35. *On some BRYOZOA from the INFERIOR OOLITE of SHIPTON GORGE, DORSET.* By EDWIN A. WALFORD, Esq., F.G.S.—Part I. (Read April 3, 1889.)

[PLATES XVII.—XIX.]

So little attention appears to have been paid by British palæontologists to the Jurassic Bryozoa, that a few scattered papers constitute the literature of the subject, and hardly a dozen new forms have been described since the appearance of Haime's Monograph in 1854. In a paper on some Lias Polyzoa *, I believe I have given the titles of nearly all of the papers. Mr. Vine's Richmond report † and two later contributions complete the list. This neglect can scarcely be accounted for by the absence of material to work upon, for though the argillaceous seas of the Lias were not favourable to the development of the Bryozoa, either in numbers or species, yet under the calcareous conditions of the Inferior and Great Oolite the contrary was the case. The reason may be sought for, perhaps, in the frequently unsatisfactory state of preservation of the delicate features necessary for their study, as well as in the difficulties into which the classification has drifted. Certain it is that too many species have been created out of ill-preserved examples, and thus another barrier has been raised in the way of systematic nomenclature. It can scarcely, however, be said that there is yet formed a natural system of classification for the division to which most of the Lower Jurassic forms belong.

In 1885, when studying the Inferior Oolite in the neighbourhood of Bridport, I detected in a small quarry some marly beds rich in numerous species of Bryozoa, and containing an otherwise remarkable fauna—Echinoderms, small Brachiopods (*Crania*, *Thecidea*, &c.), Sponges, and Foraminifera. The tranquil conditions prevailing during the deposition of the beds are indicated by the presence of so many slender and arborescent forms of Bryozoa, as well as by the Crinoids and Sponges. That the horizon of the Inferior Oolite in which the forms mentioned are found is the upper division is shown by the presence of a few characteristic shells, notably *Terebratula Phillipsii*, *Crania canalis*, Moore, and *Acanthothyris panacanthina*, Buckm. & Walker. The zone is apparently that of *Ammonites Parkinsoni*. It is worth note that Eug. Deslongchamps ‡ quotes a somewhat similar fauna of Echinoderms, Bryozoa, and Sponges as occurring in the "Oolithe Blanche" of Calvados.

The following section will illustrate the position of the calcareous

* "On some Polyzoa from the Lias," by E. A. Walford, F.G.S., Quart. Journ. Geol. Soc. vol. xliii. (1887), p. 632.

† "On Polyzoa found in the boring at Richmond, Surrey," by G. R. Vine, Quart. Journ. Geol. Soc. vol. xl. (1884), p. 784.

‡ Etudes Jurass. Inf. de la Normandie, par M. Eug. Deslongchamps, p. 109 (Paris & Caen, 1864).

Q. J. G. S. No. 179.

argillaceous beds from which the series of fossils has been collected:—

Quarry (Inferior Oolite) near New Inn, Shipton Gorge.

	ft.	in.
1. Humus	1	2
2. Compact grey limestone, weathering brown, broken and rubbly.....	1	9
3. Grey and brown marls, with fragments of limestone, Bryozoa, Sponges, &c.....	0	4
4. Broken limestone, rather argillaceous	0	6
5. Grey and brown marly clay, with Bryozoa, Sponges, &c.	1	2
6. Compact grey limestone, somewhat marly and oolitic. Base not shown	3	0

From this one locality I am able to recognize about fifty different forms representing twelve or more genera, the number being nearly equal to the whole of those described by Haime from the Lias to the Kimeridge Clay.

At the outset one has to consider the question as to how far it is possible, or rather practicable, to travel in the recognition of cell-form and disregard of zoarial growth. Certainly, to put the latter wholly aside would, in the present state of classification, lead to utter confusion, and hence, for a time, the present system must be adhered to. Nevertheless, it will be necessary to acknowledge the great variability of zoarial form, a fact which Prof. Smitt's series of papers * has demonstrated beyond a doubt. To some extent it will be my endeavour to follow, in the examination of this series of fossil Bryozoa, the laws of evolution he has so well traced.

Successive writers have suggested divisions for the Cyclostomata, which each author in turn has modified or altered, but amongst them the simple divisions of Mr. Waters †, based upon the Hincksian system, seem most feasible. He proposes "that we should divide the Cyclostomata into two subdivisions, namely, first the *Parallelata*, or those in which the surface of the zoarium is to a considerable extent formed of the lateral walls of the zoecia, of which *Crisia*, *Entalophora*, *Diastopora*, and *Tubulipora* may be taken as types; and, secondly, the *Rectangulata*, or those in which the zoecia or cancelli open for the most part at right angles to the axis or surface of the zoarium or subcolony, of which *Heteropora*, *Lichenopora*, &c. may be taken as typical." Still later, Marsson in his beautifully illustrated memoir on the Bryozoa of the Rügen Chalk ‡, re-arranges the Cyclostomata, leaning largely upon the character of the subsidiary cells, the importance of which he thinks has been overlooked. Students of the Hincksian system will look, however, with dismay at a classification which groups under one family *Heteropora* and *Spiropora*, whilst it widely separates *Defrancia* and *Diastopora*.

* "Kritisk Forteckn. öfver Skand. Hafs-Bryozoen," af F. A. Smitt, Öfvers. af K. Vet.-Akad. Förh. 1864-8 & 1871.

† "On Tertiary Cyclost. Bryozoa from New Zealand," by A. W. Waters, Quart. Journ. Geol. Soc. vol. xliii. (1887), p. 337.

‡ "Die Bryozoen der weiss. Schreiekr. der Insel Rügen," Päl. Abh. Dames u. Kayser, Band iv. Heft i. (Berlin, 1887).

Pergens and Meunier, in their description of the Faxoe Bryozoa *, point out the deficiencies in d'Orbigny's system, and add that in their opinion the time for a new classification has not yet arrived. They base their work upon the Smitt-Hineksian system, without, however, as they state, acknowledging the pretended constancy of the zoöcial orifice, which presents remarkable differences in many of the species. We must acknowledge the keenness of their criticism when they go on to say that to substitute one classification based principally upon a single character, that of the mouth of a cell, for that which has in view the form of a colony, is to replace one artificial classification by another almost further removed from the reality, and leads to ignoring what are really the staple characters in one division when applied to the other.

Suborder CYCLOSTOMATA.

Division **Parallelata**.

Family TUBULIPORIDÆ.

Genus STOMATOPORA.

Stomatopora, Bronn, Pflanzenth. p. 27 (1825).

1. STOMATOPORA DICHOTOMA, Lamx.

Alecto dichotoma, Lamouroux, Exp. méth. des genres des Pol. p. 84, pl. 81. figs. 12, 13, 14 (1821).

Aulopora dichotoma, Goldfuss, Petref. Germ. t. i. p. 218, pl. 65. fig. 2 (1833).

Alecto dichotoma, Morris, Catalogue of Brit. Fossils, p. 30 (1843); Michelin, Icon. Zoophyt. p. 238 (1846), *non* pl. 2. fig. 10, p. 10.

Stomatopora dichotoma, Haime, Descr. des Bryozoaires Foss. de la Form. Jurass. p. 160, pl. 6. fig. 1, Mém. Soc. Géol. de France, 1854; Reuss, Bryozoen, Anthoz. u. Spong. d. braun. Jura v. Balin bei Krakau, p. 2, pl. 1. fig. 4, Abhandl. Akad. d. Wissensch. Wien, mathem.-naturw. Cl. xxvii. Bd. (1867); Brauns, Die Bryozoen des mittl. Jura der Gegend v. Metz, p. 320, Zeitschr. d. deutsch. geolog. Gesellschaft, Jahrg. 1879; Vine, Polyzoa found in the Boring at Richmond, Surrey, p. 786, fig. 1, Quart. Journ. Geol. Soc. vol. xl. (1884); Vine, Notes on the Polyzoa of Caen and Ranville, p. 12, Journ. Northampton. Nat. Hist. Soc. & Field Club (1888).

Zoöcial length 0·6 millim., width 0·3; aperture 0·07.

I find two slightly diverging forms—the typical one with measurements as quoted, and agreeing well with Haime's figures †; the other, as figured by Reuss ‡, with rather shorter and more puffed-

* "Bryoz. Garumn. de Faxe," Ann. de la Soc. Malacolog. de Belg. t. xxi.

† "Descr. des Bryozoaires Foss." par Jules Haime, Mém. Soc. Géol. de France, 2^e série, t. v. pl. 1. fig. 1 (1854).

‡ "Bryozoen, Anthoz. u. Spong. d. braun. Jura v. Balin bei Krakau," Abh. Akad. d. Wissensch. Wien, mathem.-naturw. Cl. xxvii. Bd. 1867, Taf. 1. fig. 3b.

out zoecia (length 0·5 millim., width 0·4), with greater dilatation at the base. Haime describes the species as varying in different localities from $\frac{1}{3}$ to $\frac{1}{2}$ millim. in the width of the zoecia, and the length of the zoecia he cites as generally three or four times the diameter of the peristome. The Dorsetshire forms from the Inferior Oolite are slightly longer than Haime's from the Great Oolite. Occasionally one or more cells will become dilated and inflated at the proximal end, presenting quite a different zoecial type. The Ranville specimens from the Forest Marble are of Reuss's type; and the figures in 'Petrefacta Germaniæ,' pl. lxx., indicate two kinds of cells. Smitt* places *St. dichotoma*, M.-Edw. (?), under his β , forma *serpens* of *Tubulipora incrassata*, d'Orb.

2. STOMATOPORA SPIRATA, sp. nov. (Pl. XVIII. figs. 6 a, b.)

Zoecial length 0·2 to 0·3 millim., width 0·2 to 0·26; aperture 0·06.

Zoarium adnate, with uniserial zoecia disposed in a semicircular or spiral series of from ten to twenty without bifurcation. Zoecia short, only one third longer than wide, cylindrical, slightly decreasing in size from base to mouth, free for about one third of their length. Basal part of zoecia elevated, and without widened margins. The exert part narrows but very little towards the aperture. Aperture oval. Surface punctulate. Ovicells(?).

The species is well distinguished by the short cylindrical zoecia with slightly elevated bases and regular arrangement. Rare.

3. STOMATOPORA DICHOTOMOIDES, d'Orb.

Stomatopora dichotomoides, d'Orbigny, Paléont. Franç., Terr. Crét. t. v. p. 834 (1850-52); Haime, Descr. des Bryozoaires Foss. de la Form. Jurass. p. 163, pl. 6. fig. 2, Mém. Soc. Géol. de France, 1854; Brauns, Die Bryozoen der mittl. Jura der Gegend v. Metz, p. 322 (1879); Reuss, Bryozoen, Anthoz. u. Spong. d. braun. Jura, p. 3 (1867); Vine, On Polyzoa of Caen and Ranville, p. 12 (1888).

Zoecial length 0·6 millim., width 0·17 to 0·1; aperture 0·06.

The elongated slender zoecia of subconical form seem to fairly distinguish the species.

Haime† figures the zoecia widening from distal to proximal extremity; one meets, however, with a varying form in which the cells are leathern-bottle-shaped.

Var. ATTENUATA. (Pl. XVIII. fig. 9.)

Zoecial length 0·6 millim., width 0·2; aperture 0·07.

Zoarium uniserial, but with zoecia of nearly uniform thickness, excepting the slightly tapering free part, which rises almost vertically, and is $\frac{1}{3}$ the length of the whole cell. The adherent part of the zoarium is scarcely dilated. I can detect two kinds of surface-

* "Krit. fort. öfver Skand. Hafs-Bryozoer," af F. A. Smitt, Öfvers. af K. Vet.-Akad. Förh. 1866, p. 402.

† "Descr. des Bryozoaires Foss." par Jules Haime, Mém. Soc. Géol. de France, 2^e série, t. v. pl. 1. fig. 1 (1854).

pores: the larger are few in number, tubular and slightly exsert; the smaller are exceedingly fine, and cover the whole surface. Aperture oval.

It will be seen, by reference to the figure, that the zoecia have scarcely any of the claviform character of Haime's type. The preservation of the delicate terminations is due to the protection given by a colony of large *Proboscinae*, which occupy the interior of the same Aviculoid shell.

4. STOMATOPORA PORRECTA, sp. nov. (Pl. XVIII. figs. 7 a, b, 8.)

Zoecial length 1 to 1.6 millim., width 0.23; aperture 0.1.

Zoarium dichotomously branched, with uniserial, very lengthened, and sinuous (*Serpula*-like) zoecia. Zoecia rather irregularly cylindrical, coarsely wrinkled, and punctate. The exsert part of the cell is but slightly raised, and is ordinarily about $\frac{1}{3}$ of the whole in length; the terminations, however, do not seem to be perfect. Aperture oval. Ovicell (?). If the shield-like body (Pl. XVIII. fig. 8), from beneath which the branches emerge, should be the ovicell of the species, it will be of a different type from the surface-inflations of the zoarium common in the genus. The tubular surface-pores on it are the same as on the cylindrical zoecia.

The long *Serpula*-like zoecia with coarse transverse wrinkles are fairly distinctive. It is open to question whether the fragment of a Lias fossil, figured on plate xxv. fig. 10, vol. xliii. Quart. Journ. Geol. Soc., is referable to the same species, as I at one time supposed it to be: there the free part of the cell is much longer. The "Calcaire à Polypiers" at Ranville, Calvados, yields a similar form to *S. porrecta*.

5. STOMATOPORA, sp.

Zoarial length 0.4 to 0.5 millim., width 0.3; aperture 0.1.

Zoarium adnate, composed of a linear series of ten inflated and conical zoecia without dilatation at the base. Zoecia transversely wrinkled and coarsely punctate. Aperture oval.

There are one or two perforations in each cell about 0.3 millim. in diameter at irregular distances below the peristomes, recalling the features of certain Chilostomatous cells. The example, however, is a solitary one and ill-preserved. *Stomatopora granulata*, M.-Edw., is nearly related to it.

PROBOSCINA.

Proboscina (pars), Audouin in Savigny, Descr. de l'Egypte, p. 236 (1826).

Proboscina, d'Orbigny, Paléont. Franç., Terr. Crét. t. v. p. 884 (1854).

So slight are the distinctions between the genera *Stomatopora* and *Proboscina* that it has been more as a matter of convenience in this individual instance that I have placed the uniserial forms under the head of the former, than from any sense of there being a natural line

of demarcation between the two genera. The series to be subsequently dealt with furnish a good illustration of the wide variation in mode of growth of one zoöcial type, and it has only been by the collection of a large number of examples that the connecting-links have been found. Forms of considerable difference in size of cell and aperture are seen to go through similar phases of zoarial growth, so that one cannot do otherwise than recognize their close relationship. Just as Prof. Smitt has shown *Tubulipora incrassata*, d'Orb., to pass through the stages of *Stomatopora* and *Proboscina* to that of *Tubulipora*, so I shall endeavour to demonstrate the stages of growth of one type from *Stomatopora* to *Proboscina*, and thence to *Tubulipora* or *Diastopora*. Hincks has also pointed out how shadowy are the distinctions between these genera. At present, however, no more satisfactory method of classification seems to be practicable than the one now in use; hence the forms will be placed under the old family names, but with a uniform specific name.

The group for illustration is figured on Pl. XVII. figs. 1, 2, 3, 7, 8, and Pl. XVIII. figs. 10, 11, 12. Its earliest stage is that of a *Stomatopora* with uniserial zoöcia and widely dilated margin (Pl. XVII. fig. 1), merging into an irregular bi- or triserial growth (Pl. XVII. figs. 2, 3). The anastomosing of the branches is frequently so dense as to produce a *Diastopora*-like colony (Pl. XVII. fig. 8), and all intermediate phases of growth are met with. Such colonies are frequently recognizable by the trailing lines of the branches (Pl. XVII. fig. 7), but forms occur (Pl. XVII. fig. 8) which are not distinguishable from *Diastopora* of the ordinary discoid growth. When the zoöcia are thus massed there is a tendency to the production of erect branches, as shown in the capitulum on the colony (Pl. XVII. fig. 7), and though it is not at present clear, there is reason to suppose that the form subsequently described as *Entalophora magnipora* (Pl. XIX. figs. 11, 12) may be the erect stage. The interweaving of the Stomatoporoid branches gives rise to another phase of growth (Pl. XVIII. figs. 10, 11, 12), Tubuliporoid, and it will be seen that the ventricose forms approach *T. ventricosa*, Busk. Considerable variability is also met with in the shape of the zoöcia: some are cylindrical throughout, whilst others have the exsert parts conical, or, again, they may be leathern-bottle-shaped (utriform). The dimensions of the zoöcia in width vary from 0.3 millim. to 0.5 millim., the apertures from 0.13 millim. to 0.2 millim.

1. PROBOSCINA SPATIOSA, sp. nov. (Pl. XVII. figs. 1-3.)

Zoöcial length 1.16 to 0.5 millim., width 0.5 to 0.7; aperture 0.13 to 0.2.

Zoarium adnate, ramose, varying from a uniserial to an irregular bi-, tri-, or multiserial arrangement of zoöcia, the branches frequently anastomosing. Zoöcia ranging from nearly immersed to partially free, of variable shape, cylindrical or somewhat compressed, the free part conical or of uniform diameter, though more rarely the whole cell is leathern-bottle-shaped. The zoöcia have, especially in the uniserial stage, widely dilated bases. Aperture orbicular or

elliptical, with closures well within the orifice and punctate like the surface of the zoarium. Zoarial surface coarsely wrinkled and punctate, the terminations of the pores protruding slightly above the surface. The cluster of cells connected with the colony shown (Pl. XVII. fig. 3) indicates a mode of gemmation similar to that Hincks has described in *Stomatopora fasciculata* (Brit. Marine Polyzoa, p. 441).

From *S. repens* (Busk), Crag Polyzoa, pl. xx. fig. 5, it is separated by the larger cells and more irregular habit; from *S. major*, Johnst., also by the latter feature and by the shape of the zoœcia.

Var. BREVIS, nov. (Pl. XVIII. figs. 1, 2.)

Zoœcial length 0·93 to 0·6 millim., width 0·2–0·3; aperture 0·13–0·17.

Zoarium of similar habit to that of *S. spatiosa*, but with rather smaller and less robust zoœcia, their exsert parts longer and only slightly diminishing in size towards the aperture. In both uniserial and other stages it is frequently met with encircling the stems of *Entalophora*. Ovicell (?) apparently an inflation of a single cell.

Var. BREVIOR, nov. (Pl. XVIII. figs. 3–5.)

Zoœcial length 0·7 millim., width 0·3; aperture 0·1.

The distinction from var. *brevis* is almost wholly in point of size of zoœcia, which are generally shorter in proportion to the width and with smaller apertures. A cluster of small cells occurs in one specimen, of similar type to that noticed above.

2. PROBOSCINA INCRUSTANS, sp. nov. (Pl. XVII. figs. 4–6.)

Zoœcial length 0·6 millim., width 0·17; aperture 0·1.

Zoarium adnate, ramose, passing almost immediately from the one or two primary cells into a crowded irregular arrangement of zoœcia (fig. 4). Zoœcia cylindrical, compressed (Pl. XVII. fig. 6, *a*, *b*), free for about one third of their length, and less robust than in *P. spatiosa*, var. *brevior*. Aperture elliptical or rarely orbicular. Surface punctate and transversely wrinkled. Ovicells pyramidal swellings of the zoarium, rising above and enveloping one or more zoœcia and opening at the summit. The specimen figured is attached to an *Echinus*-spine, and occasionally the species is found enveloping stems of *Entalophora*.

It differs from *Proboscina Jacquoti* and *P. Alfredi*, Haime, by the smaller size and the shape of the zoœcia and their apertures, also by the closer arrangement of the zoœcia and the peculiar form of ovicell (fig. 6, *c*).

TUBULIPORA.

Tubulipora, Lamarck, Système d. Animaux sans Vertèbres, 1816.

1. TUBULIPORA SPATIOSA, sp. nov. (Pl. XVIII. figs. 10, 11.)

Zoœcial width 0·4 millim.; aperture 0·16 to 0·17.

Zoarium erect or suberect, pyriform or cylindrical. The colony

commences with a Stomatoporoid form of growth, and spreads out rapidly, the branches frequently coalescing. Zoëcia cylindrical, the exsert parts either of uniform diameter or tapering towards the aperture, or slightly flattened. Aperture orbicular or elliptical, the cell-walls thick. In well-preserved examples the mouth is lipped similarly to the species *Tubulipora ventricosa*, Busk. Closures well within the mouth, punctate. Ovicell a globose swelling, somewhat pyramidal, involving one or more zoëcia. Zoarial surface coarsely wrinkled and punctate.

The form (Pl. XVIII. fig. 11) tends to a *Pustulopora*-like growth, and one sees the funnel-shaped ovicell of a similar type to that found on *Entalophora magnipora* (Pl. XIX. fig. 11). Other but suberect forms approach *Tubulipora flabellaris*, Johnst.

There is little doubt of this species being another stage of growth of my *Proboscina spatiosa*. It has many points of resemblance to *Tubulipora ventricosa*, Busk, but yet I think it merits distinction.

Just as I noted of *Proboscina spatiosa*, that it was connected with forms of identical zoarial habit, varying principally in size of zoëcia, so also in this group are specimens with zoëcia less robust, measuring but 0·3 millim. in width, and with apertures of only 0·13 millim. in diameter.

IDMONEA.

Idmonea, Lamouroux, Exp. méth. des genres des Pol. p. 80 (1821).

1. *IDMONEA STOMATOPOROIDES*, sp. nov. (Pl. XIX. figs. 5, 6.)

Zoarial length 4·0 millim.; width 0·5; aperture (perfect) 0·03, (worn) 0·07.

Zoarium wholly adnate, broadly angular, straight, waved or encircling, attached to stems of *Entalophora* or shells. Zoëcia nearly immersed, arranged in pairs obliquely, so as to give the appearance of alternating apertures on right and left sides of zoarial ridge, often single and irregular at the beginning of a colony. Proximal extremities of zoëcia erect and mammiform. Aperture orbicular.

The size of the specimens shows this species not to be an immature stage of *I. triquetra*, Lamx., which, moreover, has six matured cells on each side of the zoarium when adherent.

2. *IDMONEA TRIQUETRA*, Lamx., var. *Y-FORMIS*, nov. (Pl. XIX. figs. 3, 4.)

Idmonea triquetra, Lamouroux, Exp. méth. des genres des Pol. p. 80, pl. 79. figs. 13–15 (1821); Morris, Catalogue of Brit. Foss. p. 40 (1843); d'Orbigny, Paléont. Franç., Terr. Crét. t. v. pp. 729, 751 (1850–52); Haime, Descr. des Bryoz. Foss. de la Form. Jurass. p. 171, pl. 7. fig. 1 (1854); Vine, Polyzoa found in Richmond Boring, p. 790, Q. J. G. S. 1884; Sorby and Vine, Fifth Rep. on Fossil Polyzoa, Brit. Assoc. p. 43 (1884); Vine, Notes on Polyzoa of Caen and Ranville, p. 7, Journ. Northampton. Nat. Hist. Soc. 1888.

Length of zoarium 4·7 millim., width at base 0·7; zoecial width 0·27; aperture 0·1.

Zoarium Y-shaped, erect, with roughly triangular stem and branches. Zoecia in irregular transverse rows or clusters, 3 or 4 on each of the two front angles of the zoarium. The front pair form a kind of mesial ridge, are mammiform, larger, and have larger apertures, which are placed obliquely so as to appear alternating. Outermost zoecia pentagonal with small apertures, the two next are less distinctly pentagonal. The ornamental areolation of the dorsal surface is given by the pentagonal walls of the blind cells. Aperture orbicular, with a calcareous centrally perforate closure within the mouth. Surface punctate. Ovicells pyriform inflations involving two or more zoecial tubes, or pyriform sacs disposed on the front of the branches.

Though the specimens are all Y-shaped, there is evidence of other branches being thrown out. It may be regarded as an erect variety of *Idmonea triquetra*, Lamx., differing also in having fewer developed cells in each row.

Another diverging form commences growth with four cells placed transversely but opening at irregular intervals. The developed zoecia subsequently increase to six, with the middle pair but very little elevated above those on the sides. Surface, aperture, and closure the same as in the type.

IDMONEA TRIQUETRA, Lamx., var. *PARKINSONI*, nov. (Pl. XVIII. fig. 13.)

Lateral width of zoarium 0·9 millim., thickness 0·6; mesial apertures 0·1.

Zoarium erect, ovately triangular, and slightly claviform. Base of stem at point of attachment narrow, rapidly increasing to normal width, and becoming somewhat sinuous in its course of growth. Zoecia in the poriferous area, three on each side, rarely four, arranged in transverse rows, with thick walls rising above the zoecial surface. The two front zoecia are larger, mammiform, and divergent. Non-poriferous area rounded, ornamented with the hexagonal or pentagonal walls of the blind cells. Apertures oval. Surface punctulate with terminal papillæ. Ovicells irregular globose swellings enveloping two or three zoecia, and placed ordinarily in front of the zoarium.

3. *IDMONEA CLAVIFORMIS*, sp. nov. (Pl. XIX. figs. 1, 2.)

Zoarial length 5·0 millim., zoarial lateral width 1·3; apertures, perfect 0·03, worn 0·1.

Zoarium erect, clavate, ovately triangular with flattened sides, ordinarily curving backwards from above the middle. Zoecia in curved alternate rows, five or six peristomes in each row on the poriferous sides of the zoarium, the median pair teat-like and forming a pseudo-carina. The width of the non-poriferous dorsal area is two thirds only of the breadth of the sides. Ovicells irregular

leech-like swellings between or enveloping six or eight of the front cells, punctulate, the pores finer than on the zoarial surface. There are calcareous floors or closures with a central perforation at about the point where the free part of the cell commences.

A semi-adherent form varies but little in zoecial arrangement, but has a sharply triangular outline where attached. One fragment only of a numerous series of *Idmoneæ* from Ranville in my collection has an approximate clavate form.

An abnormal form of this species (Pl. XIX. fig. 2) shows the mesial zoecia much more produced and becoming prominently conical towards the aperture. The zoarium is more globosely claviform, and has new colonies or branches starting from the non-poriferous area.

The whole of the *Idmonea-triquetra* series from the Inferior Oolite of Dorsetshire, when compared with the allied forms from the Forest Marble ("Calcaire à Polypiers") of Ranville, show a greater degree of robustness. The similarity of the variations of growth on each horizon impresses upon the observer belief in their belonging to one type. The typical *I. triquetra*, Lamx., is adherent and broadly triangular, with numerous rows of apertures on each of the upper sides. In the Dorsetshire series a modified form of the type occurs. In the several Dorset varieties the exsert parts of the zoecia are more prominent, especially the mesial ones, which are mammiform, and the ridge-like front more protuberant than in the Ranville form.

BISIDMONEA.

Bisidmonea, d'Orbigny, Paléont. Franç., Terr. Crét. t. v. p. 720 (1852).

D'Orbigny characterizes this genus as having quadrangular stems and branches, with alternating lines of cells upon the face of each of the four angles. Apertures prominent, placed one above the other in transverse lines. He adds that it resembles a double *Idmonea*. One finds, however, that the quadrangular stems merge into ovals with less interrupted lines of zoecia, and on this ground as well as its mode of reproduction the species is removed from *Entalophora*.

Vine, in his remarks upon *E. tetragona**, says:—"I am not surprised that d'Orbigny should suggest a new generic term, *Bisidmonea*, for this species, as in some of the finer branches the name appears to me to be eminently suitable." Waters, when describing *Idmonea bifrons*†, in which the annulations of zoecia are interrupted by two mesial lines, speaks of it as looking like a connecting-link between the *Spiropora* form of *Entalophora* and typical *Idmoneæ*.

* Vine, G. R., "Notes on the Polyzoa of Caen and Ranville &c.," Journ. Northampton. Nat. Hist. Soc. vol. v. p. 10 (1888).

† Waters, A. W., "On Fossil Cyclostomatous Bryozoa from Australia," Quart. Journ. Geol. Soc. vol. xl. p. 685.

1. *BISIDMONEA* *TETRAGONA* (Lamx.), var. *OVALIS*, nov. (Pl. XIX. figs. 7-9.)

Spiropora tetragona, Lamouroux, Exp. Méth. des genres des Pol. p. 85, pl. 82. figs. 9 & 10 (1821).

Cricopora tetragona, Michelin, Icon. Zooph. p. 235, pl. 55. fig. 12 (1845).

Entalophora tetragona, d'Orbigny, Pal. Franç., Terr. Crét. p. 779 (1850-52).

Spiropora tetragona, Haime, Descr. des Bryoz. Foss. Jurass. p. 197 (1854).

Entalophora tetragona, Vine, Notes on Polyzoa of Caen and Ranville, p. 90 (1888).

Zoarial width 1.4 millim.; zoarial width short axis 1.0; zoecial width 0.2; apertures 0.13 to 0.8.

Zoarium erect, ramose; stem and branches cylindrical and compressed. Zoecia short (0.3 millim. in length), ovoid, arranged in irregularly oblique annulations, walls thick and projecting above the zoecial surface. The zoecia forming the ridge of the oval stem are large as in *Idmonea*. Apertures elliptical, rarely orbicular, with centrally perforate and punctulate closures within the orifice. Zoarial surface punctate. Ovicells long, punctulate, leech-like swellings along the ridge of the oval stem, between or enveloping ten or twelve of the large zoecia.

Vine* prefers to retain Lamouroux's generic name *Entalophora* for the Ranville species; but if mode of reproduction, which is exactly similar in some varieties of *Idmonea* I have described, is of generic value when combined with a distinct shape of cell and aperture, then d'Orbigny's genus provides a good resting-place for such transition forms between *Idmonea* and *Entalophora*.

Spiropora compressa, Haime, appears to be nearly related.

ENTALOPHORA.

Entalophora, Lamouroux, Exp. Méth. des Genres des Pol. p. 81 (1821).

1. *ENTALOPHORA* *RICHMONDIENSE*, Vine, var.

Entalophora richmondiensis, Vine, Polyzoa found in Boring at Richmond, p. 791, fig. 3, Quart. Journ. Geol. Soc. vol. xl. 1884.

Zoecial length 0.3 to 0.5 millim., width 0.2; aperture 0.07 to 0.1.

The size of zoarium, zoecia, and apertures agrees fairly with Vine's Richmond species. The zoecia, however, vary in size of apertures, which are frequently furnished with closures. The arrangement of the zoecia differs in that the mouths open one above the other in each annulation, whereas in *E. richmondiense*, accord-

* "Notes on the Polyzoa of Caen and Ranville," by G. R. Vine, Journ. Northampt. Nat. Hist. Soc. vol. v. p. 10 (1888).

ing to Vine, the apertures of one row of annulations are on a line with the cell-walls of the succeeding row.

The same difference may be noted between the several species of *Entalophora* and *Spiropora* from Ranville, which Haime figures. The zoëcia are ordinarily disposed in alternating rows, whereas in the Dorset forms the cell-walls are thicker and the cell arrangement in longitudinal lines.

2. *ENTALOPHORA MAGNIPORA*, sp. nov. (Pl. XIX. figs. 11, 12.)

Width of zoarium 1·8 millim.; zoëcial length 0·9 to 1, width 0·3; aperture 0·13.

Zoarium erect, ramose and robust, the stem nearly 2 millim. thick, dichotomously branched. Zoëcia large, the peristomes arranged at a spiral angle of from 40° to 50°. Zoëcia free for about one fourth of their length; the exsert part, where perfect, diminishing in size towards the aperture, where it becomes more conical, and frequently projecting horizontally from the stem. Apertures orbicular, ten to each annulation, closures within the orifice. Surface of zoarium punctate and wrinkled. Surface-pores slightly exsert. Ovicells funnel-shaped inflations enveloping one or more cells (Pl. XIX. fig. 11).

A longitudinal section shows large communication-pores in the cell-walls of the interior of the zoarium; and I think there is evidence of club-like rays on the surface of the inner wall as described by Waters in some Australian *Entalophoræ* *. Between the surface-pores also there are traces of fine granulation. The zoëcial tubes in section are seen to contain coloured grains probably of oxide of iron.

As I have before noted, this may be the erect stage of *Proboscina spatiosa*, but from other *Entalophoræ* it is marked off by the greater thickness of the zoarium, and by the large zoëcia and apertures. It has, however, some relationship to *Entalophora raripora*, d'Orb.

3. *ENTALOPHORA RARIPORA*, d'Orb. (Pl. XIX. fig. 10.)

Entalophora raripora, d'Orb. Prodr. de Paléont. Strat. ii. p. 267 (1850).

Entalophora santonensis, d'Orb. Pal. Franç., Terr. Crét. pl. 623. figs. 15-17 (1850-52).

Entalophora raripora, d'Orb. Pal. Franç., Terr. Crét. p. 787, pl. 621. figs. 1-3 (1850-52); Novak, Beitr. z. Kenntn. d. Byroz. d. Böhm. Kreide, p. 32, pl. 8. fig. 2, pl. 10. figs. 1 & 2 (Wien, 1877); Waters, Foss. Cyclost. Bryoz. from Australia, Quart. Journ. Geol. Soc. vol. xl. p. 686 (1884).

Zoarial width 1·2 to 0·8 millim.; zoëcial length 1·3, width 0·4; aperture 0·13 to 0·17.

Some of the specimens are rather more robust than those figured

* "On Tertiary Cyclostomatous Bryozoa from New Zealand," by A. W. Waters, F.G.S., Quart. Journ. Geol. Soc. 1887, p. 340.

by d'Orbigny. The section (Pl. XIX. fig. 10) illustrates the internal arrangement of the zoecia and shows the large surface-pores. Longitudinal sections exhibit the cells containing coloured grains probably of oxide of iron.

4. *ENTALOPHORA RARIPORA*, d'Orb., var. *ANOMALA*, Reuss.

Entalophora anomala, Manzoni, Brioz. foss. d. Miocene d'Austr. ed Ungh. p. 10, pl. 9. fig. 3 (Denkschr. Akad. Wiss. Wien, Bd. xxxix. 1878).

Zoarial width 1·2 to 0·9 millim.; zoecial length 1·6, width 0·3; aperture 0·17.

The zoecia are longer and rather less wide than in d'Orbigny's type and open in fours around the stem. Waters, however, classes *E. anomala*, Reuss, as synonymous with *E. raripora*, d'Orb. *E. gracilis*, d'Orb., would be as well, I think, classed as a variety of *E. raripora* also, so then my variety *corrugata* as well as *anomala*, Reuss, might be placed under the head *E. raripora*, d'Orb. One finds numerous intermediate forms.

5. *ENTALOPHORA SUBGRACILIS*, d'Orb., var. *CORRUGATA*, nov. (Pl. XVIII. fig. 14.)

Entalophora subgracilis, d'Orb. Prodr. ii. p. 267 (1847); Paléont. Franç., Terr. Crét. p. 788, pl. 621. figs. 4-6 (1850-52).

Zoarial width 0·5 millim.; zoecial length 1·3, width 0·2; aperture 0·1.

The points of divergence from *E. subgracilis* are, first, the greater width of the zoarium, viz. $\frac{1}{2}$ millim. instead of $\frac{1}{3}$ millim.; secondly, the more numerous zoecia, five to a series instead of four. Furthermore the surface is transversely wrinkled and punctate. There are solid, irregularly perforated closures within the zoecial orifice.

EXPLANATION OF PLATES XVII.-XIX.

PLATE XVII.

- Fig. 1. *Proboscina spatiosa*, sp. n., uniserial form. $\times 10$.
 2, 3. The same, ordinary form. $\times 10$.
 4. *Proboscina incrustans*, sp. n. $\times 10$.
 5. The same, gonæcium? $\times 25$.
 6. The same, zoecia, flattened oecia and ovicell. $\times 25$.
 7, 8. *Diastopora spatiosa*, sp. n., with capitulum of erect branch. $\times 6$ & 7.

PLATE XVIII.

- Figs. 1, 2. *Proboscina spatiosa*, var. *brevis*. $\times 12$.
 3-5. The same, var. *brevior*. $\times 8$ & 12.
 6 a. *Stomatopora spirata*, sp. n., $\times 6$. 6 b. A portion, $\times 15$.
 7. — *correcta*, sp. n. $\times 25$.
 8. The same. $\times 18$.
 9. — *dichotomoides* (d'Orb.), var. *attenuata*. $\times 15$.
 10, 11, 12. *Tubulipora spatiosa*, sp. n. $\times 10$.
 13. *Idmonea triquetra* (Lamx.), var. *Parkinsoni*. $\times 10$.
 14. *Entalophora subgracilis*, d'Orb., var. *corrugata*. $\times 10$.

574 BRYOZOA FROM THE INFERIOR OOLITE OF SHIPTON GORGE.

PLATE XIX.

- Figs. 1, 2. *Idmonea claviformis*, sp. n. $\times 8$.
3, 4. — *triquetra* (Lamx.), var. *Y-formis*. $\times 10$.
5, 6. — *stomatoporoides*, sp. n. $\times 10$ & 16.
7. *Bisidmonea tetragona* (Lamx.), var. *ovalis*. $\times 10$.
8. The same, side view. $\times 12$.
9. The same, with ovicell. $\times 10$.
10. *Entalophora raripora*, d'Orb., transverse section. $\times 20$.
11, 12. — *magnipora*, sp. n. $\times 10$.

DISCUSSION.

Dr. HINDE remarked that Mr. Walford had been fortunate in his discovery of such well-preserved examples of Polyzoa, and that he appeared to have worked them out in a thoroughly satisfactory way.

F. H. Michael del. et lith.

Mintern Bros. imp.

INFERIOR OOLITE BRYOZOA.

F.H. Michael del. et lith.

Mintern Bros. imp.

INFERIOR OOLITE BRYOZOA.