ART. XII.—*Descriptions of New, or Little Known, Polyzoa.*

PART IX.

BY P. H. MACGILLIVRAY, M.A., M.R.C.S., F.L.S.

[Read 12th November, 1885.]

Family GEMELLARIIDÆ.

Dimetopia hirta, n. sp.

A FORM of *Dimetopia* has been sent to me by Mr. J. B. Wilson, which, although allied to *D. cornuta*, ought to be described as a new species. The cell aperture is rounder below, the margin much thicker, and the spines much more developed. Of these there are one or two on the lower margin, three above, of which the middle is longest, and three or four on each side; the uppermost usually situated further back, and directed more posteriorly.

Family NOTAMIIDÆ.

Calwellia gracilis, Maplestone.

Zoœcia very long and slender; anterior surface flattened; a short, thick process, supporting an avicularium, on each side above.

Portland, Mr. Maplestone; Port Phillip Heads, Mr. Wilson.

This species, which seems to be very rare, was described some years ago at the Microscopical Society by Mr. Maplestone, but his paper has not been published. It differs from *C. bicornis* in the zoœcia being longer, very much more slender, and flat in front. The branches are also more straggling.

Family CELLULARIIDÆ.

Menipea funiculata, n. sp. Plate I., Fig. 8.

Zoarium continuous, dichotomously branched, branches narrow, margined by radical fibres. Zoœcia multiserial, elongated, aperture large, elliptical, with a slightly-thickened margin, and overlapped by a large sacculated fornix. On

the marginal cells there are three spines at the upper and outer angle, and one at the inner; in the central cells a single spine at each side; a sessile avicularium (usually absent) attached to the upper and outer angle of the lateral zoœcia; a sessile avicularium on the front of each zoœcium, except the lateral, usually close to the peduncle of the fornix of the adjoining cell. Zoœcia posteriorly quadrate, smooth, or faintly longitudinally sulcate. Oœcia prominent, rounded, smooth. The radical fibres forming the lateral bundles spring from the lower part of the back of the cells.

Port Phillip Heads.

Closely allied to Busk's *M. benemunita,* but distinguished by the absence of the two avicularia on the front of the central zoœcia, and the different form of the fornix.

Caberea Darwinii, Busk.

In the Challenger Polyzoa, Mr. Busk describes and figures a form from New Zealand under this name, which, he says, is identical with that previously described in the *British Museum Catalogue* as *C. Boryi,* and marked on the plate *C. patagonica.* It is not uncommon in Victoria, and I quite agree with Busk in considering it as distinct from the European species. It is characterised by the zoœcia being narrowed downwards, the lower parts and sides of the area filled in by a granular layer, with the edge of the aperture finely crenulated. In perfect specimens the fornix is of large size, filling the whole aperture, except the part corresponding to the mouth. It is nearly straight above, with frequently a small process or spur projecting upwards, and the large, downwardly extending lamina has a peculiar helicoid marking, with the spiral turned inwards. Busk does not describe or figure this appearance, showing the lamina as plain, but there can be no doubt of the identity of the species. A somewhat similar, but less developed mark, is seen in an English specimen of *C. Boryi.* In older specimens the edge of the lamina is usually worn off, and it then has a reniform or hammer-shaped appearance. The ovicell when young has the margin smooth, but this gradually becomes surrounded by a thickened band.

C. glabra, n. sp.

Zoarium expanded, flabelliform. Zoœcia biserial, slightly narrowed below, area partly filled in by a smooth plate.

Fornix, with a thick peduncle, the lamina usually expanded chiefly downwards, reniform or hammer-shaped, two spines at the outer angle above, and one, frequently of enormous size, from the peduncle of the fornix. Lateral avicularia, small; central avicularia large, irregularly placed above or below the peduncle. Zoœcia posteriorily elongated, smooth or faintly sulcate. Vibracular setæ, serrated. Oœcia rounded, arcuate or irregular in outline, flattened in front, with a thickened marginal rim.

Port Phillip Heads.

Differs from *C. Darwinii* in the smoothness of the lamina filling in the area. It is closely allied to the European *C. Boryi*, in which the cells are shorter and broader, and which has a thickened smooth band round the edge of the aperture. The oœcia are at first nearly smooth at the upper edge, but gradually develop a thickened rim.

Family FARCIMINARIIDÆ.

Farciminaria simplex, n. sp. Plate I., fig 1.

Zoarium dichotomously branched, internodes long. Zoœcia much elongated, narrow, separated by raised, slightly crenulated or smooth margins. Oœcia very large, globular. No avicularia.

Port Phillip Heads.

This species differs from the others previously described in the absence of avicularia and of spines or processes of any sort on the separating margins of the zoœcia. The oœcium is of great size, occupies a distinctly bounded space between the extremities of two cells. It is smooth, globular, but when dried becomes wrinkled, and has a depression round the upper edge and sides, showing the marginal walls, owing to the shrivelling of its delicate outer envelope, which seems to be separated by some distance from the inner part.

Family BEANIIDÆ.

Beania conferta, n. sp. Plate I., fig 5.

Zoœcia large, each connected with six others by very short tubes; six large spines above, of which two from the summit project directly upwards, a similar pair (one on each side), originating a little farther back, pointing in the same direction, and the third pair, arising opposite the lower edge of the mouth, projecting upwards and forwards, and curved inwards at their bases; on each side of the aperture a double

row of long, stout spines, the outer directed forwards and outwards, and the inner series, alternating with these, arching close over the front of the cell, and meeting in the mesial line. Dorsal surface smooth, glassy; in many, especially the marginal cells, a round mark on each side towards the base, probably marking the attachment of a radical fibre. No avicularia.

Portland, Mr. Maplestone; Port Phillip Heads, Mr. J. B. Wilson.

This species is readily distinguished from the other Australian forms by the closeness of the cells, the six large spines at the anterior extremity, and the absence of avicularia. The peculiar arrangement of the marginal spines, alternately directed outwards and inwards, is not constant, but when present is very striking. It is evidently very closely allied to the form described from Algiers by Mr. Hincks as *Diachoris hirtissima*, var. *robusta*, from which it differs in having two instead of three superior spines, and in the total absence of avicularia. This and Heller's *D. hirtissima*, in both of which avicularia are absent, clearly prove the invalidity of *Diachoris* as a genus, the only reason for distinguishing which from *Beania* consists in the presence of these organs.

Family FLUSTRIDÆ.

Craspedozoum, n. genus.

Zoarium uni- or bilaminate, in strap-shaped divisions; each branch bordered in its whole extent by a bundle of radical fibres springing from the bases of the lateral zoœcia. Zoœcia quadrate, area partly filled in by a thickened lamina. Oœcia external, with a thickened rim or band at or near the margin, usually produced at the summit into a more or less prominent point.

In the *Annals and Magazine of Natural History* for August, 1881, Mr. Hincks described and figured a remarkable form from near Port Curtis as *Membranipora roborata*, pointing out at the same time the doubtfulness of its position, its characters being intermediate between those of *Flustra* and *Membranipora*, and agreeing with Gray's *Flustramorpha* in the presence of a lateral band of radical fibres. This species occurs also at Port Phillip Heads and Portland (Maplestone). At the Heads two other species have also been found, agreeing with it in their essential

generic characters, but differing in being unilaminate, and in some other points of specific value. There can be no doubt that these ought to be formed into a distinct genus, to which also, probably, Mr. Busk's *Flustra membraniporides* (*Challenger Polyzoa,* p. 54) belongs. He, however, neither figures nor describes the marginal bundle of radical fibres, which, however, may (as in *Menipea*) not be of generic value. *Flustramorpha,* if Busk's species are rightly referred to that genus, has a totally different zoœcial structure.

C. ligulatum, n. sp. Plate I., fig. 3.

Zoarium unilaminate; branches narrow, dichotomously divided. Zoœcia multiserial; a small spine at each upper angle. A single avicularium, with a triangular-pointed mandible at the base of each cell. Oœcia rounded above and slightly pointed, with a thickened margin, usually produced into a small point at the summit.

Port Phillip Heads; New Zealand, Miss Jelly.

Differs from *C.* (*Membranipora*) *roboratum* in being unilaminate, the branches being very much narrower, and consequently the rows of zoœcia fewer, and in there being only one avicularium at the base of a cell.

C. spicatum, n. sp. Plate I., fig. 2.

Zoarium unilaminar, dichotomously divided, the branches narrow. Zoœcia multiserial, rhomboidal; area broadly elliptical, the margin thickened, crenulated, the plate filling in the lower part finely granular; the central zoœcia with a spine on each side above, the marginal with two on the outer angle above, the lower of which is much larger. A sessile avicularium at the base of each zoœcium. Oœcia not prominent, nearly quadrate, a thickened band from each side of the opening passing upwards and inwards, meeting in the centre and produced upwards as a long sharp spike.

Port Phillip Heads, Mr. J. B. Wilson.

Family ESCHARIDÆ.

Schizoporella pulcherrima, n. sp. Plate I., fig. 6.

Zoœcia separated by narrow raised lines, broad and nearly flat, surface traversed by faint lines converging from minute pores or depressions at the margin; mouth very wide, edge thickened, contracted towards the base, and the lower lip

forming a slightly hollowed sinus or nearly straight. A broadly elliptical avicularium placed obliquely on each side of the mouth.

Port Phillip Heads.

The structure of the mouth approximates to that of *Gemellipora striatula.*

Smittia cribraria, n. sp. Plate I., fig. 7.

Zoarium encrusting. Zoœcia large, separated at the growing edge by raised lines; towards the older parts distinct, but the separating line not raised; whole surface occupied by large, closely set foramina, largest at the circumference; a hammer-shaped denticle in the oral sinus. Oœcia rounded, smooth or pitted, sub-immersed.

Port Phillip Heads.

On one or two of the zoœcia there is what seems to be an avicularium with an enormous flat, rounded mandible similar to that described by Hincks on *Lepralia bifrons.*

Family ADEONIDÆ.

In the Challenger Polyzoa Mr. Busk proposes a new genus *Adeonella,* which with *Adeona* (including *Dictyopora*) he places in a family Adeoneæ. Under *Adeonella* he places a number of species previously undescribed or referred to the old incongruous genus *Eschara.* These, as mentioned by him, differ from *Adeona* chiefly in the absence of a flexible stem, agreeing in the presence of distinct avicularian cells, oœcial cells and in the curious articular processes of the avicularian mandibles, as well as in the presence of a suboral pore or cluster of pores. These pores, however, as recently pointed out by Mr. Waters (*Quart. Journ. Geol. Soe.,* Aug., 1885), differ essentially in several of the species. In one group, to which he would restrict the generic name, represented here by *A. platalea* (Busk) and *A. dispar* (M'G.), the pore is formed by the growth of the peristome, and in reality opens into its tube external to the operculum and true mouth, while in the other group the pore or pores open into the body-cavity below the mouth. These last, with *Adeona* and *Dictyopora,* in which the structure is similar, he refers to *Microporella.* I cannot agree with this view, and it seems to me that Busk is quite right in forming a separate family. The characters chiefly are that in the Adeonidæ, in addition to the ordinary zoœcia, there are other purely avicularian

cells. There are no external oœcia, as in *Microporella,* but the ova seem to be developed in specially modified zoœcial cells (not, however, yet observed in some of the species), and all the avicularian mandibles (whether from the avicularian cells or from the zoœcial avicularia) have a small process at each articular angle which, so far as is at present known, is confined to this family. Busk's *Adeonella,* however, ought to be divided into two, the *Adeonellæ* proper, where the pore is external; the other where it is zoœcial (opening into the cavity of the cell). The species here described belong to the second group, to which the generic name *Adeonellopsis* may be given. It would include also *Eschara mucronata* (M'G.)

Adeonellopsis foliacea, n. sp. Plate II., fig. 1.

Zoarium large, foliaceous, lamina twisted so as to form a cellular mass. Zoœcia rhomboidal, quincuncial, separated by distinct grooves; surface pitted, a median pore or pores (when fresh obscured by the epitheca); mouth arched above, straight below; a median avicularium below the mouth, with the mandible pointed directly upwards and projecting beyond the lower lip, and one smaller on each side (occasionally absent), directed inwards and slightly downwards. Oœcial cells very large, convex, pitted and tuberculated like the ordinary cells.

Westernport, Mr. J. B. Wilson.

Mr. Wilson has also sent me a variety in which the zoarium is not foliaceous and cellular, but with branches narrower, anastomosing, and much twisted. The zoœcial characters, however, are identical; Both forms attain a large size, the specimen of the first, which is broken, measuring 6 in. x 5 in., with a depth of nearly 4 in.

A. latipuncta, n. sp. Plate II., fig. 5.

Zoarium expanded, foliaceous, simple or convoluted. Marginal cells convex, with a large circular area on the front, occupied by a cluster of 6—10 fimbriated pores; mouth arched above, slightly hollowed below. Older cells with the edge much raised, leaving the perforated area in a depression. A large central avicularium below the mouth with the long narrow mandible pointed directly upwards. Colour, yellowish brown.

Port Phillip Heads.

A. parvipuncta, n. sp. Plate II., fig. 4.

Zoarium small, erect, branched, the branches broad and flat. Youngest zoœcia elongated, convex, mouth arched above, straight or slightly projecting below; a small, round, smooth or dentate pore below the mouth. Older cells distinct, rhomboidal, quincuncial, the lateral parts much raised, convex, inclosing the mouth and pore in a deep hollow; pore single, and usually elongated and denticulate in the zoœcial cells, in the oœcial, which are broader, the depression is occupied by several denticulate or stellate pores. Small, triangular avicularia scattered on the edges of the cells and frequently on slight eminences by the sides of the mouth. Large vicarious avicularia, with triangular mandibles, arranged on the free edges of the branches.

Port Phillip Heads.

A. australis, n. sp. Plate II., figs. 2 and 3.

Zoarium erect, formed of irregularly-divided branches, flat, narrow, twisted, and truncate at the extremities. Zoœcia rhomboidal, convex, narrowed below, separated by finely crenulated, raised lines. A small, central, stellately perforated depression. Mouth arched above, straight below. A median avicularium below the mouth, with the triangular mandible directed obliquely upwards; frequently another avicularium towards the base of the cell. Oœcial cells very broad, with the mouth much wider and shallower, not very convex; occasionally with two lateral oral avicularia in addition to the central one. Vicarious avicularia very large, with triangular mandibles, interspersed among the zoœcial cells, but more frequent on the margins of the branches.

Port Phillip Heads. Common.

Bracebridgia, n. gen.

Zoarium erect, bilaminate, branched. Zoœcia distinct, entire; mouth subcircular, with an internal denticle; peristome raised, thick. Avicularian cells on the free edges of the lobate branches, the triangular mandibles with a projecting articular process at each lower angle. Oœcia ?

B. pyriformis, Busk, sp. Plate II., figs. 6 and 7.

(*Mucronella pyriformis*, Challenger Polyzoa, p. —)

The Zoarium attains a height of one or two inches, and consists of flat branches with lateral lobes, the various

branches usually more or less twisted on themselves. The Zoœcia are pyriform, separated by deep grooves; the mouth is subcircular, with a broad denticle internally and occasionally a small apiculate process on the lower lip. There is an elevated ridge round the mouth, the two sides meeting below the lower edge and continuing down the cell as a central elevation. The surface is smooth, or, especially in young cells and on the raised portion, minutely granular. As age advances the divisions between the cells become much fainter, the cells themselves are squarer, and the mouth appears as a circular opening surrounded by a broad tumid margin. Many of the cells are also completely closed. One very young specimen (fig. 7) rises as a small bifid lobe from an encrusting base. Towards the edge of the encrusting part many of the cells are closed or not properly formed, while both external and internal to these are some where the mouths have clear, narrowly elevated margins, with an apiculate mucro below and, in a few, a broadly elliptical avicularium across the front of the lower lip. I have not seen these oral avicularia in any other specimen. On the free edge of the lobate branches, in most specimens, there is a single row of avicularian cells.

This species, which is common, has been described by Mr. Busk in the Challenger Polyzoa, and doubtfully referred to *Mucronella*. There can, however, be no question that it ought to form the type of a new generic group, and I have much pleasure in associating it with the name of my friend, Mr. J. Bracebridge Wilson, who has done so much to advance our knowledge of the marine zoology and botany of Victoria. Its systematic position, however, is doubtful, and it ought perhaps to be included in the Escharidæ.

Family Celleporidæ.

Pœcilopora, n. genus.

Zoarium erect, bilaminate, branched. Zoœcia indistinct; primary mouth, with a sinus; peristome commencing as an elevated point, with a small avicularium on the summit, finally becoming a tumid, subcircular ring. Oœcia immersed, closed by a perforated plate.

P. anomala, n. sp. Plate I., fig. 9.

Of this very curious species, I have only one good specimen, for which I am indebted to Mr. Wilson, and two or

three imperfect fragments. The zoarium is small, branched, bilaminate. The youngest zoœcia and those at the margins of the branches have one side produced into a long point, with a small avicularium on the inner surface at the summit. As age advances the summit disappears, and the mouth becomes surrounded by a tumid peristome, with the avicularium usually on the outer part of the ring. The pointed process, with its surmounting avicularium, seems to be formed before the operculum, as in the cells showing these parts it cannot be detected. In a few older cells, where the peristome is developed into a thick circular ring, the internal mouth can be seen with a slit on its superior side, that is, towards the *upper* end of the branches. On the basal side of the mouth is a perforated plate, which at first I thought was an ordinary zoœcial opening similar to that of *Microporella renipuncta.* It is, however, in reality the opening of the oœcium. In young cells this appears first as a cup-shaped elevation, which becomes covered by a perforated plate, and gradually sinks into the substance of the zoœcium. The most curious circumstance is that, although it would appear to be below the mouth, it is really above it, owing to the peculiar reversal of the mouth. It is evidently closely allied to *Lekythopora hystrix* (M'G.), where the oœcia and oral avicularia are similar. The shape of the operculum is similar in both, but I have not yet made the necessary examination to ascertain if the position of the oœcium in *Lekythopora* is also superior, although seemingly inferior. The two species are most remarkable, and I hope shortly to be able to give a more detailed account of their structure.

Family HORNERIDÆ.

Idmonea interjuncta, n. sp.

Zoarium dichotomously branched, branches spreading irregularly, intricate, occasionally anastomosing; numerous bundles of prismatic, calcareous, radical tubes, passing from the back of the branches, and attached either to the surface on which it grows or to other branches. Zoœcia usually four in a series, of which the inner is shortest, turned much forward, united side to side, separated by distinct grooves, surface thickly covered with projecting pores. Posterior surface finely grooved longitudinally, covered with elevated perforations as in front; surface marked by obscure, transverse, concentric ridges.

Port Phillip Heads, Mr. J. B. Wilson.

This is so close a repetition of *I. Milneana* in miniature that I was at first disposed to rank it as a slender variety of that species. It differs in being very much more slender, the branches more interlacing, the colour dirty white instead of green, and in the branches being joined to each other in many instances by the long, calcified bundles of tubes.

EXPLANATION OF FIGURES.

Plate I.

Fig. 1. *Farciminaria simplex*, natural size. Fig. 1*a*. Outline of portion magnified, showing an oœcium.

Fig. 2. *Craspedozoum spicatum*, natural size. Fig. 2*a*. Portion magnified.

Fig. 3. *C. ligulatum*, natural size. Fig. 3*a*. Portion magnified.

Fig. 4. Portion of specimen of *C. roboratum* (Hincks sp.), natural size, to contrast with Fig. 3.

Fig. 5. Zoœcium of *Beania conferta*, magnified.

Fig. 6. *Schizoporella pulcherrima*; the left-hand cell is evidently formed by the fusion of two.

Fig. 7. *Smittia cribraria*.

Fig. 8. *Menipea funiculata*, natural size. Fig. 8*a*. Portion magnified.

Fig. 9. *Pœcilopora anomala*, natural size. Fig. 9*a*. Portion from the extremity of a branch, magnified, one of the zoœcia showing the internal or primary mouth. Fig. 9*b*. Portion from the growing edge. Fig. 9*c*. Another portion showing the growth of the oœcium.

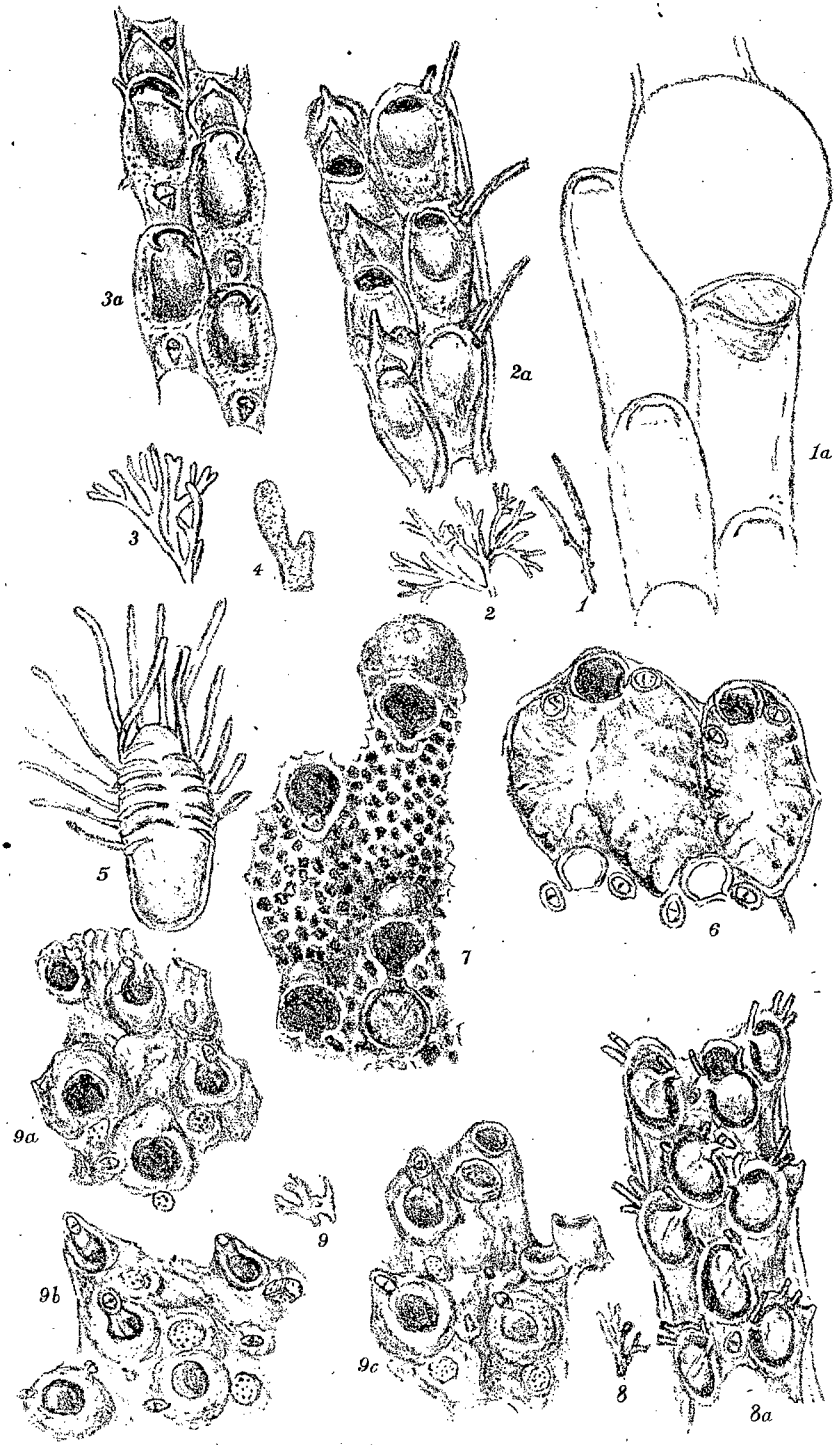
Plate II.

Fig. 1. Zoœcium and oœcial cell of *Adeonellopsis foliacea*. Fig. 1*a*. Avicularian cell of same.

Fig. 2. *A. australis*, natural size. Fig. 3. Portion of another specimen magnified, showing ordinary zoœcia, a closed zoœcium, and two avicularian cells. Fig. 3*a*. Another portion of the same to show an oœcial cell.

Fig. 4. *A. parvipuncta*, natural size. Fig. 4*a*. Portion magnified.

Plate I



P.H. McG. del & lith

C. Troedel & Co imp

Plate II.

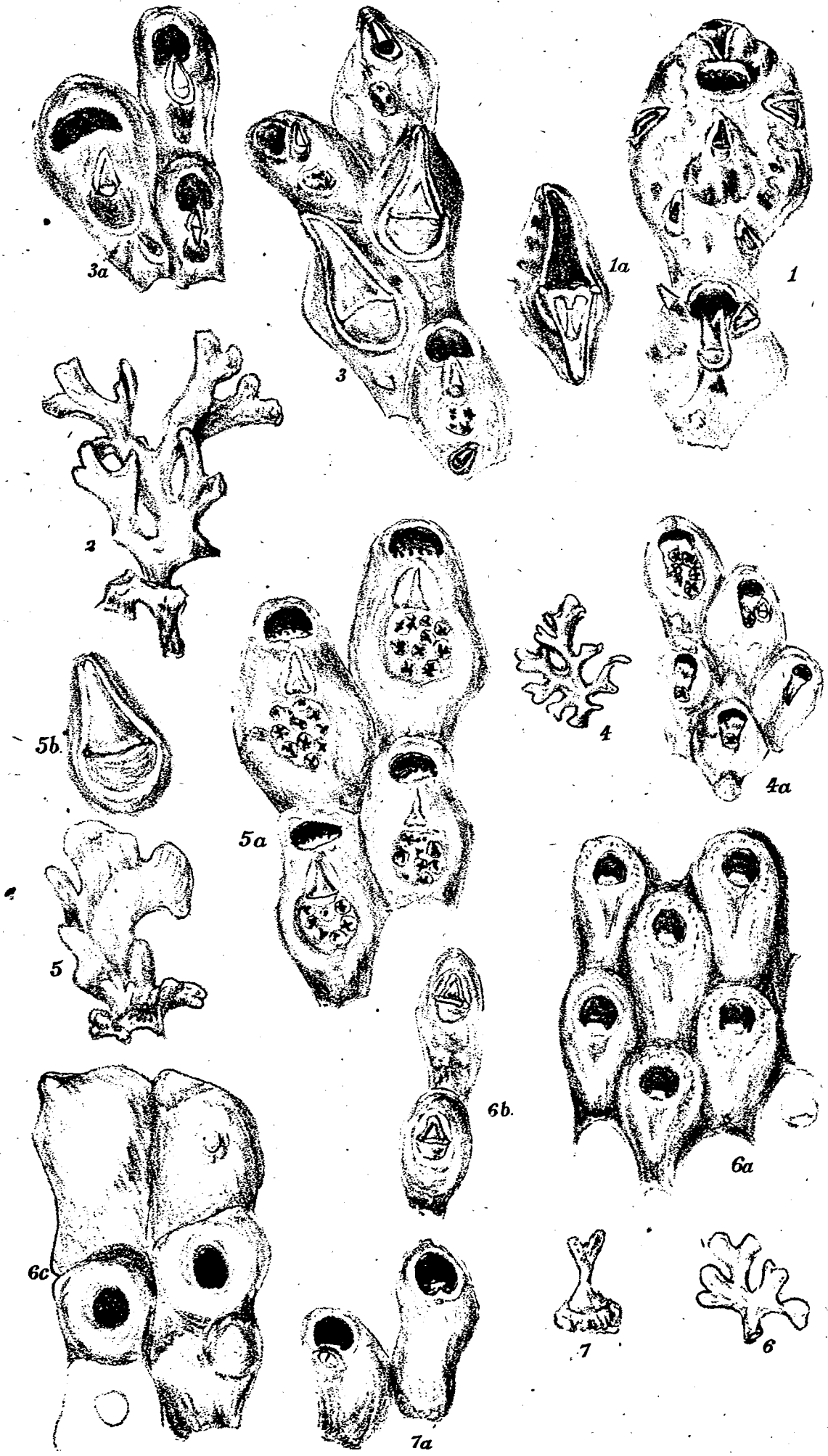


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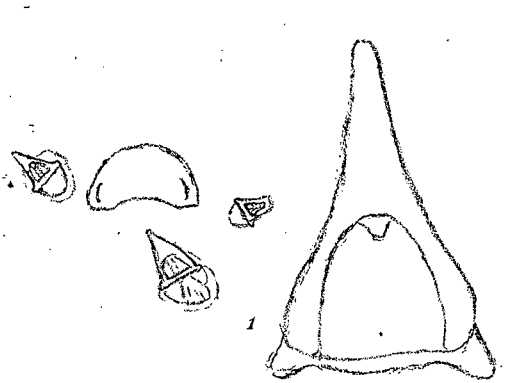
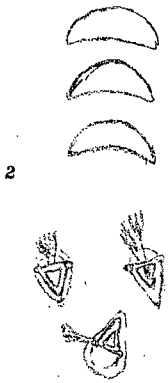
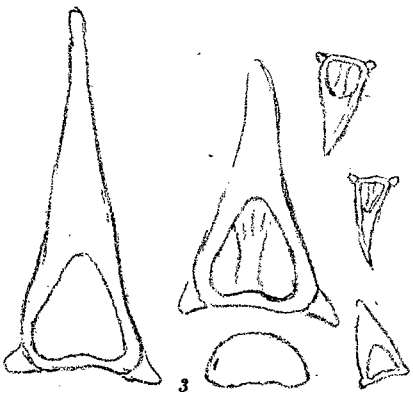
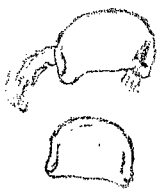
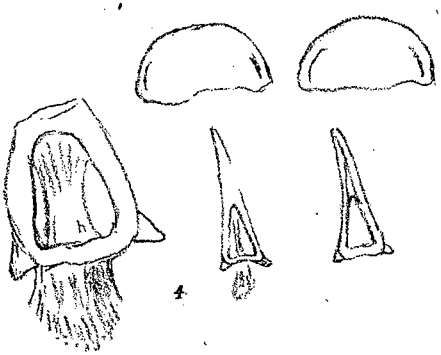
Plate III

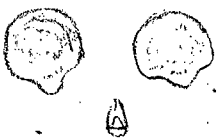












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P.H. Mc G. del & lith.

C. Troedel & Co imp

Fig. 5. *A. latipuncta,* natural size. Fig. 5*a*. Portion magnified. Fig. 5*b*. Avicularian cell.
Fig. 6. Portion of specimen of *Bracebridgia pyriformis,* natural size. Fig. 6*a*. Portion of the same magnified. Fig. 6*b*. Two avicularian cells from the free edge. Fig. 6*c*. Portion of older part of same zoarium. Fig. 7. Young specimen, natural size. Fig. 7*a*. Two Zoœcia from the same, showing an apiculate mucro and an oral avicularium.

PLATE III.

Chitinous parts of—

Fig. 1. *A. foliacea.*
Fig. 2. *A. parvipuncta.*
Fig. 3. *A. australis.*
Fig. 4. *A. latipuncta.*
Fig. 5. *Bracebridgia pyriformis.*
Fig. 6. *Pœcilopora anomala.*

ART. XIII.—*On an Apparatus for Utilising the Force of the Tides.*

BY MR. LOCKHART MORTON.

[Read December 10th, 1885.]

ART. XIV.—*On an Apparatus for Determining the Stability of Ships.*

BY C. W. M'LEAN.

[Read December 10th, 1885.]