. cit.*) is described as "marked with radiating ridges," having intervening "oval depressions, which penetrate only half through the substance of the coral, and no where reach the outer surface." The equivalent portion of the Van Diemen's Land specimen agrees perfectly with this statement, except in the form of the meshes or depressions; it is, however, not merely "like some Fenestellæ," but it possesses all the essential characters of that genus, and is believed to be a fragment of *Fen. fossula.* This inference is drawn from a minute portion mechanically detached, and which exhibited a row of large, round, projecting, cellular mouths. The external surface of *Hem. oculata* is described as "wholly covered with numerous round pores or cells"—"associated in double rows," and the corresponding portion of *Hem. sexangula* has been ascertained to consist also of a similar surface of double rows of round meshes or "pores," but with hexagonal boundaries; and they are shown, as exhibited by the specimen in its embedded state, to penetrate to the surface of the Fenestella or quadrangular net-work.

These details are conceived to be sufficient to establish a generic agreement between the Van Diemen's Land coral and *Hemitrypa oculata;* and an examination of an Irish specimen of that genus has fully confirmed the structural details exhibited in the "inner surface" of the specimen to which, provisionally, the name of *Hemitrypa sexangula* is applied.

Of the true nature of the "external" net-work no opinion is ventured. It is formed almost entirely of dark gray, calcareous matter, filling apparently an originally cellular structure; but there are also a few small patches of the outer covering, consisting of an opaque white crust on the surface, which was originally in contact with the external net-work. That it was a parasite little doubt is entertained, and the interesting agreement between the space occupied by the double row of meshes, and that of the parallel branches of the Fenestella arises apparently from the latter having afforded

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suitable base lines for attachment. In the Van Diemen's Land specimen, the agreement is marked by an increased breadth in the net-work, and by a row of projecting points. There is also a remarkable agreement between the arrangement of the mouths of the Fenestella and the meshes of the "inner" net-work. Similar conformities are admirably shown in Mr. Phillips's excellent figures (Pal. Foss. Pl. XIII. f. 38).

The solid portions of the structure being exceedingly fine, resembling the thread of the most delicate lace, attempts to discover satisfactorily internal characters proved unsuccessful, except in one place, where a true cellular arrangement was believed to be visible.* Of the nature of the investing crust, nothing also has been determined.

Though the name Hemitrypa may be objectionable, as applied to the corals under consideration, it has been thought right to retain the word, until the full characters of the genus shall have been ascertained.

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* A Codrington lens, half-an-inch in diameter, was invariably used in examining the corals described in this notice.

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