FOSSIL BRYOZOA

IN THE

DEPARTMENT OF GEOLOGY

CATALOGUE

OF

THE FOSSIL BRYOZOA

IN THE

DEPARTMENT OF GEOLOGY

BRITISH MUSEUM

(NATURAL HISTORY).

THE JURASSIC BRYOZOA.

BY

J. W. GREGORY, D.Sc., F.G.S., F.Z.S.

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PREFACE.

The present Catalogue, by Dr. J. W. Gregory, F.G.S., forms an acceptable addition to those previously printed, by order of the Trustees, upon the various groups of fossils, both Vertebrate and Invertebrate, preserved in this Department, and of which twenty-two volumes have already been issued, while four others are in progress.

Certainly no group needed more careful and critical revision and examination than the Bryozoa; and it is hoped that Dr. Gregory will be able to complete the Catalogue of both the earlier and later forms, which at present remain to be worked out in detail.

HENRY WOODWARD.

Geological Department,
British Museum (Natural History),
23*rd May*, 1896.

AUTHOR'S PREFACE.

THE selection of the Jurassic Bryozoa for the first Catalogue may seem capricious; but it was made deliberately. The two orders of Bryozoa that prevailed in the Palæozoic era became extinct or greatly reduced in importance at its close. It is among the Jurassic deposits that we have to seek the ancestors of existing types of Bryozoa. They occur there, moreover, with the primary lines of divergence well marked, and not obscured by the extreme secondary variations of later periods. It seemed, therefore, necessary to work out the Jurassic fauna before attempting the description of that of the Cretaceous, which of all British Bryozoa faunas is most in need of further investigation.

I must express my indebtedness to the Rev. T. Hincks, F.R.S., for useful advice; to Mr. Beeby Thompson, F.G.S., and to Mr. E. Walford, F.G.S., for the gift to the Museum, or loan, of specimens. Mr. C. D. Sherborn, F.Z.S., has kindly permitted me to refer to his MS. Index Generum et Specierum Animalium; and my colleagues, Messrs. R. B. Newton, G. C. Crick, and F. A. Bather, have helped in the identification of fossils encrusted by Bryozoa. For ever ready assistance in examining the recent collections of Bryozoa, and the opportunity for frequent

consultation in reference to points on classification, I am much indebted to Mr. R. Kirkpatrick, of the Zoological Department. I must also express my thanks to Miss G. M. Woodward for the preparation of the very elaborate and beautiful drawings of the Bryozoa which illustrate this Catalogue and the cases of specimens in the Geological Gallery.

J. W. GREGORY.

GEOLOGICAL DEPARTMENT,
BRITISH MUSEUM (NATURAL HISTORY),
12*th May*, 1896.

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"*The suggestion that it may be as well to give up the attempt to define species, and to content oneself with recording the varieties . . . . which accompany a definable type . . . . in the geographical district in which the latter is indigenous, may be regarded as revolutionary; but I am inclined to think that sooner or later we shall have to adopt it.*"—Huxley, 1880.

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PART I.

INTRODUCTION.

1. THE PROBLEM OF TUBULAR FOSSILS.

One of the most familiar ways in which aquatic animals seek protection from their enemies, is by surrounding themselves with a tube, formed either of foreign particles held together by slime, or of material secreted by the external surface of the body. As these tubular shells are the most easily acquired of all effective methods of defence, they have been adopted independently by animals occupying very different zoological positions, and they vary in complexity from simple tubes, to elaborate, specialized skeletons. Examples of shells formed of primitive open tubes occur in most of the phyla of the animal kingdom. Thus, in the Protozoa there is the Foraminifer *Syringammina*; in the Coelenterata there are the Hydroid *Tubularia* and the coral *Cladochonus*; among the worms we find the order Tubicola and the tube-building rotifers such as *Melicerta*; and among the Bryozoa there is the order Cyclostomata. The same type of skeleton is developed by some of the Mollusca, such as the Gasteropod *Cæcum*, the Scaphopod *Dentalium*, the Lamellibranch *Teredo*, the so-called Pteropod *Conularia*, and the earliest Cephalopods; and it even occurs among the jointed Arthropods, as in the case of the larval caddis-fly.

Not only, however, is a skeleton consisting of a simple open tube found in most groups of the Invertebrata, but the variations of this tube, both in arrangement and structure, are similar in different groups. Thus, the tubes may be single and straight, as in most of the cases above cited; or they may be gregarious, and either grow into massive bundles of parallel tubes, as in the coral *Favosites*, the worm *Galeolaria filiformis* (Sow.), and the Bryozoan *Heteropora*; or again, they may be gregarious, but contorted, forming dense tangled masses, as in the worm *Galeolaria plexus* (Sow.), the Gasteropod *Siliquaria*, the Lamellibranch *Teredina*. Similarly the structure of the tube, as a rule, does not give any clue to the systematic position of the animal that made it. The shells are often formed of miscellaneous fragments of foreign material, as in the sandy tubes of the Foraminifer *Hyperammina*, of the rotifer *Melicerta*, or of the worm *Sabella*; or as in the muddy pipes of the Hydroid *Tubularia* or the worm *Terebella*; or, again, as in the short cylinders of sticks, shells, or fish scales, which protect the larvæ of such insects as the caddis-worm. Or the shells may be secreted by the external wall of the animal, as in the case of most of those worms, Bryozoa, and Mollusca, which have adopted the habit of dwelling in tubes.

Moreover, when the tubes become specialized and more complex, the same modifications appear in those of different animal groups. Thus, when tubes which are long and narrow, still further lengthen, the older part is left empty, and is cut off by the formation of horizontal plates across the tubes. These plates are found alike in the tubular shells of the corals, Bryozoa, worms, and Mollusca; they are known as tabulæ and diaphragms respectively in the two first, and as septa in the two last. When, on the other hand, the tubes are short and broad, the walls are strengthened by the formation of loose, spongy tissue: this is found in such corals as *Diphyphyllum*, in which it is called "vesicular endotheca"; in such Bryozoa as *Prasopora*, in which it is said to be made up of cystiphragms; or in such worms as *Cornulites*, and such Brachiopods as *Cyrtina*, in which it is simply described as "vesicular tissue."

The fact that animals which belong to very different groups have skeletons, which are based on the same plan, are built of similar materials, possess the same parts, and vary within the same limits, is of great interest to the zoologist. Excluding a few forms which bore through floating wood, most of the tube-dwelling animals live in shallow waters exposed to the scour of powerful currents and tides, and therefore needing shelter from the drift of sand and shingle. Hence they either occur imbedded in sand or mud, or attached to rocks. Under either condition the power to grow rapidly in height is essential to existence. Otherwise those animals that adopt the former mode of life would be buried by the accumulation of silt, while those that adopt the latter would be choked by the growth of sea-weed, or be starved owing to the capture of all the food by taller rivals.

To the zoologist, who can base his classification upon the soft parts of the animal, as well as upon the hard, these tubicolar forms present no exceptional difficulties. They are, indeed, of especial interest, for they show how close a resemblance may exist between animals of different groups, owing to adaptation to suit the same conditions of life; and they supply the most emphatic warning that similarity in structure does not always imply community of origin.

To the palæontologist, however, who cannot check his conclusions by the evidence of vascular anatomy or embryology, these tube-dwelling animals are a vexation and a puzzle. There is so frequently no correlation between the structure of the tube and of the creature that made it. Hence the vast majority of the fossil worm tubes are now ignored by palæontologists; their study has been abandoned in despair, for, so far as we can see at present, they can give no aid in the classification of the group to which they belong, or in tracing its life history.

In the study of the Jurassic Bryozoa we are faced by the initial difficulty that their shells are tubular. In periods earlier than the Jurassic, many of the Bryozoa belonged to the order Cryptostomata; and in later times the order Cheilostomata was well represented. In these two groups the skeletons of the individual members of the colony are complex, and offer fairly reliable diagnostic characters. But in Jurassic times the former order was extinct, and the latter was represented by only two rare species; 98·5 per cent. of the forms have left no traces, except their tubular skeletons. Nevertheless, these fossils cannot be ignored like the worms, for, with the two exceptions noted, they belong to orders either wholly extinct or now of dwindling importance. Their evidence, therefore, must be considered in any attempt to trace the evolution of the Bryozoa.

As tubicolar skeletons occur in so many different groups of animals, in the study of the fossil Bryozoa we are faced at the outset by the problem, how to recognize the fossil members of this class. It must be at once admitted, that there are no diagnostic characters by which we can positively say, whether a given fossil be a Bryozoan or not. There are some large groups of Palæozoic fossils which may belong either to the Bryozoa, Actinozoa, or Hydrozoa. There are also numerous Jurassic fossils whose affinities have long been matter of dispute. Nevertheless, by means of detailed investigation of some existing allied animals, and by microscopic investigation of the fossils, it is possible to settle the probable affinities of these doubtful forms. Hence certain fossils, which have been often assigned to the Corals, are included in the present Catalogue as Bryozoa; and others, such as the genera *Acanthopora*, *Neuropora*, and *Chrysaora*, which have been previously considered to be Bryozoa, are excluded as Hydrozoa.

2. THE AFFINITIES OF THE BRYOZOA.

Unlike most animals we cannot refer the Bryozoa to any one of the eight phyla, or great divisions of the animal kingdom. Although their anatomical structure is well known, their systematic position is uncertain. When first studied they were regarded as plants, which was the orthodox view until the middle of the last century. Peysonnel, indeed, had discovered sufficient to show the erroneous nature of this conclusion;[1] but his arguments were unheeded owing to the opposition of Reaumur, who reported Peysonnel's observations to the *Académie des Sciénces* in 1727. It was not till 1742 that Jussieu[2] figured the creatures that form the skeletons, and conclusively proved their animal nature. But even then this theory was not accepted. Baster,[3] in 1760, explained the polypi as only parasites on the surfaces of aquatic plants; and Linneus,[4] even in his latest work, separated the zoophytes from the corals, and expressed his conviction that "*sunt enim stipites*

[1] De Reaumur. Observations sur la formation du Corail et des autres productions appellées Plantes pierreuses: *Mém. Acad. roy. Sci.* 1727, pp. 276–7.

[2] Bernard de Jussieu. Examen de quelques productions marines qui ont été mises au nombre des Plantes, et qui sont l'ouvrage d'une sort d'Insectes de mer: *Mém. Acad. roy. Sci.* 1742, pp. 290–302, pls. ix., x.

[3] Jobus Basterus. Opuscula subseciva Harlem, t. i. lib. 2, 1760, p. 61.

[4] Systema Naturæ, ed. 12, t. i. pars 2, 1767, p. 1287.

veræ plantæ quæ metamorphosi transeunt in flores animatos (vera Animalcula)."

In spite, however, of the influence of the great Swedish systematist, naturalists had come before the end of the eighteenth century to a general agreement as to the animal nature of these plant-like structures, which were all associated together under the name zoophytes. That this was not a single homogeneous group, was known to some last-century observers. Spallanzani remarked that the polypi are independent, and are bent in their cells like a bow, instead of being continuous downward into the central fleshy axis, as they are in such zoophytes as *Sertularia.* Loefling[1] pointed out that in *Flustra pilosa* the different polypi (zoœcia) act independently, and that the irritation of one does not cause them all to withdraw into their cells, as it does in such forms as *Sertularia.* These observations prepared the way for the work of those who by description of the anatomical structure of these animals, showed that the polypes are based on several very different plans.

Renier,[2] in 1793, discovered that some of the zoophytes agree in anatomical structure with *Ascidia,* and not with *Hydra*; in consequence one group was transferred to the Mollusca. Grant,[3] in 1827, described the animal of *Flustra,* and showed that it is equally advanced above the *Hydra* type. His work was followed by that of Vaughan Thompson[4] on some species of *Sertularia,* the cells of which he found to be inhabited by a new animal, the Polyzoa, "which agrees more closely with the Ascidiæ than with the Hydræ." He suggested that the "species of *Sertularia* in which the animals have been determined to be Polyzoæ may perhaps be referred to *one* genus," which he separated from *Sertularia* under the name of *Vesicularia* (*op. cit.* p. 97).

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[1] Pehr Loefling. Beskrifning pa tvaenne sina Coraller: *Handl. k. Sven. Vet. Acad.* vol. xiii. (1752) pp. 109–22, pl. iii.

[2] Renier. Opusc. Scelt. t. xvi. p. 256, t. 1.

[3] R. E. Grant. Observations on the Structure and Nature of *Flustræ*: *Edinb. New Phil. Journ.* vol. iii. (1827) pp. 107–18, 337–42.

[4] John Vaughan Thompson. On Polyzoa, a new animal discovered as an inhabitant of some Zoophites—with a description of the newly instituted Genera of *Pedicellaria* and *Vesicularia,* and their species: Zool. Researches, No. v. pp. 89–102, pls. i.–iii.

Thompson only treated this type of structure as of generic importance, and it was reserved for Ehrenberg,[1] a few months later, to use it as the basis of a new zoological group. This he named the Bryozoa, and made a subdivision of his class Phytozoa Polypi; his diagnosis, "*Ore anoque distinctis, tubo cilario perfecto*," when taken in conjunction with the context, is quite satisfactory. Ehrenberg, however, left the Bryozoa as close allies of the Anthozoa; but later zoologists grouped them with the Brachiopods and Ascidians to form the "subkingdom Molluscoidea." The removal of the Ascidians to the Chordata took away one of the three classes that formed this group; and the evidence for the alliance of the Bryozoa and Brachiopoda is not conclusive. The two classes agree only in the presence of the lophophore and the epistome, and in the absence or great reduction of the præ-oral region. The value of the evidence in these points is uncertain; for the lophophore appears to rise from a lobe in front of the mouth in the Brachiopoda, and in most of the Bryozoa; whereas in one group of the latter (the Entoprocta) it is a postoral structure. Again, in the Entoprocta the lip-like epistome may be homologous with the foot of the type of Molluscan larva, known as the Trochosphere; but in the Brachiopods and the rest of the Bryozoa it is the remnant of a præ-oral lobe.

Until these difficulties are removed it is impossible to determine the exact affinities of the Bryozoa. On the one hand, the Entoprocta approximate to the Mollusca; and on the other, the Ectoprocta approach the Worms.

3. THE STRUCTURE OF THE BRYOZOA.

The main facts in the anatomy of the Bryozoa may easily be determined by the examination of a common form such as the Hornwrack *Flustra foliacea*, Linn. In this species the whole Bryozoon consists of broad chitinous fronds, which expand rapidly in width and branch repeatedly. The surface, when examined by the naked eye, is seen to be marked by small lozenge-shaped

[1] C. G. Ehrenberg. Symbolæ Physicæ seu Icones et Descriptiones Animalium Evertebratorum, Dec. 1. Dated 1828. Text issued 1831. Fol. Polypi, *a*.

areas, each of which represents one individual of the colony or (to use Proudho's term) a *Bryozoïte.* If we separate one of the Bryozoites from the colony (or *zoarium*), we find it consists of a double-walled cell (or *zoœcium*), and of a *zooid* which lodges within it.

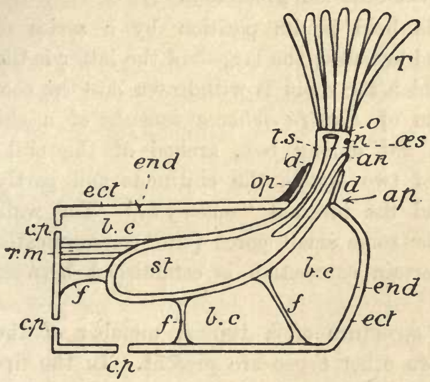

FIG. 1.—Diagram of structure of typical Bryozoa. *an.* anus; *ap.* aperture; *b.c.* body cavity; *c.p.* communication pore; *d.* diaphragm; *ect.* ectoderm; *end.* endoderm; *f.* funiculi; *n.* nerve ganglion; *o.* orifice; *œs.* œsophagus; *op.* operculum; *r.m.* retractor muscle; *st.* stomach; *T.* tentacles; *t.s.* tentacle sheath.

The zoœcium is the skeleton or shell in which the zooid lives; but it was at one time believed to be an independent individual, modified for protective purposes. This view, however, is now known to be erroneous; the zoœcium and zooid together form an individual Bryozoite, just as an oyster and its shell together form an individual Mollusc. The zooid consists, essentially, of a closed digestive tube, shaped somewhat like a fish-hook with the curved part greatly thickened. The longer arm begins with a funnel-shaped œsophagus, at the top of which is the mouth; the shorter arm ends with the anus. The expansion at the curve is the stomach. The mouth (or "orifice") is surrounded by a circle of ciliated tentacles, which form the structure known as the "lophophore." There is one small nerve ganglion beside the mouth, situated between it and the anus. The zooid lives either crowded into the cell-like zoœcium, or rising from it with its tentacles expanded. The space between the zooid and the wall of its habitation forms the body cavity or coelome; this is closed by "the diaphragm," a muscular band around the zooid, which connects it with the wall of the zoœcium. When the zooid is withdrawn into its cell, the muscular band closes the aperture; while a horny plate (the "operculum") formed on the side of the diaphragm opposite the anus, affords additional protection.

The zooid is held in its position by a series of cords (or "funiculi") and muscles; the largest of the latter is the "retractor muscle," by which the zooid is withdrawn into the zoœcium.

The zoœcium of *Flustra foliacea* consists of a chitinous case shaped like a flat oblong box, arched at the oral end. The wall consists of two layers, the chitinous and partly calcareous "ectocyst" and the internal "endocyst." The walls are complete except for some small pores (or "communication plates"), by which a certain connection is established between adjoining zoœcia.

This is the structure of a typical member of the colony of *Flustra*, but two other types are present. In the first, one part of the zoœcium bulges out to form a shallow marsupium or pouch in which the young are reared. Such marsupia are only modified organs, or parts of normal zoœcia; these are known as oœcia. [In some other Bryozoa they are formed by the modification of entire zoœcia, when they are called "gonœcia," or of parts of the zoarium, when they are named "gonocysts."] Other individual Bryozoites in the *Flustra* colony are modified in a different way. The Bryozoite is dwarfed, and there is no zooid; the operculum is enlarged into a triangular plate, which is hinged, and can be used as a beak, to hold anything that falls within its grasp. Such a Bryozoite is an "avicularium" of the simplest type.

If we turn from *Flustra* to other Cheilostomata, we find important zoœcial differences. The avicularia become more specialized, and instead of the marsupia being only oœcia, they are gonœcia. But, nevertheless, the characters of the animal of the normal Bryozoites remain very much the same throughout the order. In fact, the differences between the zooids of the Cheilostomata, and those of Ctenostomata and Cyclostomata, are comparatively insignificant. Hence *Flustra* serves as a type for the whole group of Gymnolæmata, which includes all the fossil Bryozoa.

It is unnecessary further to refer to the soft parts of the Bryozoa, but the skeleton must be considered with greater care. We may, however, neglect the skeleton of the Cheilostomata, for only two species belonging to this order are known in the Jurassic series. Attention may therefore be confined to the elements of the shell of the orders Cyclostomata and Trepostomata.

4. THE TERMINOLOGY OF THE SHELLS OF THE CYCLOSTOMATA AND TREPOSTOMATA.

Zoœcium.—The tubular skeleton of the Bryozoite. Its simplest form among the Cyclostomata is a simple open tube. The first advance on this is for the distal end of the tube to be bent round, or reflexed, as in *Stomatopora* (Fig. 2*b*). In some cases the

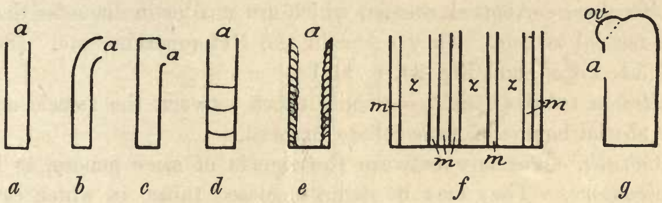

FIG. 2.—Diagrams of zoœcia of Bryozoa. *a–c.* typical Cyclostomatous zoœcia; *a.* simple form, as in *Tubulipora*; *b.* reflexed peristome, as in *Stomatopora*; *c.* lateral aperture, as in *Haploœcia*; *d.* zoœcion with diaphragms; *e.* zoœcion with cystiphragms; *f.* section of three zoœcia with mesopores; *g.* section across a Cheilostomatous zoœcion with oœcion.

a. = aperture; *m.* = mesopore; *ov.* = oœcia; *z.* = zoœcia.

distal ends of zoœcia, with such reflexed peristomes, are enlarged, or continued beyond the aperture; in such cases the aperture is somewhat contracted, so that it is smaller than the diameter of the zoœcium, and is lateral in position, as in the genus *Haploœcia*. In such cases the zoœcia closely resemble those of simple forms of Cheilostomata.

The zoœcia are generally of uniform diameter; but some are larger in one part than in others, and may be "bulging," "fusiform," or "pyriform." The zoœcia are usually open throughout, but sometimes they are divided by transverse "diaphragms."

The wall of the zoœcium is calcareous, and is usually somewhat porous in structure. When the pores are large the shell is said to be "punctate"; when the pores are small it is "punctulate." The shell is usually simple, but in some cases it is strengthened by an internal layer of vesicular tissue, to the constituents of which Ulrich has given the name "cystiphragms."

Gonœcia (the "cistern cells" of Walford).—Bryozoites specially modified to serve as marsupia; as in *Entalophora nidulata.* Pl. VIII. Fig. 2.

Gonocyst.—A form of marsupial chamber produced by expansions within the zoarium, and not by the modification of a single zoœcium; as in *Berenicea parvitubulata.* Pl. IV. Fig. 5.

Dactylethræ.—[From *δακτυλήθρα*, a finger-stall.] A name proposed for a form of aborted "zoœcia," consisting of short cæcal tubes, closed externally. They occur, for example, in *Terebellaria.* (See Pl X. Fig. 5.)

Mesopores.—Aborted zoœcia, which are smaller in diameter than the normal zoœcia. They occur in the Heteroporidæ, etc. (See Pl. XI. Fig. 3, and Fig. 2*f*, p. 11.)

Median tubuli (Ulrich).—Minute tubes between the zoœcia and the zoarial lamina of some foliate Bryozoa.

Cancelli.[1]—Passages between the zoœcia of some genera, as in *Lichenopora.* They may be definite, closed tubes, in which case they may be regarded as only a variety of median tubuli; or they may be irregular, loose passages, cavities left between the zoœcia, the walls of which do not coincide.

Acanthopores.—Tubular spines found in many Palæozoic Bryozoa. They arise from tubules which may be seen running along the walls of zoœcia. They are typical of the Trepostomata, and may be limited to that order.

Diaphragms.[2]—Transverse plates which cut across the zoœcia, either completely or incompletely. (Diaphragms close to the apertures, or the ends of broken zoœcia, have been described as opercula.) (Fig. 2*d*.)

Cystiphragms.—Curved calcareous plates which grow on the tubes of some Bryozoa; they form a vesicular lining round the tube, which is thereby strengthened. (Fig. 2*e*.)

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[1] This term was used by Busk for the structures for which Ulrich's name of *mesopores* is here adopted.

[2] This term is also used for the muscular band around the œsophagus in the Cheilostomata.

Epitheca.—An external calcareous crust, deposited upon some zoaria. In most cases it consists of a compact layer upon the basal portions of the zoaria, as in *Apsendesia.* But in others it consists only of a thin irregular deposit, filling up the depressions between zoœcia, which appear to be immersed, as in some species of *Berenicea.*

The transverse ridges which cross some zoœcia (as *Berenicea*) are probably epithecal growths.

Intervesicular tissue.—Cellular calcareous tissue, which separates the zoœcia in some genera, such as *Fistulipora.*

Zoarial lamina.—The supporting layer present in foliaceous genera such as *Diastopora* (Fig. 3). It is the "lame germinale"

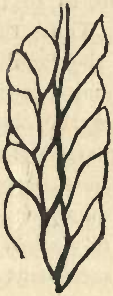

Fig. 3.—Longitudinal section through a frond of *Diastopora,* showing zoarial lamina. From Great Oolite, Bath. **D. 2246.**

of D'Orbigny, which he described in *Stellocavea.* The term lamina cannot be used without a qualifying adjective, as alone it has a different meaning in Membraniporidæ. Median lamina is used by Ulrich, but this can hardly be applied to unilaminate zoaria, such as *Diastopora lamourouxi,* M. Edw.

Lunarium.—Crescentic projecting plates, below the aperture, formed by the thickening of the peristome on the side opposite the anus, as in *Chilopora.*

Terminology of Apertures.

"*Orifice.*"—The oral opening of the digestive tubes; it is therefore the mouth of the zooid.

Aperture.—The opening or mouth of the zoœcium.

5. THE VALUE OF GENERIC DIVISIONS IN THE CYCLOSTOMATA.

1. *Simplicity of Structure.*—Examination of this list of the structures of tubicolar Bryozoa, shows that the skeleton is never a very complex one; and as many of the above structures are confined to the Trepostomata, or to exceptional genera of Cyclostomata, the majority of the members of the latter order have characters, which are both simple and variable. This renders the accurate diagnosis both of genera and species difficult, if not impossible. Among the Cheilostomata there is, at least, an approximation to an agreement as to the taxonomic value of the different skeletal elements. Thus, the suborders are founded on the *thyrion* or front wall; the families upon the nature of the openings to the exterior, and upon the presence of oœcia or gonœcia; and the genera on the characters of the zoœcia, and the arrangement of the avicularia and appendages.

But when we turn from those Bryozoa in which the zoœcia are box-shaped, and there are spines, avicularia, and vibracularia, to those in which we have to rely solely upon the modifications and grouping of simple tubes, agreement as to the range of genera ceases.

2. *The Stomatopora–Diastopora Series.*—As an example we may take the series of forms grouped round *Berenicea*. Haime, in his monograph on the Jurassic Bryozoa, accepted four genera, *Stomatopora*, *Proboscina*, *Berenicea*, and *Diastopora*. Hincks, however, with a similar series of variations in recent specimens, has merged these into the two genera *Stomatopora* and *Diastopora*. Ulrich, again, has made a genus, *Mitoclema*, for a Silurian Bryozoon, and, in reply to criticisms, maintains that it is quite different in structure from *Entalophora*; nevertheless, Waters and Vine claimed it as a normal species of that genus, and the former even placed it in the species *Entalophora verticillata*, Goldf. Haime included in the genus *Heteropora* specimens which D'Orbigny had distributed among the following fourteen genera: *Cava*, *Ceriocava*, *Ceriopora*, *Crescis*, *Heteropora*, *Multicrescis*, *Multinodicrescis*, *Nodicava*, *Nodicrescis*, *Polytrema*, *Reptomulticava*, *Reptomulticrescis*, *Reptonodicava*, and *Reptonodicrescis*. Haime even included within

one species, specimens which D'Orbigny divided among five genera, and thought he ought also to have added specimens from two more genera.

These examples show how wide are the differences of opinion between those who, like D'Orbigny, attribute generic value to trivial differences, and those who, like Hincks and most British students of recent Bryozoa, prefer to limit the number of genera. Others, again, like Haime, try to avoid the reckless multiplication of names, but find it impossible to apply to the rich fossil faunas the elastic definitions possible when dealing with the few living representatives of the Cyclostomata.

To understand the meaning of these differences, let us consider the case of the *Berenicea* series more closely. Haime divided the series into four genera: *Stomatopora*, including those in which the zooecia are encrusting, and occur in single lines; *Proboscina*, those which are encrusting, but in which the zooecia are grouped into multiple ribbon-shaped bands; *Berenicea*, which again are encrusting, but which spread out into sheets; and *Diastopora*, in which the sheets rise as erect fronds.

This arrangement is objected to by those who prefer to restrict the number of genera, on the ground that these divisions are not persistent. Thus, in the case of *Stomatopora* and *Proboscina*, they point out that specimens may be found in which the zoarium begins as a single series and ends as a multiple series. Again, they would urge that no sharp line of distinction can be drawn between ribbon-shaped bands which expand slightly in the middle, and encrusting sheets; and thus the division between *Proboscina* and *Berenicea* breaks down. Similarly with *Berenicea* and *Diastopora*; both forms originate from encrusting zooecia, which are identical in character: give the Bryozoon a broad, smooth surface over which to grow, and it will remain as an encrusting *Berenicea*; but if there be no room for this, then the edge may grow upwards into a frond and become a *Diastopora* (Fig. 4).

Hincks therefore sinks *Proboscina* in *Stomatopora*, and *Berenicea* in *Diastopora*. Pergens has described[1] a specimen which begins

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[1] E. Pergens. Revision des Bryozoaires du Crétacé figurés par d'Orbigny: *Bull. Soc. belge Géol.* t. iii. (1890) p. 327.

as a *Stomatopora*, then becomes a *Proboscina*, and ends as a *Berenicea*.

It is therefore urged that the four genera in question must be united into one, as it is absurd to treat as genera what are only individual variations in growth. The authors, however, who accept this argument in theory, only apply it partially in practice, and do not carry it to its logical conclusion. In spite of such specimens as that described by Pergens, Hincks keeps *Stomatopora* and *Berenicea* apart; though with the fossils it is much easier to

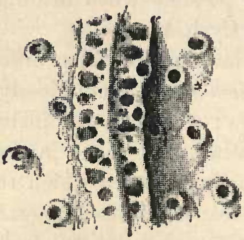

FIG. 4.—Base of *Diastopora*, showing basal Berenecoid encrustation and erect frond. *Diastopora davidsoni*, Haime. Bathonian: Ranville. **60381.**

separate *Berenicea* from *Diastopora*, than from *Stomatopora*. Pergens, moreover, accepts the evidence of one half of his specimen, and merges *Stomatopora* and *Proboscina*, but he does not accept that of the other half, and keeps *Proboscina* and *Berenicea* distinct.

If the question of merging genera ended here, it would be less important than it is. In typical *Diastopora* the zoarium consists of two layers of zoœcia, one on each side of the zoarial lamina; the two surfaces of the zoarium are parallel, and the frond is therefore thin. But in some species the fronds are narrow flat ribbons, as in *Diastopora calloviensis*, D'Orb.; in others, such as *D. lamellosa* var. *cervicornis*, the zoœcia are crowded and the fronds thickened, until they are biconvex in section (Fig. 5). In many zoaria of the variety mentioned, branches may be found which are circular in section, and in which the zoœcia are grouped into bundles instead of into sheets (Fig. 6). Such branches are indistinguishable from those of some species of the genus *Entalophora*. If, therefore, the *Stomatopora–Proboscina–Berenicea–Diastopora* series is to be included in one genus, *Entalophora* must also be included with it. And the lumping of genera does not end here. Waters[1] has pointed out that in some specimens of *Entalophora*, the zoœcia are distributed irregularly in some places, and in regular rings round the stem in others. Waters therefore regards *Spiropora* as a synonym of *Entalophora*, and this genus must therefore be merged with the rest. Again, in some species of *Spiropora*, the apertures

FIG. 5.—Section through frond of *Diastopora lamellosa*, Mich., var. *cervicornis*, to show multiple growth. Inferior Oolite: Leckhampton. **D. 2244.**

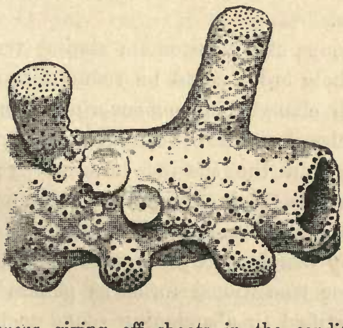

FIG. 6.—A *Diastopora* giving off shoots in the condition of *Entalophora*. Bathonian: Ranville. **D. 2221.**

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[1] A. W. Waters. On Fossil Cyclostomatous Bryozoa from Australia: *Quart. Journ. Geol. Soc.* vol. xl. (1880) p. 680.

of the zoœcia have the normal arrangement of rings in some parts of the zoarium, while elsewhere they occur in alternate lines as in *Idmonea*. This type was made by D'Orbigny into a genus, with the name of *Bisidmonea*, which has been accepted by some later authors such as Walford. But *Tubigera antiqua*, D'Orb., differs from *Bisidmonea* only by having an oval instead of a tetragonal section; and Pergens includes that species among the erect forms of *Idmonea*. The adnate forms of *Idmonea* are also brought within the same group by variation along another line from the same starting-point—*Stomatopora*. The only definite distinction between *Proboscina* and the true adnate *Idmonea*, is that in the latter the apertures are arranged in regular alternate lines on either side of the zoarium. But such a species as *Idmonea virgula*, D'Orb.,[1] is exactly intermediate between *Proboscina* and *Idmonea*. So close do these genera run to one another, that D'Orbigny named a series of species *Idmonea* on his plates and *Proboscina* in his text.

Hence, if the series *Stomatopora*, *Proboscina*, *Berenicea*, and *Diastopora* are to be united into two genera, we are equally bound to unite them into one, and also to include with this *Spiropora*, *Entalophora*, *Bisidmonea*, and both the adnate and erect *Idmonea*, as well as various massive, intermediate types such as *Reptomultisparsa*. Practically, that is to say, we unite the forms which Busk split up into the three families Idmoniidæ, Tubuliporidæ, and Diastoporidæ, into a single genus.

In the other groups of Cyclostomata similar transitions can be traced, and the whole order could be reduced to some half-dozen genera. Any such changes in nomenclature would be fatal to progress in the classification of the group. Great disturbance would be produced in the specific terminology; for the same names are frequently used in different genera, and will have to be changed if the genera be merged.

3. *Are there any Genera in Cyclostomata?*—It may be objected that to accept these transitional forms as genera is indefensible; for we are not justified in abandoning sound methods of nomenclature, either because the results are inconvenient, or because

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[1] D'Orbigny. Pal. franç. Terr. crét. t. v. pl. DCXXXI. figs. 15–17.

those who try to diminish the number of genera do not act consistently. It may be said that if two of the eggs of a single Bryozoon may grow into different forms, those forms must be regarded as the same species, and that to assign them to different genera is subversive of all ideas of nomenclature.

This raises the question whether there are such things as genera and species among Cyclostomatous Bryozoa.

If we take the Echinoidea, we find that the term genus has in that class a fairly definite value. Two individuals belonging to different genera may have had a common ancestor, but that ancestor must have lived many thousands of generations ago. For example, the two commonest living English Echinoids are *Echinus esculentus*, L., and *Echinus miliaris*, O.F.M. The distinctions between these species were nearly as well marked in the period of the Crag (Lower Pliocene or Plaisancian) as they are at present. They probably had as their common ancestor *Echinus serresi*, Desml., from the Helvetian or Middle Miocene. Let x represent the number of generations which lived in that division of geological time known as an "age"; then these two species have been distinct for at least $5x$ generations; and their common ancestor lived $7x$ generations ago. Similarly with genera. The closest ally of the genus *Echinus* is a group of small, uniformly tuberculate species, to which palæontologists give the name *Psammechinus*: the differences between the two groups are usually regarded as only subgeneric; nevertheless, the two have been distinct for $9x$ generations.

This illustration reminds us that to find the common ancestor of similar closely allied species of Echinoids, we have to go back a very long way; and to find the common ancestor of two subgenera, we have to go back still further. But in the case of the Cyclostomatous Bryozoa, great structural differences may be produced in only a few, or perhaps even within a single generation. For example, in the seas in which were deposited the Great Oolite of Normandy and of the Cotteswold Hills, there lived many specimens of the erect, frondose Bryozoa (here accepted as *Diastopora*); whereas the encrusting specimens (*Berenicea*) were very rare or absent. The conditions were favourable to erect forms, and all the young of these frondose forms adopted the same mode of growth as their parents. At Bradford, in Wiltshire, the geographical conditions changed rather suddenly, and the Bradford Clay was deposited instead of the Bath Oolite Limestone; *Diastopora* at once disappeared, and *Berenicea* became very abundant. The British Museum Collection includes 47 specimens of *Berenicea* from the Bradford Clay, and only 7 specimens from the Great Oolite. All *Diastopora* begin in a *Berenicea* stage (Fig. 7); and it is not at all improbable

FIG. 7.—The initial Stomatoporoid cell of a *Diastopora*, and expansion to Berenecoid condition. *Diastopora davidsoni*, Haime. Bathonian: Ranville. **60381.**

that, owing to the changed conditions, the young of the erect forms continued to grow in the encrusting form. Thus, perhaps in a single generation, all the *Diastopora* changed to *Berenicea.* When later on the deposition of clay ceased, and the limestones of the Forest Marble were laid down in the same locality, the conditions then were generally unfavourable to Bryozoa, so that specimens of the class are rare. But those which are found are *Diastopora*, and not *Berenicea*; so that the encrusting forms may have given birth to a frondose generation.

It may be suggested that such a sudden change of habit is improbable, and that it is more likely that the *Diastopora* were killed when the muddy conditions came, and that the *Berenicea* came from some adjoining area and replaced them. But this does not appear to be the true explanation; we do not know of any area in which *Berenicea* were abundant at the time, while there is a certain parallelism between the variation of *Diastopora* and *Berenicea*. Thus, *Diastopora foliacea*, Lamx., resembles *Berenicea compressa* (Gold.), for both have long tubular zoœcia and distant apertures. Similarly *Diastopora davidsoni*, Haime, may be the erect form of *Berenicea scobinula* (Mich.), for both have fairly long zoœcia and low peristomes arranged on long, curved, regular lines. *Diastopora michelini* (Blv.) is similarly analogous to *Berenicea concatenata*, Reuss.

It may be urged that if this parallel series proves anything, it proves the uselessness of the retention of the divisions *Berenicea* and *Diastopora*; and it certainly does suggest that an interchange of form may be produced by a sudden change of environment. But in other periods the erect and encrusting forms both lived together, and then frondose individuals probably gave birth to frondose young, and adnate individuals to adnate young. Hence in these cases the distinctions probably obtained for an indefinite period, and to ignore the great zoarial difference in this case would be a greater mistake than to accept it in others. Zoarial characters are the only ones available for systematic work among the Cyclostomata; and, as the differences appear to hold as long as the conditions remain approximately the same, I feel bound to accept the divisions based upon them. These examples, however, show that variations in this group are of very different value from those on which genera are based, in some other groups of Invertebrates.

Diastopora and *Berenicea* have been taken as illustrating the value of zoarial characters in the Cyclostomata, and they seem to prove two things—

1st. That under similar conditions there is a tendency for successive generations to have the same habit of growth.

2nd. That a sudden change in environment may lead to a sudden change in zoarial habit.

In consequence, alternative courses are offered us in respect to the treatment of zoarial characters. They may be ignored, and forms placed by most authors in different families may be included in one genus; or we must admit that there are no true genera among Cyclostomata, but only certain convenient, but artificial, groups of species.

The latter alternative is the one to which I have been driven, I must confess, rather reluctantly; for it means that there is no hope in this order of ever establishing divisions with the same absolute diagnoses as in most other groups of Invertebrates.

4. *Circuli.*—I therefore accept the terms *Stomatopora*, *Proboscina*, etc., as names for convenient groups, which are not altogether artificial, but which are not genera in the sense in which that term can be used among Echinoidea and Mammals. They could be better described as circuli than as genera. A *circulus* was one of the small groups of individuals who clustered round speakers in the Roman forum. Most of the individuals in the forum were definitely attached to a particular group; the groups were less crowded around their margins, and between them people were irregularly scattered and crossed from circulus to circulus. They thus prevented any rigid division of the crowd into definite groups.

The groups of Cyclostomata appear to me much the same; in a collection of specimens of *Stomatopora*, *Proboscina*, and *Berenicea*, the vast majority of the specimens can be assigned their position without the slightest hesitation; but occasionally specimens are intermediate between the typical forms, and cannot be so easily placed. Nevertheless, there seems no reason why most of the specimens should not be grouped simply because a few do not exactly fall into line.

6. SPECIFIC GROUPS AND INDIVIDUAL VARIATION.

1. *The Variation of Zoœcia.*—When we pass from the genera or large groups of specimens, to the species or smaller groups of specimens, we find that the same variability renders absolute diagnoses again impossible. The specimens may, however, be easily grouped around certain central types. Such groups are based on the characters of the zoœcia, viz.: their length and shape, the form of the peristome, and whether the zoœcia are crowded or scattered. Variations in the shape of the zoarium are unimportant, so long as they do not affect its structure.

The zoœcia, however, themselves vary greatly, and it is therefore necessary, in order to determine the value of these specific groups, to estimate the range of variation of the zoœcia. If this be so great that the same forms are often produced by independent variation from different stocks, at different periods or in distant places, then the time spent in trying to define species or specific groups among the Cyclostomata is wasted. But, so far as I am able to judge, this has not happened so frequently as might be expected: an occasional specimen of a *Berenicea* from the Miocene may be so much like a Jurassic species, that it is impossible to separate them by a verbal diagnosis; but I have never met with any case in which a series of Miocene specimens could not be easily recognized as different from a Jurassic series.

2. *The Comparison of Equivalent Zoœcia.*—In estimating the variations we must remember that the Bryozoa are colonial, and that colonial animals have always been recognized as especially difficult of specific diagnosis. Thus, most recent workers on the corals admit that different parts of the same mass vary so greatly, as to throw grave doubts on the use of defining species or genera. The same difficulty is experienced with animals which, like the Pteropods, live in vast shoals, subject throughout to precisely the same conditions. Similarly with the Bryozoa; the colonies are constituted of swarms of zoœcia, most of which live under almost identical conditions. Thus, one specimen of *Theonoa bowerbanki*, Haime, in the British Museum Collection, consists of over 17,000 zoœcia. But a Bryozoan colony not only includes a shoal of individuals, but zoœcia in many different stages of development. It is impossible, therefore, to compile a diagnosis which shall be equally true for every member of so extensive a series of zoœcia, including individuals of all ages, and some which have been dwarfed or aborted by overcrowding in the zoarium.

Barrois,[1] when advocating the taxonomic value of the larval stages in the Bryozoa, remarked that "il me semble en effet tout-à-fait indispensable, pour des animaux à caractères si difficiles à saisir que les Bryozoaires, de tenir compte en même temps de toutes les formes à la fois. Une classification basée sur la seule forme des zoœciums est encore, quelle que parfaite qu'elle soit, très-insuffisante." The principle of Barrois's argument is sound, but a system which would necessitate the inclusion of larval characters in diagnoses is too complex for general use. It is sufficient, however, to compare equivalent zoœcia in a colony; just as in determining worms, echinoids, or amphibians, the comparisons are made between equivalent setæ, plates, or stages.

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[1] J. Barrois. Recherches sur l'Embryologie des Bryozoaires, p. 251. Lille, 1877.

3. *Variational Formulæ.*—The range of variation within the limits of a certain specific group may be conveniently shown by formulæ. Four main characters are used in the diagnosis of these groups of specimens:—1. The elevation of the peristome or of the free portion of the zoœcial tube (*p*). 2. The shape of the zoœcia (*c*). 3. The length of the zoœcia (*l*). 4. The nature of the zoarium (*r*).

In compiling the formulæ, only normal equivalent zoœcia can be used. Each letter of the general formula, *p*, *c*, *l*, *r*, is replaced by a figure to show the extent of the development of the character represented. Thus, if the aperture of the zoœcion be flush with the surface of the zoarium, *p* is replaced by 0; if the peristome be slightly raised, it is shown by the substitution for *p* of 1, if well raised of 2, if highly raised of 3.

Thus, in the genus *Stomatopora* the terms of the formula are as follows:—

	Peristome.	Shape of Zoœcia.	Length of Zoœcia.	Zoarium.
	p.	*c.*	*l.*	*r.*
0	Flush.	Cylindrical.	Short.	Uniserial; long thin series.
1	Slightly raised.	Fusiform.	Median.	Uniserial; branches tufted at ends.
2	Well raised.	Pyriform.	Long.	Uniserial; branches tend to become double at ends.
3	Highly raised.	Hippothoiform.	Very long.	Multiserial.

Intermediate variations may be indicated by the use of dashes beside the figures.

Thus, we may at once recognize the differences between three species of the genus *Stomatopora* by comparing their formulæ:—

		p.	*c.*	*l.*	*r.*
S. dichotoma (Lamx.) =	... ...	2	0	1	1
S. dichotomoides (D'Orb.) =	... ...	1	2	1	0
S. waltoni, Haime =	... ...	1	0	2	0

The formulæ also readily enable us to compare the species of one age with those most closely allied to them which lived in other periods. Thus, the affinities of the same three species may be shown in the following comparisons :—

S. dichotoma series.

	p.	c.	l.	r.	
S. dichotoma (Lamx.)	2	0	1	1	Jurassic.
S. granulata, M. Edw. (*non auct.*)	2′	0′	1	1	Cretaceous.
S. divaricata, Reuss	2′	0′	1′	0″	Miocene.
S. trahens, Couch (*S. granulata*, Johnst.)	2″	0″	1	2	Recent.

S. dichotomoides series.

S. dichotomoides (D'Orb.)	1	2	1	0	Jurassic.
S. plicata, D'Orb.	1	2′	1	0	Cretaceous. (Ornamentation differs.)
S. vesiculosa (Mich.)	1	2″	1	0	Miocene.

S. waltoni series.

S. waltoni, Haime	1	0	2	0	Jurassic.
S. longiscata, D'Orb.	1″	0	2	0	Cretaceous.
S. reussi, n. nom.	2	0	2	0	Miocene.

Similarly we may contrast the Jurassic species of *Proboscina* amongst themselves by a list of their formulæ :—

	p.	c.	l.	r.[1]
P. eudesi, Haime	1	0	2	4–7
P. jacquoti, ,, ...	2	0	3	1–12
P. desoudini (,,)	1′	2	2	1–2
P. cunningtoni, Greg.	1	0	1	1–3
P. rigauxi (Sauv.)	1	0	2	1–12
P. morinica (Sauv.)	3	2	1	1–4
P. liassica, Quenst.	1	0	1	3–5

We may also contrast the *Proboscina* species with those of a later period, as follows :—

P. eudesi series.

	p.	c.	l.	r.	
P. eudesi, Haime	1	0	2	4–7	Jurassic.
P. radiolitorum (D'Orb.)	1′	0	2	4–7	Cretaceous.

P. jacquoti series.

P. jacquoti, Haime	2	0	3	1–12	Jurassic.
P. ramosa (Hag.)	2	0	2′	1–8	Cretaceous.
P. dilatans (Johnst.)	2	0	3	2–8	Recent.

[1] In these formulæ *r* stands for the number of zoœcia in a band.

P. desoudini series.

	p.	*c.*	*l.*	*r.*	
P. desoudini (Haime)	1′	2	2	1–2	Jurassic.
P. intermedia, Novak	1	1″	3	1–2	Cretaceous.
P. echinata (Münst.)	2	1	1	1–3	Cainozoic.

These formulæ also enable us to estimate the general stages of development in the Bryozoa at any period. The main line of progress in the Cyclostomata has been from single encrusting forms to those which are erect. Those which were able to raise their crown of tentacles highest above the sea-floor were able to obtain most food. Under the influence of the struggle for existence, there appears a constant tendency in the Cyclostomata to secure some method by which the originally encrusting forms can become erect or raised. Single series become multiple; multiple series spread into sheets; and sheets give a sufficiently firm foundation for one part to rise as a frond or tuft. All through the Cyclostomata we find the families beginning as encrusting linear series or sheets, with low peristomes. Thus, the Tubuliporidæ begin with *Stomatopora*, the Idmoniidæ with the adnate *Idmonia*, the Fascigeridæ with *Defrancia*, the Theonoidæ with *Actinopora*. In some cases the necessary increase of elevation is obtained simply by the elongation of individual zoœcia, or by the whole of the distal portion being erect and free, as in *Tubulipora*. But such isolated tubes are very readily broken off, and hence the elevation is more permanently effected by the union of several zoœcia into tufts. But even in these cases there appears a competition between the adjoining zoœcia; and the influence of the ever-constant effort towards an increase in the elevation of the peristome may be seen. Hence the degree of increase in the height of the mouth appears to serve as some measure of the progress effected along any particular line of development. This is seen in the case of the representative species of different geological ages, as is shown in the following average formulæ of the previously mentioned species of *Stomatopora*:—

	p.	*c.*	*l.*	*r.*
Jurassic	1′	0″	1′	0′
Cretaceous	1″	0‴	1′	0′
Miocene	1″	1	1′	0′

But the formulæ for all the Jurassic and all the Recent species of a genus show that the progress has, on the whole, been great, though numerous cases of degeneration occur.

4. *Continuous Variation.*—Comparisons between the formulæ of allied species belonging to different geological periods show that the differences between them are often very small. The species are often so much alike that it is impossible to indicate the distinctions by general diagnoses, for there appears to have been a continuous variation from one species or specific group to the next. We cannot, however, refer to such continuous variation without considering Mr. Bateson's[1] recent discussion of the nature of variation, and his conclusion of the greater importance of discontinuous than of continuous variation in the origin of new species. Mr. Bateson has shown (*e.g.*, *op. cit.* p. 41) that the individuals included in a species are not distributed uniformly among the different variations included with the limits of that species. The great majority of the members of the species agree with one or two types, and comparatively few members are scattered near the bounds of the limit of variation, or far from the main centres of organic stability. This is exactly the idea of a circulus. Each circulus is a "centre of organic stability," and the variation around it is of continuous and almost imperceptible gradations. Bateson takes as his first axiom[2] that "The forms of living things are various, and, on the whole, are discontinuous or specific." He concludes[3] "that the discontinuity of species results from the discontinuity of variation." Elsewhere he tells us that "such discontinuity is not in the environment: may it not, then, be in the living thing itself?"[4]

The study of the Cyclostomata does not appear to me to support these views. Bateson's axiom is doubtless true for living Bryozoa, and was doubtless true for the Bryozoa that lived at any one previous epoch. But it is not true if we compare the Bryozoa of successive faunas instead of different individuals of the same fauna. The nearest contemporary ally of *Stomatopora dichotoma* (Lamx.) differs from it by an amount expressed by formula as

$$1 \quad 2 \quad 0 \quad 1$$

The nearest ally of that species, found in the succeeding geological period, differs from it only by

$$0' \quad 0' \quad 0 \quad 0$$

[1] W. Bateson. Materials for the Study of Variation, treated with special regard to Discontinuity in the Origin of Species. 1894.

[2] *Op. cit.* p. 3. [3] *Op. cit.* p. 568. [4] *Op. cit.* p. 17.

And this in turn was succeeded by a form with a difference of only

$$0 \quad 0 \quad 0' \quad 0''$$

That is to say, that if we compare the forms of Bryozoa that lived in one particular zone, the species are discontinuous; but if we compare the forms of Bryozoa that lived in successive zones, the species are continuous. Variation in this case is therefore continuous in time and discontinuous in space. And the latter need not surprise us when we remember the evidence advanced by Darwin in support of his argument, that the rarity of existing intermediate varieties is only to be expected, for "the very process of natural selection constantly tends, as has been so often remarked, to exterminate the parent forms and the intermediate links."[1]

It is because the element of time necessarily enters into the idea of a circulus that it supplies instructive analogy as to the nature of specific groups.

The occurrence of individuals well separated from the main mass of the circulus (but still so much nearer to it than to any other as to be unquestionably members of it) presents us with a case of discontinuous variation; and such discontinuous variation has almost certainly taken place in the Bryozoa.

The sudden change from *Diastopora* to *Berenicea*, as we pass from the Great Oolite to the Bradford Clay (p. 20), supplies a marked case of discontinuous variation. Bateson's position is that the "discontinuity is not in the environment"; whereas, as we have seen, in that case it was due to a direct change of environment. But such cases are exceptional. The general evidence of the fossil specimens, and the great difference of opinion as to the range of specific variation between those who multiply species indefinitely, and those who place Silurian and recent individuals in the same species—tend to show that most of the forms of Cyclostomata have arisen by slow, imperceptible, continuous variation.

7. THE CLASSIFICATION OF THE CYCLOSTOMATA.

It is the fact that continuous variation has played the leading part in the evolution of the Cyclostomata, that renders the

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[1] C. Darwin. The Origin of Species, 6th ed., 1882, p. 138.

diagnosis of genera so difficult, but their classification remarkably complete. Most of the well-known families can be arranged in series, beginning with simple adnate forms and ending as erect fronds or tufts. This is shown for three families by the following table:—

Families.	Linear Series.	Attached Sheets.	Massive.	Erect.
Tubuliporidæ Fascigeridæ Theonoidæ	*Proboscina*	*Berenicea* *Defrancia* *Actinopora*	*Reptomultisparsa* *Apsendesia* *Kololophos*	*Diastopora* *Fasciculipora* *Theonoa*

The possibility of discontinuous variation, however, renders the classification in some respects uncertain, until the limits of the discontinuity are known. Thus, the Cretaceous and Cainozoic Bryozoa, which are provided with cancelli, are here grouped into a suborder, the Cancellata. But it is possible that the whole of these genera are not descended from one ancestor, but that cancelli may have arisen independently in different families of Tubulata. Until this is settled, it seems wisest to leave the cancellate forms in a separate group.

1. *The Four Orders of Gymnolæma.*—The Jurassic Bryozoa all belong to that section of the subclass Ectoprocta known as the Gymnolæma (p. 38). This is usually regarded as divisible into three orders—the Cheilostomata, Ctenostomata, and Cyclostomata. The two first may be dismissed at once, as there are only two Jurassic species known to belong to them, and these are both members of the Cheilostomata.

The last order of these three, the Cyclostomata, is defined by Hincks as follows: "Zoœcia tubular, with a plain, inoperculate orifice; marsupia and appendicular organs wanting." Three out of the five statements in this diagnosis are negative; and the only positive characters are that the zoœcia are tubular and the orifice (*i.e.* aperture) is plain. But both characters are also met with among the Cheilostomata, for Dr. Hincks commences his diagnosis of the Æteidæ with "Zoœcia tubular,"[1] and in the same family the aperture is terminal and plain.

[1] Hincks. Brit. Mar. Polyz. p. 1.

Ulrich has divided the Bryozoa which are tubular and asetose into two groups — the Cyclostomata and the Trepostomata. So great is the difference in structure amongst the Bryozoa included in these two divisions, that Ulrich's proposal seems to me wise. In his important monograph on the Palæozoic Bryozoa of Illinois,[1] he has given general descriptions of these divisions rather than definite diagnoses, and he has included among the Trepostomata forms which I prefer to leave with the Cyclostomata. The following diagnoses show the sense in which I accept Ulrich's new order.

Cyclostomata.—Zoœcia tubular and simple in structure. Apertures terminal (and rarely subterminal); inoperculate. Appendicular organs, mesopores, and acanthopores absent. Dactylethræ and cancelli may be present.

Trepostomata. — Zoœcia consisting of prismatic or cylindrical tubes, generally forming massive zoaria or thick sheets. Apertures always terminal; crowded. Zoœcia divided into a proximal, immature, thin-walled part, which is simple in structure; and a distal, mature part, of which the walls are thick and complex, and in which the zoœcia are crossed by diaphragms. Mesopores and acanthopores often present; no avicularia or vibracularia, but spines may occur.

The formation by Ulrich of this group of Trepostomata considerably simplifies the classification of the old order, the Cyclostomata. The step was foreshadowed by Mr. Waters, who in 1887 proposed to divide the Cyclostomata into the Parallelata and the Rectangulata. Had he formally diagnosed these groups, his names would have had priority over Ulrich's; but, as it is, it would be unfair to the American author to reject the terms which he has based on careful descriptions and elaborate microscopical investigations, for others tentatively advanced.

2. *Previous Classifications of the Cyclostomata.*—I have no intention of attempting here to discuss the respective value of the classifications of the Cyclostomata which we owe to D'Orbigny (1851), Hagenow (1851), Busk (1859 and 1875), Smitt (1865), Hincks (1880), MacGillivray (1887), Pergens and Meunier (1887), Waters (1885), Jullien (1883), Novak (1877), or Marsson

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[1] Geol. Surv. Illinois, vol. viii. sect. vii. 1890.

(1887). This could not be done without reference to and description of many Cretaceous forms. I hope, therefore, to consider the question in greater detail when describing the Cretaceous Bryozoa. Classifications founded only on recent species are of little value; for the existing fauna includes but a small number of Cyclostomata, which are not representative of the varied types met with in the Mesozoic.

The first serious attempt to classify the Cyclostomata was that of D'Orbigny in 1851, whose "Bryozoaires Centrifuginés" include this order. He divided this group into two suborders, one of which practically corresponds with Busk's division, the Articulata. The rest, or the *Centrifuginés empatés*, consists of the Cyclostomata, Inarticulata, and of many Palæozoic forms now included in the Cryptostomata. His first division was named the *Operculés*, but as it was based on an entire misconception of the forms included within it, it may be ignored. The rest, however, of D'Orbigny's major divisions seem to me to be based on truth. His scheme is as follows:—

Division *B*. Fasciculinés. Zoœcia grouped in bundles.
- Fam. 1. *Fascigeridæ*. No mesopores.
- ,, 2. *Fasciporidæ*. Mesopores present.

,, *C*. Tubulinés. Zoœcia tubular and more or less free.
- Fam. 1. *Tubigeridæ*. Apertures in transverse series.
- ,, 2. *Sparsidæ*. Apertures scattered.
- ,, 3. *Clausidæ*. Aborted zoœcia present.
- ,, 4. *Crisinidæ*. Zoœcia on one face, and intermediate pores on the other.
- ,, 5. *Caveidæ*. Zoœcia and mesopores on one face, and intermediate pores on the other.

,, *D*. Foraminés. Zoœcia not projecting above surface of zoarium.
- Fam. 1. *Ceidæ*. Zoœcia funnel-shaped.
- ,, 2. *Cavidæ*. Zoœcia not funnel-shaped.
- ,, 3. *Cytisidæ*. Intermediate tubuli.
- ,, 4. *Crescisidæ*. Mesopores present.

This classification seems to me to contain a good deal of truth. It recognizes the importance of mesopores, and that the forms included within it may be divided into three main types of zoarial structure—those in which the zoœcia occur as masses of tubes (Trepostomata or Rectangulata), in bundles, and in varied congeries of tubes.

The subdivisions of these groups accepted by D'Orbigny have been recognized by nearly every subsequent worker to be artificial and useless, and the amount of truth the classification contains has therefore not been recognized.

Busk followed in 1859 with a classification, of which the only part that is now accepted is the separation of the Crisiidæ from the rest as the Articulata. Smitt in 1865 accepted this arrangement, and two of D'Orbigny's divisions, for which he used the same names but in a Latin form, viz. Tubulinea and Fasciculinea; as he dealt only with recent species, he had not to consider the forms included in the division Foraminés. Hincks in 1880 and MacGillivray in 1887, also each dealt only with living species, which are so few in number that family divisions are sufficient in their classification; Hincks therefore referred the British species to four families, and MacGillivray those of Victoria to five. Pergens and Meunier, who in the same year described the Cretaceous Bryozoa of Faroe, also used only family divisions, ten in number. Marsson in 1887 divided the Cyclostomata into two groups, the Solenoporina and the Metopoporina, including in the latter only *Melicertites* and its allies. Pergens in 1890 accepted the same division, though he abandoned the name Metopoporina; and he made many great changes in the families.

3. *The Classification proposed.*—Without attempting a formal revision of the classification of the whole order of the Cyclostomata, which to be of value must be based upon, and prove applicable to, the Cretaceous fauna, it will be useful to show the grouping into which the Jurassic representatives of the order may be arranged. The Jurassic species are few in comparison with the Cretaceous, but they offer the great advantage of showing the commencement of the lines of development, which by the succeeding period had given rise to extraordinarily varied forms. The lines of evolution can therefore be recognized unobscured by the great secondary variations of the Cretaceous fauna.

The Articulata section of Cyclostomata is not known to be represented in the Jurassic, and thus this group may be dismissed.

The Jurassic Cyclostomata fall fairly readily into two groups. In the first, all the zoœcia are functional, open, and tubular; in the second, normal zoœcia occur surrounded by aborted, closed zoœcia (or dactylethræ), which generally form a large proportion of the zoarium. In the Cretaceous period there is a third type, in which cancellated interzoœcial tissue is present; but so far, I cannot verify the occurrence of any species of this group in the Jurassic. The differences between these three groups seem to me more important than variations in zoarial form, for they involve differences in zoœcial structure. I therefore propose to call them the Tubulata, the Dactylethrata, and the Cancellata.

The subdivisions of these orders must depend on zoarial characters. It is natural to commence with the largest of the three, which is also the most difficult, because the most simple. The most primitive form is a simple linear zoarium—*Stomatopora*. This serves as the starting-point of several different lines of development. On the one hand, the zoœcia grow into ribbon-shaped bands; these expand into sheets, which may remain encrusting or rise as fronds. For this group we may adopt the name Tubuliporidæ.

A second family is formed by the primitive zoœcion giving rise to banded zoaria in which the apertures are arranged in regular transverse rows, instead of having them scattered irregularly. The adnate bands give rise to erect forms, in which the zoœcia only open on one side. These form the family Idmoniidæ. Those Bryozoa which arise from a similar embryonic zoœcion, but give rise to solid bundles, instead of to sheets or unilateral dendroid forms, represent a third group, for which we may accept Pergens' name—Entalophoridæ.

The second group of Tubulata arises from a different larval form, which was originally described as the genus *Pelagia* or *Defrancia*. The young stage of the zoarium is cupuliform, instead of stomatoporiform. The zoaria may be discoid, as in *Actinopora*, or the zoœcia may be elongated into such types as *Apsendesia* and *Fasciculipora*.

The Dactylethrata is a much smaller group, and contains the three types, *Reticulipora*, *Multiclausa*, and *Terebellaria*.

The Cancellata do not appear until the Cretaceous.

The following summary of the classification includes the Jurassic families, while a few of the principal families found in later periods are mentioned, in order to suggest the lines of development subsequently followed. The Cretaceous genera seem to fall easily into places in this scheme.

Order CYCLOSTOMATA.

Suborder I.—ARTICULATA.

Fam. *Crisiidæ.*

,, II.—TUBULATA.

(*a*) Young stage. Stomatoporiform or Probosciniform.

Fam. 1. *Tubuliporidæ.* Fam. 3. *Idmoniidæ.*

,, 2. *Entalophoridæ.* ,, 4. *Horneridæ.*

(*b*) Young stage. Cupuliform or discoid.

Fam. 5. *Fascigeridæ.* Fam. 7. *Theonoidæ.*

,, 6. *Osculiporidæ.*

,, III.—DACTYLETHRATA.

Reticuliporidæ. Multiclausidæ. Terebellariidæ.

,, IV.—CANCELLATA.

Discoporellidæ.

Order TREPOSTOMATA.

Families represented in the Jurassic—

Fam. 1. *Ceramoporidæ.* *Chilopora.*

,, 2. *Heterotrypidæ.* *Heteropora.*

,, 3. *Amplexoporidæ.* *Ceriopora.*

8. PREVIOUS WORK ON THE JURASSIC BRYOZOA.

The study of the Jurassic Bryozoa is facilitated by the fact that this group was practically unrecognized in the first half-century of the study of systematic zoology. The first work which contains any information of much importance upon this subject is Lamouroux's "Exposition Méthodique des Polypiers," published in 1821. In this were figured specimens of most of the common forms found in the Bathonian deposits of Normandy; they were fairly well figured and described, and no less than nine Jurassic genera date from this work. These names gained general acceptance by zoologists, who unfortunately have used some of them in a sense different from that in which they were proposed by Lamouroux. Thus, *Idmonea* is generally said to be "erect" in zoological diagnoses; whereas the type species is encrusting. Milne Edwards (1838) and Michelin (1840–6) added some new species to those described by Lamouroux, and D'Orbigny, both in his Prodrome and the "Paléontologie française" (1850–2), named many new forms; but he gave such imperfect diagnoses that most of them are indeterminable. In 1854 appeared the monograph of Ed. Haime, which is the most valuable work published upon this group. He accurately figured and described most of the principal forms, all of which he included in one family. The monograph is worthy of Haime's great reputation.

Since this time there has been no general work on Jurassic Bryozoa as a whole; and we have only to notice papers on separate faunas, or the descriptions of isolated species in works on general Jurassic Palæontology. A list of these papers is given in the Appendix; and it is only necessary to say that the most important contributions will be found under the names of Reuss, Brauns, Waagen, Sauvage, and Friren for Continental species, and of Walford and Vine for those of England.

9. THE BRITISH MUSEUM COLLECTION.

Jurassic Bryozoa are upon the whole scarce. In some horizons they may be abundant, but as a rule the Jurassic limestones may be searched in vain for recognizable specimens. From some English members of the Jurassic sequence, in which, from the conditions of deposition, numerous Bryozoa might be expected, I am not aware that a single specimen has ever been found. No species has been previously recorded from either the British Portlandian, Kimeridgian, or Corallian deposits.

The British Museum contains, however, a fine series of Jurassic Bryozoa, both English and foreign, most of which have been obtained from the following collections:—

Brodie Collection.—Rich in Inferior Oolite specimens from the Cotteswolds. Purchased from the Rev. P. B. Brodie, F.G.S., in 1895.

Brauns Collection.—Bryozoa from Bavaria. Purchased in 1838.

Bright Collection.—Many specimens from Normandy. Presented by Benjamin Bright, Esq., in 1873.

Cunnington Collection.—Specimens from the Jurassic of Wiltshire. Purchased from Wm. Cunnington, Esq., F.G.S.

Holl Collection.—Mainly Inferior Oolite. Purchased from Executors of late H. B. Holl, M.D., F.G.S., in 1887.

Tesson Collection.—An extensive series from the Bathonian deposits of Normandy. Purchased of M. Tesson, 1857.

Vine Collection.—Types of Vine's species from Cornbrash of Northamptonshire. Purchased of Executors of G. R. Vine, Oct. 1893.

10. THE JURASSIC SEQUENCE.

The following table shows the Jurassic sequence and the time divisions used in the present Catalogue. The principal localities from which the Bryozoa have come are given in the two last columns.

THE JURASSIC SEQUENCE.

Time.			Principal Localities yielding Bryozoa. British.	Principal Localities yielding Bryozoa. Foreign.
Upper Oolite.	Portlandian ...	Purbeck Beds	None.	None.
		Portland Limestone	Tisbury.	
		Portland Sands	None.	
	Kimeridgian ...	Kimeridge Clay	... ...	Streitberg, Bavaria; Weissenstein, Baden; Lindener Berg, Völksen, and Ahlem, nr. Hanover.
Middle Oolite.	Corallian ...	Upper Calcareous Grit / Coral Rag ...	... ...	Rabenstein, Bavaria; Hoheneggelsen and Mehle, Prussia; Valfin, Haut-Jura.
	Argovian ...	Coralline Oolite	Hinton-Trowbridge.	
	Oxfordian ...	Up. and Mid. Oxford Clay		
	Callovian ...	Lower Oxford Clay / Kelloway Rock	... ...	Crain and Percey-le-Grand, Haut-Jura.
Lower Oolite.	Bathonian ...	Cornbrash	Thrapston; Thornboro'; Bedford; [Draycot; Scarboro'.	Wast, nr. Boulogne; Lion-sur-Mer; Buchsweiler, [Elsass
		Forest Marble		
		Bradford Clay	Bradford; Box; Tetford Road.	
		Great Oolite	In Wilts; Bath; Bradford; Minchinhampton; Richmond boring.	Lebisey, Luc, Ranville, Oustreham, etc., in Calvados; Balin, Galicia; Conflans and Wodécourt, Moselle; Niedersweiler, Baden.
		Stonesfield Slate	None.	
		Fuller's Earth	Gloucestershire.	
	Bajocian ...	Inferior Oolite	Cotteswold, Shepton and Burton Bradstock, Dorset; Coombe Hill.	Plappeville, Montvaux, Mietesheim, and Ars, Elsass; Croizille, St Vigor; Bayeux; Port-en-Bessin; Pouilly, Flacé, etc., nr. Maçon; Gingen, Würtemberg; Pommer and Jungingen, Hohenzollern.
Liassic.	Toarcian ...	Sands with *R. cynocephala* / Upper Lias		
	Charmouthian	Middle Lias	King's Sutton; Fenny Compton; [Tilton.	Giverdy, St. Bonnet; Ohmenhausen, Würtemberg.
	Sinemurian ...	Lower Lias	... ...	Valière, nr. Metz; Chilly, Fleigneux, and Renwez, [Ardennes.
	Hettangian ...	White Lias	Itchington.	
Rhætic.	Rhætian ...	Rhætic Beds		

PART II.

SYSTEMATIC SYNOPSIS.

CLASS BRYOZOA, Ehrenberg, 1831.[1]

Diagnosis.—Coelomate Metazoa, the individual members of which are small in size. The body is surrounded by an ectocyst and endocyst, the former of which secretes a cuticle. There is a single nerve ganglion. The digestive canal is ciliated and bent into a U shape, the mouth and anus being situated close together. The mouth is within a circular or horseshoe-shaped ridge, bearing ciliated tentacles (the lophophore). The anus opens either within or outside the lophophore. The larva is free-swimming.

The Bryozoa are usually fixed, and compound. The individual animals or Bryozoites grow by gemmation into zoaria.

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[1] In the discussion as to which of the terms, Polyzoa or Bryozoa, is to be taken as the name of the class, it is assumed that Thompson's name predates Ehrenberg's. Thompson's work is usually quoted (*e.g.* by Engler) as 1831–4, whereas Memoir No. 5, containing that on Polyzoa, is assigned to 1830 by Busk (*Ann. Mag. Nat. Hist.* ser. 2, t. x. p. 352) and Hincks (Brit. Mar. Polyz. p. 589). The confusion is probably due to the statement in *Mag. Nat. Hist.* vol. vii. p. 656, December 1834, that Memoir No. 5 had been "just published"; but this was a mistake for Memoir No. 6, as the subject is mentioned in the reference. Thompson's series dates from 1828–34; the memoir on the Polyzoa was issued in December, 1830, as a long review of it was given in the number of Férussac's *Bull. Sci. Nat.* for January 1831. The dates of publication of the various parts are as follows:—

Memoir	1.	... 1828.	*Fide* Férussac,	*Bull. Sci. Nat.*	t. xvi. 1829, p. 473.
,,	2.	Apr. 1829.	,,	,,	t. xx. 1830, p. 312.
,,	3.	Jan. 1830.	,,	,,	t. xxii. 1830, p. 331.

SUBCLASS I. ENTOPROCTA, Nitsche.

Both mouth and anus within the lophophore, which is præ-oral in origin. [No fossil representatives known.]

SUBCLASS II. ECTOPROCTA, Nitsche.

The lophophore postoral in origin; it does not enclose the anus.

Section 1. PHYLACTOLÆMA, Allman.

Lophophore horseshoe-shaped. A movable epistome overhangs the mouth. [No fossil representatives known.]

Section 2. GYMNOLÆMA, Allman.

Lophophore orbicular. No epistome.

Order 1. CTENOSTOMATA, Busk.

Zoœcia never calcareous. Orifices guarded by setæ-like processes. [No certain fossil representatives of this order are known, the unity of which is very doubtful.]

Order 2. CYCLOSTOMATA, Busk.

Bryozoa in which the zoœcia are simple, elongated, and cylindrical, and typically grow in tufts or sheets formed of radiating zoœcia. Mesopores are rarely (if ever) present. Mouths circular, and generally raised above the surface of the zoarium. Oœcia of enlarged zoœcia. Appendages absent.

Memoir 4. } Dec. 1830. *Fide* Férussac, *Bull. Sci. Nat.* t. xxiv. 1831, pp. 79–82.
,, 5. }
,, 6. ... 1834. *Fide Mag. Nat. Hist.* vol. vii. 1834, p. 656.
Ehrenberg's name Bryozoa was apparently not published until 1831, although the date on the cover of the part of Symbolæ Physicæ in which it appeared is 1828; the plates were issued in that year, but the text was not issued till 1831, if we may trust the authority of Isis, 1832, p. 1274, for reference to which I am indebted to Mr. C. D. Sherborn's MS. Index Generum et Specierum.

Suborder I.—Articulata. Zoarium divided into internodes, by horny tubes at the nodes; joints usually flexible.

Fam. 1.—*Crisiidæ.* No Jurassic representatives.

Suborder II.—Tubulata. Zoarium formed of monomorphic zoœcia, not divided into internodes; zoœcia of elongated tubes grouped into bundles or sheets, or linear series.

Section 1.—Young zoarium Stomatoporiform or Probosciniform.

Fam. 1.—*Tubuliporidæ.* See p. 41.

,, 2.—*Entalophoridæ.* See p. 137.

,, 3.—*Idmoniidæ.* See p. 133.

,, 4.—*Horneridæ.* No Jurassic representatives.

Section 2.—Young zoarium. Cupuliform.

Fam. 5.—*Fascigeridæ.* See Pt. III.

,, 6.—*Osculiporidæ.* See Pt. III.

,, 7.—*Theonoidæ.* See Pt. III.

Suborder III.—Dactylethrata. Zoarium multilamellar, usually erect and dendroid; largely composed of dactylethræ. (For diagnosis see Pt. III.)

Fam. 1.—*Clausidæ.* See Pt. III.

,, 2.—*Reticuliporidæ.* See Pt. III.

Suborder IV.—Cancellata. Zoarium composed of simple zoœcia separated by cancelli. (For diagnosis see Pt. III.) No Jurassic representatives.

Order 3. TREPOSTOMATA, Ulrich.

Gymnolæma in which the zoarium consists of straight, prismatic, or cylindrical tubes, growing in thick sheets or masses. Apertures always terminal. Zoœcia divided into proximal, immature portions, in which the zoœcia are thin-walled, and of which the structure is simple; and into distal, mature regions, in which the walls are thickened and diaphragms are numerous. Mesopores occur in many forms. No avicularia or vibracularia, but spines sometimes occur (acanthopores).

Fam. 1.—*Ceramoporidæ.* See Pt. III.

,, 2.—*Heterotrypidæ.* See Pt. III.

,, 3.—*Amplexoporidæ.* See Pt. III.

Order 4. CHEILOSTOMATA, Busk.

Gymnolæmata in which the orifice is guarded by an operculum. Zoœcia dimorphic, some being modified into avicularia and vibracularia.

Suborder I.—Athyriata. Cheilostomata with the front wall uncalcified or incompletely calcified.

Fam. 1.—*Membraniporidæ.*

„ 2.—*Microporidæ.*

"*We have . . . . reached the point long ago predicted by Lamarck in promulgating the evolution theory, namely, that the lines drawn in the Linnean system of nomenclature would be finally obliterated by discovery. In fact, we are now beginning to retain the binomial system upon grounds of convenience and of scientific courtesy, rather than upon lines of definition.*"—Osborn and Wortman, 1895.

PART III.

DESCRIPTION OF SPECIES.

Class ECTOPROCTA, Nitsche.

Subclass GYMNOLÆMATA, Allman.

Order CYCLOSTOMATA, Busk.

Suborder TUBULATA, Gregory.

Diagnosis.—See p. 39.

Family TUBULIPORIDÆ.

Synonymy:

Tubuliporidæ, M. Edwards, *pars*; Busk; Smitt, *pars*; MacGillivray, *pars*; Hincks, *pars*; Ulrich; Johnston, *pars*; Haime, *pars*; Jullien, *pars*.
Diastoporidæ, *pars*; Busk, *pars*; Smitt; Pergens and Meunier.
Diastoporidæ, Marsson.
Stomatoporidæ, Pergens and Meunier.
Sparsidæ, D'Orbigny, *pars*.

Diagnosis.—Cyclostomata Tubulata in which the zoœcia are simple, open tubes, which either grow as linear series, or as encrusting or erect sheets. The sheets may be coiled into hollow tubes, but only exceptionally form solid bundles. The zoœcia may be wholly immersed or partly free.

Affinities.—This family contains a group of the simplest known forms of Cyclostomata. It includes the members of the family Tubuliporidæ founded by Busk in 1859, with the addition of the genus *Diastopora* and its allies. It includes most of the forms included by Hincks in the Tubuliporidæ, but by no means all. The sense in which it is here used agrees closely with that in which it was accepted by MacGillivray.

STOMATOPORA, Bronn,[1] 1825.

SYNONYMY:

Alecto, Lamouroux, 1821.
Aulopora, *pars*, Goldfuss, etc.

Diagnosis.—Tubuliporidæ with the zoœcia forming flat adnate zoaria, composed of uniserial lines. These zoœcial lines branch dichotomously, and sometimes anastomose into a reticulate web. The cell mouth is flush or slightly raised; zoœcia tubular or sub-pyriform.

Type species.—*S. dichotoma*, Lamouroux, 1821.

Affinities.—This genus, in its normal form of a fan-shaped zoarium, is very well marked off from other Cyclostomata. The genus to which it approaches most nearly is *Proboscina*; this is included by Hincks as a subgenus of *Stomatopora*. Such species as that described by Haime as *Stomatopora bouchardi*, Haime, certainly do seem like connecting links. Nevertheless there seems such a very different appearance in the simple series of zoœcia, from that of those with the zoœcia in multiple series, that it seems to me advisable to use this as a generic distinction.

Stomatopora, as here used, includes, therefore, only part of the species included in it by Haime and Hincks. It is here restricted, and the genus *Proboscina* enlarged. Haime includes in *Stomatopora* some multiserial species, and Hincks a group of forms which are partially erect and free.

The genus was first described as *Alecto* by Lamouroux, in 1821. Mr. Hincks proposed the substitution of Bronn's term, owing to the prior use of *Alecto* among Crinoids. As *Alecto* is, however,

[1] Bronn. Syst. Pflanz. p. 27, pl. vii. fig. 3.

only a synonym in this phylum, it might have been retained, according to the rules of the British Association. *Stomatopora* is, however, now universally adopted.

1. Stomatopora dichotoma (Lamouroux), 1821.

SYNONYMY:

Alecto dichotoma, Lamouroux, 1821, Expos. Méth. p. 84, pl. lxxxi. figs. 12–14.
,, ,, Conybeare and Phillips, 1822, Geol. England and Wales, p. 214.
,, ,, Lamouroux, 1824, Encycl. Méth., Zooph. p. 41.
,, ,, Defrance, 1826, Dict. Sci. nat. t. xlii. p. 390.
,, ,, Fleming, 1828, Brit. Anim. p. 534.
,, ,, Blainville, 1830, Dict. Sci. nat. t. lx. p. 428, pl. xliii. fig. 1.
,, ,, Lonsdale, 1832, Oolitic district Bath: *Trans. Geol. Soc.* ser. 2, vol. iii. p. 273.
,, ,, Passy, 1832, Descr. géol. dép. Seine-inférieure, p. 339.
,, ,, Blainville, 1834, Man. Act. p. 464, pl. lxv. fig. 1.
,, ,, M. Edwards, 1838, Mém. Cris.: *Ann. Sci. nat. Zool.* sér. 2, t. ix. p. 206, pl. xv. fig. 4.
,, ,, Morris, 1843, Cat. Brit. Foss. p. 30.
,, ,, M. Edwards, 1846, Zooph. in Cuvier, Règne Anim. ed. 3, pl. lxxii. fig. 4.
,, ,, *pars*, Michelin, 1846, Icon. Zooph. p. 238 (*non* 1840, p. 10, pl. ii. fig. 10).
,, ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 317.
,, ,, Buvignier, 1852, Stat. Geol. dép. Meuse, pp. 194, 229, 262.
,, ,, *pars*, Quenstedt, 1852, Handb. Petref. p. 639, pl. lvi. figs. 21–2 (*non* 24).
,, ,, Morris, 1854, Cat. Brit. Foss. ed. 2, p. 119.
,, ,, Quenstedt, 1858, Der Jura, p. 666, pl. lxxxi. figs. 75–6.
,, ,, *pars*, Quenstedt, 1867, *op. cit.* ed. 2, p. 766, pl. lxxiii. figs. 21–3 (*non* 24).
,, ,, Phillips, 1871, Geol. Oxford, p. 239.
,, ,, *pars*, Quenstedt, 1885, *op. cit.* ed. 3, p. 985, pl. lxxix. figs. 35–7 (*non* 38).
,, ,, Beesley, 1886, Lias of Fenny Compton, p. 19.
,, ,, Gregory, 1895, Rev. pt. i.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xv. p. 225.

Stomatopora dichotoma, Bronn, 1825, Pflanzenth. pp. 27, 43, pl. vii. fig. 3 (bad figure).
,, ,, Bronn, 1837, Leth. Geogn. ed. 2, p. 242, pl. xvi. fig. 25.
,, ,, Bronn, 1848, Nomencl. p. 1201.
,, ,, Bronn, 1849, Enum. p. 139.
,, ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 835.

Stomatopora dichotoma, Bronn and Römer, 1851, Leth. Geogn. ed. 3, Bd. ii. Th. iv. p. 85, pl. xvi. fig. 25.

,, ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. pp. 160–2, pl. vi. figs. 1*a–d*.

,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 143.

,, ,, E. Eudes-Deslongchamps, 1864, Geol. Calvados, 3e art.: *Bull. Soc. linn. Norm.* t. viii. p. 225.

,, ,, E. Eudes-Deslongchamps, 1865, Jura inf. Norm.: *Mém. Soc. linn. Norm.* t. xiv. p. 151.

,, ,, Reuss, 1867, Bry. braun. Jura Balin: *Denk. k. Akad. Wiss. Wien.* Bd. xxvii. p. 2, pl. i. figs. 3*a* and 4 (3*b* on plate).

,, ,, Brauns, 1879, Bry. mittl. Jura Metz: *Zeit. deut. geol. Ges.* Bd. xxxi. p. 320.

,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 264.

,, ,, Vine, 1884, 4th Rep. Foss. Polyz.: *ibid.* 1883, p. 186.

,, ,, Vine, 1884, Polyz. Richmond boring: *Quart. Journ. Geol. Soc.* vol. xl. p. 786. (Fig. misleading.)

,, ,, Schlippe, 1888, Fauna Bath. oberrh. Tiefl.: *Abh. geol. Specialk. Elsass-Loth.* Bd. iv. Ht. 4, p. 97.

,, ,, Vine, 1888, Polyz. Caen: *Journ. Northampton Nat. Hist. Soc.* vol. v. p. 12.

,, ,, Walford, 1889, Bry. Shipton, pt. i.: *Quart. Journ. Geol. Soc.* vol. xlv. pp. 563–4.

,, ,, Sauvage, 1889, Bry. jur. Boul.: *Bull. Soc. géol. France*, sér. 3, t. xvii. p. 40.

Aulopora dichotoma, Goldfuss, 1831, Petref. Germ. Bd. i. p. 218, pl. lxv. fig. 2 (? *non* 2*a*).

non,, ,, Reuss, 1846, Verst. böhm. Kreidef. p. 66, pl. xv. figs. 32–4.

,, ,, Quenstedt, 1878, Petref. Deutschl. Bd. vi. Abth. 1, p. 107, pl. cxlvii. figs. 19, 26.

Stomatopora antiqua, Haime, 1854, Bry. jurass.: *Mém. Soc. géol France*, sér. 2, t. v. p. 162, pl. vi. fig. 7.

,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 143.

,, ,, Terquem and Piette, 1865, Lias Inf. Est Fr.: *Mém. Soc. géol. France*, sér. 2, t. viii. p. 124, pl. xiv. figs. 31–2 (*non* 27–8 as text).

,, ,, Terquem, 1868, in Jacquot, Descr. géol. dép. Moselle, p. 231.

,, ,, Witchell, 1882, Geol. Stroud, p. 14.

,, ,, Dumortier, 1869, Étud. pal. Jur. Basse-Rhône, t. iii. p. 343.

,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, pp. 251, 264.

,, ,, Vine, 1884, 4th Rep. Foss. Polyz.: *ibid.* 1883, p. 186.

,, ,, Beesley, 1886, Lias of Fenny Compton, p. 19.

,, ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 51.

,, *dilatans montlivaltiformis*, Vine, 1883, *op. cit.* pp. 251, 264.

Stomatopora haimei, Terquem and Piette, 1865, *op. cit.* p. 124, pl. xiv. figs. 29, 30.
,, *montlivaltiformis*, Vine, 1884, 4th Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1883, p. 186.
,, *terquemi*, Haime, 1854, *op. cit.* p. 164, pl. vi. fig. 4.
,, ,, Pictet, 1857, *op. cit.* p. 143.
,, ,, Ferry, 1862, Bajoc. Maçon: *Mém. Soc. linn. Norm.* t. xii. p. 35.
,, ,, Waagen, 1868, Zone *Amm. sowerbyi*, Geogn. Pal. Beitr. Bd. i. p. 647.
,, ,, Terquem, 1868, in Jacquot, *op. cit.* p. 290.
,, ,, Terquem and Jourdy, Ét. Bath. Moselle: *Mém. Soc. géol. France*, sér. 2, t. ix. 1871, pp. 164, 168.
,, ,, Vine, 1883, 3rd Rep. *op. cit.* p. 264.
,, ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 51.
Diastopora ,, Terquem, 1855, Pal. dép. Moselle (sep. copy), p. 28.
Stomatopora spirata, Walford, 1889, *op. cit.* p. 564, pl. xviii. fig. 6.
,, *porrecta*, Walford, 1889, *op. cit.* p. 565, pl. xviii. figs. 7, 8.
,, *waltoni*, *pars*, Vine, 1884, Polyz. Richmond boring: *Quart. Journ. Geol. Soc.* vol. xl. p. 787.
,, ,, *ex syn.* Vine, 1887, Polyz. neigh. North.: *Journ. Northampton Nat. Hist. Soc.* vol. iv. p. 204. pl. i. fig. 1.
,, *recurva*, Waagen, 1868, Zone *Amm. sowerbyi*, Geogn. Pal. Beitr. Bd. i. p. 647, pl. xxxii. fig. 9.
,, ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 51.

DIAGNOSIS:

Zoarium typically forming a loose, irregular network; the lines radiate from the centre and repeatedly branch dichotomously. Eight or ten zoœcia may occur between two points of bifurcation. Such series are often curved (var. *spirata*, Walf.). Young forms consist of a single line, which may at first branch very sparingly (var. *porrecta*, Walf.). Crowded growths occur.

Zoœcia regularly cylindrical.

Peristomes well raised, varying in height from half to one and a half times the diameter of the zoœcia. Surface punctulate and transversely wrinkled. The wrinkling is best seen in young zoœcia. The normal zoœcia vary in length from one and a half to three times the diameter.

Oœcia small; appear as small hemispherical tubercles; diameter about half that of the zoœcia; punctulate.

Formula.—$p, c, l, r = 2, 0, 1, 1$.

DISTRIBUTION.

ENGLAND.—*Lower Oolite:*

Cornbrash: Thrapston, Northamptonshire; Islip (*fide* Phillips).
Bradford Clay: Bradford, Wilts; Box; Tetbury Road.
Great Oolite: Stanton; Richmond boring; Bath.
Fuller's Earth: Wiltshire.
Inferior Oolite: Leckhampton; Crickley; Ravensgate (Low. Trigonia Grit); Shipton Gorge, Dorset.

Lias:

Middle—Zone of *Amaltheus spinatus*: King's Sutton.
,, *Ægoceras jamesoni*: Fenny Compton (*fide* Beesley).
Lower—Zone of *Ægoceras raricostatus*: Stroud (*fide* Witchell).
,, *Arietites henleyi*: Cherrington.

FOREIGN:

Kimeridgian: Streitberg and Weissenstein. Weisser Jura, γ.
Cornbrash: Wast, near Boulogne (*fide* Deslongchamps); Elsass (*fide* Schlippe).
Bathonian: Lebisey; Luc; and Marquise (*fide* Haime).
Calcaire à polypiers: Ranville; Caen.
Zone of *Parkinsonia parkinsoni*: Thiancort and Clapes (*fide* Terquem).
Zone of *Perisphinctes quercinus*: Thumeréville (*fide* Terquem); Dép. de Meuse (*fide* Buvignier); Franconia.
Zone of *Cosmoceras subfurcatum*: Baden and Elasss (*fide* Schlippe).
Bajocian—Braun Jura, δ: Aalen (*fide* Quenstedt); Balin.
Zone of *Sonninia sowerbyi*: Gingen (Würtemberg); Pommer and Jungingen, Hohenzollern (*fide* Waagen).
Calcaire ferrugineuse and Calcaire à polypiers: Moselle (*fide* Terquem).
Montvaux and Plappeville, near Metz (*fide* Terquem and Friren); Pouilly, near Maçon (*fide* Ferry).
Middle Lias: Giverdy and St. Bonnet, Rhône Basin (*fide* Dumortier).
Lower Lias—Sinemurian: Valière, near Metz.
Zone of *Arietites bisulcatus*: Fleigneux.
Zone of *Schlotheimia angulata*: Chilly (*fide* Terquem); Moselle (Terquem).

DOUBTFUL RECORDS:

Corallian: Dép. de Meuse (*fide* Buvignier).
Oxfordian: Dép. de Meuse ,, ,,
Sequanian?—Malm: Rabenstein, Bavaria.

Description of Figure.—Pl. I. Fig. 1. Zoarium encrusting *Apiocrinus elegans* (Defr.), nat. size, with three zoœcia, × 25 dia. Bradford Clay: Bradford, Wilts. **B. 4833.** Pl. I. Fig. 2. Part of zoarium with oœcium, × 25 dia. Bradford Clay: Box, Wilts. Holl Coll. **B. 4860.**

Affinities.—This species is the type of the genus. It belongs to a group of species which has lasted from the Jurassic to the present day. It is represented in the Cretaceous by a group of forms described by D'Orbigny as different species, but now included as *Stomatopora granulata*, M. Edw.[1] In the Cainozoic representatives of the genus are much scarcer than in the Cretaceous; nevertheless the group of species to which *S. dichotoma* belongs is represented by *Stomatopora divaricata* (Reuss),[2] from the Hungarian Miocene (Leithakalk), and by a living species, identified by Johnston as *S. granulata*, M. Edw. In this course Johnston has been followed by Hincks, Busk, and others. The recent species, however, has the distal end of the zoœcia raised to a greater extent than the Cretaceous species, and the zoœcia are also more pyriform; in Milne Edwards' specimen the zoœcia are regularly cylindrical. M. Pergens[3] has previously expressed doubt as to the occurrence of the Cretaceous species in recent seas. If the common English species is to be separated from that described by Milne Edwards, then a new name will have to be given it, as there is no available synonym.

S. dichotoma differs from *S. granulata* (M. Edw. *non auct.*) in having the zoœcia more regularly cylindrical, and having the peristomes, as a rule, less raised. It approaches more closely to the variety figured by D'Orbigny as *S. incrassata*, to which it is nearly allied. This is not the *S. incrassata* of Smitt, which is a *Proboscina*. It differs from *S. divaricata* (Reuss) by the fact that the Miocene species has a looser zoarium and longer zoœcia.

If the common recent English species is to be included with the Cretaceous *S. granulata*, then both of these must also be included with the Jurassic *S. dichotoma*. As, however, there are definite differences between them, it appears better to keep them distinct.

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[1] H. Milne Edwards. Mém. sur Crisiés: *Ann. Sci. nat. Zool.* sér. 2, t. ix. 1838, p. 205, pl. xvi. figs. 3, 3*a*.

[2] A. E. Reuss. Foss. Polyp. Wien. Tert.: *Haid. Naturwiss. Abh.* Bd. ii. 1847, p. 53, pl. vii. fig. 18.

[3] E. Pergens. Revision Bry. Cret. D'Orb.: *Bull. Soc. belge Géol.* t. iii. 1889, Mém. p. 330.

Unfortunately, in no case can the use of the name *S. granulata* by zoologists be justified. Either it is a different species from the Cenomanian form (the typical *S. granulata*[1]), in which case it must be renamed, or else it is the same species, when both are synonyms of *S. dichotoma.*

The three species are unquestionably closely allied. We are reduced either to making them varieties of one species, or species belonging to the same group in the genus. The latter seems to me the best course. I therefore suggest for the recent species the name *Stomatopora trahens* (Couch).[2]

Notes on Synonymy.—This species is the type of the genus, so there can be no doubt as to the retention of the name.

S. dichotoma has been generally clearly understood, but there seem to be several forms which should be included with it. The one in regard to which I feel most doubt is *S. antiqua*, Haime, from the Lower Lias. Haime founded this practically only on variations in the branching of the lines of zoœcia. This character is shown by the large series of specimens in the British Museum Collection to be of little value. The peristomes are not so much raised as in the typical form, but in this character likewise there are such variations in the same zoarium that the difference is not sufficiently well marked. Vine's *S. dilatans montlivaltiformis* goes along with *S. antiqua*, so also does *S. haimei*. *S. spirata*, Walford, appears to be only a single spiral branch, such as that shown in Pl. I. Fig. 1. *S. porrecta*, Walford, is founded, apparently, only on some primitive zoœcia. *Stomatopora haimei*, Terq. and P., agrees exactly with *S. antiqua*, Haime, and therefore must be included with it among the synonyms of this species. *Stomatopora terquemi* appears to be only a very crowded, densely growing variety, with the peristomes less raised than in the typical form.

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[1] D'Orbigny. Pal. franç. Terr. crét. Bryozaires, t. v. p. 837, pl. DCXXVIII. figs. 9–11.

[2] R. Q. C. Couch. Zooph. Cornwall: *Trans. R. Cornwall Polyt. Soc.* 1841, p. 71; Cornish Fauna, pt. iii. 1844, p. 105, pl. xix. fig. 5 (*non* 3). An unfortunate series of misprints has led to a misinterpretation of this species. Pl. xix. fig. 3 is said in the text to be *T. trahens*, and pl. xix. fig. 5 to be *T. deflexa*; on the legend of the plate both figures are given as *trahens*. The descriptions of the species, however, leave no doubt that fig. 3 should be *deflexa* and fig. 5 *trahens*. This has led Hincks to regard this species (Brit. Mar. Polyz. p. 427) as probably a synonym of *Proboscina* (or, as he puts it, *Stomatopora*) *major* (Johnst.).

LIST OF SPECIMENS.

D. 895. Cornbrash. Thrapston. Vine Coll.

B. 4860. On *Ostrea.* Bradford Clay. Box, Wilts. Holl Coll. Figd. Pl. I. Fig. 2.

D. 2171, D. 2172. On *Ostrea.* Bradford Clay. Tetbury Road, Gloucestershire. Brodie Coll.

B. 4833. On *Apiocrinus elegans* (Defr.). Bradford Clay. Bradford. Old Coll. Figd. Pl. I. Fig. 1.

40388. On *Apiocrinus elegans* (Defr.). ,, ,, J. Wood Coll.

24958. ,, ,, ,, ,, ,, Cunnington ,,

D. 1815. ,, ,, ,, ,, ,, Purchased.

D. 1821. On *Terebellaria ramosissima,* Lamx. ,, ,, ,,

B. 4856. On *Exogyra.* Bradford Clay. Box. Holl Coll.

D. 2159. A worm-tube. Bradford Clay. Bradford. Brodie Coll.

B. 1956. Great Oolite. Richmond boring, 1205 ft. Presented by Professor J. W. Judd, F.R.S.

D. 900. Great Oolite. ,, ,, ,, ,, J. W. Judd, F.R.S. Figd. as *S. waltoni*: *Quart. Journ. Geol. Soc.* vol. xl. p. 787, fig. 2*a*.

60535. On *Zeilleria obovata* (J. de C. Sow.). Great Oolite. Stanton. Cunnington Coll.

B. 4832. On *Terebratula intermedia,* J. de C. Sow. Fuller's Earth. Gloucestershire. Old Coll.

D. 1786. On *Holectypus hemisphæricus* (Ag.). Inferior Oolite. Purchased.

D. 1790. On *Stomechinus bigranularis* (Lamx.). ,, ,, (A form with long series of simple zoœcia.)

D. 1850. On *Terebratula simplex,* Buckm. Inferior Oolite. Crickley. Holl Coll.

B. 4834. On *Terebratula intermedia,* J. de C. Sow. Inferior Oolite. Old Coll.

D. 1800. On *Terebratula* ,, ,, ,, Leckhampton? Purchased.

B. 4835. On *Terebratula maxillata.* ,, ,, Lower Trigonia Grit. Ravensgate. Holl Coll.

D. 2130, D. 2136. On shell fragments. Inferior Oolite. Near Leckhampton. Brodie Coll.

65469. On *Zeilleria biappendiculata* (Desl.). Calcaire à polypiers. Ranville. Tesson Coll.

46785. On *Apiocrinus*? Calcaire à polypiers. Ranville. Tesson Coll.

58017. ,, *elongatus.* ,, ,, ,,

46218. ,, ,, ,, ,, J. Wood Coll.

D. 2075. Sequanian ?—Malm. Rabenstein, Bavaria. Brauns Coll. A long straight form (var. *porrecta*).

2. Stomatopora dichotomoides (D'Orbigny), 1849.

SYNONYMY:

Alecto dichotomoides, D'Orbigny, 1849, Prod. Pal. t. i. p. 288.
Stomatopora „ D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. pp. 834–5.
„ „ Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. pp. 163-4, pl. vi. figs. 2*a–c*.
„ „ Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 143.
„ „ Wright, 1860, Subdiv. Inf. Ool.: *Quart. Journ. Geol. Soc.* vol. xvi. p. 12.
„ „ E. E. Deslongchamps, 1857, Syst. ool. inf. Calvados: *Bull. Soc. linn. Norm.* t. ii. p. 328.
„ „ ? Ferry, 1862, Bajoc. Maçon: *Mém. Soc. linn. Norm.* t. xii. p. 23.
„ „ Reuss, 1867, Bry. braun. Jura Balin: *Denk. k. Akad. Wiss. Wien.* Bd. xxvii. p. 3.
„ „ Terquem and Jourdy, 1871, Ét. Bath. Moselle: *Mém. Soc. géol. France*, sér. 2, t. ix. pp. 156, 168.
„ „ Brauns, 1879, Bry. mittl. Jura Metz: *Zeit. deut. geol. Ges.* Bd. xxxi. p. 322.
„ „ Witchell, 1882, Geol. Stroud, p. 48.
„ „ Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 264.
„ „ Vine, 1884, 4th Rep. Foss. Polyz.: *ibid.* 1883, p. 186.
„ „ Vine, 1888, Polyz. Caen: *Journ. Northampton Nat. Hist. Soc.* vol. v. p. 12.
„ „ Walford, 1889, Bry. Shipton, pt. i.: *Quart. Journ. Geol. Soc.* vol. xlv. p. 564.
„ „ Woods, 1891, Cat. Type Foss. Cambridge, p. 49.
„ „ Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 51.
„ „ Gregory, 1895, Rev. pt. i.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xv. p. 225.
Alecto dichotoma, *non* Lamx., Michelin, 1840, Icon. Zooph. p. 10, pl. ii. fig. 10.
Stomatopora bouchardi, Haime, 1854, *op. cit.* p. 164, pl. vi. fig. 6.
„ „ Pictet, 1857, *op. cit.* p. 143.
„ „ Étallon, 1860, Jura Graylois: *Ann. Sci. physiq. nat. Lyon*, sér. 3, t. iv. p. 161.
„ „ Reuss, 1867, *op. cit.* p. 2.
„ „ Vine, 1883, *op. cit.* p. 264.
„ „ Sauvage, 1889, Bry. jur. Boul.: *Bull. Soc. géol. France*, sér. 3, t. xvii. p. 40, pl. iii. figs. 1–4.

Stomatopora waltoni, *pars*, Vine, 1884, Polyz. Richmond boring: *Quart. Journ. Geol. Soc.* vol. xl. p. 787, fig. 2*b* (*non* 2*a*). [Brit. Mus. No. **D. 901**.]

,, *jurensis*, Étallon, 1862, Étud. Haut-Jura Cor. pt. i.: *Mém. Soc. Émul. Doubs.* sér. 3, t. vi. p. 211.

,, *phillipsi*, Vine, 1893, Polyz. Thrapston: *Proc. Yorks. Geol. Soc.* new ser. vol. xii. pt. iii. pp. 250–2, pl. xii. figs. 1–3.

,, *intermixta*, Vine, 1893, *ibid.* p. 252, pl. xii. fig. 4.

,, *dichotoma*, Vine, 1893, *ibid.* p. 252, ? pl. xii. fig. 5.

,, *waltoni*, Vine, 1893, *ibid.* p. 253, ? pl. xii. fig. 5.

Diagnosis:

Zoarium of uniserial zoœcia branching dichotomously or irregularly. Typically it is very loose. Long unbranched series occur. Crowded varieties with tufted ends to the branches also occur.

Zoœcia at first regularly cylindrical, but soon becoming pyriform or subpyriform; obscurely transversely ridged; surface punctulate.

Peristomes slightly raised, usually not on the median line.

Oœcia unknown.

Formula.—$p, c, l, r = 1, 2, 1, 0$.

Description of Figures.—Pl. I. Fig. 3. Four zoœcia from a specimen encrusting *Multiclausa*, sp., × 20 dia. Great Oolite: Hamcastle, near Bath. **B. 4249**. Pl. I. Fig. 4. Zoœcia of a young specimen (the var. *attenuata* of Walford), × 20 dia. Cornbrash: Thrapston, Northamptonshire. **D. 927**. (Vine Coll.)

DISTRIBUTION.

British:

Corallian—Lower Calcareous Grit: Hinton-Trowbridge.
Cornbrash: Thrapston; Bedford.
Great Oolite: Richmond boring, 1205 ft.; Hamcastle, near Bath.
Fuller's Earth: Wiltshire.
Inferior Oolite: Gloucestershire, Cleeve Hill; Leckhampton; Postlip (Cambridge); Stroud (*fide* Witchell); Shipton Gorge, Dorset.

Foreign:

Corallian: Valfin, Haut-Jura. (Diceratian.)
Oxfordian: Boulogne.
Callovian: Crain and Percey le Grand, Haut-Jura.
Bathonian: Ranville, Calvados; Conflans and Wodécourt, Moselle.
Zone of *Perisphinctes quercinus*: Longwy; Balin, Austria.

Bathonian—Zone of *Cosmoceras subfurcatum*: Moselle (*fide* Terquem).
Braun Jura: Balin.
Bajocian: Croizille and St. Vigors; Bayeux and Moutiers (*fide* D'Orbigny); Montvaux and Ars-sur-Moselle (*fide* Friren); ? Milly, near Maçon (*fide* Ferry).

Differences and Affinities.—This species was originally figured by Michelin as *Alecto dichotoma.* D'Orbigny recognized the differences between the specimen used by Michelin and the type form, and founded a new species for it. It is, however, nearly allied to *S. dichotoma.* It forms a more open zoarium than does that species, but this point is of little value. The main difference between it and *S. dichotoma* is that the zoœcia are pyriform. A tendency to this shape occurs in some of the zoœcia of *S. dichotoma*, in portions of the colony where the zoœcia are short and crowded. The difference, however, appears to me to be of specific importance, for all the normal zoœcia of *S. dichotoma* are regularly cylindrical. Haime's type is now at Cambridge, and examination of it shows that the peristome was raised.

The young zoœcia are longer and less pyriform than the older ones. They have been figured by Walford as the var. *attenuata.*

The representative of this species in the Cretaceous is *S. plicata* (D'Orb.),[1] from the Cenomanian of Le Mans. In this, however, the pyriform shape is still more marked, and the zoœcia almost become elliptical. The transverse ridging is reduced to a single well-marked rib.

As a Cainozoic representative of this species may be quoted *S. vesiculosa* (Mich.),[2] from the Miocene of the West of France. This agrees more closely with *S. plicata* than with *S. dichotomoides*, from which it may be distinguished by the almost hippothoiform shape of the zoœcia and the greater development of the transverse rib.

A species which seems to me to belong here is that described by Haime as *S. bouchardi*, from the Oxfordian of Boulogne. Haime had only a very imperfect specimen, which he regarded as a close ally of *S. dichotoma.* Brauns regarded it as a synonym

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[1] Pal. franç. Terr. crét. t. v. 1850, pl. DCXXIX. figs. 12–15; 1852, p. 839.

[2] *Alecto vesiculosa*, Michelin, 1847, Icon. Zooph. p. 319, pl. lxxvii. fig. 3.

of this species, but Sauvage kept it distinct, and gave some admirable figures of it. These certainly show that it differs from *S. dichotoma*, but seem to me to bring it within the range of *S. dichotomoides*. It has the bulging pyriform zoœcia, and slightly raised peristomes, irregular transverse ridges of that species.

Vine has referred a series of specimens from Thrapston to four different species, two of which were new. His collection is now in the British Museum, but his types cannot be recognized. The whole series, however, seems to me to belong to *S. dichotomoides*. The figure on Pl. XII. Fig. 5 is referred in the text to *S. waltoni*, and in the description of the plate to *S. dichotoma*; but it is equally unlike both, having the pyriform zoœcia of *S. dichotomoides*.

LIST OF SPECIMENS.

D. 1855. On *Ostrea*, sp. Calcareous Grit. Hinton-Trowbridge. Cunnington Coll.

D. 1854. On *Gervillia*, sp. ,, ,, ,, ,,

D. 896, 898. Three specimens. Cornbrash. Thrapston, Northamptonshire. Vine Coll.

D. 927. Var. *attenuata* (Walf.) ,, ,, ,, Vine Coll. Figd. Pl. I. Fig. 4.

D. 2064. On *Holectypus depressus* (Leske). Cornbrash. Midland Railway Pit, Bedford.

D. 2065, D. 2068. On *Holectypus depressus* (Leske), with *Berenicea archiaci*, Haime. Cornbrash. Midland Railway Pit, Bedford. (**D. 2065** is a crowded variety.)

D. 2067. On *Nucleolites clunicularis* (Phil.), with *Berenicea archiaci*, Haime. Cornbrash. Midland Railway Pit, Bedford.

D. 901. Great Oolite. Richmond boring, 1205 ft. Presented by Professor Judd. Figd. as *S. waltoni*: *Quart. Journ. Geol. Soc.* vol. xl. p. 787, fig. 2*b*.

B. 1950. Two specimens. Great Oolite. Richmond boring, 1205 ft. Presented by Professor Judd.

D. 210. One specimen. Great Oolite. ,, ,, ,, ,, by Professor Judd.

B. 4249. Encrusting *Multiclausa*. Great Oolite. Hamcastle, near Bath. Figd. Pl. I. Fig. 3.

B. 4247. On *Terebratula* aff. *plicata*. Fuller's Earth. Gloucestershire. Old Coll.

D. 1798. On *Heteropora ficulina*, Mich. Inferior Oolite. ,, ? Purchased.

D. 1842. With young *Ceriocava.* Inferior Oolite—Pea Grit. Gloucestershire. Holl Coll.

D. 2196. On shell fragment. Inferior Oolite. Cleeve Hill. Brodie Coll.

D. 2131. With *Berenicea archiaci*, Haime. Inferior Oolite. Near Leckhampton. Brodie Coll.

D. 2208. On shell fragment. Bathonian. Ranville.

3. Stomatopora waltoni, Haime, 1854.

SYNONYMY:

Stomatopora waltoni, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. vi. p. 162, pl. vi. figs. 3*a*–*b*.

,, cf. ,, Walford, 1883, Relation Northptn. Sd.: *Quart. Journ. Geol. Soc.* vol. xxxix. p. 239.

non ,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 251.

non ,, ,, Vine, 1884, 4th Rep. Foss. Polyz.: *ibid.* 1883, p. 186.

non ,, ,, Vine, 1884, Polyz. Richmond boring: *Quart. Journ. Geol. Soc.* vol. xl. p. 787, fig. 2.

non ,, ,, Vine, 1887, Jur. Polyz. Northptn.: *Journ. Northampton Nat. Hist. Soc.* vol. iv. p. 204, pl. i. fig. 1.

non ,, ,, Vine, 1888, Polyz. Caen: *ibid.* vol. v. p. 13.

,, ,, Woods, 1891, Cat. Type Foss. Cambridge, p. 49.

non ,, ,, Vine, 1893, Polyz. Thrapston: *Proc. Yorks. Geol. Soc.* new ser. vol. xii. p. 253, ? pl. xii. fig. 5.

,, ,, Gregory, 1895, Rev. pt. i.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xv. p. 226.

Alecto bajocensis, D'Orbigny, 1849, Prod. Pal. t. i. p. 288.

Stomatopora bajocensis, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 835.

,, ,, E. E. Deslongchamps, 1857, Syst. ool. inf. Calvados: *Bull. Soc. linn. Norm.* t. ii. p. 328.

DIAGNOSIS:

Zoarium of uniserial zoœcia forming delicate, radiating, and very divergent lines; these branch repeatedly, occasionally interlace, and end in loose tufts.

Zoœcia cylindrical and very thin, transversely ridged.

Peristomes have thickened rims, but are not reflexed.

Formula.—$p, c, l, r = 1, 0, 2, 0$.

DISTRIBUTION.

BRITISH:

Cornbrash: Loc. ?
Bradford Clay: Bradford.
Fuller's Earth: Gloucestershire.
Inferior Oolite: Coombe Hill (*fide* Walford).

FOREIGN:

Bajocian: Port-en-Bessin (*fide* D'Orbigny).
Oolithe blanc: Calvados (*fide* Deslongchamps).

Description of Figure.—Pl. I. Fig. 5. Part of a specimen encrusting *Terebratula* aff. *plicata*, Buckm., × 22 dia. Fuller's Earth: Gloucestershire. No. 97083.

Affinities.—This species is a very close ally of *S. dichotomoides*, D'Orb., from which it differs by its zoœcia being thinner and generally regularly cylindrical, instead of pyriform. But the specimen figured shows a tendency toward this shape, and resembles the var. *attenuata* of *S. dichotomoides*. The zoœcia, however, are not transversely wrinkled, as in that form. This species has as its Cretaceous representative *S. longiscata*, D'Orb.,[1] but in this the peristomes are more elevated.

It has a Cainozoic representative in a species described by Reuss[2] as *Aulopora divaricata*. The species seems valid, but the name is preoccupied by *S. divaricata*, Röm.,[3] from the Hilsthon (Neocomian) of Northern Germany, and I therefore propose for it the name of *Stomatopora reussi*.

LIST OF SPECIMENS.

97083. On *Terebratula* aff. *plicata*, Buckm. Fuller's Earth. Gloucestershire. Presented by G. R. Waterhouse, Esq. Figd. Pl. I. Fig. 5.

D. 1818. On *Zeilleria ornithocephala* (Sow.). Inferior Oolite. Gloucestershire. Holl Coll.

98135. On *Zeilleria obovata* (Sow.). Cornbrash. J. Brown Coll.

D. 2177, D. 2178. On *Ostrea*, sp. Bradford Clay. Tetbury Road, Wilts. Brodie Coll.

D. 2119. On shell fragment. Lower Lias. Hatherley Down. Brodie Coll.

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[1] *Op. cit.* 1850, pl. DCXXIX. figs. 9–11; 1852, p. 839.

[2] A. E. Reuss. Foss. Polyp. Wien. Tertiärb. 1847, p. 53, pl. vii. fig. 18.

[3] F. A. Römer. Die Versteinerungen des Norddeutschen Oolithen-Gebirges, Nachtrag, 1839, p. 15, pl. xvii. fig. 3.

4. **Stomatopora smithi** (Phillips), 1829.

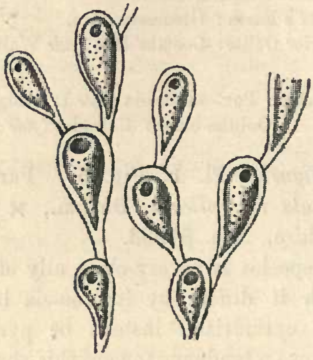

Fig. 8.—Part of type specimen.

Synonymy:

Cellaria smithi, Phillips, Geol. Yorks. pt. i. Yorks. Coast, 1829, p. 143, pl. vii. fig. 8.
,, ,, Bean, 1839, Cat. Foss. Cornbr. Scarb.: *Mag. Nat. Hist.* ser. 2, vol. iii. p. 58.
,, ,, Wright, 1860, Subdiv. Inf. Ool.: *Quart. Journ. Geol. Soc.* vol. xvi. p. 28.
Hippothoa smithi, Morris, 1843, Cat. Brit. Foss. p. 39.
,, ,, Bronn, 1848, Nomencl. p. 590; 1849, Enum. p. 128.
,, ,, Morris, *op. cit.* ed. 2, 1854, p. 125.
,, ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 217.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 103.
,, ,, Platnauer, 1891, List Figured Specimens, York Museum: *Ann. Rep. Yorks. Phil. Soc.* 1891, p. 62.
,, ,, Fox-Strangways, 1892, Jurassic Rocks of Britain, vol. ii.: Yorkshire Tables of Fossils, p. 148.
Alecto smithi, D'Orbigny, 1849, Prod. Pal. t. i. p. 317.
Stomatopora smithi, Gregory, 1894, Jur. Bry. York Mus.: *Rep. Yorks. Phil. Soc.* 1893, p. 58, fig. 1.
,, ,, Gregory, 1895, Rev. pt. i.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xv. p. 226.

Diagnosis:

Zoarium hippothoiform, uniserial; branches crowded and irregular; entirely adherent.

Zoœcia pyriform; long, slender, proximal ends; front wall well raised, rounded, and punctate; orifice small, circular, surrounded by a low rim.

Peristomes slightly raised. Flat, regular rims surround each of the zoœcia.

Formula.—$p, c, l, r = 1, 3, 2, 0$.

Distribution.—Adherent to *Cardium citrinoidum*, Cornbrash, near Scarborough. Only the type specimen known. (York Museum.)

Figure.—Fig. 8. Part of zoarium of type specimen.

Affinities.—The species agrees best among Jurassic species of the genus in its pyriform zoœcia with *S. dichotomoides* (D'Orbigny), but the hippothoiform zoarium and long whip-like proximal portions of the zoœcia clearly distinguish it. Owing to the imperfection of Phillips' figures, much uncertainty has existed regarding it. The front walls are often broken away, giving the specimen a Schizoporellidan aspect.

5. Stomatopora intermedia (Münster), 1831.

SYNONYMY:

Aulopora intermedia,	Münster, 1831, Goldfuss, Petref. Germ. p. 218, pl. lxv. fig. 1.
,, ,,	Quenstedt, 1878, Petref. Deutschl. Bd. vi. Abth. 1, p. 108, pl. cxlvii. fig. 19.
Alecto intermedia,	D'Orbigny, 1850, Prod. Pal. t. ii. p. 25.
non ,, ,,	Quenstedt, 1858, Der Jura, p. 457, pl. lviii. fig. 2.
Stomatopora ,,	Bronn, 1849, Ind. pal. p. 1202.
,, ,,	D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 835.
,, ,,	Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 165.
,, ,,	Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 143.
,, ,,	Étallon, 1860, Jura Graylois: *Ann. Sci. physiq. nat. Lyon*, sér. 3, t. iv. p. 175.
,, ,,	Étallon, 1862, Étud. Haut-Jura Cor. pt. i.: *Mém. Soc. Émul. Doubs*. sér. 3, t. vi. p. 210.

DIAGNOSIS:

Zoarium forming a crowded network.

Zoœcia cylindrical; very short. Peristomes raised and much thickened.

Distribution.—Foreign. Corallian: Germany—Streitberg; Böllert (*fide* Quenstedt). France—Chassigny (*fide* Étallon); Glyptician, Ste. Claude (*fide* Étallon).

Affinities.—This species appears to be sufficiently distinguished by the combination of stumpy zoœcia and thickened peristomes. The shortness of the zoœcia is equalled in some specimens of *S. dichotoma.* The specimen figured by Quenstedt is a *Berenicea,* but it is specifically indeterminable. The species is not represented in the Museum collection.

INDETERMINABLE SPECIES.

1. Stomatopora calloviensis (D'Orb.), 1849.

SYNONYMY:

Alecto calloviensis, D'Orbigny, 1849, Prod. Pal. t. i. p. 344.
Stomatopora calloviensis, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 835.
,, ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France,* sér. 2, t. v. p. 165.
,, ,, E. Eudes-Deslongchamps, 1856, Cornbrash à Lion: *Bull. Soc. linn. Norm.* t. i. p. 25.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 143.

Distribution.—Bathonian: Lion-sur-Mer.

2. Stomatopora corallina (D'Orb.), 1850.

SYNONYMY:

Alecto corallina, D'Orbigny, 1850, Prod. Pal. t. ii. p. 25.
,, ,, Coquand, 1860, Descr. phys. géol. Charente, t. ii. p. 81.
Stomatopora ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 835.
,, ,, Étallon, 1862, Étud. Haut-Jura Cor.: *Mém Soc. Émul. Doubs.* sér. 3, t. vi. p. 210.
,, cf. ,, Oppel, 1866, Zone *Amm. transversarius*: *Geogn. Pal. Beitr.* Bd. i. p. 296.

Distribution. — Lower Oxfordian: Oberbuchsiten, Solothurn. Corallian: La Rochelle; Streitberg; Ste. Claude, Haut-Jura.

Affinities.—This species was founded on a figure by Goldfuss (referred to as *Aulopora dichotoma,* Petref. Germ. 1831, p. 218, pl. lxv. fig. 2). This figure, however, shows two specimens, the characters of which do not entirely agree. Étallon says they belong to two distinct species. He has described some specimens, which he refers to this species, but which seem to belong to *dichotomoides*.

3. Stomatopora elongata, Walf., 1887.

SYNONYMY:

S. elongata, Walford, 1887, Polyz. Lias: *Quart. Journ. Geol. Soc.* vol. xliii. p. 636, footnote, pl. xxv. fig. 10.

Distribution.—Middle Lias: King's Sutton.

Affinities.—? A *Tubulipora*.

4. Stomatopora rupellensis (D'Orb.), 1850.

SYNONYMY:

Alecto rupellensis, D'Orbigny, 1850, Prod. Pal. t. ii. p. 25.
,, ,, Coquand, 1860, Descr. phys. géol. Charente, t. ii. p. 81.
Stomatopora ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 835.

Distribution.—Corallian: near La Rochelle.

Affinities.—? A *Proboscina*.

SYNOPSIS OF SPECIES.

I. Zoœcia regularly tubular.		
	Peristomes well raised; zoœcia short ...	... *dichotoma* (Lx.).
	,, slightly raised; zoœcia long	... *waltoni*, Haime.
	,, thickened	... *intermedia* (Münst.).
II. Zoœcia pyriform		... *dichotomoides* (D'Orb.).
III. ,, hippothoiform		... *smithi* (Phil.).

PROBOSCINA, Audouin, 1826.[1]

SYNONYMY:

Stomatopora, *pars*, Hincks.
Reptotubigera, D'Orbigny.
Diastopora, *pars*, Quenstedt, Vine, etc.

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[1] Vict. Audouin. Explication Sommaire des planches des Polypes de l'Egypte et de la Syrie; Descr. de l'Egypte Hist. Nat. t. i. pt. iv. p. 236, Polyp. pl. vi. figs. 4, 5 (*non* fig. 6).

Diagnosis.—Tubuliporidæ in which the zoœcia form flat, adnate, multiserial zoaria. The zoaria are mainly in linear bands, which may or may not branch. The zoœcia are tubular. The peristome is either flush with the surface of the zoarium or somewhat raised.

Type species.—*P. boryi*, Audouin.

Affinities.—The retention of this genus is somewhat reactionary, for most authors now place it as a synonym of *Stomatopora*, *Berenicea*, *Diastopora*, or even *Entalophora*. It is certainly nearest to *Stomatopora* and *Berenicea*, between which it is intermediate. Pergens has described a specimen which begins as a *Diastopora*, then gives rise to branches of *Proboscina*, and these end as *Stomatopora*; and upon the evidence of this specimen he merges the two latter. This specimen, however, proves either too much or too little. If its evidence is to be accepted, then the three genera ought to be united. But Pergens retains *Stomatopora* as distinct from *Diastopora* in spite of it. To do otherwise would be practically to abandon the use of genera in the Cyclostomata. I frankly admit that there are specimens intermediate between *Proboscina* and *Diastopora* on the one hand, and between the former and *Stomatopora* on the other. Nevertheless, there is a large group of species which exhibit the characters of the above diagnosis, and the genus is therefore a convenient one; and to expect genera of Cyclostomata to be more than convenient groups of species, seems hopeless at present. *Proboscina* is therefore accepted as a genus which differs from *Stomatopora* by having a multiserial zoarium, and from *Berenicea* by having its zoœcia arranged in bands instead of in broad sheets.

1. Proboscina eudesi, Haime, 1854.

SYNONYMY:

Proboscina eudesi, J. Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 167, pl. vi. figs. 9*a–b*.

,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 144.

,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 264.

,, ,, Schlippe, 1888, Bath. oberrhein. Tiefland.: *Abh. geol. Specialk. Elsass-Loth.* Bd. iv. livr. 4, p. 97.

,, ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 45.

,, ,, Gregory, 1895, Rev. pt. ii.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvi. p. 447.

Proboscina davidsoni, Haime, 1854, *op. cit.* p. 167, pl. vi. fig. 11.
,, ,, Pictet, 1857, *op. cit.* p. 144.
,, ,, Vine, 1883, *op. cit.* p. 264.
,, ,, Woods, 1891, Cat. Type Foss. Cambridge, p. 48.
Proboscina buchi, Haime, 1854, *op. cit.* p. 168, pl. vi. fig. 10.
,, ,, Pictet, 1857, *op. cit.* p. 144.
,, ,, E. E. Deslongchamps, 1865, Jura inf. Norm.: *Mém. Soc. linn. Norm.* t. xiv. p. 151.
,, ,, Terquem and Jourdy, 1871, Ét. Bath. Moselle: *Mém. Soc. géol. France*, sér. 2, t. ix. p. 156.
,, ,, Vine, 1883, *op. cit.* p. 264.
Stomatopora (*P.*) *davidsoni*, Vine, 1884, 4th Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1883, p. 186.

Diagnosis:

Zoarium formed of fairly regular, anastomosing bands, composed usually of from four to six zoœcia. Each branch in section appears as a rounded ridge.

Zoœcia regularly cylindrical.

Peristomes usually in regular transverse lines, slightly raised. Zoœcia of medium length.

Formula.—*p*, *c*, *l*, *r* = 1, 0, 2, 4–7.[1]

DISTRIBUTION.

British:

Great Oolite: Hampton, near Bath (Cambridge Museum).
Inferior Oolite—Pea Grit: Gloucestershire.

Foreign:

Bathonian: Luc; Ranville, in Calvados.
Zone of *Cosmoceras subfurcatum*: Longwy (*fide* Terquem).
Bajocian: Ars-sur-Moselle; Lothringen (*fide* Friren).

Description of Figure.—Pl. II. Fig. 1. Part of a zoarium, × 20 dia. Inferior Oolite: Gloucestershire. Holl Coll. **D. 1843.**

Affinities.—This species is represented by the formula *p*, *c*, *l*, *r* = 1, 0, 2, 4–7. It is well characterized by its regularity, both in the arrangement of the peristomes and the branching of the zoarium. The two forms *P. davidsoni* and *P. buchi* seem to me unquestionably identical, the differences between them being

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[1] *r* in the formulæ for *Proboscina* indicates the number of zoœcia in the width of the branches.

that in *P. davidsoni* the sutures between the zoœcia are not shown, and that *P. buchi* is a young, incomplete zoarium. Both appear to be synonyms of *P. eudesi*, from which they differ only in that the orifices are slightly larger, and the surface of the zoarium is flatter.

The nearest ally of *Proboscina eudesi*, Haime, is a form figured by D'Orbigny [1] as *Reptotubigera ramosa*, D'Orb., from the French Senonian. This Cretaceous species differs, however, by having larger orifices and a more carinate zoarium. Its formula is 1′, 0, 2, 4-7, a comparison of which with that for *P. eudesi* will show the closeness of the two forms.

The reference to D'Orbigny's species raises the difficult question as to its right name. The term *ramosa* has been applied to forms which must be included in *Proboscina* (as that genus is here defined) by Hagenow and Michelin, as well as twice by D'Orbigny. The following names all have claims to recognition:—

Aulopora ramosa, Hag., 1839.
Diastopora ramosa, Mich., 1845.
Proboscina ramosa, D'Orb., 1852.
Reptotubigera ramosa, D'Orb., 1852.
Stomatopora sarthacensis, Perg., 1890.

The *Aulopora ramosa*, Hag.,[2] has priority, and as the description of it is full and lucid, the name has to stand as that of the true *Proboscina ramosa*. The specimens figured by D'Orbigny as his *Proboscina ramosa* [3] probably belong to this species, in spite of the fact that D'Orbigny includes them with Michelin's species, and makes no mention of Hagenow's. Pergens, moreover, has separated them from Hagenow's species, and made them the type of a new species—*Stomatopora sarthacensis*.[4] D'Orbigny's figures, however, appear to agree in all essentials with Hagenow's description. They both have the "zart fadenförmig" shape, the same mode of branching of the zoarium, and the form of the zoœcia.

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[1] D'Orbigny. *Op. cit.* p. 754, pl. DCCLI. figs. 1–3.

[2] Von Hagenow. Mon. Rugen'schen Kreide-Verst. Abth. 1, Neu Jahrb. 1839, p. 291.

[3] D'Orbigny. *Op. cit.* p. 851, pl. DCXXXII. figs. 1–3; pl. DCXXXIII. figs. 1–3.

[4] E. Pergens. Rev. Bry. fig. par D'Orb.: *Bull. Soc. belge Géol.* t. iii. Mém. 1890, p. 332.

I therefore propose to include *S. sarthacensis*, Perg., among the synonyms of *P. ramosa* (Hag.).

Michelin's species,[1] on the other hand, appears to be distinct, for the zoarium is formed of regular bands, which branch repeatedly and may anastomose; the zoœcia are shorter, and the peristomial portions less raised. Michelin's species is more allied to D'Orbigny's *Reptotubigera ramosa* than to his *P. ramosa*. From the former it is separable only by the fact that the peristomes open irregularly, whereas in that species they occur in straight series. It is therefore necessary to find a new name for Michelin's species. It appears to me practically identical with D'Orbigny's *P. toucasiana*,[2] though in this the zoarial bands are less regular; they agree, however, in the general shape of the zoarium, its flat, depressed surface, and the irregularity of the peristomes.

It is also necessary to find a name for D'Orbigny's *Reptotubigera ramosa*, which, as has been previously remarked, is the closest ally of *P. eudesi*, Haime. Pergens includes with it *Reptotubigera serpens*, D'Orb., and *Proboscina radiolitorum*, D'Orb., a course with which I fully agree. As the last name dates from the Prodrome in 1849, it takes precedence as the name of the species.

The formulæ for the four species are as follows:—

P. eudesi, Haime	1	0	2	4-7	
P. ramosa (Hag.)	2	0	2″	1-8,	including *P. ramosa*, D'Orb., and *S. sarthacensis*, Perg.
P. radiolitorum (D'Orb.) ...	1′	0	2	4-7,	including *Reptotubigera ramosa*, D'Orb.
P. toucasiana, D'Orb.... ...	1	0	2	4-8,	including *D. ramosa*, Mich.

LIST OF SPECIMENS.

D. 14. On *Terebratula intermedia*, J. de C. Sow. Great Oolite. Gloucestershire. Wright Coll.

D. 1843. Inferior Oolite—Pea Grit. Gloucestershire. Holl Coll. Figd. Pl. II. Fig. 1.

60365. Bathonian. Ranville, Calvados. Tesson Coll.

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[1] H. Michelin. Icon. Zooph. 1845, p. 203, pl. lii. fig. 3.

[2] D'Orbigny. *Op. cit.* p. 856, pl. DCXXXIV. figs. 1-6

2. Proboscina jacquoti, Haime, 1854.

Synonymy:

Proboscina jacquoti, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 169, pl. vii. figs. *5a–b*.

" " Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 144.

" " Ferry, 1862, Étage Bajoc.: *Mém. Soc. linn. Norm.* t. xii. p. 30.

" " Waagen, 1868, Zone *Amm. sowerbyi*: *Geogn. Pal. Beitr.* Bd. i. p. 647.

" " Brauns, 1879, Bry. mittl. Jura Metz: *Zeit. deut. geol. Ges.* Bd. xxxi. p. 324.

" " Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 264.

" " Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 45.

" " Gregory, 1895, Rev. pt. ii.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvi. p. 448.

Stomatopora (P.) jacquoti, Vine, 1884, 4th Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1883, p. 186.

Reptotubigera jacquoti, Terquem, 1855, Pal. dép. Moselle (sep. copy), p. 28.

" " Terquem, 1868, in Jacquot, Descr. géol. min. dép. Moselle, p. 292.

Proboscina thrapstonensis, Vine, 1893, Polyz. Thrapston: *Proc. Yorks. Geol. Soc.* vol. xii. p. 257, pl. xii. fig. 6.

" *ornata*, Vine, 1893, Polyz. Thrapston: *ibid.* p. 257, pl. xiii. fig. 10.

Diagnosis:

Zoarium consisting of two or more flabellate expansions arising from a narrow stolon-like band of zoœcia.

Zoœcia long, cylindrical, irregularly placed. In the typical form from one to five zoœcia in each branch. In some forms (var. *expansa*) spreading out into multiserial *Berenicea*-like sheets, which are fenestrate.

Peristomes raised; irregularly arranged.

Gonocysts large, hemispherical. Irregularly distributed.

Formula.—$p, c, l, r = 2, 0, 3, 1\text{–}12$.

DISTRIBUTION.

England:

Cornbrash: Thrapston, Northamptonshire.
Inferior Oolite: near Leckhampton.

Foreign:

Bajocian—Calcaire à *T. phillipsi*: Tramayes, near Maçon (*fide* Ferry).
Ars-sur-Moselle, Plappeville, and Montvaux (*fide* Terquem and Friren).
Zone of *Sonninia sowerbyi*: Gingen, Würtemberg (*fide* Waagen).

Description of Figures.—Pl. I. Fig. 6. Part of a zoarium, × 25 dia., showing the gonocysts. Encrusting *Nucleolites orbicularis* (Phil.). Cornbrash: Thrapston. **D. 2063**. Vine Coll. Pl. II. Fig. 2. A zoarium, × 11 dia., from same locality. Shows the var. *expansa*, formed of fenestrate sheets. **D. 921**.

Affinities.—This species is distinguished most readily by its much branched zoarium, with its flabellate expansions. Haime founded the species for a single specimen from the Bajocian. Vine's collection includes a large series of fairly good specimens, which enables a fuller diagnosis to be prepared.

The short, rapidly expanding, fan-shaped branches readily distinguish this from any other Jurassic species.

Among Cretaceous species it is most nearly allied to *Proboscina ramosa* (Hag.), as that species was limited in the discussion of the affinities of *P. eudesi*, Haime. This species was not figured by Hagenow,[1] but D'Orbigny's illustrations appear to be reliable. This species differs from *P. jacquoti* by having a more convex zoarium and shorter and more crowded zoœcia. In the former character *P. dilatata*, D'Orb.,[2] is nearer to the Jurassic species, but that also has the zoœcia more crowded and more elevated at their distal ends.

Among recent species *Prob. dilatans* (Johnst.)[3] is the closest ally. This, however, is much less flabelliform.

The formulæ for this group of species are as follows :—

P. jacquoti, Haime, Jurassic	2	0	3	1-12
P. ramosa (Hag.), Cretaceous	2	0	2′	1-8
P. dilatans (Johnst.), Recent	2	0	3	2-8

LIST OF SPECIMENS.

D. 2063. On *Nucleolites orbicularis* (Phil.). Cornbrash. Thrapston. With gonocysts. (Type of Vine's *P. ornata.*) Figd. Pl. I. Fig. 6. Vine Coll.

D. 903. On *Nucleolites orbicularis* (Phil.). Cornbrash. Thrapston. With gonocysts. (Type of *P. thrapstonensis*, Vine.) *Op. cit.* pl. xii. fig. 6 (? **6 B**).

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[1] Von Hagenow. Mon. Rugen'schen Kreide-Verst. Abth. 1, *Neu Jahrb.* 1839, p. 291. *P. ramosa*, D'Orbigny, Pal. franç. Terr. crét. t. v. pl. DCXXXII. figs. 1–3; pl. DCXXXIII. figs. 1–3.

[2] D'Orbigny. *Op. cit.* p. 851, pl. DCXXXII. figs. 4–6.

[3] See Hincks. Brit. Mar. Polyz. pl. lvii. fig. 3.

D. 921. On *Nucleolites orbicularis* (Phil.). Cornbrash. Thrapston. Figd. Pl. II. Fig. 2.

D. 902, 905, 906, 907, 925, 932, 934, 935, 936. Nine specimens on *Nucleolites orbicularis* from ditto.

D. 908. On *Nucleolites clunicularis* (Phil.). Ditto. Ditto.

D. 904. On *Isocardia rostrata*, Sow. Ditto. Ditto.

D. 909, D. 914. On *Arcomya jurassi* (Brongn.). Two specimens. Ditto. Ditto.

D. 910–912. On *Homomya* aff. *ovalis* (Sow.). Three specimens. Ditto. Ditto.

D. 913, D. 931. On Mollusca indet. Two specimens. Ditto. Ditto.

D. 922, D. 923, D. 926. Var. *expansa*, on *Nucleolites orbicularis.* Three specimens. Ditto. Ditto.

D. 2188. Var. *expansa*. Inferior Oolite. Near Leckhampton. Brodie Coll.

3. Proboscina desoudini (Haime), 1854.

SYNONYMY:

Stomatopora desoudini, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 165, pl. vi. figs. 5*a–b*.

,, ,, Terquem, 1855, Pal. dép. Moselle, p. 30.

,, ,, Terquem, 1868, in Jacquot, Descr. géol. min. dép. Moselle, p. 296.

Proboscina ,, Gregory, 1895, Rev. pt. ii.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvi. p. 448.

Idmonea stomatoporoides, Walford, 1889, Bry. Shipton, pt. i.: *Quart. Journ. Geol. Soc.* vol. xlv. p. 568, pl. xix. figs. 5, 6.

DIAGNOSIS:

Zoarium very irregular. Composed of narrow bands anastomosing to an irregular network. Each band from one to three zoœcia in width.

Zoœcia narrow; of medium length; often slightly sinuous. In crowded areas some zoœcia become pyriform.[1] Transverse ribbing well marked.

Peristomes slightly raised.

Formula.—p, c, l, $r = 1'$, 2, 2, 1–2.

DISTRIBUTION.

ENGLAND:

Cornbrash: Thrapston, Northamptonshire.
Inferior Oolite: Shipton.

FOREIGN:

Bajocian: Longwy, France.
Bathonian: Moselle (*fide* Terquem).

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[1] Haime shows some pyriform and others elongated and cylindrical.

Description of Figure.—Pl. II. Fig. 3. Zoarium encrusting *Nucleolites orbicularis* (Phil.), × 12 dia. Cornbrash: Thrapston. No. **D. 1010.** Vine Coll.

Affinities.—This species may be recognized by its extreme irregularity, both in zoœcial and zoarial characters. Haime's figure shows two different types of zoœcia—one long, cylindrical, and sinuous; the other short and pyriform. The specimen from Thrapston which I have referred to this species agrees with the latter type. The zoarium in it is regularly biserial. Its formula is $p, c, l, r = 1', 2, 2, 1\text{–}2$. Haime's type is 1′, 0 or 2, 2, 1–3. Considering the irregularity of the latter, it seems unnecessary to separate the species. The occurrence of the pyriform zoœcia seems sufficient to distinguish this from any other Jurassic species, except *P. morinica* (Sauv.). As noticed in the remarks on that species, the two ought probably to be included in the same species.

Among Cretaceous species the nearest ally of this is *P. intermedia*, Novak,[1] which has more regular and longer zoœcia, while many of these are almost uniform in diameter.

Proboscina echinata (Münst.) represents this group in the Cainozoic, but this has a loose open zoarium, the branches of which do not anastomose, while the zoœcia are shorter than in either of its predecessors.[2] The formulæ for the three forms are as follows:—

P. desoudini (Haime), Jurassic	1′	2	2	1-2
P. intermedia, Novak, Cretaceous	1	1″	3	1-2
P. echinata (Münst.), Cainozoic	2	1	1	1-3

SPECIMEN.

D. 1010. Encrusting *Nucleolites orbicularis* (Phil.). Cornbrash. Thrapston. Vine Coll. Figd. Pl. II. Fig. 3.

4. **Proboscina cunningtoni,** Gregory, 1895.

SYNONYMY:

Proboscina cunningtoni, Gregory, 1895, Rev. pt. ii.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvi. p. 449.

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[1] O. Novak. Beitr. zur böhm. Kreidef.: *Denk. k. Akad. Wiss. Wien.* Bd. xxxvii. Abth. 2, 1877, p. 102, pl. v. figs. 1–13.

[2] *Cellepora echinata*, Münst., in Goldfuss, Petref. Germ. p. 102, pl. xxxvi. fig. 14. *Diastopora echinata*, Reuss, Foss. Polyp. Wien. Tert.: *Naturw. Abh.* Bd. ii. p. 52, pl. vii. figs. 14–15.

DIAGNOSIS:

Zoarium formed of loose, flabelliform, *Stomatopora*-like tufts; these may radiate from a centre, to form a circular zoarium. The branches begin uniserially, and may end in sheets containing twelve zoœcia in width.

Zoœcia regularly cylindrical. Front wall ornamented by a transverse wrinkling. Of medium length, broad.

Peristomes with somewhat thickened rims. Slightly raised.

Formula.—p, c, l, $r = 1, 0, 1, 1–3$.

DISTRIBUTION.

ENGLAND:

Fuller's Earth: Bruton.
Cornbrash: Chippenham; Corsham.

Description of Figures.—Pl. II. Fig. 4. Part of a colony encrusting *Zeilleria ornithocephala* (J. de C. Sow.), × 17 dia. Fuller's Earth: Bruton. Cunnington Coll. **88742**. Pl. II. Fig. 5. One sector of a circular colony encrusting *Terebratula maxillata*, J. de C. Sow., showing terminal expansions of the branches, × 10 dia. Cornbrash: Corsham, Wiltshire. W. Buy Coll. No. **23852**.

Affinities.—This species is well characterized by its loose *Stomatopora*-like zoarium. Some branches end in sheets, and these ally it to *P. rigauxi* (Sauv.). From this, however, it may be distinguished by the looseness of the zoarium. Its nearest ally is the recent *P. major* (Johnst.). (See Hincks, Brit. Mar. Polyz. p. 427, pl. lviii.) This, however, has a formula 2, 0, 2, 1–4, and may be distinguished by the greater elevation of the peristomes and length of the zoœcia.

The species is named after William Cunnington, Esq., from whom the British Museum received the specimen taken as the type, and whose careful collection has added greatly to the knowledge of Jurassic palæontology.

LIST OF SPECIMENS.

88742. On *Zeilleria ornithocephala* (J. de C. Sow.). Fuller's Earth. Bruton. Cunnington Coll.

97617. On *Terebratula maxillata*, J. de C. Sow. Cornbrash. Chippenham. Waterhouse Coll. Presented by Sir R. Owen.

23852. On *Terebratula maxillata* var. *submaxillata*, Morr. Cornbrash. W. Buy Coll.

5. Proboscina rigauxi (Sauvage), 1889.

SYNONYMY:

Stomatopora rigauxi, H. E. Sauvage, 1889, Bry. jur. Boul.: *Bull. Soc. géol. France*, sér. 3, t. xvii. p. 42, pl. iii. figs. 6–8.
,, sp. G. R. Vine, 1887, Jur. Polyz. Northptn.: *Journ. Northptn. Nat. Hist. Soc.* vol. iv. p. 204, pl. i. fig. 2.
Proboscina ,, Gregory, 1895, Rev. pt. ii.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvi. p. 449.
Proboscina clementina var. *minuta*, Vine, 1893, Polyz. Thrapston: *Proc. Yorks. Geol. Soc.* vol. xii. p. 256, pl. xiii. fig. 9.
,, ,, var. *depressa*, Vine, 1893, *ibid.* p. 256.

DIAGNOSIS:

Zoarium forming dense circular tufts. The branches end in crowded tufts, which almost form *Berenicea*-like sheets.

Zoœcia cylindrical, short, thick. Front wall with a well-marked transverse ribbing. Surface punctulate.

Peristomes raised into a thickened rim, but not reflexed.

Formula.—$p, c, l, r = 1, 0, 2, 1\text{–}12$.

DISTRIBUTION.

ENGLAND:

Cornbrash: Rushden.

FOREIGN:

Bathonian—Fuller's Earth: Hydrequent, near Boulogne (*fide* Sauvage).

Description of Figure.—Pl. II. Fig. 6. Part of zoarium encrusting *Terebratula intermedia*, J. de C. Sow., × 12 dia. Cornbrash: Rushden. **B. 4846**.

Affinities.—This species is extremely well marked. It was carefully described and figured by M. Sauvage. It is distinguished by the broad expansions at the ends of the branches, which often greatly resemble *Berenicea*. There is, however, always a marked difference between the fenestrated zoarium of this species and that of the nearest forms of *Berenicea*. Even in such species as *Berenicea compacta* (Norman),[1] which have greatly divided zoaria, the characteristic distinction between this and *Proboscina* can be seen. Though including the two varieties of *P. clementina* in this species,

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[1] See *Stomatopora compacta*, Hincks. Brit. Mar. Polyz. p. 435, pl. lxiii. figs. 1, 2.

I express no opinion as to the affinities of the type form of that species.

Among well-described Cretaceous species, that which approaches nearest to this is *Proboscina subelegans*, D'Orb.[1]; but the zoarium is more convex and the branches are not flabelliform.

SPECIMEN.

B. 4846. With *Berenicea diluviana*, Lamx., on *Terebratula intermedia*, J. de C. Sow. Cornbrash. Rushden. Figd. Pl. II. Fig. 6.

6. **Proboscina morinica** (Sauvage), 1889.

SYNONYMY:

Stomatopora morinica, Sauvage, 1889, Bry. jur. Boul.: *Bull. Soc. géol. France*, sér. 3, t. xvii. p. 41, pl. iii. fig. 5; pl. iv. figs. 6, 7.
Proboscina ,, Gregory, 1895, Rev. pt. ii.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvi. p. 450.
Proboscina obscura, Vine, 1893, Polyz. Thrapston: *Proc. Yorks. Geol. Soc.* vol. xii. p. 255, pl. xiii. fig. 7.

DIAGNOSIS:

Zoarium of an irregular, reticulate encrustation. Branches made up of from one to five zoœcia.

Zoœcia short, thick, with wide orifices. Shape in places almost hippothoïform; otherwise elliptical.

Peristomes irregular, slightly raised.

Formula.—$p, c, l, r = 2, 2, 1, 1\text{–}4$.

DISTRIBUTION.

ENGLAND:

Cornbrash: Thrapston.
Inferior Oolite—Pea Grit: Gloucestershire.

FOREIGN:

Oxfordian: near Boulogne.

Description of Figure.—Pl. VII. Fig. 1. Inferior Oolite: Cleeve. Part of zoarium, × 17 dia. Holl Coll. **D. 1840.**

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[1] D'Orbigny, *op. cit.* p. 853, pl. DCCLIX. figs. 8–13. For characters of zoœcia see Pergens, *op. cit.* p. 332, pl. xi. fig. 3.

Affinities.—This species is most nearly allied to *P. desoudini*, Haime, of which it may be a synonym. Some of the zoœcia appear identical, but whereas these are associated in *P. desoudini* with regularly cylindrical, tubular zoœcia, in this species they occur with hippothoiform zoœcia. Not having seen specimens, I must leave the matter in doubt. Its nearest Cainozoic ally is that described by Hincks as *Stomatopora fasciculata*.[1] The formula of this is 2, 2, 1, 1–4, whereas that of *P. morinica* is 1, 2, 0, 1–4. The recent species may be distinguished by not having the short, stumpy zoœcia, and by having lower peristomes than its Jurassic ally.

I cannot identify Vine's type of *P. obscura* in his collection, and feel doubts as to the correct position of the species; but it appears to be a young specimen with a loose zoarium.

SPECIMEN.

D. 1840. Inferior Oolite—Pea Grit. Cleeve Hill. Holl Coll.

7. **Proboscina spatiosa,** Walford.

SYNONYMY:

Proboscina spatiosa, Walford, 1889, Bry. Shipton, pt. i.: *Quart. Journ. Geol. Soc.* vol. xlv. pp. 566–7, pl. xvii. figs. 1–3; pl. xviii. figs. 1–5.

" " Gregory, 1895, Rev. pt. ii.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvi. p. 450.

DIAGNOSIS:

Zoarium of irregular, narrow, irregularly branching bands, each composed of from one to four zoœcia in width.

Zoœcia pyriform or subpyriform, of medium length, coarsely wrinkled and punctate.

Peristomes much raised. Apertures elliptical or circular.

Formula.—$p, c, l, r = 3, 2, 1, 1–4$.

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[1] *Stomatopora fasciculata*, Hincks, *non* Reuss, Brit. Mar. Polyz. p. 441, pl. lix. figs. 4, 5. This name is preoccupied by a Cretaceous species, and I have therefore had to rename it, which I have pleasure in doing, after the author who has so well described the recent form, *Proboscina hincksi*.

DISTRIBUTION.

Inferior Oolite: Shipton Gorge, Dorsetshire.

Affinities.—This species is most nearly allied to *P. desoudini* (Haime), from which it may be separated by the greater elevation of the peristomes and the shorter zoœcia; the zoarium appears, moreover, less irregular than in that species. The formula of Mr. Walford's species is $p, c, l, r = 3$, 0–2, 1, 1–4, whereas that of *P. desoudini* is 1′, 0–2, 2, 1–3.

Its nearest Cretaceous ally is *Proboscina fasciculata* (Reuss).[1] From this, however, it is very distinct. The formula of *P. fasciculata* (Reuss, *non* Hincks) is 2, 1–2, 0, 1–2. *P. echinata* (Münst.) is more nearly allied to this species than to *P. desoudini*, Haime, with which it has been contrasted in the description of the latter. The species is separated from *P. spatiosa*, Walf., by having less raised peristomes and shorter zoœcia. The Pliocene and recent *Prob. repens* is also allied, as Walford as remarked; but it has shorter, squatter zoœcia, and a stronger transverse marking.

P. spatiosa, Walf., is not represented in the Museum collection.

8. **Proboscina liassica** (Quenstedt), 1852.

Synonymy:

Diastopora	*liassica*,	Quenstedt, 1852, Handb. Petref. p. 637, pl. lvi. fig. 10.
,,	,,	Oppel, 1854, Mittl. Lias Schwab. p. 130.
,,	,,	Quenstedt, 1858, Der Jura, pp. 280, 292.
,,	,,	Quenstedt, 1867, Handb. ed. 2, p. 765, pl. lxxiii. fig. 10.
,,	,,	Quenstedt, 1885, *op. cit.* ed. 3, p. 984, pl. lxxix. fig. 28.
,,	,,	Lepsius, 1875, Beitr. Kenntn. Juraf. Unter-Elsass, p. 13.
,,	,,	Walford, 1879, Mid. Up. Lias Banbury, pp. 16, 20.
,,	,,	Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 264.
,,	,,	Thompson, 1889, Mid. Lias Northptnsh. p. 59.
Proboscina	,,	Gregory, 1895, Rev. pt. ii.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvi. p. 450.
Aulopora	,,	Quenstedt, 1878, Petref. Deutschl. Bd. vi. Abth. 1, p. 113, pl. cxlvii. fig. 28.

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[1] *Diastopora fasciculata*, Reuss, Verst. böhm. Kreidef. p. 666, pl. xv. figs. 35–7. *Proboscina fasciculata*, D'Orbigny, 1852, Pal. franç. t. v. p. 857, pl. dcxxxiv. figs. 10–13.

Berenicea Edwardsi, Terquem, 1855, Pal. dép. Moselle, p. 26.
,, ,, Terquem, 1868, in Jacquot, Descr. géol. min. dép. Moselle, p. 290.
Proboscina ,, Terquem and Piette, 1865, Lias inf. Est France : *Mém. Soc. géol. France*, sér. 2, t. viii. p. 125, pl. xiv. figs. 21–2 (*non* 25–6, as in text).
,, *prorepens*, Waagen, 1868, Zone *Amm. sowerbyi*: *Geogn. Pal. Beitr.* Bd. i. pp. 535, 647, pl. xxxiii. fig. 3.
,, cf. ,, Walford, 1883, Relation Northptn. Sd.: *Quart. Journ. Geol. Soc.* vol. xxxix. p. 239.
,, ,, Friren, 1893, Bry. inf. ool. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vii. p. 45.

Diagnosis:

Zoarium of narrow branching bands, composed of from three to five zoœcia in width.

Zoœcia cylindrical, of medium length; fine transverse lines traverse the walls.

Peristomes slightly raised; orifices somewhat elliptical.

Formula.—$p, c, l, r = 1, 0, 1, 3\text{–}5$.

DISTRIBUTION.

England:

Inferior Oolite: Coombe Hill, Oxfordshire (*fide* Walford).
Middle Lias—*spinatus* zone and transition bed: Appletree, near Banbury (*fide* Walford); Northamptonshire (*fide* Thompson).

Foreign:

Bajocian: Montvaux and Plappeville, near Metz (*fide* Friren).
Zone of *Sonninia sowerbyi*: Gingen, Würtemberg.
Lytoceras jurensis Marl: Silzbrunnen, Elsass (*fide* Lepsius).
Lias: Heiningen.
Middle Lias: Ohmenhausen (*fide* Oppel).

Affinities.—The formula for this species, as far as the figure given by Terquem and Piette enables one to judge, is $p, c, l, r = 1, 0, 1, 3\text{–}5$. It is distinct from either of the species previously described. The authors of the species compare it with Haime's *P. alfredi*, with which it may be identical. This latter species, however, was founded on such a very imperfectly preserved specimen that I cannot be sure of its affinities. The whole zoarium appears to have been eroded, and all the superficial characters have been destroyed. Thus it is impossible to say whether the peristomes were raised or flush. Its formula is

1, (?), 1, 3–5. *P. liassica* is therefore a near ally of *P. alfredi*, if not identical with it. Its nearest ally among the previously described species is *P. eudesi*, from which it differs in the greater irregularity in the distribution of the orifices and the flatness of the zoarium.

The species is not represented in the Museum collection.

INDETERMINABLE SPECIES.

1. Proboscina alfredi, Haime.

SYNONYMY:

Proboscina alfredi, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 168, pl. vi. fig. 8.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 144.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 264.
,, ,, Friren, 1893. Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 46.
Reptotubigera ,, Terquem, 1855, Pal. dép. Moselle (sep. copy), p. 28.
,, ,, Terquem, 1868, in Jacquot, Descr. géol. min. dép. Moselle, p. 292.

Distribution.—Bajocian: near Metz.

2. Proboscina ammonitorum (D'Orb.).

SYNONYMY:

Idmonea ammonitorum, D'Orbigny, 1849, Prod. Pal. t. i. p. 378.
Proboscina ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 846.

Distribution.—Oxfordian: France.

3. Proboscina complanata (D'Orb.).

SYNONYMY:

Idmonea complanata, D'Orbigny, 1849, Prod. Pal. t. i. p. 288.
Proboscina ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 846.
,, ,, E. E. Deslongchamps, 1857, Syst. ool. inf. Calvados: *Bull. Soc. linn. Norm.* t. ii. p. 328.

Distribution.—Bajocian and Bathonian: France.

4. Proboscina divisa, Vine (*non* Étall.).

SYNONYMY :

Proboscina divisa, Vine, 1893, Polyz. Thrapston: *Proc. Yorks. Geol. Soc.* vol. xii. p. 256, pl. xiii. fig. 8.

Distribution.—Cornbrash : Thrapston.

Vine's type cannot be recognized, but a second specimen, labelled "*P. divisa*, poor," has upon it a young *P. desoudini* and several zoaria of *P. jacquoti*.

5. Proboscina elegantula (D'Orb.).

SYNONYMY :

Idmonea elegantula, D'Orbigny, 1849, Prod. Pal. t. i. p. 288.
Proboscina ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 845.
,, ,, E. E. Deslongchamps, 1857, Syst. ool. inf. Calvados: *Bull. Soc. linn. Norm.* t. ii. p. 328.

Distribution.—Bajocian and Bathonian : France.

6. Proboscina expansa, Étallon.

SYNONYMY :

Proboscina expansa, Étallon, 1860, Jura Graylois: *Ann. Sci. phys. nat. Lyon*, sér. 3, t. iv. p. 175.

Name only.

Distribution.—Corallian—substage Glyptician: Chassigny, France.

7. Proboscina gracilis, D'Orbigny.

SYNONYMY :

Idmonea gracilis, D'Orbigny, 1849, Prod. Pal. t. i. p. 317.
Proboscina ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 846.
,, ,, E. E. Deslongchamps, 1865, Jur. inf. Norm.: *Mém. Soc. linn. Norm.* t. xiv. p. 151.

Distribution.—Bathonian : Ranville.

SYNOPSIS OF SPECIES.

I. Zoœcia all cylindrical.
Peristomes well raised ; zoarium flat ... ... *jacquoti*, Haime.
Peristomes low ; zoarium in linear bands, mostly biserial, frequently branched ... ... *cunningtoni*, Greg.
Multiserial, seldom branched
Zoarium flat ... ... *liassica* (Quenst.).
Zoarium ridged ... ... *eudesi* (Haime).
Zoarium in tufts and sheets ... ... *rigauxi* (Sauv.).

II. Zoœcia pyriform.

Peristomes well raised	*spatiosa*, Walf.
Peristomes low; zoœcia long	*desoudini* (Haime).
Zoœcia short	*morinica* (Sauv.).

BERENICEA, Lamouroux, 1821.

Diagnosis.—Tubuliporidæ in which the zoarium is a thin, flat, encrusting sheet. The zoœcia are tubular. The peristome is either flush with the surface or somewhat raised.

Type species.—*B. prominens*, Lamx. [The *B. obelia* (Johnst.).]

Affinities.—*Berenicea* was founded by Lamouroux for a recent Mediterranean species, generally known among zoologists by the name given to it by Johnston twenty-six years later. The genus, as here accepted, includes the flat, encrusting Tubuliporidæ, while *Diastopora* includes the erect, foliaceous forms. It has often been proposed to merge the two, but the distinction is so convenient that it is advisable, if possible, to retain it. The evidence that one species is sometimes erect and sometimes encrusting, is very insufficient. Reuss[1] has made a species, *D. corrugata*, which, he says, is sometimes erect and sometimes adnate. His figures, however, show marked differences between the two. In some recent species growing upon the stems of seaweeds, I have seen cases where the two sides of a *Berenicea* have met, and, pressing against one another, have formed a small, free, bilaminate expansion. But an exceptional and abnormal growth such as this hardly seems sufficient to destroy a distinction, so well marked in the vast majority of cases.

A distinction which it is more difficult to define is that between this genus and *Tubulipora*. The separation can only be based on the condition of the distal ends of the zoœcia. In the typical species of *Berenicea* the peristome is either flush with, or raised but slightly above, the general surface of the zoarium. In *Tubulipora*, a great length of the distal end of the zoœcia is free and reflexed. There are some species, however, of *Berenicea*, such as *e.g. Berenicea spatiosa* (see Pl. III, Fig. 1), in which the peristomes

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[1] A. E. Reuss. Tert. Bry. Kischenew in Bessarabia: *Sitz. k. Akad. Wiss. Wien.* Bd. lx. Abth. 1, 1869, p. 510, pl. i. figs. 6, 7; pl. ii. figs. 1–5.

are well raised; these represent an approach to the condition of *Tubulipora*, and it is not easy to draw the line between the two genera.

1. **Berenicea allaudi** (Sauvage), 1889.

SYNONYMY:

Rosacilla allaudi, Sauvage, 1889, Bry. jur. Boul.: *Bull. Soc. géol. France*, sér. 3, t. xvii. p. 46, pl. iv. figs. 1–5.
Berenicea ,, Gregory, 1894, Cat. Jur. Bry. York Mus.: *Rep. Yorks. Phil. Soc.* 1893, p. 60.
,, ,, Gregory, 1896, Rev. pt. iii.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 44.

DIAGNOSIS:

Zoarium a large thin disc, somewhat irregular at the border. Surface flat.

Zoœcia cylindrical, somewhat fusiform; visible throughout; of medium length, punctulate; front wall traversed by slight undulations.

Peristomes slightly elevated; irregularly arranged.

Formula.[1]—$p, c, l, r = 1, 1, 1, d0$.

DISTRIBUTION.

BRITISH:

Great Oolite: Cox's Pit, Bedford.
Inferior Oolite: Burton Bradstock. (York Museum.)
Lower Ragstone: Cold Comfort, near Leckhampton.

FOREIGN:

Inferior Oolite—Callovian and Oxfordian: Boulogne.

Description of Figure.—Pl. III. Fig. 6. Part of a zoarium from Inferior Oolite, × 16 dia.; it is worn, and thus does not show the ornamentation. Brit. Mus. **D. 1795.**

Affinities.—Among the British Jurassic species, *B. allaudi* most resembles *B. striata*, from which, however, it differs by the shortness of the zoœcia in the former, as well as in the flabellate arrangement of the zoœcia in the latter. The species is well marked; it is rare in England, but a good series of figures of it has been given by M. Sauvage. Its closest Cretaceous ally is

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[1] In the last term of the formulæ for *Berenicea*, d = discoid; f = flabelliform; i = irregular; 0, 1, and 2, refer to the crowding of the peristomes.

B. regularis, D'Orb.,[1] and especially the form figured by him as *B. densata*.[2] It differs, however, from this by the zooecia in the Cretaceous species being more uniformly cylindrical and more crowded.

LIST OF SPECIMENS.

D. 2072. On *Ostrea* sp. Great Oolite. Cox's Pit, Bedford.

D. 1794. On *Terebratula plicata*, Buckm. Inferior Oolite.

D. 1795. On *Terebratula plicata*, Buckm. Inferior Oolite. Figd. Pl. III. Fig. 6.

B. 4855. On *Astarte obliqua*, Lam. Inferior Oolite—Lower Ragstone. Cold Comfort. Holl Coll.

2. **Berenicea compressa** (Goldfuss), 1829.

SYNONYMY:

Aulopora compressa, Goldfuss, 1829, Petref. Germ. Bd. i. p. 84, pl. xxxviii. fig. 17.

,, ,, Lepsius, 1875, Beitr. Kennt. Juraf. Elsass, p. 5.

Stomatopora ,, Bronn, 1848, Nomencl. p. 1201; 1849, Enum. p. 139.

Cellepora ,, Quenstedt, 1851, Flözgeb. Würtemb. ed. 2, p. 357.

Diastopora ,, Quenstedt, 1852, Handb. Petref. p. 637, pl. lvi. figs. 11, 12.

,, ,, Quenstedt, 1858, Der Jura, p. 457, pl. lviii. fig. 1. (Fig. indet.)

,, ,, Quenstedt, 1867, Handb. Petref. ed. 2, p. 765, pl. lxxiii. figs. 11, 12.

,, ,, Quenstedt, 1878, *op. cit.* ed. 3, p. 984, pl. lxxix. fig. 29.

,, ,, Brauns, 1869, Mittl. Jura, p. 301.

,, ,, Brauns, 1874, Ob. Jura. im nordw. Deutsch. p. 400.

Berenicea ,, *ex. syn.* Waagen, 1868, Zone *Amm. sowerbyi*: *Geogn. Pal. Beitr.* Bd. i. p. 645.

,, ,, Gregory, 1896, Rev. pt. iii.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 42.

Diastopora lamourouxi, *pars*, M. Edwards, 1838, Mém. Cris.: *Ann. Sci. nat. Zool.* sér. 2, t. ix. p. 225.

Aulopora flabellulum, Quenstedt, 1878, Petref. Deutschl. Bd. vi. Abth. 1, p. 112, pl. cxlvii. fig. 27.

Berenicea insignis, Reuss, 1867, Bry. braun. Jura Balin: *Denk. k. Akad. Wiss. Wien.* Bd. xxvii. p. 6, pl. i. figs. 4*a*–*b*.

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[1] D'Orbigny. *Op. cit.* p. 865, pl. DCXXXVI. figs. 9, 10; pl. DCXXXVII. figs. 1–4.

[2] *Ibid.* pl. DCXXXVII. figs. 1, 2.

Diastopora stomatoporoides, Vine, 1881, Further Notes on Diastoporidæ: *Quart. Journ. Geol. Soc.* vol. xxxvii. p. 384, pl. xix. figs. 1–10.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 264.
,, ,, Vine, 1884, 4th Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1883, p. 187.
,, ,, Wilson and Crick, 1889, Lias Tilton: *Geol. Mag.* dec. 3, vol. vi. p. 342.

DIAGNOSIS:

Zoarium thin, irregular, in flabelliform sheets; sometimes sub-orbicular in shape.

Zoœcia very long; cylindrical, sinuous; visible throughout their length. Some zoœcia expanded just below the aperture. Walls punctate.

Peristomes very slightly raised; distant; very irregularly arranged.

Gonocysts large; low rounded domes or pyriform; coarsely punctulate.

Formula.—*p*, *c*, *l*, *r*=1, 0, 3, *f*0.

DISTRIBUTION.

BRITISH:

Corallian—Calcareous Grit: Hinton-Trowbridge.
Cornbrash: Thrapston.
Bradford Clay: Bradford, Wilts.
Great Oolite: Gloucestershire.
Inferior Oolite: Leckhampton; Cold Comfort, near Cheltenham.
Upper Lias—Zone of *Lytoceras cornucopiæ*.
Middle Lias—Marlstone: Tilton, Leicestershire (*fide* Wilson and Crick).
Zone of *Ægoceras henleyi*: Cherrington, Oxfordshire.

FOREIGN:

Corallian: Mehle, Germany (*fide* Brauns).
Bathonian—Braun Jura: Balin, Austria.
Bajocian—Braun Jura, δ: Eisenoolith, Dettingen.
Zone of *Sonninia sowerbyi*: Rabenstein, Franconia; Gingen, Würtemberg.
Toarcian—Zone of *Harpoceras opalinum*: Gundershofen, Elsass (*fide* Lepsius).
Middle Lias: Grotz, Franconia.

Description of Figures.—Pl. III. Fig. 2. Part of zoarium from Bradford Clay. Bridgewater Quarry, Bradford. **D. 1782.**

× 12 dia. Pl. III. Fig. 3. Part of a zoarium with gonocyst, from Cornbrash. Thrapston. **D. 924.** × 18 dia.

Affinities.—This species is most closely related among English Jurassic Bryozoa to *B. sauvagei*, Greg.; the differences between them are noted in the description of that species. Vine includes with it, though doubtfully, the two species *B. crussolensis* (Dum.) and *Diastopora liassica* (Quenst.). The latter is, however, a *Proboscina*, and I see no especial affinity between the former and the species under consideration.

The zoœcia greatly resemble those of *B. normani* (D'Orb.), but the peristomes are more raised than in that species, and the zoarium more irregular and flabelliform. Among Cretaceous species the one most nearly allied to this is *B. folium*, Novak.[1] This has the same long sinuous zoœcia, and slightly raised peristomes. The only difference I can detect between them is in the structure of the gonocysts. These are rounded or pyriform in *B. compressa*, but broad and irregular in *B. folium*. I had for some time adopted Novak's name, as it is prior to Vine's, but the difference of the gonocysts seems sufficient to keep them apart. Two other Bohemian Cretaceous species, which are allied to the present, are *B. lacrimopora*, Nov., and *B. pilosa*, Nov. The former[2] differs by having a raised rim round the peristomes, and having the distal ends of many of the zoœcia considerably expanded in breadth. The zoœcia, moreover, are more irregular in form and distribution. *Berenicea pilosa*,[3] Nov., is distinguished by a greater ornamentation, as well as having the zoœcia less regularly cylindrical and the peristomes more elevated. Another species which belongs to this group is *Berenicea papyracea*, D'Orb., *pars*; this differs by having straight zoœcia[4] and a regular zoarium.

The sinuosity of the zoœcia in *B. compressa* is not well shown in Pl. III. Fig. 3, which is given to illustrate the gonocyst; but it is well shown in Vine's figures, and is indicated in Pl. III. Fig. 2.

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[1] O. Novak. Beitr. Kennt. böhm. Kreidef.: *Denk. k. Akad. Wiss. Wien.* Bd. xxxvii. Abth. 2, 1877, p. 96, pl. iv. figs. 11–14.

[2] *Ibid.* p. 97, pl. iv. figs. 23–4.

[3] *Ibid.* p. 21, pl. iv. figs. 1–10.

[4] D'Orbigny. *Op. cit.* p. 868, pl. DCXLI. figs. 3, 4; *non* pl. DCCLVIII. figs. 14–16, which has been made into a new species, *Diastopora mutata*, Pergens. Rev. Bry. Cret. D'Orb.: *Bull. Soc. belge Géol.* 1890, t. iii. Mém. p. 335.

LIST OF SPECIMENS.

24685. On *Perna* sp. Corallian—Calcareous Grit. Hinton-Trowbridge. Cunnington Coll.

D. 924. Specimen with gonocyst. Cornbrash. Thrapston. Vine Coll. Figd. Pl. III. Fig. 3.

D. 938. On *Nucleolites orbicularis* (Phil.). Cornbrash. Thrapston. Vine Coll.

D. 940. On *Ostrea*. Cornbrash. Thrapston. Vine Coll.

51342. On *Apiocrinus elegans* (Defr.). Bradford Clay. Bradford. With *B. diluviana*, *coartata*, *verrucosa*. Specimen has gonocysts.

D. 1782. On shell. Bradford Clay. Bridgewater Quarry, Bradford. Figd. Pl. III. Fig. 2.

B. 4862. On *Terebratula maxillata*, J. de C. Sow. Great Oolite. Wright Coll.

D. 13. On ,, ,, ,, ,,

D. 1803. On *Terebratula perovalis*, J. de C. Sow. Inferior Oolite.

D. 1807. On *Zeilleria leckenbyi* (Walk.). Inferior Oolite. Leckhampton.

D. 1791. On *Terebratula curvifrons*, Oppel. ,, ? ,,

D. 1844. On *Perna quadrata*, Sow. ,, Cold Comfort, near Cheltenham. Holl Coll.

D. 2073. On *Belemnites*. Braun Jura, δ. Eisenoolith. Dettingen.

D. 2074. On fragment of shell. Braun Jura, δ. Eisenoolith. Dettingen.

D. 2077. On fragment of shell. ,, ,, ,,

1908. On fragment of shell. Mid. Lias. Grotz, Franconia. Brauns Coll.

3. Berenicea normani (D'Orb.), 1849.

Synonymy:

Diastopora normaniana, D'Orbigny, 1849, Prod. Pal. t. i. p. 288.

Diastopora verrucosa (*non* M. Edw.), Michelin, 1840, Icon. Zooph. p. 10, pl. ii. fig. 11; 1840–4, p. 112; *non* 1846, p. 242, pl. lvi. fig. 14.

Diagnosis:

Zoarium discoid, thin.

Zoœcia visible throughout their length; very long, sinuous; cylindrical, but inclining to become trumpet-shaped; punctulate.

Peristomes low, very slightly raised. Apertures distant and irregularly arranged.

Formula.—$p, c, l, r = 1', 0, 3, d0$.

DISTRIBUTION.

Foreign.—Bajocian: Bayeux and Moutiers, France.

Affinities.—The species is most closely allied to *B. portlandica*, Greg., but it differs from this by the zoœcia being plain instead of ornamented by transverse ridging.

Michelin gave three figures, which he referred to *B. verrucosa*, M. Edw. D'Orbigny recognized that one of these clearly did not belong to Milne Edwards' species, and named it *Diastopora normani*. Waagen made a suggestion that this might be the same as the *B. compressa* (Goldf.), a species to which it is unquestionably closely allied. Goldfuss has not figured or described the zoarium, but there can be little doubt that it is irregular in form, and agrees with those figured by Quenstedt. The two species therefore differ by *B. compressa* being irregular instead of discoid, and having the zoœcia flabelliform; the peristomes are also less raised in *B. normani* than in *B. compressa*. Milne Edwards' suggestion that *B. compressa* is indistinguishable from his *D. lamourouxi* was not fortunate.

4. **Berenicea sauvagei**, Gregory, 1896.

SYNONYMY:

Berenicea sauvagei, Gregory, 1896, Rev. pt. iii.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 43.

DIAGNOSIS:

Zoarium of large, thin, circular discs.

Zoœcia very long; cylindrical; sometimes expanded a little below the orifice; visible throughout their length; slightly sinuous; minutely punctulate.

Peristomes slightly raised. Distributed regularly in a quincuncial pattern.

Formula.—$p, c, l, r = 1, 0, 3, d1$.

DISTRIBUTION.

Bradford Clay: Bradford, Wilts. (**B. 194**, Brit. Mus.)
Upper Lias: Moulton, near Northampton.

Description of Figure.—Pl. III. Fig. 4. Part of zoarium on *Apiocrinus elegans* (Defr.). Some worn zoœcia show perforated diaphragms. Bradford Clay: Bradford. × 15 dia. Presented by B. Bright, Esq. **B. 194**.

Affinities.—This species resembles *B. archiaci* in its long zoœcia, but it has no known oœcia; the zoaria are larger; the zoœcia are longer, more sinuous, and not so markedly radial in arrangement. It is nearer to *B. allaudi*, from which it differs in the quincuncial arrangement of the orifices and the greater length of the zoœcia.

Among the species with irregular zoaria it must be compared with *B. compressa* (Goldf.). With this it agrees in the length of its zoœcia, their faint punctulation, and the slight expansion just below the raised portion of the aperture. The species differ, however, in the greater distance of the apertures in the old species, and their very irregular distribution. One has only to compare the crowded regular quincuncial orifices of *B. sauvagei* with Vine's figure (*op. cit.* pl. xix. figs. 3 and 7) to see the extent of this difference.

LIST OF SPECIMENS.

B. 194. On *Apiocrinus elegans* (Defr.). Bradford Clay. Bradford. Presented by Benj. Bright, Esq. Figd. Pl. III. Fig. 4.

D. 2271. Upper Lias. Moulton, near Northampton. Presented by Beeby Thompson, Esq., F.G.S.

5. **Berenicea portlandica,** Gregory, 1896.

SYNONYMY:

Berenicea portlandica, Gregory, 1896, Rev. pt. iii.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 43.

DIAGNOSIS:

Zoarium small, discoid. Zoœcia arranged at first on a somewhat flabelliform plan. Borders of zoarium a little irregular. The zoarium is a thin sheet.

Zoœcia long, cylindrical. Front wall ornamented by several sharp ridges: usually five or six on each zoœcium. Zoœcia visible throughout their length.

Peristomes flush or raised on lower margin. Circular.

Formula.—p, c, l, $r = 0\text{–}0'$, 0, 3, $d\,0$.

DISTRIBUTION.

Portland Oolite. Tisbury, Wilts. Brit. Mus. **D. 1853.** Presented by J. W. Gregory.

Description of Figure.—Pl. III. Fig. 5. Zoarium. $\times$ 12 dia.

Affinities.—This species greatly resembles Haime's figure of *Berenicea striata* (Bry. jurass. pl. vii. figs. 8*a–b*), owing to the transverse ribbing. The two species are closely allied; thus *B. striata* has a formula of 1, 1, 2, $f\,0$. The differences between the zoœcia of the two species are, that those of *B. striata* have higher peristomes, are more fusiform and shorter. These seem sufficient to separate them, apart from the differences in the zoaria, which in *B. striata* are irregular and flabelliform. The specimens occur on an *Ostrea*, found in the Portland Oolite at Tisbury, and they are of interest, as the only Bryozoa known from this stage in England. The species is well marked; its nearest Cretaceous ally is *B. clementina*, D'Orb.,[1] which is, however, nearer to *B. striata*. *B. portlandica* differs from *B. clementina* in having a discoid zoarium, the apertures more scattered, and longer zoœcia.

6. **Berenicea striata**, Haime, 1854.

Synonymy:

Berenicea striata, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 179, pl. vii. figs. 8*a–b*.

,, ,, Terquem, 1855, Pal. Ét. inf. Lias Lux.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 334.

,, ,, Terquem, 1855, Pal. dép. Moselle (sep. copy), p. 15.

,, ,, Terquem and Piette, 1865, Lias inf. Est France: *Mém. Soc. géol. France*, sér. 2, t. viii. p. 124, pl. xiv. figs. 19, 20 (*non* 23, 24 as text).

,, cf. ,, Waagen, 1868, Zone *Amm. sowerbyi*: *Geogn. Pal. Beitr.* Bd. i. p. 646, pl. xxxiii. fig. 4.

,, ,, Terquem, 1868, in Jacquot, Descr. géol. dép. Moselle, p. 231.

non ,, ,, Manzoni, 1875, Brioz. Castrocaro, p. 44, pl. vi. fig. 74; pl. vii. fig. 79.

,, ,, Vine, 1880, Rev. Fam. Diastoporidæ: *Quart. Journ. Geol. Soc.* vol. xxxvi. p. 357.

,, ,, Witchell, 1882, Geol. Stroud, p. 14.

,, ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. pp. 50 and 62.

,, ,, Gregory, 1894, Cat. Jur. Bry. York Mus.: *Rep. Yorks. Phil. Soc.* 1893, p. 60.

,, ,, Gregory, 1896, Rev. pt. iii.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 44.

Diastopora ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 264.

non ,, ,, Neviani, 1893, Sec. contrib. Brioz. foss. Ital.: *Boll. Soc. geol. Ital.* vol. xii. p. 133.

Diagnosis:

Zoarium flabellate; irregularly lobed or discoid. Forms a thin sheet.

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[1] D'Orbigny. Pal. franç. Terr. crét. t. v. p. 865, pl. dcxxxvi. figs. 1, 2.

Zoœcia somewhat fusiform; very long; ornamented by sharp transverse ridges. Zoœcia visible throughout.

Peristomes slightly raised.

Formula.—$p, c, l, r = 1, 1, 3, f0$.

DISTRIBUTION.

ENGLAND:

Inferior Oolite: Leckhampton.
Lower Lias: Stroud (*fide* Witchell).

FOREIGN:

Sinemurian—Calcaires à *Gryphea arcuata*: Valières-lès-Metz and Grigy; Lothringen.
Zone of *Belemnites acutus*: Étales.
,, ,, *bisulcatus*: Valière.
,, ,, *angulatus*: Jamoigne; Luxembourg, Belgium.

Affinities.—Amongst Jurassic Bryozoa this species most clearly resembles *B. portlandica*, Greg.; the differences between them are noted in the description of that species (p. 84). It is still more allied to *B. clementina*, D'Orb., which is its Cretaceous representative. The differences between them are, that the zoœcia of the Cretaceous species are shorter and more uniform in diameter, they being regularly cylindrical. The formula for *B. clementina* is $1, 0'', 1'', f0$.

Manzoni and Neviani have both included in this species some Italian Pliocene specimens, for which the formula would be $1, 1, 2, d0$. It seems to me that their species is quite distinct, for it is not striated, but punctulate, and has a much thicker zoarium.

LIST OF SPECIMENS.

? D. 1785. Inferior Oolite. Loc. ?
? D. 2215. Inferior Oolite. Near Leckhampton. Brodie Coll.

Berenicea striata var. discoidea.

SYNONYMY:

Berenicea striata, Reuss, 1867, Bry. braun. Jura Balin: *Denk. k. Akad. Wiss. Wien*. Bd. xxvii. p. 7, pl. i. fig. 5.
,, cf. ,, Waagen, 1868, Zone *Amm. sowerbyi*: *Geogn. Pal. Beitr.* Bd. i. p. 646, pl. xxxiii. fig. 4.

DISTRIBUTION.

Bathonian—Braun Jura: Balin.
Bajocian.

Affinities.—This species agrees precisely in its zoœcial characters with the type form figured by Haime. The zoarium, however, is discoid instead of very irregularly lobed. The difference may therefore be taken as varietal.

7. **Berenicea spatiosa** (Walford), 1889.

SYNONYMY:

Tubulipora spatiosa, Walford, 1889, Bry. Shipton, pt. i.: *Quart. Journ. Geol. Soc.* vol. xlv. p. 567, pl. xviii. figs. 10–12.
Berenicea spatiosa, Gregory, 1896, Rev. pt. iii.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 41.
Diastopora diluviana (*non* Lamx.), Vine, 1884, Polyz. Richmond boring: *Quart. Journ. Geol. Soc.* vol. xl. p. 787.
,, *microstoma* (*non* Mich.), Vine, 1884, *ibid.* p. 788.
,, *lamourouxi* (*non* Edw.), Vine, 1884, *ibid.* p. 789.

DIAGNOSIS:

Zoarium an irregular, thin, encrusting sheet.

Zoœcia visible throughout. The distal portions are reflexed at right angles. The general aspect is therefore that of a number of rings irregularly scattered over a thin crust. The raised portions taper slightly towards the free end.

Peristomes highly raised. Apertures circular.

Gonocysts somewhat pyramidal.

Formula.—$p, c, l, r = 3, 1, 2, i0$.

DISTRIBUTION.

ENGLAND:

Great Oolite: Hampton, near Bath.
Inferior Oolite: near Leckhampton.

FOREIGN:

Bathonian: Ranville.
Braun Jura, δ: Germany.

Description of Figure.—Pl. III. Fig. 1. Great Oolite: Hampton. Part of zoarium, × 22 dia. Holl Coll. **D. 30.**

Affinities.—This is a very well-marked species. The extremely high, reflexed peristomal portions of the zoœcia are sufficient to characterize it. It corresponds to *D. foliacea* in the *Diastopora* series, and to *S. dichotoma* (Lamx.) in that of *Stomatopora.*

Mr. Walford has also described a *Diastopora spatiosa* and a *Proboscina spatiosa*, and it is not altogether clear whether he regards these as three species belonging to three different genera, or as one species, which, nevertheless, belongs to three different genera. The *D. spatiosa* and the *P. spatiosa* are both referred to *Proboscina.*

An allied species is *Berenicea megapora* (D'Orb.),[1] which agrees with this in consisting of an irregular sheet, and having highly raised peristomes. The Cretaceous species, however, has the peristomes far more raised, while they are more crowded. The Cainozoic species which most resembles the present is *B. flabellum* (Reuss),[2] from the Leithakalk of Austria; but in that species the peristomes are less raised, and the zoarium is regularly flabelliform.

The three species can be compared by their formulæ as follows:—

spatiosa	3	1	2	*i* 0.
megapora	3*	1	1	*i* 2.
flabellum	1	1	1	*i* 0.

LIST OF SPECIMENS.

D. 2174. Bradford Clay. Bradford. Brodie Coll.

D. 30. Great Oolite. Hampton, near Bath. Holl Coll. Figd. Pl. III. Fig. 1.

D. 209, D. 1908, D. 1922, D. 1923, D. 1924. Great Oolite. Richmond boring, 1205 ft. Presented by Professor J. W. Judd, F.R.S. The *D. diluviana* of Vine.

D. 1918, D. 1920. Great Oolite. Richmond boring, 1205 ft. Presented by Professor J. W. Judd, F.R.S. The *D. microstoma* of Vine.

D. 1921, D. 1925. Great Oolite. Richmond boring, 1205 ft. Presented by Professor J. W. Judd, F.R.S. The *D. lamourouxi* of Vine.

D. 2195. Inferior Oolite. Near Leckhampton. Brodie Coll.

D. 2085, D. 2089. On annelid tubes. Bathonian — Calcaire à polypiers. Ranville.

B. 4524. On *Dictyothyris coarctata* (Park.). Bathonian—Calcaire à polypiers. Ranville.

D. 2218. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll.

D. 2090. Braun Jura, δ. Eisenoolith. Dettingen.

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[1] D'Orbigny. Pal. franç. Terr. crét. t. v. p. 863, pl. DCXXXV. figs. 4, 5.

[2] Reuss. Foss. Polyp. Wien. Tert.: *Naturw. Abh.* Bd. ii. 1847, p. 51, pl. vii. fig. 9.

8. **Berenicea denticulata,** Terq and Jourdy, 1871.

SYNONYMY:

Berenicea denticulata, Terquem and Jourdy, 1871, Mon. Bath. Moselle: *Mém. Soc. géol. France,* sér. 2, t. ix. p. 142, pl. xiv. figs. 13, 14.

DIAGNOSIS:

Zoarium irregular, thick.

Zoœcia visible throughout their length; plain.

Peristomes reflexed; highly raised; with a denticulate border. Arranged in loose, curved lines.

Formula.—$p, c, l, r = 3, 0, 2, d0$.

DISTRIBUTION.

FOREIGN:

Bathonian—Zone of *Parkinsonia parkinsoni*: Clapes, Moselle.

Affinities.—This species is characterized by its denticulate peristome. Its two closest allies are *B. tenuis*, D'Orb., and *B. spatiosa* (Walf.). From the former it is distinguished by the walls being plain, instead of striated; from the latter by the irregularity and thinness of the zoarium in that species. In later periods the species which most reminds me of this one is that which was described by Reuss[1] as *Diastopora sparsa.* From this it differs in having the zoœcia more crowded, and the peristomes less raised, and the peristomes denticulate. The distal ends of the zoœcia in Reuss' species are, however, so much raised, that the species must be included in *Tubulipora.* Waters and Neviani both place it as a synonym of *Diastopora latomarginata*, D'Orb., a conclusion with which I am disposed to agree, removing this species to *Tubulipora.*

9. **Berenicea tenuis** (D'Orb.), 1850.

SYNONYMY:

Diastopora tenuis, D'Orbigny, 1850, Prod. Pal. t. ii. p. 55.
Berenicea ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 861.
Rosacilla ,, Sauvage, 1889, Bry. jur. Boul.: *Bull. Soc. géol. France,* sér. 3, t. xvii. p. 48, pl. iv. figs. 8, 9.
non Berenicea tenuis, Reuss, 1854, Beitr. Char. Kreid. Ostalpen: *Denk. k. Akad. Wiss. Wien.* Bd. vii. p. 136, pl. xxvii. fig. 9.

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[1] A. E. Reuss. Foss. Polyp. Wien. Tert.: *Naturw. Abh.* Bd. ii. 1847, p. 51, pl. vii. fig. 10.

Diagnosis :

Zoarium a circular disc, very thin. May have a lacuna around the primitive zoœcia.

Zoœcia long and cylindrical, separated from one another; visible throughout their length. Slight transverse striation.

Peristomes well raised.

Formula.—$p, c, l, r = 2, 1, 2, d0$.

DISTRIBUTION.

Foreign : Mid. Portlandian : Boulogne.

Affinities.—This species was so very inadequately described by D'Orbigny that it is only on M. Sauvage's description that it can be retained. His figures are clear. The species is most nearly allied to *B. allaudi* (Sauv.), from which it differs in that the zoœcia are separated, and the peristomes more raised.

This species is not represented in the British Museum Collection.

The name was given by Reuss in 1854 to a form which he had previously described as *D. gracilis* (M. Edw.), he having overlooked the twice prior use of that name by D'Orbigny. In spite of the shortness of the latter's diagnosis, the mention of the locality renders it recognizable. Reuss' use of the name cannot therefore be continued.

10. **Berenicea diluviana,** Lamouroux, 1821.

Synonymy :

Berenicea diluviana, Lamouroux, 1821, Expos. Méth. p. 81, pl. lxxx. figs. 3, 4.
,, ,, Conybeare and Phillips, 1822, Geol. England and Wales, p. 214.
,, ,, Lamouroux, 1824, Encycl. Méth. Zooph. p. 140.
,, ,, Bronn, 1825, Pflanzenth. p. 43, pl. vii. fig. 4.
,, ,, Defrance, 1826, Dict. Sci. nat. t. xlii. p. 391.
,, ,, Fleming, 1828, Brit. Anim. p. 533.
,, ,, Blainville, 1830, Dict. Sci. nat. t. lx. p. 410, pl. xliii. fig. 4.
,, ,, Lonsdale, 1832, Oolitic Bath.: *Trans. Geol. Soc.* ser. 2, vol. iii. p. 273.
,, ,, Blainville, 1834, Man. d'Act. p. 445, pl. lxv. fig. 4.
,, ,, M. Edwards, 1836, in Lamarck, Hist. Nat. Anim. s. Vert. éd. 2, t. ii. p. 264.
,, ,, Bronn, 1837, Leth. Geogn. ed. 2, p. 240, pl. xvi. fig. 8.

Berenicea diluviana, Archiac, 1843, Descr. géol. dép. Aisné: *Mém. Soc. géol. France*, t. v. pt. ii. pp. 341, 348.

,, ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 177. pl. vii. figs. 2*a–d*.

,, ,, Wright, 1860, Subdiv. Inf. Ool.: *Quart. Journ. Geol. Soc.* vol. xvi. p. 12.

,, ,, Ferry, 1862, Bajoc. Maçon: *Mém. Soc. linn. Norm.* t. xii. pp. 13, 30, 35.

,, ,, E. E. Deslongchamps, 1865, Jur. inf. Norm.: *Mém. Soc. linn. Norm.* t. xiv. p. 151.

,, ,, Reuss, 1867, Bry. braun. Jura Balin: *Denk. k. Akad. Wiss. Wien.* Bd. xxvii. p. 6, pl. i. figs. 1, 2.

,, ,, Waagen, 1868, Zone *Amm. sowerbyi*: *Geogn. Pal. Beitr.* Bd. i. pp. 548, 564, 646.

,, ,, Terquem and Jourdy, 1871, Bath. Moselle: *Mém. Soc. géol. France*, sér. 2, t. ix. pp. 142, 156.

,, ,, Brauns, 1879, Bry. mittl. Jura Metz: *Zeit. deut. geol. Ges.* Bd. xxxi. p. 325.

,, ,, Branco, 1879, Unt. Dogger Deut. Loth.: *Abh. geol. Specialk. Elsass-Loth.* Bd. ii. Ht. 1, p. 132.

,, ,, Vine, 1880, Rev. Fam. Diastoporidæ: *Quart. Journ. Geol. Soc.* vol. xxxvi. p. 357.

,, ,, Witchell, 1882, Geol. Stroud, p. 48.

,, ,, Schlippe, 1888, Bath. oberrhein. Tieflande: *Abh. geol. Specialk. Elsass-Loth.* Bd. iv. Ht. 4, pp. 65, 96.

,, ,, Bigot, 1892, Esq. géol. Basse-Norm.: *Bull. Lab. Géol. Caen*, t. ii. p. 24.

,, ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 46.

,, ,, Gregory, 1894, Cat. Jur. Bry. York Mus.: *Rep. Yorks. Phil. Soc.* 1893, p. 60.

,, ,, Gregory, 1896, Rev. pt. iii.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvi. p. 45.

Diastopora ,, *pars*, M. Edwards, 1838, Mém. Cris.: *Ann. Sci. nat. Zool.* sér. 2, t. ix. pp. 228, 238, pl. xv. fig. 3, *non* pl. xiv. fig. 4.

,, ,, Morris, 1843, Cat. Brit. Foss. p. 35.

,, ,, Michelin, 1846, Icon. Zooph. p. 241, pl. lvi. fig. 13.

non ,, ,, Reuss, 1846, Verst. böhm. Kreidef. Abth. 2, p. 65, pl. xiv. fig. 14.

,, ,, Bronn, 1848, Nomencl. p. 420.

,, ,, Bronn, 1849, Enum. p. 141.

,, ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 317.

,, ,, Buvignier, 1852, Stat. géol. dép. Meuse, pp. 194, 229, 238.

,, ,, Morris, 1854, Cat. Brit. Foss. ed. 2, p. 121.

,, ,, Terquem, 1855, Pal. dép. Moselle (sep. copy), p. 30.

,, ,, Terquem, 1868, in Jacquot, Descr. géol. dép. Moselle, p. 296.

Diastopora diluviana, Phillips, 1871, Geol. Oxford, pp. 239, 302, pl. xi. figs. 22–3; pl. xii. fig. 2 (figs. indet.).
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, pp. 256, 264.
,, ,, Vine, 1884, 4th Rep. Foss. Polyz.: *ibid.* p. 187.
,, ,, *pars*, Vine, 1884, Polyz. Richmond boring: *Quart. Journ. Geol. Soc.* vol. xl. p. 787.
,, ,, Vine, 1887, Jur. Polyz. Northptn.: *Journ. Northptn. Nat. Hist. Field Club*, vol. iv. p. 206, pl. i. figs. 12–16.
,, ,, Vine, 1888, Polyz. Caen: *ibid.* vol. v. p. 13.
,, ,, Thompson, 1889, Mid. Lias Northamptonshire, p. 59.
,, ,, Fox-Strangways, 1892, Jur. Rks. Britain, vol. ii.: Yorks. Tables of Fossils, pp. 148, 200.
Reptomultisparsa diluviana, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 876.
,, *diluviana*, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 138.
Rosacilla ,, Sauvage, 1889, Bry. jur. Boul.: *Bull. Soc. géol. France*, sér. 3, t. xvii. p. 44, pl. iv. fig. 11.
Diastopora spatiosa, Walford, 1889, Bry. Shipton, pt. i.: *Quart. Journ. Geol. Soc.* vol. xlv. p. 573, pl. xvii. figs. 7, 8.

DIAGNOSIS:

Zoarium in large, irregular, encrusting sheets. Young forms are flabelliform.

Zoœcia of medium length, cylindrical. Young central zoœcia visible throughout; the more adult, peripheral zoœcia are crowded, and thus not wholly seen.[1] Front wall plain, or crossed by faint, transverse ridges, best seen in young zoaria.

Peristomes slightly raised in peripheral zoœcia; central ones almost flush. Irregularly distributed; but in large zoaria they are in places sub-linear.

Gonocysts pyriform; rather narrow; usually but slightly broader than the zoœcia.

Formula.—$p, c, l, r = 1\text{–}1''$, 0, 2, i0.

DISTRIBUTION.

ENGLAND:

Lower Calcareous Grit: Yorkshire (*fide* Hudleston).
Oxford Clay: St. Clements (*fide* Phillips).
Cornbrash: Rushden and Thrapston; Islip (*fide* Phillips); and Yorkshire (*fide* Fox-Strangways).
Bradford Clay: Bradford; Box; Corsham.

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[1] Reuss' two figures (Reuss, *op. cit.* 1*b* and 2*a*) well show the difference between the central and crowded peripheral portions of the zoarium.

Great Oolite: Hampton, near Bath; Stanton; Richmond boring; Kirtlington (*fide* Phillips).
Fuller's Earth: Wiltshire.
Inferior Oolite: Cotteswolds.
Lias—*spinatus* beds: Northampton.

FOREIGN:
Cornbrash: Vogesheim, Baden (*fide* Schlippe).
Oxfordian: Meuse (*fide* Buvignier).
Bathonian—Hauptrogestein: Merdingen, Baden, and Buchsweiler, Elsass (*fide* Schlippe).
Zone of *Parkinsonia ferruginea*: Neiderweiler, Baden (*fide* Schlippe).
Marnes Bradfordiennes: Meuse (*fide* Buvignier).
Calcaire gris marneux: Aubenton, Eparcy (*fide* Archiac).
Calcaire oolithe miliare: Les Vallées (*fide* Archiac).
Calcaire à polypiers: Ranville; Caen; Luc; Guéret (*fide* Haime).
Bajocian—Zone of *Cosmoceras subfurcatum*: Longwy; Moselle (*fide* Terquem).
Zone of *Sonninia sowerbyi*: Gingen, Würtemberg; Flacé, near Maçon; Cheveuges, Ardennes (*fide* Ferry and Waagen); Ars, Lothingen (*fide* Branco); Plappeville-lès-Metz (*fide* Friren).
Calcaire à *Collyrites ringens*: Pouilly, near Maçon (*fide* Ferry).
Calcaire à *Terebratula phillipsi*: Tramayes, near Maçon (*fide* Ferry).

Description of Figures.—Pl. IV. Fig. 4. Bradford Clay: Box Tunnel, Wilts. Encrusting *Terebratula maxillata*, J. de C. Sow. Part of zoarium, × 13 dia. **B. 4251.** Pl. II. Fig. 6. A young zoarium (the *Diastopora spatiosa*, Walford). Cornbrash: Rushden. Encrusting *Terebratula intermedia*, J. de C. Sow. × 12 dia. **B. 4846.**

Affinities.—This is the best known and commonest of the British Jurassic Bryozoa; and it is surprising, considering the length of the list of references, how simple the synonymy is. The only important difference of opinion is whether *B. verrucosa* (M. Edw.) is a distinct species or a young form. Milne Edwards figured the two forms, and these appear very distinct. Haime gave a good illustration of a zoarium, which he identified as a young *B. diluviana*, and which he regarded as the same as Milne Edwards' *B. verrucosa*. I feel no doubt that Haime's figure was that of a young *diluviana*, but cannot accept it as *B. verrucosa*. The species appear to me to be separated by several well-defined differences. *B. verrucosa* has higher peristomes, and the zoœcia are shorter and more crowded; the zoarium, moreover, is discoid, whereas in *B. diluviana* it occurs as flat sheets, while the young forms are flabellate, as is shown in Haime's figure (*op. cit.* pl. vii. fig. 2*c*).

A form which appears to me to be probably a synonym of this species is *Diastopora spatiosa*, Walf.[1] It has the irregularly raised peristomes, wrinkled front walls, and flabellate arrangement of the zoœcia characteristic of the young zoarium of *B. diluviana.*

This species differs from *B. boloniensis* (Sauv.) by having longer zoœcia, less crowded and less regularly arranged peristomes; from *B. parvitubulata*, Greg., by the greater diameter of the zoœcia; and from *B. archiaci*, Haime, by the form of the zoarium and the shape of the oœcia.

Its nearest Cretaceous ally is *B. gracilis* (M. Edw.),[2] which appears to differ only in having a smaller and more regular zoarium. But this character is so unimportant that the Cretaceous species ought probably to be reckoned as a variety. It is not here formally included in *B. diluviana*, for I have not seen any Cretaceous specimens of *B. gracilis*, in which the zoaria completely swamp the shells on which they grow, as the Jurassic specimens often do.

B. foliacea (Reuss),[3] from the Austrian Miocene, may be a Tertiary representative of this type; but Manzoni's figures suggest that this species may belong to *Tubulipora*, in which Reuss originally placed it. The greater elevation of the peristomes enables it to be readily distinguished from *B. diluviana.*

LIST OF SPECIMENS.

British:

D. 928, D. 929, D. 930. On *Nucleolites orbicularis* (Phil.). Cornbrash. Thrapston. Vine Coll.

D. 937. On *Nucleolites orbicularis* (Phil.). Cornbrash. Thrapston. Vine Coll. Young specimen.

B. 4846. On *Terebratula intermedia*, J. Sow. Cornbrash. Rushden. Young specimen. Figd. Pl. II. Fig. 6.

B. 4251. On *Terebratula maxillata*, J. de C. Sow. Bradford Clay. Box Tunnel. Figd. Pl. IV. Fig. 4.

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[1] Walford. Bry. Shipton Gorge, pt. i.: *Quart. Journ. Geol. Soc.* vol. xlv. p. 573, pl. xvii. figs. 7, 8.

[2] M. Edwards. Recherches sur les Polypes: *Ann. Sci. nat. Zool.* sér. 2, t. ix. 1838, p. 237, pl. xiv. fig. 3. Also D'Orbigny, *op. cit.* p. 864, pl. DCXXXV. figs. 10–13.

[3] A. E. Reuss. Foss. Polyp. Wien. Tert.: *Naturw. Abh.* Bd. ii. 1847, p. 49, pl. vii. fig. 5. See also Manzoni, Brioz. foss. Mioc. Aust. Ungh. pt. iii.: *Denk. k. Akad. Wiss. Wien.* Bd. xxxviii. Abth. 2, p. 13, pl. xii. fig. 47.

60535. On *Terebratula intermedia*, J. Sow. Bradford Clay. Wiltshire.

D. 24. On *Apiocrinus elegans* (Defr.). Bradford Clay. Bradford. The *verrucosa* stage of Haime (*non* M. Edwards). Baber Coll.

B. 4842. On *Apiocrinus elegans* (Defr.). Bradford Clay. Bradford. Bowerbank Coll.

D. 2168. On *Apiocrinus elegans* (Defr.). (With B. *archiaci*, Haime, and *B. verrucosa*, M. Edw.) Bradford Clay. Bradford. Brodie Coll.

46239. On *Apiocrinus elegans* (Defr.). Bradford Clay. Bradford.

51342. On *Apiocrinus elegans*. (With *B. compressa*, Goldf., etc.) Bradford Clay. Bradford.

24958. On *Apiocrinus elegans* (Defr.). Bradford Clay. Bradford.

D. 2166. On ,, ,, ,, Bradford Clay. Bradford. Brodie Coll.

46240. On *Apiocrinus elegans*, root. Bradford Clay. Bradford. J. Wood Coll.

B. 4851. On *Apiocrinus elegans*, root. Bradford Clay. Bradford.

D. 1817. On *Terebellaria ramosissima*, Lamx. Bradford Clay. Bradford.

D. 26. On *Exogyra nana* (J. de C. Sow.). Bradford Clay. Corsham.

23857. On *Oxytoma costata* (Smith). Bradford Clay. Box. Buy Coll.

23857. On *Oxytoma*, sp. Bradford Clay. Box. Buy Coll.

B. 4859. On *Gryphea*, sp. Bradford Clay. Box. Holl Coll.

38597. On *Ostrea acuminata*, J. de C. Sow. Bradford Clay. Bradford. J. Wood Coll.

B. 194. On *Apiocrinus elegans* (Defr.). Bradford Clay. Bradford. Presented by Benj. Bright, Esq.

B. 4841. On *Apiocrinus elegans*, root. Bradford Clay. Bradford.

D. 2091. On *Ostrea acuminata*, J. de C Sow. Bradford Clay. Wiltshire.

B. 4843. On *Terebratula intermedia*, J. de C. Sow. Great Oolite. Hampton Common.

60535. On *Terebratula maxillata*, J. de C. Sow. Great Oolite. Stanton. Cunnington Coll.

D. 1910, D. 1917, D. 1927. On *Terebratula maxillata*, J. de C. Sow. Great Oolite. Richmond boring, 1205 ft. Presented by Prof. J. W. Judd, F.R.S.

D. 1943. On *Zeilleria ornithocephala* (J. Sow.). Fuller's Earth. Wiltshire.

D. 1809. On *Terebratula maxillata*, J. de C. Sow. Inf. Oolite. Loc. ?

D. 1796. On ,, *globata*, J. de C. Sow. Inf. Oolite. Loc. ?

D. 2216. Inf. Oolite. Near Leckhampton. Brodie Coll.

D. 7. Inf. Oolite. Loc. ? Holl Coll.

D. 16. On *Ctenostreon pectiniformis* (Schloth.). Inf. Oolite. With gonocysts.

D. 1801. On *Trichites* (with *Proboscina*, sp.). Inf. Oolite. Gloucestershire.

FOREIGN:

25987. Bathonian—Couches à polypiers. Ranville, Normandy. Ramain Coll. (purchased 1851).

D. 1831. On *Modiola imbricata*, J. de C. Sow. Bathonian. Normandy.

D. 1837. On *Lymnorea mamillosa* (Lamx.). Bathonian. Normandy.

11. Berenicea parvitubulata, Gregory, 1896.

SYNONYMY :

Berenicea parvitubulata, Gregory, 1896, Rev. pt. iii.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 45.

DIAGNOSIS :

Zoarium thin, irregular sheets ; much lobed when large.

Zoœcia very narrow, cylindrical, of medium length. Central zoœcia flabellate, and visible throughout their length ; peripheral ones more crowded, and visible only in part. Surface plain.

Peristomes small, slightly raised; from one-third to one-fourth the width of those of *B. diluviana*.

Gonocysts low, rounded domes ; three or four times the width of the zoœcia.

Formula.—$p, c, l, r = 1, 0, 2, i0$.

DISTRIBUTION.

Cornbrash : Rushden.
Bradford Clay : Bradford.
Great Oolite : Richmond boring.

Description of Figures.—Pl. IV. Fig. 5. Part of a zoarium showing gonocysts, × 18 dia. Great Oolite : Richmond boring. Presented by Prof. J. W. Judd, F.R.S. **D. 1912**. Pl. IV. Fig. 6. Part of a worn zoarium, × 16 dia. ; showing form of zoœcia and gonocysts. Cornbrash : Rushden. **60535**.

Affinities.—This species is characterized by the delicacy and narrowness of its zoœcia. It thus takes the place in the *Berenicea* series held by *S. waltoni* in that of *Stomatopora*, and *D. mettensis* in that of *Diastopora*.

Its nearest ally is *B. diluviana*, from which it differs only in the size of the zoœcia and the less elevation of the peristome. It differs from *B. undulata* (Mich.) in the absence of the wavy ridges that cross that species, and also by the size of the orifices. The smallness of the apertures reminds one of the species described as *B. microstoma* by Haime. This, however, is only a synonym of *B. undulata* (Mich.), while the true *D. microstoma* of Michelin is referred to the genus *Reptomultisparsa*. It differs from this, in addition to the generic characters, by the orifices being more crowded and smaller, and the surface plain.

LIST OF SPECIMENS.

60535. On *Terebratula intermedia*, J. Sow. Cornbrash. Rushden. Cunnington Coll. Figd. Pl. IV. Fig. 6.
D. 1811. On *Terebratula maxillata*, J. de C. Sow. Bradford Clay. Bradford.
D. 1787. On ,, ,, ,, Great Oolite.
D. 208. Great Oolite. Richmond boring, 1205 ft. Presented by Prof. J. W. Judd, F.R.S. The *D. microstoma*, Vine.
D. 1912. Great Oolite. Richmond boring, 1205 ft. Presented by Prof. J. W. Judd, F.R.S. The *D. microstoma*, Vine. Figd. Pl. IV. Fig. 5. With gonocysts.

12. **Berenicea boloniensis** (Sauvage), 1889.

SYNONYMY:

Rosacilla bolcniensis, Sauvage, 1889, Bry. jur. Boul.: *Bull. Soc. géol. France*, p. 48, pl. iii. figs. 9, 10.
Berenicea ,, Gregory, 1896, Rev. pt. iii.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 46.
Rosacilla corallina, Sauvage (*non* Étallon), 1889, *ibid.* sér. 3, t. xvii. p. 47, pl. iii. figs. 11–15.

DIAGNOSIS:

Zoarium irregular sheets.

Zoœcia not visible throughout; slightly fusiform. Raised at the extremities, which are crowded. Front wall punctulate.

Peristomes raised, owing to crowding of zoœcia. Fairly regularly arranged.

Gonocysts generally irregularly quincuncial, in long series; irregular, wide; extending across from four to six zoœcia.

Formula.—$p, c, l, r = 1, 0'', 1, i1$.

DISTRIBUTION.

ENGLISH:

Bradford Clay: Box, Wiltshire; Busfield.

FOREIGN:

Corallian and Sequanian: near Boulogne.
Middle Oolite (probably Sequanian): Rabenstein, Bavaria.

Description of Figure.—Pl. V. Fig. 1. Part of a zoarium encrusting *T. maxillata*, J. de C. Sow., × 18 dia. Bradford Clay: Busfield. 50777.

Affinities.—This species is most nearly allied to *B. diluviana*, Lamx., from which it differs mainly by having the peristomes arranged in long, slightly sinuous series; these are best seen when the specimen is examined without magnification. The broad zoarium is then seen to be traversed by long lines of dots. The slightly fusiform shape of the zoœcia, and their shortness, also serve to distinguish it from *B. diluviana*. The name *B. corallina* has been preoccupied by Étallon, and thus *boloniensis* had better be retained.

LIST OF SPECIMENS.

D. 1825. On *Terebratula*, sp. Bradford Clay. Bradford.

B. 987. On *Apiocrinus elegans* (Defr.). Bradford Clay. Bradford. Egerton Coll.

50777. On *Terebratula maxillata*, J. de C. Sow. Bradford Clay. Busfield. Figd. Pl. V. Fig. 1.

1636, 1637. Middle Oolite (probably Sequanian). Rabenstein, Bavaria. Brauns Coll.

13. Berenicea archiaci (Haime), 1854.

SYNONYMY:

Berenicea archiaci, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 180, pl. ix. figs. 11*a–b*.

,, ,, E. and E. E. Deslongchamps, 1858, Mém. Couche à Lept.: *Bull. Soc. linn. Norm.* t. iii. p. 185, pl. vii. fig. 14.

,, ,, Ferry, 1862, Bajoc. Maçon: *Mém. Soc. linn. Norm.* t. xii. pp. 13, 23, 30.

,, ,, Waagen, 1868, Zone *Amm. sowerbyi*: *Geogn. Pal. Beitr.* Bd. i. pp. 548, 645.

,, ,, Terquem and Jourdy, 1871, Bath. Moselle: *Mém. Soc. géol. France*, sér. 2, t. ix. pp. 142, 156, 168.

,, ,, Gregory, 1896, Rev. pt. iii.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 44.

Dacryopora ,, Terquem, 1855, Pal. dép. Moselle (sep. copy), p. 26.

,, ,, Terquem, 1868, in Jacquot, Descr. géol. dép. Moselle, pp. 290, 296.

Berenicea ventricosa, G. R. Vine, 1881, Further Notes on Diastoporidæ: *Quart. Journ. Geol. Soc.* vol. xxxvii. p. 385, pl. xix. figs. 15–17.

,, ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 48.

Diastopora ,, G. R. Vine, 1882, Diastoporidæ: *Sci. Gossip*, 1882, p. 245, figs. 1–3.

,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 264.

Diastopora ventricosa, Vine, 1884, 4th Rep. Foss. Polyz. : *ibid.* 1883, p. 187.
,, ,, Vine, 1887, Jur. Polyz. Northptn. : *Journ. Northptn. Nat. Hist. Field Club*, vol. iv. p. 205, pl. i. figs. 6–8.
Berenicea oolitica, Vine, 1881, *op. cit.* p. 386, pl. xix. figs. 11–14.
Diastopora ,, Vine, 1882, *op. cit.* p. 245, figs. 4–7.
,, ,, Walford, 1883, Relation Northptn. Sd. : *Quart. Journ. Geol. Soc.* vol. xxxix. p. 239.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz. : *Rep. Brit. Assoc.* 1882, p. 264.
,, ,, Vine, 1884, 4th Rep. Foss. Polyz. : *ibid.* 1883, p. 187.
,, ,, Vine, 1887, *op. cit.* p. 205, pl. i. figs. 3–5.
,, ,, Wilson and Crick, 1889, Lias Tilton: *Geol Mag.* dec. 3, vol. vi. p. 342.

Diagnosis:

Zoarium discoid: a thin sheet.

Zoœcia not visible throughout their whole length. Long; cylindrical.

Peristomes well raised; crowded at the margins; more distant in the middle; irregularly arranged.

Gonocysts large, pyriform; closed sacs, which bulge out above the general level of the zoarium; disposed somewhat irregularly.

Formula.—$p, c, l, r = 1, 0, 2, di.$

Description of Figures.—Pl. IV. Fig. 1. Part of a zoarium with gonocyst, growing on root of *Apiocrinus*, × 6 dia. Bradford Clay: Bradford, Wilts. J. Sharp Coll. **51342.** (With whole zoarium, nat. size.)

Pl. IV. Fig. 2. Zoarium with gonocysts, encrusting *Ostrea*, sp., × 7 dia. Cornbrash: Thrapston. Vine Coll. **D. 919.**

Pl. IV. Fig. 3. Zoarium without gonocysts, on *Nucleolites orbicularis* (Phil.), × 11 dia. Vine Coll. **D. 920.**

DISTRIBUTION.

England:

Oxford Clay: St. Ives, on *Gryphea dilatata* (Cambridge Museum).
Cornbrash: Bedford.
Bradford Clay: Bradford.
Great Oolite: Blisworth.
Inferior Oolite: Coombe Hill (*fide* Walford).
Mid. Lias: Ilminster.
Marlstone: Tilton, Leicestershire (*fide* Wilson and Crick).

Foreign:

Sequanian—Weisser Jura, β: Lochen, Würtemberg.

Bajocian—Calcaire ferrugineuse: Moselle (*fide* Terquem).
Zone of *Cosmoceras subfurcatum*: Longwy, near Metz.
Zone of *Sonninia sowerbyi*: Flacé, near Maçon (*fide* Ferry and Waagen).
Zone of *Perisphinctes quercinus*: Thuméreville (*fide* Terquem).
Calcaire à *T. phillipsi*: Tramayes, near Maçon (*fide* Ferry).
Lias: Banz, Bavaria.

Affinities.—This species is characterized by the development of the oœcia, which are large and pyriform. Its zoœcia resemble those of both *B. diluviana* and *B. boloniensis*. It is therefore necessary to consider whether this species is a form of either of these, in which the gonocysts are strongly developed. The species, however, differs from *B. diluviana* by having a discoid zoarium, and the orifices are more crowded. The gonocysts of the latter species are also much smaller and narrower. The first of these three characters also helps to separate this species from *B. boloniensis*; from this it also differs owing to the peristomes being irregularly arranged, and the zoœcia being longer. *B. scobinula* (Mich.) is another Jurassic species with which this must be compared, for they agree in several respects. *B. scobinula*, however, has the zoœcia regularly arranged, and the zoœcia are visible only at the ends, whereas in *B. archiaci* the central ones are visible throughout their length.

In the Cretaceous, this type is represented by *B. disciformis* (Hag.) and *B. confluens* (Röm.), but neither of them are very closely allied to this. In *B. disciformis* (Hag.) [1] the gonocysts are not known, but it differs by having lower peristomes, and less crowded peristomes than *B. archiaci*. *B. confluens* (Röm.) [2] has a thicker and more crowded zoarium, as the zoœcia are shorter. *B. hagenowi* (Reuss) [3] is another ally; this differs by the absence of the large oœcia, while the zoœcia are less crowded.

A Cainozoic representative of this group is *B. rotula* (Reuss); but the gonocysts of this species are not known, both the zoœcia

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[1] F. v. Hagenow. Bryoz. Maastr. Kreideb. 1851, p. 16, pl. x. fig. 7.

[2] Römer. Verst. norddeut. Kreidegeb. 1840, p. 19. Better known by description of Novak, Beitr. Bryoz. böhm. Kreidef.: *Denk. k. Akad. Wiss. Wien*. Bd. xxxvii. p. 98, pl. iv. figs. 19–22.

[3] A. E. Reuss. Beitr. Char. Kreid. Ostalpen: *Denk. k. Akad. Wiss. Wien*. Bd. vii. 1854, p. 136, pl. xxviii. fig. 6.

and the peristomes are shorter, and this species is more allied to *B. disciformis* than to the Jurassic form.

The formulæ of the four forms are as follows:—

archiaci, Haime, Jurassic	1	0	2	*d*1
disciformis (Hag.), Cretaceous	0	0	2	*d*0
confluens (Röm.), ,, ...	1	0″	0	*d*2
rotula (Reuss), Miocene	0	0	1	*d*0

LIST OF SPECIMENS.

D. 919. On *Ostrea*, sp. Cornbrash. Thrapston. Vine Coll. Figd. Pl. IV. Fig. 2.

D. 920. On *Nucleolites orbicularis* (Phil.). Cornbrash. Thrapston. Vine Coll. Figd. Pl. IV. Fig. 3.

D. 899, D. 938. On *Nucleolites orbicularis* (Phil.). Cornbrash. Thrapston. Vine Coll.

? B. 4852. The *Discopora confecta*, Bean MS. Cornbrash. Scarboro'. Bean Coll.

D. 917. On *Nucleolites orbicularis* (Phil.). Cornbrash. Thrapston. Vine Coll. With gonocysts.

D. 2071. On *Terebratula*, sp. Cornbrash. Midland Railway Pit, Bedford.

D. 2069. On *Nucleolites clunicularis* (Phil.). Cornbrash. ,, ,,

D. 2070. On *Holectypus depressus* (Leske). ,, ,, ,,

D. 2067. With *Stomatopora dichotoma* (D'Orb.), on *Nucleolites clunicularis* (Phil.). Cornbrash. Midland Railway Pit, Bedford.

D. 2065, D. 2068. With *Stomatopora dichotoma* (D'Orb.), on *Holectypus depressus* (Leske). Cornbrash. Midland Railway Pit, Bedford.

D. 2066. On *Natica*, sp. ,, ,, ,, ,,

D. 2168. On *Apiocrinus elegans* (Defr.), with *B. diluviana*, Lamx., and *B. archiaci*, Haime. Bradford Clay. Bradford. Brodie Coll.

B. 987. On *Apiocrinus elegans* (Defr.). Bradford Clay. Bradford. Egerton Coll.

51342. On *Apiocrinus elegans* (Defr.). ,, ,, ,, J. Sharp Coll. Figd. Pl. IV. Fig. 1.

D. 1822. On *Terebellaria ramosissima*, Lamx. Bradford Clay. Bradford.

D. 2272. On *Terebratula maxillata*, J. de C. Sow. Great Oolite. Blisworth. Presented by Beeby Thompson, Esq., F.G.S.

D. 1797. On *Terebratula curvifrons*, Oppel. Inferior Oolite. Leckhampton.

D. 2131. With *Stomatopora dichotomoides* (D'Orb.). Inferior Oolite. Near Leckhampton. Brodie Coll.

B. 4855. On *Astarte obliqua*, Lamx., with *B. allaudi*. Lower Ragstone. Cold Comfort. Holl Coll.

67691. On *Zeilleria numismalis*. Middle Lias. Ilminster. Etheridge Coll.

D. 2076. On *Ostrea*. Middle Lias. Banz, Bavaria. Brauns Coll.

55088. On limestone. Weisser Jura, γ (Sequanian). Lochen. P. Mohr Coll.

14. Berenicea exilis (Reuss), 1867.

SYNONYMY:

Berenicea exilis, Reuss, 1867, Bry. braun. Jura Balin: *Denk. k. Akad. Wiss. Wien.* Bd. xxvii. p. 8, pl. ii. fig. 3.

" " Gregory, 1896, Rev. pt. iii.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 48.

Diastopora cricopora, Vine, 1881, Further Notes on Diastoporidæ: *Quart. Journ. Geol. Soc.* vol. xxxvii. p. 387, pl. xix. figs. 18–25.

" " Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 264.

" " Vine, 1884, 4th Rep. Foss. Polyz.: *ibid.* 1883, p. 187.

" " Vine, 1887, Jur. Polyz. Northptn.: *Journ. Northptn. Nat. Hist. Field Club*, vol. iv. p. 206, pl. i. figs. 9–11.

DIAGNOSIS:

Zoarium thin, irregular sheets.

Zoœcia crowded, and visible only at the ends.

Peristomes well raised; irregularly distributed. Those of adjoining, parallel zoœcia distant from one another from two to three times their diameter.

Gonocysts small, round, hemispherical; equal in width to two or three zoœcia.

Formula.—$p, c, l, r = 2, 0, 1, i1$.

DISTRIBUTION.

ENGLAND:

Cornbrash: Thrapston; Chippenham.
Great Oolite: Hampton Common, near Bath.
Inferior Oolite: Bridport; Cleeve Hill, near Leckhampton.

FOREIGN:

Bathonian—Braun Jura: Balin; Ranville.

Description of Figure.—Pl. VI. Fig. 1. Part of a zoarium with gonocysts, × 18 dia. Inferior Oolite: near Leckhampton. Brodie Coll. **D. 2217.**

Affinities.—This species most resembles *B. coartata*, which it resembles both in the shape of the zoarium and the characters of the zoœcia. The peristomes are, however, much less crowded, as well as being irregularly arranged. In the latter character it resembles *B. verrucosa* (M. Edw.), but it differs from this by having shorter zoœcia, and an irregular instead of a discoid zoarium. The regular shape and small size of the gonocysts enable the species to be distinguished from *B. boloniensis* (Sauv.), which it resembles closely.

LIST OF SPECIMENS.

D. 916. On *Nucleolites orbicularis* (Phil.). Cornbrash. Thrapston. Vine Coll.

B. 2301. On limestone (2 specimens). Great Oolite. Hampton Common.

88746. On *Terebratula* sp. Inf. Oolite. Bridport.

D. 2217. On limestone with gonocysts. Inf. Oolite. Near Leckhampton. Brodie Coll. Figd. Pl. VI. Fig. 1.

30455. On *Terebratula intermedia*, J. de C. Sow. Cornbrash. Chippenham. Buy Coll.

50777. On *Terebratula maxillata*, J. de C. Sow.

D. 1941. Inf. Oolite—Pea Grit. Cleeve Hill. Holl Coll.

D. 2132, D. 2133. On limestone. Inf. Oolite—Pea Grit. Cleeve Hill. Brodie Coll.

34073. On *Terebratula plicata*, Buckm. Inf. Oolite.

D. 1794. On ,, ,, ,, ,,

D. 1808. On ,, ,, ,,

D. 1828. On limestone. Inf. Oolite. Loc. ?

D. 1851. Bathonian—Couches à polypiers. Ranville, Normandy.

15. **Berenicea verrucosa** (M. Edwards), 1838.

SYNONYMY:

Diastopora verrucosa, M. Edwards, 1838, Mém. Cris.: *Ann. Sci. nat. Zool.* sér. 2, t. ix. p. 229, pl. xiv. figs. 2, 2*a*.

,, ,, Morris, 1843, Cat. Brit. Foss. p. 35.

,, ,, *pars*, Michelin, 1846, Icon. Zooph. p. 242, pl. lvi. fig. 14 (*non* 1840, p. 10, pl. ii. fig. 11).

,, ,, Bronn, 1848, Nomencl. p. 420.

,, ,, Bronn, 1849, Enum. p. 141.

,, ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 317.

,, ,, Buvignier, 1852, Stat. géol. dép. Meuse, pp. 184, 194, 262.

,, ,, Morris, 1854, Cat. Brit. Foss. ed. 2, p. 122.

,, ,, Reuss, 1867, Bry. braun. Jura Balin: *Denk. k. Akad. Wiss. Wien.* Bd. xxvii. p. 7, pl. i. fig. 7.

Berenicea ,, Vine, 1890, Rev. Fam. Diastoporidæ: *Quart. Journ. Geol. Soc.* vol. xxxvi. p. 357.

,, ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 47.

,, ,, Gregory, 1896, Rev. pt. iii.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 47.

Cellepora orbiculata, Goldfuss, 1827, Petref. Germ. Bd. i. p. 28, pl. xii. fig. 2.
,, ,, Römer, 1836, Verst. norddeut. ool. Geb. p. 18.
,, ,, Bronn, 1848, Nomencl. p. 255.
,, ,, Bronn, 1849, Enum. p. 132.
,, ,, Quenstedt, 1851, Flözgeb. Würtemb. ed. 2, p. 358.
,, ,, Quenstedt, 1858, Der Jura, p. 665, pl. lxxxi. figs. 71, 72.
,, ,, Credner, 1863, Glied. ob. Juraform. p. 15.
,, ,, Oppel, 1866, Zone *Amm. transversarius*: *Geogn. Pal. Beitr.* Bd. i. p. 296.
,, ,, Brauns, 1874, Ob. Jura nordw. Deutschl. pp. 57, 113.
,, ,, Struckmann, 1878, Ob. Jura Hannover, pp. 26–7.
,, ,, *pars*, Quenstedt, 1878, Petref. Deutschl. Bd. vi. Abth. 1, p. 108, pl. cxlvii. fig. 21 (*non* figs. 22–3).
Diastopora ,, D'Orbigny, 1850, Prod. Pal. t. ii. p. 25.
,, ,, H. Coquand, 1860, Descr. phys. géol. Charente, t. ii. p. 81.
Berenicea ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 181.
,, ,, Étallon, 1860, Jura Graylois: *Ann. Sci. phys. nat. Lyon*, sér. 3, t. iv. p. 161.
,, ,, Étallon, 1862, Étud. Haut-Jura Cor.: *Mém. Soc. Émul. Doubs.* sér. 3, t. vi. p. 212.

DIAGNOSIS:

Zoarium a thick circular disc.

Zoœcia crowded, and only the distal portions are visible. Cylindrical, slightly above medium length, punctulate.

Peristomes well raised (except on margin). Disposed on a slightly irregular, quincuncial plan.

Gonocysts large, irregular; equal in width to three or four zoœcia.

Formula.—$p, c, l, r = 2, 0, 1'', d\,1$.

DISTRIBUTION.

ENGLAND:

Cornbrash: Thrapston; Rushden.
Bradford Clay: Bradford; Box.
Great Oolite: Hampton Common; Sutton, Wilts; Kingsthorpe.
Inferior Oolite: Broad Winsor; Cleeve Hill.

FOREIGN:

Upper Kimeridgian: N.W. Germany (*fide* Brauns).
Corallian: La Rochelle (*fide* D'Orbigny); Streitberg, Bayreuth, Bavaria, Goslar, Hoheneggelsen (*fide* Brauns); Lindener Berg, near Hanover (*fide* Brauns and Credner, and Struckmann); Mönkeberg and Völksen (*fide* Struckmann).

Low Oxfordian: Oberbuchsiten, Solothurn; Aubigne, Sarth (*fide* Oppel).
Callovian: Orain, Côte d'Or; and Percey-le-Grand, Haute-Saône (*fide* Étallon).
Bathonian: Ranville, Luc, in Calvados. Braun Jura: Balin.
Bajocian: Plappeville-lès-Metz, Ars (*fide* Friren).

Description of Figures.—Pl. V. Fig. 5. Part of zoarium encrusting ossicle of *Apiocrinus*, × 18 dia. Bradford Clay: Bradford. Brit. Mus. **B. 4867.** Pl. V. Fig. 4. Zoarium encrusting *Holectypus hemisphæricus* (Ag.), × 4 dia. Inferior Oolite: Broad Winsor. **B. 2284.**

Affinities.—This species is distinguished from the previously described discoid forms by its thick zoarium, and the crowded raised peristomes. Its zoœcia most resemble those of *B. coartata*, Greg. This species, however, differs somewhat in zoœcial characters, so that the zoarial difference is probably not merely due to mode of growth; for the zoœcia in *B. verrucosa* are longer than in *B. coartata*, whereas in discoid forms they are, as a rule, shorter than in those with irregular encrusting zoaria.

The species has often been regarded as the young stage of *B. diluviana* (Lamx.). The reasons, however, for accepting M. Edwards' species as distinct are given on p. 93.

The closest ally of this species is *B. polystoma* (Röm.),[1] from the Neocomian of France and Germany. This differs from *B. verrucosa* only by having longer, more upright, and more scattered zoœcia. The species has been retained by Pergens,[2] and is no doubt entitled to distinction.

The specimen figured by Reuss[3] as *Tubulipora stelliformis* (Mich.) is also a close ally of *B. verrucosa*, M. Edw. It differs from it by the greater elevation of the peristomes; the zoarium is also much thicker and smaller. A recent Australian species, *B. bicolor*, MacGill.,[4] is another ally; but it has less crowded and longer

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[1] F. A. Römer. Verst. norddeutsch. Ool. Geb. Nachtr. 1839, p. 14, pl. xvii. fig. 6. Better described by D'Orbigny, Pal. franç. Terr. crét. t. v. p. 863, pl. DCXXXV. figs. 6–9.

[2] E. Pergens. Rev. Bry. D'Orb.: *Bull. Soc. belge Géol.* t. iii. Mém. 1890, p. 333.

[3] A. E. Reuss. Foss. Polyp. Wien. Tert.: *Naturw. Abh.* Bd. ii. p. 49, pl. vii. fig. 4.

[4] P. H. MacGillivray. Descr. Polyz. pt. viii.: *Trans. R. Soc. Vict.* vol. xxi. 1885, p. 117, pl. v. fig. 2.

zoœcia, and a peripheral zone of imperfectly developed zoœcia.

Étallon's description of the specimen he refers to as *B. orbiculata*, suggests that it is probably a *B. allaudi* (Sauv.).

LIST OF SPECIMENS.

D. 915, D. 939. On *Nucleolites orbicularis* (Phil.). Cornbrash. Thrapston. Vine Coll.

11175. On *Zeilleria ornithocephala* (J. de C. Sow.). ,, Rushden. Miss Baker Coll.

50990. On *Terebratula intermedia*, J. de C. Sow. Great Oolite. Sutton, Wilts. Morris Coll.

B. 4867. On ossicle of *Apiocrinus elegans* (Defr.). Bradford Clay. Bradford. Figd. Pl. V. Fig. 5.

67667. On *Rhynchonella obsoleta*, J. de C. Sow. Bradford Clay. Bradford.

D. 2168. On *Apiocrinus elegans* (Defr.), with *B. diluviana*, Lx., and *B. archiaci*, Haime. Bradford Clay. Bradford. Brodie Coll.

B. 4859. On *Ostrea acuminata*, J. de C. Sow., with *B. diluviana*, Lx., and *B. archiaci*, Haime. Box. Holl Coll.

20434. On *Clypeus mulleri*. Great Oolite. Kingsthorpe.

B. 4844. On *Terebratula intermedia*, J. de C. Sow. Great Oolite. Hampton Common. Byne Coll.

97418. On *Rhynchonella obsoleta*, J. de C. Sow.

D. 6. Inferior Oolite. Holl Coll.

D. 1839. ,, ,, Cleeve Hill, Gloucestershire.

B. 2284. On *Holectypus hemisphæricus* (Ag.). Broad Winsor. Figd. Pl. V. Fig. 4.

B. 4529, B. 4562. Bathonian. Ranville. Tesson Coll.

16. **Berenicea concatenata,** Reuss, 1867.

Synonymy:

Berenicea concatenata, Reuss, 1867, Bry. braun. Jura Balin: *Denk. k. Akad. Wiss. Wien.* Bd. xxvii. p. 9, pl. i. fig. 8.

Diagnosis:

Zoarium discoid, rather thick.

Zoœcia short, stumpy, transversely striated. Arranged in linear, radial series.

Peristomes raised with thickened margins; elongate; those of the same radial series in close contact. Not quincuncial.

Formula.—$p, c, l, r=2, 0, 0, d2$.

Distribution. — Bathonian — Braun Jura: Balin; Ranville, Normandy.

Affinities. — This species, in its general appearance, closely resembles *B. coartata.* It differs, however, in that the zoarium is discoid and the zoœcia arranged in regular, radiating rows. *B. scobinula* is perhaps a close ally, but in this the zoœcia are longer and less crowded.

The Cainozoic form which most resembles this species is that figured by Reuss as *Tubulipora echinulata*; but an enlarged figure of that species, which shows the zoœcia, suggests doubts whether it really belongs to this family at all.

SPECIMEN.

D. 2273. Bathonian. Ranville. Tesson Coll.

17. Berenicea scobinula (Michelin), 1840.

SYNONYMY:

Diastopora scobinula, Michelin, 1840, Icon. Zooph. p. 10, pl. ii. fig. 12.
,, ,, Bronn, 1848, Nomencl. p. 420; 1849, Enum. p. 141.
,, ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 288.
non ,, ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France,* sér. 2, t. v. p. 186, pl. viii. figs. 6*a–b*.
? ,, ,, E. E. Deslongchamps, 1857, Syst. ool. inf. Calvados: *Bull. Soc. linn. Norm.* t. ii. p. 328.
non ,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 264.
non ,, ,, Vine, 1884, 4th Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1883, p. 188.
non ,, ,, Woods, 1891, Cat. Type Foss. Cambridge, p. 46.
Berenicea ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 860.
,, ,, Waagen, 1868, Zone *Amm. sowerbyi*: *Geogn. Pal. Beitr.* Bd. i. pp. 530, 535, 536, 645.
,, ,, Gregory, 1896, Rev. pt. iii.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 46.
? ,, *corallina,* Étallon, 1862, Étud. Haut-Jura Cor.: *Mém. Soc. Émul. Doubs.* sér. 3, t. vi. p. 212.
,, *tenera,* Reuss, 1867, Bry. braun. Jura Balin: *Denk. k. Akad. Wiss. Wien.* Bd. xxvii. p. 8, pl. i. fig. 9.

DIAGNOSIS:

Zoarium circular; forming very large discs, often somewhat irregular.

Zoœcia crowded, so visible only at distal ends; cylindrical; long; punctulate.

Peristomes slightly raised; arranged regularly along slightly curved lines.

Formula.—$p, c, l, r=1, 0, 2, d1$.

DISTRIBUTION.

ENGLAND:
Cornbrash: Scarboro'.
Bradford Clay: Bradford; Box.

FOREIGN:
Corallian—Diceratian: Valfin, Haut-Jura.
Bathonian—Braun Jura: Balin, Austria.
Bajocian—Braun Jura, δ: Dettingen; Croixille, Calvados; Moutiers and Guéret, Sarthe (*fide* D'Orbigny); Moselle (*fide* Terquem).
Zone of *Harpoceras sowerbyi*: Pommer, Franconia; Gingen, Würtemberg; Jungingen, Hohenzollern (*fide* Waagen).

Description of Figure.—Pl. V. Fig. 3. Part of a zoarium encrusting *Oxytoma costata* (Smith), × 16 dia. Bradford Clay: Box, Wilts. Holl Coll. **B. 4858.**

Affinities.—This species was well figured by Michelin, and is characterized by the regularly linear arrangement of the peristomes. Its nearest Jurassic ally is *B. archiaci*, Haime, but it differs from this by its lower peristomes, and by having these regular and linear in arrangement instead of irregularly quincuncial.

Étallon's description of *B. corallina* (*non* Sauv.) would give this the same formula, except that the peristomes are described as "saillantes." In the absence of figures one cannot see the extent of this elevation, and thus the species cannot be definitely placed. It is, however, probably a synonym of *B. scobinula*.

The closest Cretaceous ally of this species is *Berenicea papillosa* (Reuss),[1] in which the peristomes are raised twice or three times as much as in the Jurassic form. This is not shown in D'Orbigny's figure of *B. oceanica*, which he places in the text as a synonym of *B. papillosa*; it is probable that D'Orbigny's type specimen was worn, as is suggested by the shape of the orifices. If it be not so, I should be doubtful as to the correctness of including it as a synonym of *B. papillosa*.

The Cainozoic representative of this species is *Berenicea minima*

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[1] Reuss. Verst. böhm. Kreidef. p. 65, pl. xv. fig. 44. Syn. *B. oceanica* (D'Orb.), *op. cit.* p. 867, pl. DCXXXIX. figs. 6, 7.

(Reuss),[1] which has the same large, flat, discoid zoaria, serial, crowded, and slightly reflexed peristomes. This form resembles *B. scobinula* so closely that it cannot be regarded at most as more than a variety; but I do not include it definitely among the synonyms without having seen a specimen. It is described by Reuss as rare.

LIST OF SPECIMENS.

B. 4858. On *Oxytoma costata* (Smith). Bradford Clay. Box, Wilts. Holl Coll. Figd. Pl. V. Fig. 3.

B. 4354. On *Ostrea*, sp. Cornbrash. Scarboro'. Bean Coll. The type of *Tubulipora inconstans*. Bean MS.

D. 2167. On *Apiocrinus elegans* (Defr.). Bradford Clay. Bradford, Wilts. Brodie Coll.

58017. With *Stomatopora dichotoma* (Lamx.) on *Apiocrinus elegans* (Defr.). Bathonian—Calcaire à polypiers. Ranville. Tesson Coll.

46785. Bathonian ,, ,, ,, ,,

D. 2086. On annelid tube. Bathonian. ,, ,,

D. 2090. On shell fragment. Braun Jura, δ. Dettingen.

18. Berenicea coartata, Gregory, 1896.

SYNONYMY:

Berenicea coartata, Gregory, 1896, Rev. pt. iii.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 47.

Diastopora diluviana, *pars*, Vine, 1884, Polyz. Richmond boring: *Quart. Journ. Geol. Soc.* vol. xl. p. 787.

DIAGNOSIS:

Zoarium in somewhat thick, irregular sheets.

Zoœcia very crowded, and visible only at the ends.

Peristomes well raised. Quincuncial in arrangement. Very densely packed. The distance of the apertures from one another is equal only to their diameter.

Formula.—$p, c, l, r = 2, 0, 1, i2$.

DISTRIBUTION.

ENGLAND:

Great Oolite: Hampton Common; Richmond boring.
Inferior Oolite: Crickley, Leckenby, Cleeve, in Cotteswolds.

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[1] Reuss. Foss. Polyp. Wien. Tert.: *Naturw. Abh.* Bd. ii. p. 50, pl. vii. fig. 7.

Description of Figure.—Pl. V. Fig. 2. Part of a zoarium encrusting *Terebratula plicata*, Buckm., × 18 dia. Inferior Oolite: Crickley. No. **67553**.

Affinities.—This species is most closely allied to *B. scobinula*, Mich. From this it differs in the much greater crowding of the raised portions of the zoœcia, and from these being regularly quincuncial in arrangement. In *B. exilis*, Reuss, *B. cricopora* (Vine), the distal portions of the zoœcia rise from a flat crust. In *B. coartata* they are so closely packed, that no flat basal expansion can be seen between them.

This species seems to me exceptionally well marked.

LIST OF SPECIMENS.

B. 4845. On *Terebratula intermedia*, J. Sow. Great Oolite. Hampton Common. Byne Coll.

D. 1944. On *Terebratula intermedia*, J. Sow. Great Oolite. Richmond boring, 1205 ft. Presented by Prof. J. W. Judd, F.R.S.

67553. On *Terebratula plicata*, Buckm. Inf. Oolite. Crickley. Figd. Pl. V. Fig. 2.

B. 4863. On *Terebratula plicata*, Buckm. Inf. Oolite. Wright Coll.

D. 1806. On *Terebratula perovalis*, J. de C. Sow. Inf. Oolite.

D. 1807. On *Zeilleria leckenbyi* (Walk.). Inf. Oolite. Leckhampton.

D. 1849. On *Terebratula plicata*, Buckm. Inf. Oolite. Gloucestershire. Holl Coll.

D. 1942. Inf. Oolite—Pea Grit. Cleeve Hill. Holl Coll.

D. 1950. On *Pygaster semisulcatus* (Ph.). Inf. Oolite. Loc. ? Holl Coll.

D. 2198. On *Terebratula*, sp. Inf. Oolite. Cleeve Hill. Brodie Coll.

D. 2210. On limestone. Inf. Oolite. Near Leckhampton. Brodie Coll.

MISCELLANEOUS RECORDS AND INDETERMINABLE SPECIES.

1. **Berenicea belemnitorum** (D'Orbigny), 1849.

SYNONYMY:

Diastopora belemnitarum, D'Orbigny, 1849, Prod. Pal. t. i. p. 288.

,, *belemnitorum*, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 860.

Distribution.—Bajocian: Port-en-Bessin, Calvados, France.

2. **Berenicea crussolensis** (Dumortier), 1874.

SYNONYMY :

Diastopora crussolensis, Dumortier, 1874, Étud. Pal. dép. Jur. Rhône, t. iv. p. 226, pl. xlviii. figs. 11, 12.
,, *crassolensis*, Vine, 1883, 3rd Rep. Foss. Polyp.: *Rep. Brit. Assoc.* 1882, p. 264.

Distribution.—Upper Lias: Crussol, France.

Affinities.—Vine has suggested this as possibly the same as his *B. stomatoporoides*, but I fail to see any resemblance between them.

3. **Berenicea dilatata** (D'Orbigny), 1849.

SYNONYMY :

Diastopora dilatata, D'Orbigny, 1849, Prod. Pal. t. i. p. 378.
Berenicea ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 861.
,, ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 181.

Distribution.—Oxfordian: Calvados, France.

Affinities.—Probably a synonym of *B. diluviana*, Lamx.

4. **Berenicea ? garnieri,** Dumortier, 1874.

SYNONYMY:

Berenicea ? garnieri, Dumortier, 1874, Étud. Pal. dép. Jur. Rhône, t. iv. p. 226, pl. xlviii. figs. 13, 14.

Distribution.—Upper Lias: Rhône Valley.

Affinity.—Generically indeterminable.

5. **Berenicea laxata** (D'Orbigny), 1849.

SYNONYMY :

Diastopora laxata, D'Orbigny, 1849, Prod. Pal. t. i. p. 345.
,, ,, E. E. Deslongchamps, 1856, Cornb. à Lion-sur-Mer: *Bull. Soc. linn. Norm.* t. i. p. 25.
Berenicea ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 861.
,, ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 181.
,, ,, Étallon, 1860, Jura Graylois: *Ann. Sci. phys. nat. Lyon*, sér. 3, t. iv. p. 161.

Distribution.—Callovian: Calvados; Sacquenaz, Côte d'Or (*fide* E'tallon). Bathonian—Cornbrash: Lion-sur-Mer (*fide* Deslongchamps).

6. Berenicea margopunctata, Waagen, 1868.

SYNONYMY:

Berenicea margopunctata, Waagen, 1868, Geogn. Pal. Beitr. Bd. i. pp. 535, 646, pl. xxxii. fig. 12.
,, cf. ,, Walford, 1883, Relation Northptn. Sd.: *Quart. Journ. Geol. Soc.* vol. xxxix. p. 239.

Distribution.—BRITISH: Bajocian: Coombe Hill (*fide* Walford). FOREIGN: Bajocian—Zone of *Sonninia sowerbyi*: Gingen.

Affinities.—The basal portion of the zoarium appears to be on a different structure from anything known in *Berenicea*, and I feel unable to place this species generically. It may be a *Berenicea* encrusting a Trepostomatous Bryozoan.

7. Berenicea rugosa, D'Orbigny, 1852.

SYNONYMY:

Berenicea rugosa, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 861.
,, ? ,, Haime, 1854, *op. cit.* p. 181.

Distribution.—Corallian: Charente-Inférieure.

8. Berenicea subflabellum, D'Orbigny, 1852.

SYNONYMY:

Diastopora flabellum, D'Orbigny, 1849, Prod. Pal. t. i. p. 288.
Berenicea subflabellum, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 860.
,, ,, Haime, 1854, *op. cit.* p. 181.
,, ,, E. E. Deslongchamps, 1857, Descr. Syst. ool. inf. Calvados: *Bull. Soc. linn. Norm.* t. ii. p. 328.

Distribution.—Bajocian: Port-en-Bessin, Calvados, France.

9. Berenicea substriata, Étallon, 1860 (name only).

SYNONYMY:

Berenicea substriata, Étallon, 1860, Jura Graylois: *Ann. Sci. phys. nat. Lyon*, sér. 3, t. iv. p. 162.

Distribution.—Callovian: Orain, Côte d'Or.

SYNOPSIS.

A.—Zoœcia visible throughout.

Low peristomes. 1. Zoœcia short ... ... *allaudi* (Sauv.).

2. Zoœcia long,

plain, irregular { zoarium irregular ... *compressa* (Goldf.).
zoarium discoid ... *normani* (D'Orb.).

plain, regular ... . *sauvagei*, Greg.

striated, { peristomes flush; zoœcia cylindrical ... ... *portlandica*, Greg.
peristomes raised; zoœcia fusiform ... ... *striata*, Haime.

High peristomes.

Zoarium irregular. Peristomes sharply reflexed *spatiosa*, Walf.

Zoarium discoid { plain; denticulate peristomes *denticulata*, Terq. and P.
slightly striated; plain ,, *tenuis* (D'Orb.).

B.—Central zoœcia visible throughout. Peripheral ones only at ends.

Zoarium irregular; peristomes low { apertures of normal size *diluviana*, Lamx.
apertures small ... *parvitubulata*, Greg.

Peristomes raised ... ... *boloniensis* (Sauv.).

Zoarium discoid ... ... *archiaci*, Haime.

C.—Zoœcia visible only at ends.

Zoœcia irregularly arranged. Zoarium irregular *exilis*, Reuss.

Zoarium discoid ... ... *verrucosa* (M. Edw.).

Zoœcia regularly arranged;

linear; zoarium discoid { zoœcia short, peristomes very crowded .. ... *concatenata*, Reuss.
zoœcia long, peristomes not crowded... ... ... *scobinula* (Mich.).

quincuncial; zoarium irregular; zoœcia very crowded ... ... *coartata*, Greg.

REPTOMULTISPARSA, D'Orbigny, 1852.

SYNONYMY:

Berenicea, pars, auct.
Rosacilla, ,,
Diastopora ,, ,,

Diagnosis.—Tubuliporidæ in which the zoarium is encrusting, and consists of thick, multilamellar sheets. The zoœcia are cylindrical, and parallel to the surface upon which the zoarium has grown. The peristome is flush or slightly raised.

Type species.—*R. microstoma* (Mich.), *i.e. B. diluviana*, Edw. and Mich. (*non* Lamx.).

Affinities.—This genus was founded by D'Orbigny for thick, multilamellar species allied to *Berenicea*. The division seems to me convenient. The first species included in the five which the

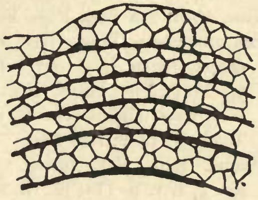

FIG. 9.—Transverse section across part of a zoarium of *Reptomultisparsa*, sp., showing concentric layers. Inferior Oolite. **D. 3.**

author of the genus referred to it, is the *D. diluviana*, Edw. and Mich., *non* Lamx. This, however, I regard as the same as Michelin's *D. microstoma*.

MacGillivray founded a genus *Densipora*[1] for what he regarded as a massive form of *Diastopora*. The species was described about the same time by Mr. Waters,[2] who rightly referred it to *Heteropora*.

It may be questioned whether *Reptomultisparsa* is worthy of recognition as a distinct section of the Tubuliporidæ. Considering, however, how shadowy and uncertain generic characters are among the Cyclostomata, it may be regarded as valid. Young forms are, of course, less massive than adults, and are intermediate between this and *Berenicea*. In the same way *Berenicea* can be linked to *Proboscina*, and *Proboscina* to *Stomatopora*, and it could be maintained that the whole of the Tubuliporidæ ought to be formed into one genus. So long as it is recognized that the genera in this group are of no absolute value, but are only used as a matter of relative convenience, it is wisest to accept them, and *Reptomultisparsa* has as good a claim to recognition as the rest.

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[1] P. H. MacGillivray. On two new genera of Polyzoa: *Trans. Roy. Soc. Vict.* vol. xvii. (1881) pp. 16, 17, pl., fig. 2.

[2] A. W. Waters. On the occurrence of Recent *Heteropora*: *Journ. Roy. Micro. Soc.* ser. 2, vol. ii. (1879) p. 392, pl. xv. figs. 9–11.

1. Reptomultisparsa microstoma (Michelin), 1846.

SYNONYMY:

Diastopora microstoma, Michelin, 1846, Icon. Zooph. p. 243, pl. lvii. fig. 1.
,, ,, Bronn, 1848, Nomencl. p. 420.
,, ,, Bronn, 1849, Enum. p. 141.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, pp. 256, 264.
,, ,, Vine, 1884, 4th Rep. Foss. Polyz.: *ibid.* 1883, p. 187.
non ,, ,, var. *connectens*, Vine, 1884, Polyz. Richmond boring: *Quart. Journ. Geol. Soc.* vol. xl. p. 789.
? ,, ,, Vine, 1887, Jur. Polyz. Northptn.: *Journ. Northptn. Nat. Hist. Field Club*, vol. iv. p. 207.
Reptomultisparsa ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 877.
non Berenicea ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 178, pl. vii. fig. 3.
non ,, ,, Ferry, 1862, Bajoc. Maçon: *Mém. Soc. linn. Norm.* t. xii. pp. 35, 42.
,, ,, E. E. Deslongchamps, 1865, Jur. inf. Norm.: *Mém. Soc. linn. Norm.* t. xiv. p. 151.
non ,, ,, Reuss, 1867, Bry. braun. Jura Balin: *Denk. k. Akad. Wiss. Wien.* Bd. xxvii. p. 8, pl. i. fig. 6.
non ,, ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 47.
Rosacilla ,, Sauvage, 1889, Bry. jur. Boul.: *Bull. Soc. géol. France*, sér. 3, t. xvii. p. 45, pl. iv. fig. 10.
Diastopora diluviana, *non* Lamx., Edwards, 1838, Mém. Cris.: *Ann. Sci. nat. Zool.* sér. 2, t. ix. p. 228, pl. xv. fig. 3.
,, *incrustans*, D'Orbigny, 1849, Prod. Pal. t. i. p. 288 (*fide* D'Orb. 1852).
Reptomultisparsa diluviana, *non* Lamx., D'Orbigny, 1852, *op. cit.* t. v. p. 877, pl. DCCLXI. fig. 7.

DIAGNOSIS:

Zoœcia long, slender, and cylindrical. The surface is punctulate and not wavy. Peristomes slightly raised, and regularly arranged in long, curved lines. In some parts of the zoarium this arrangement is disturbed.

Gonocysts pyriform; regular; very large.

DISTRIBUTION.

Bathonian: Ranville.
Bajocian: Conlie, Sarthe (*fide* D'Orbigny).

LIST OF SPECIMENS.

60221.	Bathonian.	Ranville,	Normandy.	Tesson Coll.
D. 2113.	,,	,,	,,	,,
60242.	,,	,,	,,	,,

2. Reptomultisparsa undulata (Michelin), 1846.

Synonymy:

Diastopora undulata, Michelin, 1846, Icon. Zooph. p. 212, pl. lvi. fig. 15.
,, ,, Bronn, 1848, Nomencl. p. 420.
,, ,, Bronn, 1849, Enum. p. 141.
,, ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 317.
,, *microstoma* var. *connectens*, Vine, 1884, Polyz. Richmond boring: *Quart. Journ. Geol. Soc.* vol. xl. p. 789.
Berenicea undulata, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 860.
,, *microstoma*, *non* Mich., Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 178, pl. vii. fig. 3.
,, ,, Ferry, 1862, Bajoc. Maçon: *Mém. Soc. linn. Norm.* t. xii. pp. 35, 42.
,, ,, Friren 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 47.

Diagnosis:

Zoarium in large, thick, irregular encrusting sheets, which in the adult completely bury the shell they encrust. Young forms are flabelliform.

Zoœcia long or medium in length. Young zoœcia are seen throughout. The more adult peripheral zoœcia are crowded, and thus not wholly seen. Surface traversed by sinuous raised ridges.

Peristomes slightly raised. Irregularly distributed.

Formula.—$p, c, l, r = 1\text{–}1'', 0, 2, i0$.

DISTRIBUTION.

English:

Lower Oolite: Loc.? Bradford Clay: Bradford.
Great Oolite: Richmond boring.

Foreign:

Bathonian: Ranville and Boulogne, France.
Bajocian: Pouilly, near Maçon, France (*fide* Ferry); Plappeville, Montvaux, Germany (*fide* Friren).

Description of Figures.—Pl. VI. Fig. 2. Lower Oolite. Loc.? Part of a zoarium, × 10 dia. **B. 4850.** Pl. VI. Fig. 3. Bradford Clay: Bradford. Some zoœcia, × 18 dia. **35250.**

Affinities.—The zoœcia of this species are closely allied to those of *B. diluviana*, Lamx., and the two species have the same formula. The most striking difference between the individual zoœcia of the two species is the prominence of the sinuous transverse ridges in the form under consideration. This species has been regarded as a synonym of *B. microstoma* (Mich.), as *e.g.* by Haime and Sauvage. This course is not followed here, as the ornamentation is different; the zoœcia, moreover, are shorter and thicker, and the apertures are irregularly arranged.

In later times the species which seems most nearly allied to this is *B. corrugata*, Reuss, *pars.*[1] But the Russian species has longer zoœcia, and these are more clearly marked off from one another, instead of being submerged in the general surface of the zoarium. The latter character is often produced by the weathering of a zoarium; but that this does not explain it in the present case, is shown by the preservation of the ornamentation.

LIST OF SPECIMENS.

35250. Bradford Clay. Bradford, Wilts. J. Wood Coll. Figd. Pl. VI. Fig. 3.

D. 2126. Bradford Clay. ,, ,,

35249. On root of *Apiocrinus*. Bradford, Wilts. J. Wood Coll.

B. 4850. Lower Oolite. Figd. Pl. VI. Fig. 2.

D. 1911. Great Oolite. Richmond boring, 1205 ft. Presented by Prof. J. W. Judd, C.B., F.R.S. The type of *Diastopora microstoma* var. *connectens*, Vine.

D. 2088. On annelid tube. Bathonian. Ranville.

60346. Bathonian—Calcaire à polypiers. ,, Tesson Coll.

DIASTOPORA, Lamouroux, 1821, emended.

Synonymy:

Diastopora, *pars*, Lamouroux, 1821.
,, Milne Edwards, 1838, *et auct.*
Mesenteripora, Blainville.
Bidiastopora, D'Orbigny, 1849.
Elea, D'Orbigny, 1852.
Multelea, D'Orbigny, 1852.
Cisternifera, *pars*, Walford, 1894.

Diagnosis.—Tubuliporidæ in which the zoarium is erect and foliaceous. (These may be simple fronds; or may be split up into multifid segments; or may grow into hemispherical masses

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[1] A. E. Reuss. Tert. Bryoz. Kisch. Bessarabien: *Sitz. k. Akad. Wiss. Wien.* Bd. lx. 1869, p. 510, pl. i. figs. 6, 7, *non* pl. ii. figs. 1-5.

by the crumpling of the fronds; or may be cylindrical or reteporiform.) The zoarium is unilaminate or bilaminate. The zoœcia are tubular. The peristomes flush, or raised only a small proportion of the length of the zoœcia. Gonœcia are often present.

Type species.—*D. foliacea*, Lamouroux.

Affinities.—This genus was founded by Lamouroux,[1] on some fossil species from the Bathonian of Normandy. His diagnosis clearly shows that he included in it both bilaminate and unilaminate forms. The erectness of the zoarium was, however, clearly an essential character of the genus. Blainville[2] dismembered the genus, retaining *Diastopora* for the unilaminate, and founding *Mesenteripora* for the bilaminate forms. Many later authors, on the other hand, have enlarged the genus by including in it all the adnate encrusting forms, here regarded as *Berenicea.*

Pergens[3] has retained the genus for the unilaminate forms, transferring *Bidiastopora* and *Mesenteripora* to the Entalophoridæ. He also retains *Elea* as one of the Melicertitidæ. They are, however, all here included as synonyms of *Diastopora.* The two first are thus placed, as the distinction between unilaminate and bilaminate forms does not appear to me to be of generic value. *Elea* has generally been taken as founded on Michelin's figures of *Diastopora cervicornis* (Icon. Zooph. pl. lvi. fig. 12), but interpreted according to his figure of *Eschara ranvilliana* (*ib.* pl. lvii. fig. 12) and Haime's figure of *Diastopora lamellosa* (*Mém. Soc. géol. France*, sér. 2, t. v. pl. ix. fig. 1*c*). Haime and Pictet, however, recognized that the genus was thus founded only on worn specimens of *Diastopora,* and with that view I fully concur. *Multelea*, D'Orb., falls also with *Elea.*

In connection with this genus it is necessary to refer to Longe's paper "On the relation of the Escharoid Forms of Oolitic Polyzoa."[4] The discussion in this paper is mainly founded on specimens of *Diastopora*; the author concludes by establishing a family Diastoporidæ, including not only such Cyclostomata as

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[1] Expos. Méth. (1821) p. 42.

[2] Man. Act. 1834, pp. 430 and 432.

[3] Pergens. Revision Bry. fig. par D'Orbigny: *Bull. Soc. belge Géol.* t. iii. Mém. p. 326.

[4] Geol. Mag. 1881, dec. 2, vol. viii. pp. 23–34, pl. ii.

Diastopora and *Entalophora*, but many Cheilostomata, as *Lepralia*, *Myriozoum*, *Cellepora*, etc. Such a classification shows the absurdity of the ideas on which it is based.

Mr. Walford's recently founded genus *Cisternifera* must also be mentioned, but I regret that I cannot understand it. It is not clear whether it is founded on a species, which was new at the time of the foundation of the genus, or on one previously described as *Tubulipora inconstans*, Walf.

1. **Diastopora foliacea,** Lamouroux, 1821.

SYNONYMY:

Diastopora foliacea (*pars*), Lamouroux, 1821, Expos. Méth. p. 42, pl. lxxiii. figs. 1, 2 (*non* figs. 3, 4).
,, ,, Lamouroux, 1824, Encycl. Méth. Zooph. p. 250.
,, ,, Defrance, 1826, Dict. Sci. nat. t. xlii. p. 392, pl. xli. figs. 1, 1*a* (*non* figs. 1*b* and 1*c*).
,, ,, Blainville, 1830, Dict. Sci. nat. t. lx. p. 395.
,, ,, Blainville, 1834, Man. Act. p. 430, pl. lxiii. figs. 1, 1*a*, 1*c*.
,, ,, M. Edwards, 1838, Mém. Cris.: *Ann. Sci. nat. Zool.* sér. 2, t. ix. p. 224, pl. xv. fig. 1.
non ,, ,, Morris, 1843, Cat. Brit. Foss. p. 35.
non ,, ,, Michelin, 1846, Icon. Zooph. p. 239, pl. lvi. fig. 8.
,, ,, Bronn, 1848, Nomencl. p. 420.
,, ,, Bronn, 1849, Enum. p. 141.
,, ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 317.
,, ,, Bronn, 1851, and Römer, Leth. Geogn. ed. 3, Bd. ii. Th. 4, p. 88, pl. xv. fig. 4.
,, ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 826.
,, ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 184, pl. viii. fig. 3.
non ,, ,, Morris, 1854, Cat. Brit. Foss. ed. 2, p. 121.
non ,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 135.
,, ,, E. E. Deslongchamps, 1865, Jur. inf. Norm.: *Mém. Soc. linn. Norm.* t. xiv. p. 151.
non ,, ,, Huxley and Etheridge, 1865, Cat. Foss. M.P.G. p. 223.
,, ,, Vine, 1883, 3rd Rep. Brit. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 264.
,, ,, Vine, 1888, Polyz. Caen: *Journ. Northptn. Nat. Hist. Soc.* vol. v. p. 16.
,, ,, Bigot, 1892, Géol. Basse-Norm.: *Bull. Lab. Géol. Caen*, Ann. 2, No. 1, p. 24.
,, ,, Gregory, 1896, Rev. pt. iv.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 152.

Eschara foliacea, Bronn, 1837, Leth. Geogn. ed. 2, Bd. i. p. 241.
Elea ,, Brauns, 1879, Bry. mittl. Jura Metz: *Zeit. deut. geol. Ges.* Bd. xxxi. p. 313, pl. vi.
Berenicea ,, G. R. Vine, 1880, Review Diastoporidæ: *Quart. Journ. Geol. Soc.* vol. xxxvi. p. 357.
Diastopora eudesiana, M. Edwards, 1838, *op. cit.* p. 226, pl. xiv. fig. 1.
,, ,, Michelin, 1846, Icon. Zooph. p. 240, pl. lvi. fig. 9.
,, ,, M'Coy, 1848, New Mesozoic Radiata: *Ann. Mag. Nat. Hist.* ser. 2, vol. ii. p. 419.
,, ,, Bronn, 1848, Nomencl. p. 420.
,, ,, Bronn, 1849, Enum. p. 141.
,, ,, Haime, 1854, *op. cit.* p. 185, pl. viii. fig. 4.
,, ,, M'Coy, 1854, Contrib. Brit. Pal. p. 66.
,, ,, Morris, 1854, *op. cit.* ed. 2, p. 121.
,, ,, E. E. Deslongchamps, 1864, Notes Géol. Calvados, art. 3: *Bull. Soc. linn. Norm.* t. viii. p. 225.
,, ,, E. E. Deslongchamps, 1865, *op. cit.* p. 151.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 264.
,, ,, Vine, 1884, 4th Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1883, p. 188.
Mesenteripora ,, D'Orbigny, 1852, *op. cit.* t. v. p. 808.
non ,, ,, Manzoni, 1878, Brioz. foss. Mioc. Aust. pt. iii.: *Denk. k. Akad. Wiss. Wien.* Bd. xxxviii. Abth. 2, p. 13, pl. ix. fig. 36; pl. xii. fig. 49.
,, ,, Sauvage, 1889, Bry. jur. Boul.: *Bull. Soc. géol. France*, sér. 3, t. xvii. p. 50.
Berenicea ,, Vine, 1880, *op. cit.* p. 357.
Bidiastopora meandrina, D'Orbigny, 1849, Prod. Pal. t. i. p. 289.
Mesenteripora ,, D'Orbigny, 1852, *op. cit.* t. v. p. 807.
Diastopora mettensis, Haime, 1854, *op. cit.* p. 190, pl. viii. fig. 10.
,, ,, Terquem, 1855, Pal. dép. Moselle (sep. copy), p. 26.
,, ,, Wright, 1860, Subdiv. Inf. Ool.: *Quart. Journ. Geol. Soc.* vol. xvi. p. 12.
,, ,, Terquem, 1868, in Jacquot, Descr. géol. dép. Moselle, p. 290.
,, ,, Witchell, 1882, Geol. Stroud, p. 48.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 265.
,, ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 52.
,, (*Mesenteripora*) *mettensis*, Brauns, 1879, *op. cit.* p. 329.
Bidiastopora macropora, D'Orbigny, 1852, *op. cit.* t. v. p. 799.
? *Diastopora* ,, Haime, 1854, *op. cit.* p. 191.
,, *petaloides*, Waagen, 1868, Zone *Amm. sowerbyi*: *Geogn. Pal. Beitr.* Bd. i. Ht. 3, p. 645.

Diagnosis:

Zoarium loose and open, the fronds being generally broad, thin, and only slightly contorted. Bilaminate.

Zoœcia visible throughout, the zoœcia being long, and the apertures distant from one another and irregular in arrangement. The zoœcia are regularly cylindrical. The peristomes well raised, giving a rough aspect to the zoarium.

Formula.—$p, c, l, r = 2, 0, 3, fr.\ i0$.

DISTRIBUTION.

British:

Cornbrash: Thornboro', Bucks.
Great Oolite: Bath; Bredon; Minchinhampton.
Inferior Oolite: Stroud (*fide* Witchell).

Foreign:

Bathonian: Marquise and Wast, near Boulogne; Caen, Langrune, Lebisey, St. Aubin, in Calvados.
Bajocian—Calcaire ferrugineuse: Saint Quentin, near Metz.
Zone of *Sonninia sowerbyi*: Gingen, Würtemberg.

Description of Figure.—Pl. VI. Fig. 4. Part of zoarium with gonœcium, × 15 dia. Inferior Oolite. Loc.? Holl Coll. **D. 5.**

Affinities.—There is the usual confusion as to the form to which this name belongs, and therefore as to the type of *Diastopora*. Lamouroux, as Milne Edwards pointed out, clearly included two species in his *D. foliacea*. The latter author, however, regarded one of these as encrusting, and for this he retained the name; but his text, footnotes, and explanation of the plate do not agree. Milne Edwards figured as *D. foliacea* the form shown in Lamouroux's figures No. 1 and 2; and in this sense the name has been accepted.

I include in this species *D. eudesiana*, M. Edw., which was described as differing from *D. foliacea* by its greater flatness. This appears, however, to be due to the lowering of the peristomal portion of the zoœcia by wear. A frond from Ranville (Brit. Mus. No. **60239**) is of the *D. eudesiana* type in one portion, and elsewhere is a typical *foliacea*. The species *D. mettensis*, Haime, appears to be founded on eroded fragments, which show prominently the sutures between the zoœcia.

The nearest Cretaceous ally of this species is *D. marginata* (D'Orb.),[1] in which the zoœcia are even more scattered and irregular.

LIST OF SPECIMENS.

D. 2151, D. 2152. Cornbrash. Thornboro', Bucks. Brodie Coll.
? D. 2150. ,, ,, ,,
D. 2222. Great Oolite. Loc. ?
D. 5. Inferior Oolite. Loc. ? Holl Coll. Figd. Pl. VI. Fig. 4.
D. 2146, D. 2147. Inferior Oolite. Near Leckhampton. Brodie Coll.
D. 8. (Form *mettensis*, Haime.) Inferior Oolite. Bredon, Worcestershire. Holl Coll.
B. 4836. Lower Oolite. Loc. ?
60039, 60217, 60222. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll.
60351. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll.
B. 4523. ,, ,, ,, ,, ,,
D. 2220. Young specimen. Bathonian — Calcaire à polypiers. Ranville. Tesson Coll.
B. 4565. (Form *eudesiana.*) ,, ,, ,, ,, Tesson Coll.
B. 4567. (Form *eudesiana.*) (With *D. lamourouxi.*) Bathonian—Calcaire à polypiers. Ranville. Tesson Coll.
B. 4839. (Form *eudesiana.*) Bathonian. Boulogne. Wright Coll.

2. **Diastopora davidsoni,** Haime, 1854.

SYNONYMY:

Diastopora davidsoni, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 185, pl. viii. fig. 9.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 264.
,, ,, Vine, 1884, 4th Rep. Foss. Polyz.: *ibid.* 1883, p. 188.
,, ,, Vine, 1887, Jur. Polyz. Northptn.: *Journ. Northptn. Nat. Hist. Soc.* vol. iv. p. 207, pl. i. figs. 17–19.
,, ,, Woods, 1891, Cat. Type Foss. Woodw. Mus. p. 46.
,, ,, Gregory, 1896, Rev. pt. iv.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 153.
,, *wrighti*, Haime, 1854, *op. cit.* p. 186, pl. viii. fig. 5.
,, ,, E. E. Deslongchamps, 1857, Syst. ool. inf. Calvados: *Bull. Soc. linn. Norm.* t. ii. p. 328.

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[1] *Mesenteripora marginata*, D'Orb., Pal. franç. Terr. crét. t. v. p. 809, pl. DCCLXXXV. figs. 1–3.

Diastopora wrighti, Wright, 1860, Subdiv. Inf. Ool.: *Quart. Journ. Geol. Soc.* vol. xvi. p. 12.
,, ,, Terquem and Jourdy, 1871, Bath. Moselle: *Mém. Soc. géol. France*, sér. 2, t. ix. p. 164.
,, ,, Witchell, 1882, Geol. Stroud, p. 48.
,, ,, Vine, 1883, *op. cit.* p. 264.
,, ,, Vine, 1884, *op. cit.* p. 188.
,, ,, Woods, 1891, Cat. Type Foss. Woodw. Mus. p. 46.
,, *foliacea*, *non* Lamx., Morris, 1843, Cat. Brit. Foss. p. 35 (*fide* Haime).
,, *terquemi*, Haime, 1854, *op. cit.* p. 187, pl. viii. figs. 7*a–d*.
,, ,, Terquem, 1855, Pal. dép. Moselle (sep. copy). pp. 26, 28.
,, ,, Terquem, 1868, in Jacquot, Descr. géol. dép. Moselle, pp. 290, 292.
,, ,, Vine, 1883, *op. cit.* p. 264.
,, ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 52.
non ,, *scobinula*, Michelin, 1840, *op. cit.* p. 10, pl. ii. fig. 12.
non ,, ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 288.
,, ,, (*non* Mich.), Haime, 1854, *op. cit.* p. 186, pl. viii. fig. 6.
,, ,, (*non* Mich.), Terquem, 1868, in Jacquot, Descr. géol. dép. Moselle, p. 292.
,, ,, (*non* Mich.), Terquem and Jourdy, 1871, Bath. Moselle: *Mém. Soc. géol. France*, sér. 2, t. ix. p. 164.
,, (*Mesenteripora*) *scobinula* (*non* Mich.), Brauns, 1879, Bry. mittl. Jura Metz: *Zeit. deut. geol. Ges.* Bd. xxxi. p. 330.
? ,, *scobinula* (*non* Mich.), Vine, 1888, Polyz. Caen: *Journ. Northptn. Nat. Hist. Soc.* vol. v. p. 18.
,, ,, (*non* Mich.), Woods, 1891, Cat. Type Foss. Woodw. Mus. p. 46.
,, ,, (*non* Mich.), Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 52.
Mesenteripora ,, (*non* Mich.), Sauvage, 1889, Bry. jur. Boul.: *Bull. Soc. géol. France*, sér. 3, t. xvii. p. 49.

Diagnosis:

Zoarium loose, composed of broad and fairly flat fronds. Bilaminate.

Zoœcia visible throughout their length, or almost so. Their length is medium, and in shape they are regularly cylindrical. The peristomes are slightly raised, but not reflexed, and they are mostly arranged in fairly regular oblique lines.

Formula.—$p, c, l, r = 1, 0, 2, r0$.

DISTRIBUTION.

BRITISH:

Cornbrash: Bedford (*fide* Vine).
Great Oolite: Hampton, near Bath.
Inferior Oolite: Postlip.

FOREIGN:

Bathonian: Marquise, near Boulogne; Ranville.
Bajocian: Chavier, Haute-Saône; Croixille, Calvados (*fide* Michelin); Guéret, Sarthe (*fide* D'Orbigny); St. Quentin and Montvaux, near Metz; Plappeville (*fide* Friren). Zone of *Parkinsonia parkinsoni*: Fontoy and Gorze (*fide* Terquem).

Description of Figures.—Pl. VI. Fig. 5. Part of zoarium of a normal variety, × 18 dia. Great Oolite: Hampton Common. **B. 2302.** Pl. VI. Fig. 6. Part of base of a zoarium with gonocyst, of var. *wrighti*, × 18 dia. Inferior Oolite: near Leckhampton. Brodie Coll. **D. 2142.** Fig. 7, p. 20, shows initial cell of a colony. Fig. 4, p. 16, shows the transition from the Berenecoid to the Diastoporoid condition.

Affinities.—In this species I include *D. terquemi*, Haime, which appears to be founded on a part of the zoarium where the lines of peristomes are more oblique, and the apertures therefore somewhat quincuncial. The figure given by Haime of *D. davidsoni* is exceptionally regular, and the normal distribution is shown in Pl. VI. Fig. 5. *D. wrighti* must also be included in this species, as it has all the essential characters. Haime's specimens appear to be young and worn.

This species may be distinguished from *D. foliacea*, Lamx., by having a lower peristome, shorter zoœcia, and regularly distributed peristomes.

The species is represented in the Cretaceous by *D. campicheana* (D'Orb.).[1]

LIST OF SPECIMENS.

B. 2302.	Great Oolite.	Hampton Common.	Figd. Pl. VI. Fig. 5.	
B. 2301.	,,	,,	,,	
B. 4837.	,,	Loc.?	Holl Coll.	
D. 2142.	Form *wrighti*. With gonocyst.	Inferior Oolite.	Near Leckhampton.	Brodie Coll. Figd. Pl. VI. Fig. 6.

[1] *Bidiastopora campicheana*, D'Orbigny, Pal. franç. Terr. crét. t. v. p. 800, pl. DCCLXXXIV. figs. 6–8, which shows both the regular and irregular distribution of the peristomes.

D. 2148. Form *wrighti.* Inferior Oolite. Near Leckhampton. Brodie Coll.
D. 2139, D. 2140, D. 2144, D. 2145, D. 2199. Form *wrighti.* Inferior Oolite. Near Leckhampton. Brodie Coll.
B. 4838, D. 1781. Inferior Oolite. Loc.?
D. 15. ,, ,, Wright Coll.
60219. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll.
60381. ,, ,, ,, ,, ,, With other species. Shows both the fixed base and commencement of the frond. Fig. No. 4, p. 16, and Fig. 7, p. 20.
8891. Bajocian. Chavier, Haute-Saône. Mantell Coll. With *Spiropora cæspitosa*, Lamx.

3. Diastopora michelini (Blainville), 1830.

SYNONYMY:

Mesenteripora michelini, Blainville, 1830, Dict. Sci. nat. t. lx. p. 397.
,, ,, Blainville, 1834, Man. Act. p. 432, pl. lxxi. fig. 5.
,, ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 808.
Diastopora ,, M. Edwards, 1838, Mém. Cris.: *Ann. Sci. nat. Zool.* sér. 2, t. ix. p. 226, pl. xiii. figs. 1–1*d*.
,, ,, Michelin, 1846, Icon. Zooph. p. 240, pl. lvi. fig. 10.
,, ,, Bronn, 1848, Nomencl. p. 420.
,, ,, Bronn, 1849, Enum. p. 141.
,, ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 188, pl. viii. fig. 8.
,, ,, Terquem, 1855, Pal. dép. Moselle (sep. copy), pp. 26, 28.
,, ,, Wright, 1860, Subdiv. Inf. Ool.: *Quart. Journ. Geol. Soc.* vol. xvi. p. 12.
,, ,, Deslongchamps, 1865, Jur. inf. Norm.: *Mém. Soc. linn. Norm.* t. xiv. p. 151.
,, ,, Reuss, 1867, Bry. braun. Jura Balin: *Denk. k. Akad. Wiss. Wien.* Bd. xxvii. p. 10.
,, ,, Terquem, 1868, in Jacquot, Descr. géol. dép. Moselle, pp. 290, 292.
,, ,, Terquem and Jourdy, 1871, Bath. Moselle: *Mém. Soc. géol. France*, sér. 2, t. ix. p. 156.
,, ,, Witchell, 1882, Geol. Stroud, p. 48.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 264.
,, ,, Vine, 1884, 4th Rep. Foss. Polyz.: *ibid.* 1883, p. 188.
,, ,, Vine, 1888, Polyz. Caen: *Journ. Northptn. Nat. Hist. Soc.* vol. v. p. 17.
,, ,, Woods, 1891, Cat. Type Foss. Woodw. Mus. p. 46.
,, ,, Gregory, 1896, Rev. pt. iv.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 153.

Bidiastopora michelini, D'Orbigny, 1849, Prod. Pal. t. i. p. 317.
Mesenteripora dædalea, Blainville, 1830, *op. cit.* p. 397.
,, ,, Blainville, 1834, *op. cit.* p. 432, pl. lxxi.
Diastopora foliacea (*non* Lamx.), Michelin, 1846, *op. cit.* p. 239, pl. lvi. fig. 8.
Bidiastopora microphylla, D'Orbigny, 1849, Prod. Pal. t. i. p. 317.
Mesenteripora ,, D'Orbigny, 1852, *op. cit.* t. v. p. 808.
Diastopora ,, ? Haime, 1854, *op. cit.* p. 191.
Bidiastopora latifolia, D'Orbigny, 1852, *op. cit.* p. 799.
Diastopora ,, Haime, 1854, *op. cit.* p. 191.
? ,, *conferta*, Reuss, 1867, Bry. braun. Jura Balin: *Denk. k. Akad. Wiss. Wien.* Bd. xxvii. p. 10, pl. ii. fig. 6.

Diagnosis:

Zoarium hemispherical, formed of interlocking, contorted, bilaminate fronds. The surface appears cerebriform, as the sinuous edges of the fronds are separated by narrow depressions.

Zoœcia short and very crowded. Only visible at the distal ends. Peristomes well raised. Zoœcia fusiform. The distribution of the peristomes is along irregular curved lines; but in some places the linear arrangement is not apparent.

Formula.—$p, c, l, r = 2, 1, 1'', r2$.

DISTRIBUTION.

British:

Forest Marble: Wiltshire.
Great Oolite: Hampton.
Inferior Oolite: Postlip; Stroud (*fide* Witchell).

Foreign:

Bathonian: Lebisey and Ranville, Calvados; La Jonnelière, Sarthe (*fide* Haime). Braun Jura: Balin.
Bajocian: Montvaux. Zone of *Cosmoceras subfurcatum*: Amanvilliers (*fide* Terquem).

Description of Figure.—Pl. VII. Fig. 2. Part of a zoarium, × 17 dia. Forest Marble: Wiltshire. Cunnington Coll. **24770.**

Affinities.—This species is well characterized by its crowded, short, fusiform zoœcia. The form figured as *Diastopora scobinula* by Michelin has the same features, and is regarded as a synonym of this species. But the name *D. scobinula* was applied by Haime and subsequent authors to a form which does not appear to me to be the same as that to which Michelin gave it, but to a form of *D. davidsoni*.

D. michelini differs from *D. foliacea*, Lamx., and *D. davidsoni*, Haime, by the above-mentioned characters. Its crowded zoœcia and raised peristomes distinguish it from *D. lamellosa*, Mich., which is allied to it, by the shape of the zoœcia.

D. neocomiensis (D'Orb.)[1] is a Cretaceous species, which agrees with this in the crumpled fronds and obliquely placed zoœcia; but these are less crowded than in the Jurassic species.

LIST OF SPECIMENS.

24770. Forest Marble. Wiltshire. Cunnington Coll. Figd. Pl. VII. Fig. 2.
60218. Bathonian. Ranville. Tesson Coll.
60373. ,, ,, ,,
46785. ,, ,, ,,
60244. ,, ,, ,,
D. 1832. Bathonian. Normandy.
B. 177, B. 209, B. 180. Bathonian. Ranville. Presented by Benj. Bright, Esq.

4. Diastopora lamellosa, Michelin, 1846.

SYNONYMY:

Diastopora lamellosa, Michelin, 1846, Icon. Zooph. p. 241, pl. lvi. fig. 11.
,, ,, Bronn, 1848, Nomencl. p. 420.
,, ,, Bronn, 1849, Enum. p. 141.
,, ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 188, pl. ix. figs. 1*a–d*.
,, ,, Deslongchamps, 1865, Jur. inf. Norm.: *Mém. Soc. linn. Norm.* t. xiv. p. 151.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 264.
,, ,, Vine, 1884, 4th Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1883, p. 188.
,, ,, Vine, 1888, Polyz. Caen: *Journ. Northptn. Nat. Hist. Soc.* vol. v. p. 17.
,, ,, Gregory, 1896, Rev. pt. iv.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 154.
Mesenteripora ,, Sauvage, 1889, Bry. jur. Boul.: *Bull. Soc. géol. France*, sér. 3, t. xvii. p. 50.
non Bidiastopora lamellosa, D'Orbigny, 1850, Prod. Pal. t. ii. p. 266.

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[1] *Mesenteripora neocomiensis*, D'Orbigny, Pal. franç. Terr. crét. t. v. p. 808, pl. DCCLVI. figs. 7–9.

Eschara ranvilliana, Michelin, 1846, *op. cit.* p. 243, pl. lvii. fig. 12.
,, ,, Bronn, 1848, Nomencl. p. 471.
,, ,, Bronn, 1849, Enum. p. 134.
,, ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 316.
,, ,, Terquem, 1855, Pal. dép. Moselle (sep. copy), p. 30.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 123, pl. xc. fig. 26.
,, ,, Terquem, 1868, in Jacquot, Descr. géol. dép. Moselle, p. 296.
Elea ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 628.
Lateromultelea ,, D'Orbigny, 1852, *op. cit.* p. 629.
Diastopora cervicornis, Michelin, 1846, *op. cit.* p. 241, pl. lvi. fig. 12.
,, ,, Bronn, 1848, Nomencl. p 420.
,, ,, Bronn, 1849, Enum. p. 141.
,, ,, Haime, 1854, *op. cit.* p. 189, pl. ix. fig. 2.
,, ,, Deslongchamps, 1865, *op. cit.* p. 151.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 265.
Bidiastopora ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 317.
,, ,, D'Orbigny, 1849, Genr. nouv. Bry.: *Rev. Mag. Zool.* sér. 2, t. i. p. 502.
Elea ,, D'Orbigny, 1852, *op. cit.* t. v. p. 628.
Bidiastopora ramosissima, D'Orbigny, 1849, Prod. Pal. t. i. p. 317.
Diastopora ,, Haime, 1854, *op. cit.* p. 190, pl. ix. fig. 3.
,, ,, Terquem, 1855, Pal dép. Moselle (sep. copy), p. 26.
,, ,, Deslongchamps, 1865, *op. cit.* p. 151.
,, ,, Terquem, 1868, in Jacquot, Descr. géol. dép. Moselle, p. 290.
,, ,, Vine, 1883, *op. cit.* p. 265.
,, ,, Vine, 1888, *op. cit* p. 17.
,, ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 53.
Elea ,, D'Orbigny, 1852, *op. cit.* t. v. p. 628.
Entalophora ,, Vine, 1884, *op. cit.* p. 188.
Bidiastopora luciana, D'Orbigny, 1849, Prod. Pal. t. i. p. 317.
Multisparsa luceana, D'Orbigny, 1852, *op. cit.* p. 870, pl. dcclxi. figs. 1-3.
? *Diastopora lucensis*, Haime, 1854, *op. cit.* p. 191.
,, *fenestrata*, Reuss, 1867, Bry. braun. Jura Balin: *Denk. k. Akad. Wiss. Wien.* Bd. xxvii. p. 11, pl. ii. fig. 5.

DIAGNOSIS:

Zoarium bilaminate, forming either thin, broad, crumpled fronds or thick, narrow branches.

Zoœcia short and broad; fusiform. Peristomes slightly raised; not crowded; quincuncially arranged.

Formula.—$p, c, l, r = 1, 2, 1, r0$.

DISTRIBUTION.

British:

Bradford Clay: Pound Pill; Corsham.
Great Oolite: Bath; Hampton.
? Inferior Oolite: Postlip (*fide* Haime).

Foreign:

Bathonian: Ranville; Luc; Marquise, near Boulogne; La Jonnelière, Sarthe; Moselle (*fide* Terquem). Braun Jura: Balin.
Bajocian: St. Quentin (*fide* Haime); Montvaux (*fide* Friren).

Description of Figure.—Pl. VII. Fig. 3. Fragment of a zoarium, × 17 dia. Great Oolite: Ancliff, near Bath. **24521.**

Affinities.—The almost lozenge-shaped zoœcia of this species are very different from those of the cylindrical zoœcia of all the preceding species, and it is therefore easily distinguished from any of them. *D. michelini* (Blv.) has an approach to this form, but the zoœcia in that species are very crowded, and the peristomes are more raised.

The main difficulty in regard to this species is whether *D. cervicornis*, Mich., ought not to be kept distinct. The difference is that *D. lamellosa* has broad, thin fronds, and *D. cervicornis* narrow, thick ones. At first sight, the difference appears of specific value; but in some specimens (such as B.M. **D. 2092**) the terminal expansions are on the *D. lamellosa* type, and the lower, older parts of the zoarium on that of *D. cervicornis*. *D. ramosissima* appears to be only a fragment of this species, with the peristomes worn down.

LIST OF SPECIMENS.

24521. Great Oolite. Ancliff, near Bath. Cunnington Coll. Figd. Pl. VII. Fig. 3.
D. 2223. Great Oolite. Loc. ?
B. 2301. Great Oolite. Hampton. Var. *cervicornis.*
D. 10, D. 12. Great Oolite. Hampton. Holl Coll. Var. *cervicornis.*
D. 2135, D. 2137, D. 2141. Inferior Oolite. Near Leckhampton. Brodie Coll.
60220. Bathonian. Ranville. Tesson Coll.
60367. ,, ,, ,,
60371. ,, ,, ,, Var. *cervicornis.*
D. 2219 (7 specimens). Bathonian. Ranville. Tesson Coll. Var. *cervicornis.*
60369. Bathonian. Ranville. Tesson Coll. With *Entalophora cellarioides.*
D. 2092. ,, ,, ,,
D. 2114. ,, ,, ,, (The *Multisparsa luceana*, D'Orb.)

5. Diastopora calloviensis (D'Orbigny), 1852.

Synonymy:

Elea calloviensis, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 629.
Diastopora calloviensis, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 191.
,, ,, Gregory, 1896, Rev. pt. iv.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 154.
? ,, *subramosa*, Waagen, 1868, Zone *Amm. sowerbyi*: *Geogn. Pal. Beitr.* Bd. i. Ht. 3, p. 645, pl. xxxiii. fig. 8.

Diagnosis:

Zoarium of loose tufts; composed of bands which branch irregularly; bilaminate.

Zoœcia long, broad, and regular in shape. Peristomes distant and well raised; irregularly distributed. Zoœcia visible throughout their length.

Formula.—$p, c, l, r = 1'', 0, 2'', i0$.

DISTRIBUTION.

England:

Inferior Oolite: near Leckhampton.

Foreign:

Bathonian: Ranville, Normandy.
Callovian: Guéret, Sarthe (*fide* D'Orbigny).

Description of Figure.—Pl. VII. Fig. 5. Part of a tufted zoarium, × 13 dia. Bathonian—Calcaire à polypiers: Ranville. Tesson Coll. **60368.**

Affinities.—This species is most closely allied to *D. davidsoni*, Haime; from this it differs by having higher peristomes and longer zoœcia, and by the irregular distribution of the peristomes. The most conspicuous difference is that the zoarium consists of bands, instead of fronds; but, unless this were accompanied by zoœcial differences, I should not venture to regard it as entitling the form to specific distinction.

The zoarium resembles that described by Haime as *D. ramosissima*, but the zoœcial characters show the species are distinct, for in Haime's form the peristomes are regularly quincuncial, and the zoœcia lozenge-shaped.

D'Orbigny's diagnosis is very short, and was not accompanied by any figure. Hence the species has generally been dismissed as a doubtful record. The description, however, exactly represents both the zoarial and zoœcial characters of this species.

LIST OF SPECIMENS.

60368.	Bathonian.	Ranville.	Tesson Coll.	Figd. Pl. VII. Fig. 5.
D. 2256.	,,	,,	,,	
? D. 2200.	Inferior Oolite.	Near Leckhampton.	Brodie Coll.	

6. Diastopora lamourouxi, M. Edwards, 1838.

Synonymy:

Diastopora lamourouxi, M. Edwards, 1838, Mém. Cris.: *Ann. Sci. nat. Zool.* sér. 2, t. ix. p. 225, pl. xv. fig. 2.
,, ,, M. Edwards, 1846, Atlas règne anim. Cuvier (Zooph.) pl. lxxii. fig. 2.
,, ,, Michelin, 1846, Icon. Zooph. p. 239, pl. lvi. fig. 7.
,, ,, Bronn, 1848, Nomencl. p. 420.
,, ,, Bronn, 1849, Enum. p. 141.
,, ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 317.
,, ,, Buvignier, 1852, Stat. géol. dép. Meuse, p. 184.
,, ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 183, pl. viii. figs. 1*a*–*b*.
,, ,, Deslongchamps, 1865, Jur. inf. Norm.: *Mém. Soc. linn. Norm.* t. xiv. p. 151.
,, ,, Reuss, 1867, Bry. braun. Jura Balin: *Denk. k. Akad. Wiss. Wien.* Bd. xxvii. p. 9, pl. ii. fig. 4.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 264.
,, ,, Vine, 1884, 4th Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1883, p. 188.
,, ,, Vine, 1888, Polyz. Caen: *Journ. Northptn. Nat. Hist. Soc.* vol. v. p. 15.
,, ,, Gregory, 1896, Rev. pt. iv.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 155.
,, *foliacea*, *pars*, Lamouroux, 1821, Expos. Méth. pl. lxxiii. fig. 3.
,, ,, Bronn, 1825, Pflanzenth. p. 25, pl. vi. fig. 8.
,, ,, *pars*, Blainville, 1830, Dict. Sci. nat. t. lx. p. 395.
,, ,, *pars*, Blainville, 1834, Man. Act. p. 430, pl. lxiii. fig. 1*b*.
,, ,, *pars*, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 135, pl. xci. fig. 12.
,, *waltoni*, Haime, 1854, *op. cit.* p. 184, pl. viii. figs. 2*a*–*b*.
,, ,, Pictet, 1857, *op. cit.* p. 135.
,, ,, Wright, 1860, Subdiv. Inf. Ool.: *Quart. Journ. Geol. Soc.* vol. xvi. p. 12.
,, ,, Witchell, 1882, Geol. Stroud, p. 48.
,, ,, Vine, 1883, *op. cit.* p. 264.
,, ,, Vine, 1884, *op. cit.* p. 188.
,, ,, Woods, 1891, Cat. Type Foss. Woodw. Mus. p. 46.
,, ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 52.

DIAGNOSIS:

Zoarium unilaminate, growing in irregular tubes, which may branch repeatedly or open to funnel-shaped expansions.

Zoœcia usually visible throughout, the zoœcia being long and the apertures usually distant. The peristomes (in well-preserved specimens) are highly raised, and irregular in distribution, though occasionally there is a tendency towards a quincuncial system. Zoœcia regularly cylindrical.

Formula.—$p, c, l, r = 3, 0, 2, i0$.

DISTRIBUTION.

BRITISH:

Inferior Oolite: near Leckhampton; Postlip; Stroud (*fide* Witchell).

FOREIGN:

Bathonian: Ranville; Lebisey, Calvados. Braun Jura: Balin.
Bajocian: Plappeville (*fide* Friren).

Description of Figure.—Pl. VII. Fig. 4. Part of a funnel-shaped end of a zoarium, × 17 dia. Inferior Oolite: near Leckhampton. Brodie Coll. **D. 2194.**

Affinities.—The zoœcia of this species are much like those of *D. foliacea*, but differ in being slightly shorter, and having the peristomes raised more highly. Moreover, the zoarium is unilaminate instead of consisting of two layers of zoœcia. The irregularity of the distribution of the apertures distinguishes it from *D. davidsoni*, and the wide distance between these from *D. michelini*.

The main difficulty in this species is whether *D. waltoni*, Haime, is to be included within it. Some specimens in the British Museum (such as **60238**) have the peristomes in places crowded and regular, and pass into the *waltoni* form; elsewhere, on the same zoarium, they are distant and irregular, and thus are on the *lamourouxi* type. I have therefore felt bound to merge the species.

The nearest Cretaceous ally of this species is *D. tubulus*, D'Orb.[1]

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[1] Pal. franç. Terr. crét. t. v. 1852, p. 829, pl. DCXLI. figs. 9, 10.

LIST OF SPECIMENS.

D. 2194. Inferior Oolite. Near Leckhampton. Brodie Coll. Figd. Pl. VII. Fig. 4.
B. 4521. Bathonian. Calvados.
60238, 60352, 60354. Bathonian. Ranville, Calvados. Tesson Coll.
D. 4567, 60243. Bathonian. Ranville, Calvados. Tesson Coll.

7. **Diastopora retiformis,** Haime.

Synonymy:

Diastopora retiformis, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France,* sér. 2, t. v. p. 191, pl. vii. fig. 9.
,, ,, Terquem, 1855, Pal. dép. Moselle (sep. copy), p. 26.
,, ,, Terquem, 1868, in Jacquot, Descr. géol. dép. Moselle, p. 290.
,, ,, Brauns, 1879, Bry. mittl. Jura Metz: *Zeit. deut. geol. Ges.* Bd. xxxi. p. 331.
,, ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz,* sér. 2, t. vi. p. 53.

Diagnosis:

Zoarium retiform; about six zoœcia in each branch.

Zoœcia cylindrical, of medium length; peristomes low, arranged on somewhat irregular, oblique lines.

DISTRIBUTION.

Bajocian: Saint Quentin and Montvaux, near Metz.

Affinities.—This species is known only from the description and figure given by Haime, from specimens in the Terquem Collection. It is quite distinct from any other Jurassic form.

DOUBTFUL SPECIES.

Diastopora inconstans (Walford), *pars* (*non* Bean).

Synonymy:

Tubulipora inconstans, Walford, 1887, Polyz. Lias: *Quart. Journ. Geol. Soc.* vol. xliii. p. 633, pl. xxv. figs. 1-9 and 12.
Cisternifera inconstans, Walford, 1894, Cheil. Bry. Mid. Lias: *Quart. Journ. Geol. Soc.* vol. L. p. 80, pl. v.; pl. vi.; pl. vii. figs. 10,12–16.

Distribution.—Middle Lias: King's Sutton, Northamptonshire. Transition bed to Upper Lias, Appletree, near Banbury, and Badby, near Daventry.

SYNOPSIS OF SPECIES.

I.—Zoœcia cylindrical.

A. Zoarium bilaminate.

a. Zoœcia visible throughout.

Zoarium frondose.

peristomes well raised; peristomes irregular *foliacea.*

peristomes slightly raised; peristomes sub-regular ... ... *davidsoni.*

Zoarium ribbon-shaped.

peristomes raised; peristomes irregular ... *calloviensis.*

b. Zoœcia visible at ends ... ... *michelini.*

B. Zoarium unilaminate ... ... *lamourouxi.*

C. Zoarium reticular ... ... *retiformis.*

II.—Zoœcia lozenge-shaped ... ... *lamellosa.*

Family IDMONIIDÆ.

SYNONYMY:

Tubigeridæ, pars, D'Orbigny.
Tubuliporidæ, pars, Johnston; Smitt; and Hincks.
Idmoniidæ, pars, Busk; MacGillivray; Pergens and Meunier; Marsson.

Diagnosis—Cyclostomata Tubulata in which the zoœcia are simple, open tubes, and grow into adnate or erect branching zoaria. The zoarium is branched, and the zoœcia open only on one side of it. The apertures are disposed in regular transverse series, usually alternately arranged.

Affinities.—This family was founded by Busk in 1859 for a group including *Hornera*, *Terebellaria*, *Idmonea*, *Pustulopora*, *Cricopora*, and *Cyrtopora*. Smitt removed *Hornera* from this group as a separate family, and though this course has not been adopted by MacGillivray or Pergens, it seems to me wisest to accept it. Pergens, in 1886, raised *Pustulopora* and its allies into the family Entalophoridæ, and also pointed out that *Cyrtopora* belonged to another distinct type. Moreover, *Terebellaria* is more different from *Idmonea* than is any of the others.

The Idmoniidæ are therefore left as a small group, embracing those Tubulata in which the zoœcia open on one side only of the zoarium, and the apertures are arranged in regular transverse rows. It differs by the first character from the Entalophoridæ, and by the second and by the branched zoarium from the Tubuliporidæ.

IDMONEA, Lamouroux, 1821.

[Expos. Méth. p. 80.]

Diagnosis. — Zoarium adnate, or erect. Branches ridged or triangular in section. Zoœcia in regular transverse and usually alternate series. The zoarium divides into branches, and the branches usually radiate from a centre. The branches sometimes anastomose.

Type species.—*Idmonea triquetra*, Lamx., 1821.

Affinities.—The genus *Idmonea* was founded by Lamouroux for a species found in the Calcaire à polypiers at Ranville, which is always an encrusting form. Later authors, however, not only include the erect branching forms in *Idmonea*, but frequently exclude the type species from the genus. Thus, Busk ("Crag Bryozoa," p. 94) uses the erect mode of growth as one of the diagnostic characters of the family Idmoniidæ, while D'Orbigny founds the genus *Reptotubigera* on the type species of *Idmonea*. Either the term *Idmonea* must be used for both the erect and adnate forms, or must be kept for the latter, and the former be renamed. The former course seems to me to be the most convenient, as some adnate forms often curl up at the ends, and the zoarium becomes semi-erect. This is therefore a case in which the distinction between the erect and encrusting mode of growth is not of generic, if even of specific, importance.

Idmonea triquetra, Lamouroux, 1821.

Synonymy:

Idmonea triquetra, Lamouroux, 1821, Expos. Méth. p. 80, pl. lxxix. figs. 13-15.
,, ,, Defrance, 1821, Dict. Sci. nat. t. xxii. p. 564.
,, ,, Lamouroux, 1824, Encycl. Méth. Zooph. p. 462.
,, ,, Bronn, 1825, Pflanzenth. pp. 21, 43, pl. vi. fig. 12.
,, ,, Blainville, 1834, Man. Act. p. 420, *non* pl. lxviii. fig. 2.
,, ,, Bronn, 1837, Leth. Geogn. ed. 2, Bd. i. p. 249, pl. xvi. fig. 11.
,, ,, M. Edwards, 1838, Mém. Cris.: *Ann. Sci. nat. Zool.* sér. 2, t. ix. p. 215.

Idmonea triquetra, Morris, 1843, Cat. Brit. Foss. p. 40.
,, ,, Michelin, 1846, Icon. Zooph. p. 234, pl. lvi. fig. 16.
,, ,, Bronn, 1848, Nomencl. p. 607.
,, ,, Bronn, 1849, Enum. p. 140.
,, ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 317.
,, ,, Bronn and Römer, 1851, Leth. Geogn. ed. 3, Bd. ii. Th. 4, p. 87, pl. xvi. fig. 11.
,, ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 729.
,, ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 171, pl. vii. fig. 1.
,, ,, Morris, 1854, Cat. Brit Foss. ed. 2, p. 125.
,, ,, Vine, 1884, Polyz. Richmond boring: *Quart. Journ. Geol. Soc.* vol. xl. p. 790.
,, ,, Vine, 1888, Polyz. Caen: *Journ. Northptn. Nat. Hist. Soc.* vol. v. p. 7.
non ,, ,, Walford, 1889, Bry. Shipton, pt. i.: *Quart. Journ. Geol. Soc.* vol. xlv. pp. 568–9, pl. xviii. fig. 13; pl. xix. figs. 3, 4.
,, ,, Woods, 1891, Cat. Type Foss. Woodw. Mus. p. 48.
,, ,, Gregory, 1896, Rev. pt. v.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 194.
Reptotubigera ,, D'Orbigny, 1852, *op. cit.* p. 751.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 139.
Idmonea gracilis, D'Orbigny, 1849, *op. cit.* p. 317.

Diagnosis:

Zoarium composed of triangular branches, beside each of which is a thin flat selvage. The branches dichotomize repeatedly.

Zoœcia from four to seven in each series. Peristomes open along the summit of a low ridge. Zoœcia slender and cylindrical in adult; short, thick, and angular in young stages. Walls punctulate.

DISTRIBUTION.

England:

Bradford Clay: Bradford; Box; Pound Pill.
Great Oolite: Minchinhampton; Richmond boring.

Foreign:

Bathonian—Calcaire à polypiers: Ranville, Luc, and Caen, in Calvados, France.

Description of Figure.—Plate VII. Fig. 6. Part of a young zoarium, × 32 dia. Great Oolite: Minchinhampton. Byne Coll. 20730.

Affinities.—This is the type species of the genus, and it is fairly common in the Lower Oolitic rocks of England and France.

LIST OF SPECIMENS.

B. 4250. On *Terebratula maxillata*, J. de C. Sow. Bradford Clay. Box Tunnel.
50775. On ,, ,, ,, ,, Loc. ? Morris Coll.
67568. On ,, ,, ,,
B. 4831. On ,, ,, ,, ,, Box Tunnel. H. B. Holl Coll.
23837. On *Terebratula maxillata*, ,, ,, ,, Buy Coll.
B. 4840. On *Terebratula maxillata*, ,, ,, ,, J. G. Lowe Coll.
B. 4830. On *Terebratula* sp., J. de C. Sow. Great Oolite. Loc. ? J. Wood Coll.
B. 4861. On *Ostrea* sp. Bradford Clay. Box.
B. 4876. On *Dictyothyris coarctata* (Park.). Bradford Clay. Box.
B. 4857. On *Avicula costata*, J. de C. Sow. Bradford Clay. Bradford. H. B. Holl Coll.
D. 2115. On *Terebratula maxillata*, J. de C. Sow. Box. Buy Coll.
20730. Young stage on *Pileolus lævis*, Sow. Great Oolite. Minchinhampton. Figd. Pl. VII. Fig. 6. Byne Coll.
? D. 1899–1901. 3 slides. Great Oolite. Richmond boring, 1205 ft. Presented by Prof. J. W. Judd, C.B., F.R.S.
D. 2207. Bathonian—Calcaire à polypiers. Ranville.

INDETERMINABLE RECORDS.

1. *Idmonea ammonitorum*, D'Orbigny, 1849, Prod. Pal. t. i. p. 378.

Distribution.—Oxfordian: La Vendée, France.

2. *Idmonea complanata*, D'Orbigny, 1849, *op. cit.* p. 288.

Distribution.—Bajocian: Bayeux, France.

3. *Idmonea claviformis*, Walford, 1889, Bry. Shipton, pt. i.: *Quart. Journ. Geol. Soc.* vol. xlv. p. 569, pl. xix. figs. 1, 2.

Distribution.—Inferior Oolite: Shipton, England.

4. *Idmonea depressa* (D'Orbigny), 1852.

Syn. *Reptotubigera depressa*, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 752.

Distribution.—Bathonian : Langrune, France.

5. *Idmonea elegantula*, D'Orbigny, 1849, *op. cit.* p. 288.

Distribution.—Bajocian : France.

6. *Idmonea triquetra* (*non* Lamouroux), Walford, 1889.

,, var. Y-*formis*, Walford, 1889, Bry. Shipton, pt. i.: *Quart. Journ. Geol. Soc.* vol. xlv. p. 568, pl. xix. figs. 3, 4.

,, ,, *parkinsoni*, Walford, *ibid.* p. 569, pl. xviii. fig. 13.

Distribution.—Inferior Oolite : Shipton, England.

Family ENTALOPHORIDÆ.

Diagnosis.—Cyclostomata Tubulata in which the zoarium is erect and dendroid; the branches consist of solid bundles of zoœcia. The zoœcia are monomorphic, and open on all sides of the stems.

ENTALOPHORA, Lamouroux, 1821.

SYNONYMY:

Pustulopora (*non* Blainville), Busk, Hagenow, etc.
Pergensia, Walford.
Clavisparsa, D'Orbigny.

Diagnosis.—Entalophoridæ in which the zoarium consists of thin stems, each of which is composed of a small number of zoœcia. The peristomes are scattered irregularly. The zoœcia are cylindrical.

Type species.—*E. cellarioides*, Lamx.

Affinities.—This species was founded by Lamouroux for a species from the Bathonian rocks of Normandy; his figure was so misleading that Blainville, who next referred to the genus, regarded it as probably a Hydroid zoophyte. Busk, in the second part of his "Challenger Monograph," also suggested that it might be a coralline. These suggestions were due to the "trumpet-shaped" appearance of the zoœcia in Lamouroux's figure. Specimens from the same locality leave no doubt that this is only a misrepresentation by the artist, for the zoœcia are of the normal Cyclostomatous type.

The doubt as to the meaning of Lamouroux's figure has led to unfortunate confusion in synonymy, for Busk and some other authors have accepted *Pustulopora*, Blv., instead of *Entalophora*. D'Orbigny, Smitt, Hincks, and Waters, however, have adopted *Entalophora*, and I feel no doubt as to the wisdom of their decision. *Pustulopora*, as proposed by Blainville, is really not a synonym of *Entalophora*, but of *Spiropora*. The first species given by Blainville is one figured by Goldfuss[1] as *Ceriopora madreporacea*. The type specimen has been refigured by Hagenow,[2] but it is

[1] Petref. Germ. p. 35, pl. x. fig. 12. [2] Bryoz. Maastr. Kreideb. pl. i. fig. 8.

so worn that its exact affinities are not quite certain. The most definite character of the form is that the apertures occur in annular series. Blainville states, in his diagnosis of the genus, that the zoœcia are "regularly disposed," and he even includes in it the well-known species *S. verticillata* (Goldf.). These three facts show that *Pustulopora*, as used by Blainville, is a synonym of *Spiropora*, instead of *Entalophora*.

The limitation of *Entalophora* is a difficult task. As used by Waters it includes three different types—

1. Species in which the zoœcia are long and cylindrical, and irregularly arranged.
2. Species in which the zoœcia are long and cylindrical, and arranged in regular lines.
3. Species in which the zoœcia are short and hexagonal.

The question is whether these are all to be regarded as one genus or as three. The early writers on the group kept them distinct, while D'Orbigny even added many other divisions. Thus, the first group was regarded as *Entalophora*, the second as *Spiropora* (*Cricopora*), and the third as *Melicertites*.

Waters[1] has shown that in one part of a zoarium the peristomes may be arranged in lines (as in *Spiropora*) and in another irregularly (as in *Entalophora*). He therefore proposes to merge the two groups. This evidence is conclusive that the distinction between these two types is not absolute. But in the vast majority of the fossil forms the distinction holds, except sometimes at a point of bifurcation, where irregularity results from overcrowding. It is therefore very convenient to retain the distinction, for to merge the genera would necessitate the renaming of many species. I accordingly accept *Spiropora* as a section of *Entalophora*.

In regard to the group of species with hexagonal zoœcia, it is also true that we may find a few hexagonal zoœcia in zoaria,[2] of which the majority are tubular. If we are to act on the

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[1] A. W. Waters. Fossil Cycl. Bry. Australia: *Quart. Journ. Geol. Soc.* vol. xl. (1884), p. 680. North Ital. Bry. pt. ii.: *ibid.* vol. xlviii. (1892) p. 158.

[2] As *e.g.* in Busk's careful figure of *E. regularis*, MacG. (Chall. Bry. pt. ii. pl. iv. fig. 2).

evidence of these occasional zoœcia, then the two groups of species must be united. But in the Mesozoic faunas there are many species in which all the zoœcia are regularly hexagonal; these are so strikingly unlike the irregular tubular zoœcia of *Entalophora*, that the difference has been regarded as of family, or even of ordinal, value. It seems unnecessary to ignore this great and fairly constant difference owing to the occurrence of a few abnormal zoœcia.

The name to be applied to this group of species with polygonal zoœcia must be either *Pustulopora*, *Melicertites*, or a new name. The first was defined by Blainville[1] in 1830, and the second by Römer[2] in 1841. Neither genus as given by these authors was homogeneous. Blainville took as his type a specimen figured by Goldfuss, of which the only determinable character is the annular arrangement of the peristomes. The other specimens figured by Hagenow had hexagonal zoœcia, and it is quite possible that Goldfuss' type had the same. But as that cannot be discovered, *Pustulopora* must stand as a synonym of the *Spiropora* group of Entalophoridæ.

1. Entalophora cellarioides, Lamouroux, 1821.

Synonymy:

Entalophora cellarioides, Lamouroux, 1821, Expos. Méth. p. 81, pl. lxxx. figs. 9–11.
,, ,, Bronn, 1825, Pflanzenth. p. 27, pl. vii. fig. 10.
,, ,, Defrance, 1826, Dict. Sci. nat. t. xlii. p. 392.
,, ,, Blainville, 1830, Dict. Sci. nat. t. lx. p. 453.
,, ,, Blainville, 1834, Man. Act. p. 489, pl. lxxxii. fig. 1.
,, ,, Bronn, 1837, Leth. Geogn. ed. 2, Bd. i. p. 243, pl. xvi. fig. 24.
,, ,, Michelin, 1846, Icon. Zooph. p. 233, pl. lvi. fig. 4.
,, ,, Bronn, 1848, Nomencl. p. 462.
,, ,, Bronn, 1849, Enum. p. 141.
,, ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 318.
,, ,, Bronn, 1851, Leth. Geogn. ed. 3, Bd. ii. Th. 4, p. 87, pl. xvi. fig. 24.
,, ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 779.
,, ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 199, pl. ix. fig. 8.

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[1] Dict. Sci. nat. t. lx. p. 382.
[2] Verst. norddeut. Kreidegeb. p. 18.

Entalophora cellarioides, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 134, pl. xci. fig. 10.
,, ,, E. E. Deslongchamps, 1864, Géol. Calvados, art. 3: *Bull. Soc. linn. Norm.* t. viii. p. 225.
,, ,, E. E. Deslongchamps, 1865, Jur. inf. Norm.: *Mém. Soc. linn. Norm.* t. xiv. p. 151.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 261.
,, ,, Vine, 1884, 4th Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1883, p. 188.
,, ,, Vine, 1888, Polyz. Caen and Ranville: *Journ. Northptn. Nat. Hist. Soc.* vol. v. p. 8.
,, ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz,* sér. 2, t. vi. p. 55.
,, ,, Gregory, 1896, Rev. pt. v.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 195.
,, *laxipora,* D'Orbigny, 1849, *op. cit.* p. 318.
,, ,, D'Orbigny, 1852, *op. cit.* p. 779.
,, *subgracilis,* D'Orb., var. *corrugata,* Walford, 1889, Bry. Shipton, pt. i.: *Quart. Journ. Geol. Soc.* vol. xlv. p. 573, pl. xviii. fig. 14.

DIAGNOSIS:

Zoarium cæspitose, composed of thin fragile branches, about 1 mm. in diameter.

Zoœcia long; the free, distal portion is often very long; the peristomes are irregularly quincuncial in arrangement.

DISTRIBUTION.

BRITISH:

Great Oolite: Hampton, near Bath (*fide* Haime).
Inferior Oolite: Shipton, Dorset.

FOREIGN:

Bathonian: Ranville, St. Aubin, Normandy; Marquise and Wast, near Boulogne.

Description of Figure.—Pl. VIII. Fig. 1. Part of a zoarium, showing the long, free portions of the zoœcia, × 17 dia. Calcaire à polypiers: Ranville. Tesson Coll. **D. 2257.**

Affinities.—This species is the type of the genus. Lamouroux's figure was diagrammatic, and has been the cause of much confusion. The specimens since found and described have not such crowded zoœcia, but they probably belong to Lamouroux's species. The Cretaceous representative of this thin, irregular form is *Entalophora* *icaunensis*, D'Orb.,[1] which appears, however, to have the peristomes more scattered and less reflexed. *Entalophora horrida*, D'Orb.,[2] on the other hand, has the peristomes far more crowded and reflexed more regularly at right angles.

LIST OF SPECIMENS.

D. 2257. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll. Figd. Pl. VIII. Fig. 1.

60359. Bathonian—Calcaire à polypiers. ,, ,,

60369. ,, ,, ,, ,, ,, With *Diastopora lamellosa*, Mich., etc.

60224. Bathonian—Calcaire à polypiers. ,, ,, With *Spiropora annulosa*, Lamx.

B. 4518. Bathonian—Calcaire à polypiers. ,, ,, With *Terebellaria ramosissima*, Lamx.

2. Entalophora nidulata (Walford), 1894.

SYNONYMY:

Pergensia nidulata, Walford, 1894, Bry. Shipton, pt. ii.: *Quart. Journ. Geol. Soc.* vol. L. p. 73, pl. ii. figs. 1, 2.
,, *major*, Walford, 1894, *ibid.* p. 74, pl. ii. figs. 3, 4.
,, *porifera*, Walford, 1894, *ibid.* p. 75, pl. ii. fig. 6.
,, *galeata*, Walford, 1894, *ibid.* p. 76, pl. iii. fig. 27.
,, *minima*, Walford, 1894, *ibid.* p. 74, pl. ii. fig. 12.
Entalophora richmondiensis var. *pustulopora*, Vine, 1884, Polyz. Richmond boring: *Quart. Journ. Geol. Soc.* vol. xl. p. 792.

DIAGNOSIS:

Zoarium short, clavate; cylindrical in section.

Zoœcia cylindrical; partly immersed, but a free distal portion, the extent of which varies greatly. The apertures are irregularly arranged, but a tendency to a spiral form occurs in the proximal portion of the zoarium.

Gonœcia large, spherical.

Distribution.—Bathonian—Great Oolite: Richmond. Inferior Oolite: Shipton Gorge.

Description of Figure.—Pl. VIII. Fig. 2. Young zoarium, × 26 dia. Great Oolite: Richmond boring. Presented by Prof. J. W. Judd, F.R.S. D. 1931.

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[1] Pal. franç. Terr. crét. t. v. p. 781, pl. DCXVI. figs. 12–14.

[2] *Ibid.* p. 789, pl. DCXXI. figs. 13–15.

Affinities.—This is a typical young *Entalophora*, and is closely allied to the Cretaceous *E. clavata*, D'Orb.[1] The two specimens from the Richmond boring which Vine took as the type of his var. *pustulopora* of his *E. richmondiensis*, do not seem to me related to that species. They agree exactly with the series of specimens figured by Walford from the Shipton Gorge. *E. clavata*, D'Orb., represents this type in the Cretaceous; the zoœcia in that species have a ribbed ornamentation, instead of being punctate, and none of the specimens figured show oœcia.

LIST OF SPECIMENS.

D. 1931, D. 1933, D. 1934. Great Oolite. Richmond boring, 1205 ft. Vine's type of *E. richmondiensis* var. *pustulopora*.

3. **Entalophora magnipora,** Walford, 1889.

SYNONYMY:

Entalophora magnipora, Walford, 1889, Bry. Shipton, pt. i.: *Quart. Journ. Geol. Soc.* vol. xlv. p. 572, pl. xix. figs. 11, 12.
?,, *subirregularis*, D'Orbigny, 1849, Prod. Pal. t. i. p. 289.
,, ,, D'Orbigny, 1852, *op. cit.* p. 778.
,, *raripora*, *non* D'Orb., Walford, 1889, *op. cit.* p. 572, pl. xix. fig. 10.
,, *raripora* var. *anomala*, Walford, 1889, *op. cit.* p. 573.
Cisternifera clausa, Walford, 1894, Cheil. Lias, pt. ii. vol. L. p. 82, pl. vii. figs. 11, 17.
,, *inconstans*, *pars*, Walford, 1894, *ib.* pt. ii. vol. L. p. 80, pl. vii. fig. 16.

DIAGNOSIS:

Zoarium of thin, regularly cylindrical branches, composed of about twelve zoœcia. Branches from 1 to 2 mm. in diameter.

Zoœcia long, cylindrical, with only a small portion free. Apertures irregular in distribution; distant. Surface wrinkled.

DISTRIBUTION.

BRITISH:

Great Oolite: Murhead, near Bath.
Inferior Oolite: Shipton Gorge, Dorset.
Middle Lias: King's Sutton, Northamptonshire.

FOREIGN:

? Bajocian: Ste. Honoriné, Calvados.

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[1] *Clavisparsa clavata*, D'Orb., Pal. franç. Terr. crét. t. v. p. 776, pl. DCXXI. figs. 8-12.

Description of Figure.—Pl. VIII. Fig. 3. Part of zoarium, × 17 dia. Great Oolite: near Bath. Presented by J. W. Gregory. D. 2098.

Affinities.—This species appears to me to be very different from the *E. raripora*, D'Orb.,[1] which has very few zoœcia in a zoarium, and more highly raised peristomes. It is more nearly allied to a form figured as *E. raripora* by Beissel,[2] but the evidence is not sufficient to show their identity.

The species differs from *E. cellarioides*, Lamx., by the greater regularity of the branches and of the arrangement of the zoœcia; for *E. cellarioides*, as known from specimens, is closely allied to *E. raripora*. The species here described also differs from *E. nidulata*, owing to the greater length of the branches, which are regularly cylindrical and not clavate.

D'Orbigny's brief diagnosis of his *E. subirregularis* suggests that it is this species.

LIST OF SPECIMENS.

D. 2098. Fragment from Great Oolite, Murhead, near Bath. Figd. Pl. VIII. Fig. 3. Presented by J. W. Gregory.

D. 2099. Three slides of fragments, probably the same, but too rolled for determination, from same locality.

D. 2100. Mass of limestone from Murhead, with fragments of same species. Presented by A. M. Davies, Esq.

D. 2154. Middle Lias Marlstone. King's Sutton. Brodie Coll.

D. 2201. ,, ,, ,, ,, ,,

SPECIES INDETERMINABLE OR NOT REPRESENTED IN COLLECTION.

1. *Entalophora amphoralis* (Walford), 1894.

Syn. *Pergensia amphoralis*, Walford, 1894, Bry. Shipton, pt. ii.: *Quart. Journ. Geol. Soc.* vol. L. p. 75, pl. ii. figs. 5–8; pl. iii. figs. 21–4.

Distribution.—Inferior Oolite: Shipton, England.

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[1] Pal. franç. Terr. crét. t. v. p. 787, pl. DCXXI. figs. 1–3.

[2] Bry. Aach. Kreidebild.: *Natuurk. Verh. holl. Maatsch. Wet. Haarlem*, ser. 2, vol. xxii. 1865, pl. x. fig. 123.

2. *Entalophora calloviensis*, D'Orbigny, 1852.
,, ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 779.

Distribution.—Callovian: Pizieux, France. This species is probably an *Haplooecia.*

3. *Entalophora jugata* (Walford), 1894.
Syn. *Pergensia jugata*, Walford, 1894, *op. cit.* p. 76, pl. ii. figs. 9–11; pl. iv. figs. 6–15, 18–21.

Distribution.—Inferior Oolite: Shipton, England.

SPIROPORA, Lamouroux, 1821.

SYNONYMY:

Entalophora, pars, Hincks, Waters.
Pustulopora, Blainville.
Cricopora, Blainville.

Diagnosis.—Entalophoridæ in which the apertures of the zoœcia open in regular annular or spiral lines. The zoœcia are regularly cylindrical.

Type species.—*Spiropora elegans*, Lamx., 1821.

Affinities.—The reasons for the retention of this name is given in the discussion of the genus *Entalophora* (*vide* pp. 138–9).

1. Spiropora elegans, Lamouroux, 1821.

SYNONYMY:

Spiropora elegans, Lamouroux, 1821, Expos. Méth. p. 47, pl. lxxiii. figs. 19–22.
,, ,, Bronn, 1825, Pflanzenth. p. 21, pl. vi. fig. 3.
,, ,, Defrance, 1827, Dict. Sci. nat. t. L. p. 300, pl. xlv. fig. 1.
,, ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 317.
,, ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 707.
,, ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 194.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 132.
,, ,, E. E. Deslongchamps, 1865, Jur. inf. Norm.: *Mém. Soc. linn. Norm.* t. xiv. p. 151.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 265.
,, ,, Vine, 1888, Polyz. Caen: *Journ. Northptn. Nat. Hist. Soc.* vol. v. p. 11.
,, ,, Bigot, 1892, Géol. Basse-Norm. III.: *Bull. Lab. Géol. Caen*, Ann. 2, p. 24.

Cricopora elegans, Blainville, 1830, Dict. Sci. nat. t. lx. p. 385.
,, ,, Blainville, 1834, Man. Act. p. 421, pl. lxvii. fig. 1.
,, ,, M. Edwards, 1836, in Lamarck, Anim. s. Vert. éd. 2, t. ii. p. 453.
,, ,, Bronn, 1837, Leth. Geogn. ed. 2, Bd. i. p. 247.
,, ,, Michelin, 1846, Icon. Zooph. p. 234, pl. lv. fig. 13.
,, ,, Bronn, 1848, Nomencl. p. 348.
,, ,, Bronn, 1849, Enum. p. 140.
,, ,, Bronn and Römer, 1851, Leth. Geogn. ed. 3, Bd. ii. Th. 4, p. 89.

DIAGNOSIS:

Zoarium formed of loose tufts. Branches dichotomize repeatedly. Branches rather stout.

Zoœcia long, regularly tubular. Peristomes slightly elevated; arranged in regular, horizontal rows. From five to seven peristomes are seen on one side of a branch. The rows of peristomes are distant, the zoœcia being long.

DISTRIBUTION.

BRITISH:

Great Oolite: Bath; ? Richmond boring.

FOREIGN:

Bathonian—Calcaire à polypiers: Ranville, Langrune, Lebisey, Luc, in Calvados; Vassy, Yonne (*fide* Michelin).

Description of Figure.—Pl. VIII. Fig. 4. Part of a zoarium, × 17 dia. Great Oolite: near Bath. **60173.**

Affinities.—As this is the type species of the genus, it is unnecessary to refer to its affinities at any length. The species is common in the Great Oolite of Ranville, and its characters are constant. The regularity of the circles of peristomes and their distance from one another are constant throughout the zoarium. In the older parts of the zoarium the peristomal circles are closer than on the higher parts; the same is also the case just before a bifurcation.

The nearest Cretaceous ally to this species is *Spiropora antiqua*, D'Orb., especially the variety originally described as a distinct species under the name of *Cricopora annulata*, D'Orb.[1] D'Orbigny

[1] Pal. franç. Terr. crét. t. v. pl. DCXV. figs. 10–12.

has assigned a great range of variation to his species; if all his synonyms are to be included within one species, it varied far more than did its Jurassic representative. Marsson goes further than D'Orbigny, and reduces *S. antiqua* to a synonym of *S. verticillata*. The greater thinness of the tufts seems to characterize the Cretaceous specimens, and may enable this series to be kept distinct. Otherwise they must be included within *S. elegans*.

LIST OF SPECIMENS.

60173. Great Oolite. Near Bath. Etheridge Coll. Figd. Pl. VIII. Fig. 4.
?D. 1936. ,, ,, Richmond boring, 1205 ft. Presented by Prof. J. W. Judd, C.B., F.R.S. Small fragment, probably of this species.
60223. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll.
60295. ,, ,, ,, ,, ,,
B. 4516. (Six fragments.) Bathonian. ,, ,,
60227. (Illustrates variations in distances of peristomal circles.) Bathonian. Ranville. Tesson Coll.
46785, 60226. Bathonian. Ranville. Tesson Coll.
B. 179. ,, ,, Presented by B. Bright, Esq.
D. 2095. ,, Loc.?

2. Spiropora annulosa (Michelin), 1847.

SYNONYMY:

Cricopora annulosa, Michelin, 1847, Icon. Zooph. p. 339, pl. lvi. fig. 3.
,, ,, M'Coy, 1848, New Mesoz. Rad.: *Ann. Mag. Nat. Hist.* ser. 2, vol. ii. p. 419.
,, ,, M'Coy, 1854, Contrib. Brit. Pal. p. 66.
Spiropora ,, Gregory, 1896, Rev. pt. v.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 197.
Cricopora verticillata, *non* Goldf., Michelin, 1846, *op. cit.* p. 236, pl. lvi. fig. 3.
,, ,, *non* Goldf., Bronn, 1848, Nomencl. p. 348.
,, ,, *non* Goldf., Bronn, 1849, Enum. p. 140.
? ,, ,, *non* Goldf., Reuss, 1847, Foss. Polyp. Wien. Tert.: *Naturw. Abh.* Bd. ii. p. 40.
Laterotubigera ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 715.
Cricopora subverticillata, D'Orbigny, 1849, Prod. Pal. t. i. p. 318.
,, *tessonis*, Michelin, 1846, Icon. Zooph. p. 236, pl. lvi. fig. 6.
,, ,, M'Coy, 1848, New Mesoz. Rad.: *Ann. Mag. Nat. Hist.* ser. 2, vol. ii. p. 419.
,, ,, Bronn, 1848, Nomencl. p. 348.
,, ,, Bronn, 1849, Enum. p. 140.
,, ,, Buvignier, 1852, Stat. géol. dép. Meuse, p. 224.

Cricopora tessonis, M'Coy, 1854, Contrib. Brit. Pal. p. 66.
,, ,, Morris, 1854, Cat. Brit. Foss. ed. 2, p. 121.
Entalophora ,, D'Orbigny, 1849, *op. cit.* t. i. p. 318.
,, ,, D'Orbigny, 1852, *op. cit.* t. v. p. 779.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 134.
Spiropora ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 195.
,, ,, E. E. Deslongchamps, 1865, Jur. inf. Norm.: *Mém. Soc. linn. Norm.* t. xiv. p. 151.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 265.
,, ,, Schlippe, 1888, Fauna Bath. oberrh. Tiefl.: *Abh. geol. Specialk. Elsass-Loth.* Bd. iv livr. 4, p. 97.
,, *straminea*, *non* Phill., Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 196, pl. ix. fig. 6.
,, ,, Terquem, 1855, Pal. dép. Moselle, p. 26.
,, ,, Ferry, 1862, Bajoc. Maçon: *Mém. Soc. linn. Norm.* t. xii. p. 14.
,, ,, E. E. Deslongchamps, 1865, *op. cit.* p. 151.
,, ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 54.
Entalophora ,, Brauns, 1879, Bry. mittl. Jura Metz: *Zeit. deut. geol. Ges.* Bd. xxxi. p. 331.
Spiropora cæspitosa, *non* Lamx., Haime, 1854, *op. cit.* p. 195 (*ex. syn.*), pl. ix. fig. 7.
,, *compressa*, Haime, 1854, *op. cit.* p. 197, pl. ix. fig. 5.
,, ,, E. E. Deslongchamps, 1865, *op. cit.* p. 151.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 265.
Tubigera compressa, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 139.
Entalophora ,, Vine, 1888, Polyz. Caen: *Journ. Northptn. Nat. Hist. Soc.* vol. v. p. 10.
Cricopora acutimargo, Waagen, 1868, Zone *Amm. sowerbyi*: *Geogn. Pal. Beitr.* Bd. i. Ht. 3, p. 641, pl. xxxiii. fig. 7.

DIAGNOSIS:

Zoarium forming very loose tufts. Branches dichotomize irregularly; of medium thickness. Section of branches circular, oval, or compressed.

Zoœcia regularly cylindrical, rather short. Peristomes raised and arranged in regular rows; these are horizontal or slightly oblique. From five to seven peristomes can be seen on one side of a branch. The distance between the rows of peristomes is short.

DISTRIBUTION.

British :

Great Oolite : Skillington, Hampton, Minchinhampton.
Inferior Oolite : Bredon, Worcestershire ; Leckhampton.
Witchellia Grit : Cold Comfort, near Leckhampton.

Foreign :

Oxfordian : Montsec, Meuse (*fide* Buvignier).
Bathonian : Ranville, Luc, Lebisey.
Bajocian : Mt. Ceindre, near Lyon ; St. Quentin, Montvaux, near Metz.
Calcaire à entroques : Flacé, near Maçon.

Description of Figure.—Pl. VIII. Fig. 5. Part of a branch, × 26 dia. Inferior Oolite : Bredon Hill. Holl Coll. **B. 4864**.

Affinities.—This species was well figured by Michelin, who in his text named it *S. verticillata*, which was preoccupied by Goldfuss. He apparently discovered this, for he named the species in the description of the plates *S. annulosa*. This name has been overlooked, and *S. verticillata* generally employed.

The species agrees in most of its characters with *S. elegans*, from which it differs in the shortness of the zoœcia and the proximity of the peristomal rows. This is well shown in Michelin's figures and the Museum specimens. The shape of the branches varies considerably, and Haime's species *S. compressa* I regard as only a form with flattened branches. A certain tendency to irregularity in the arrangement of the orifices occurs at the points of bifurcation of the branches (as in B. M. **B. 4866**). *S. straminea*, Haime, *non* Phill., is here considered as such a case. Haime's specimen of *S. cæspitosa* I also include here, as it differs from the type form of that species, which is probably identical with *S. bajocensis*.

The species is most nearly allied to *S. cenomana*, D'Orb.,[1] which is, however, more massive and has more numerous zoœcia.

Reuss has referred to this species a specimen from the Tegel of the Vienna Basin, and his figure has all the essential characters of this species. It is also allied to *S. conferta*, Reuss.[2]

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[1] Pal. franç. Terr. crét. t. v. p. 708, pl. DCXV. figs. 1-9.

[2] A. E. Reuss, Pal. Stud. ält. Tertiärsch. Alpen : *Denk. k. Akad. Wiss. Wien.* Bd. xxix. 1869, p. 287, pl. xxxvi. fig. 3. Also Manzoni, Brioz. foss. Mioc. Aust. Ungh. pte. iii. : *ibid.* Bd. xxxviii. Abth. 2, 1878, p. 12, pl. x. fig. 39.

LIST OF SPECIMENS.

B. 2304. Great Oolite. Hampton Common.
D. 2101. Great Oolite Limestone. Skillington, Lincolnshire. Presented by J. W. Gregory.
D. 2102, D. 2104, D. 2108. 6 slides from Skillington, Lincolnshire. Presented by J. W. Gregory.
D. 2103. Var. *compressa.* Skillington, Lincolnshire. Presented by J. W. Gregory.
56829. Inferior Oolite. Near Leckhampton. Brodie Coll. Thin section.
B. 4864. ,, Bredon. Holl Coll. Figd. Pl. VIII. Fig. 5.
B. 4866. ,, ? ,, ? ,, [Specimen showing the irregularity of the form *straminea*, Haime (*non* Ph.), at bifurcations.]
D. 1772. Inferior Oolite—Upper *Witchellia* Grit. Cold Comfort, near Leckhampton.
D. 1770, D. 1771. Inferior Oolite—Lower *Witchellia* Grit. Cold Comfort, near Leckhampton.
B. 2228. Inferior Oolite. Loc. ? Specimen similar to **B. 4866.**
D. 2120-2, D. 2124, D. 2125. Inferior Oolite. Near Leckhampton. Brodie Coll.
D. 2123. Inferior Oolite. Cleeve. Brodie Coll.
56829. ,, Leckhampton. Etheridge Coll. (Specimen, slide and thin section.)
B. 2282. Inferior Oolite. Loc. ?
60224. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll. (With *E. cellarioides*, Lamx.)
B. 4522. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll.
B. 181. ,, ,, ,, ,, Pres. by B. Bright, Esq.
D. 2096. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll. Var. *compressa*, Haime.
60348. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll. Var. *compressa*, Haime.
D. 1776. Bathonian—Calcaire à polypiers. Ranville.
D. 1829. 4 specimens. Bathonian—Calcaire à polypiers. Normandy.
D. 1833, D. 1836. 3 specimens. Bathonian—Calcaire à polypiers. Normandy.
D. 1773. Couche à Bryozoaires. Mt. Ceindre, near Lyon.
? D. 1775. ,, ,, ,, ,,

3. Spiropora abbreviata (Michelin), 1846. Blainville MS. 1830.

SYNONYMY:

Cricopora abbreviata, Blainville, 1830, Dict. Sci. nat. t. lx. p. 386.
,, ,, Blainville, 1834, Man. Act. p. 421.
,, ,, Michelin, 1846, Icon. Zooph. p. 236, pl. lvi. fig. 2.
,, ,, Bronn, 1848, Nomencl. p. 348.
,, ,, Bronn, 1849, Enum. p. 140.

Entalophora abbreviata, D'Orbigny, 1849, Prod. Pal. t. i. p. 318.
,, ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 779.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 134.
Spiropora ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 195.
,, ,, E. E. Deslongchamps, 1865, Jur. inf. Norm.: *Mém. Soc. linn. Norm.* t. xiv. p. 151.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 265.
,, *deslongchampsi*, Ferry, 1862, Bajoc. Maçon: *Mém. Soc. linn. Norm.* t. xii. p. 13.
,, ,, Waagen, 1868, Zone *Amm. sowerbyi*: *Geogn. Pal. Beitr.* Bd. i. Ht. 3, p. 642.
Pustulopora arborea, Waagen, 1868, *ibid.* p. 640, pl. xxxii. fig. 8.
Spiropora ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 54.

Diagnosis:

Zoarium tufted; branches thick and short.

Zoœcia short. Peristomes well raised; quincuncially arranged, the series being oblique and close together.

DISTRIBUTION.

Bathonian: Ranville, Calvados.
Bajocian: near Maçon, Saône-et-Loire; Gingen, Würtemberg; Plappeville, near Metz.

Affinities.—This species is not represented in the British Museum, and I accept it on the evidence of Michelin's figure. It is allied to *S. cæspitosa*, Lamx., by the arrangement of the peristomes, but differs owing to the massiveness of its stems. It may be easily distinguished from *S. elegans*, Lamx., and *S. annulosa*, Mich., as the peristomes are not arranged in regular horizontal series.

This species is represented in the Cretaceous by *Spiropora brevissima* (D'Orb.),[1] which may be a synonym.

Ferry's *S. deslongchampsi* is shown by the description to have the same characters as this species, having thick stems (3 mm. in dia.), crowded rows of well-raised peristomes, and branching in the same manner.

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[1] Pal. franç. Terr. crét. t. v. p. 794, pl. dcxxv. figs. 5–10.

4. Spiropora cæspitosa, Lamx., 1821.

SYNONYMY:

Spiropora cæspitosa, Lamouroux, 1821, Expos. Méth. p. 86, pl. lxxxii. figs. 11, 12.
,, ,, Defrance, 1827, Dict. Sci. nat. t. L. p. 300.
non ,, ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France,* sér. 2, t. v. p. 195, pl. ix. fig. 7.
,, ,, Terquem, 1855, Pal. dép. Moselle, p. 26.
,, ,, E. E. Deslongchamps, 1865, Jur. inf. Norm.: *Mém. Soc. linn. Norm.* t. xiv. p. 151.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 260.
,, ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz,* sér. 2, t. vi. p. 54.
,, ,, Gregory, 1896, Rev. pt. v.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 197.
Cricopora ,, Blainville, 1830, Dict. Sci. nat. t. lx. p. 386.
,, ,, Blainville, 1834, Man. Act. p. 421.
,, ,, M. Edwards, 1836, in Lamarck, Anim. s. Vert. éd. 2, t. ii. p. 453.
,, ,, Bronn, 1837, Leth. Geogn. ed. 2, Bd. i. p. 247, pl. xvi. fig. 10.
,, ,, Morris, 1843, Cat. Brit. Foss. p. 34.
,, ,, Murchison, 1845, Geol. Cheltenham, ed. 2, p. 72.
,, ,, Michelin, 1846, Icon. Zooph. p. 235, pl. lvi. fig. 1.
,, ,, Bronn, 1848, Nomencl. p. 348.
,, ,, Bronn, 1849, Enum. p. 140.
,, ,, Bronn and Römer, 1851, Leth. Geogn. ed. 3, Bd. ii. Th. 4, p. 89, pl. xvi. fig. 10.
,, ,, Morris, 1854, Cat. Brit. Foss. ed. 2, p. 121.
Entalophora ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 318.
,, ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 779.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 134.
,, ,, Brauns, 1879, Bry. mittl. Jura Metz: *Zeit. deut. geol. Ges.* Bd. xxxi. p. 333.
,, ,, Vine, 1884, 4th Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1883, p. 188.
,, ,, Vine, 1888, Polyz. Caen and Ranville: *Journ. Northptn. Nat. Hist. Soc.* vol. v. p. 9.
Spiropora capillaris, Lamouroux, 1821, *op. cit.* p. 47.
Cricopora ,, Blainville, 1830, *op. cit.* p. 386.
,, ,, Blainville, 1834, *op. cit.* p. 421.
,, ,, M. Edwards, 1836, *op. cit.* ed. 2, t. ii. p. 453.
,, ,, Bronn, 1848, Nomencl. p. 348.
,, ,, Bronn, 1849, Enum. p. 140.
Intricaria bajocensis, Defrance, 1822, Dict. Sci. nat. t. xxiii. p. 546, pl. xlvi. fig. 1.

Intricaria	*bajocensis*,	Blainville, 1830, *ibid.* t. lx. p. 420.
,,	,,	Blainville, 1834, Man. Act. p. 456, pl. lxviii. fig. 1.
,,	,,	Bronn, 1835, Leth. Geogn. ed. 2, Bd. i. p. 242, pl. xvi. fig. 13.
,,	,,	M. Edwards, 1836, in Lamarck, Anim. s. Vert. éd. 2, t. ii. p. 195.
,,	,,	Murchison, 1845, Geol. Cheltenham, ed. 2, p. 72.
,,	,,	Michelin, 1846, Icon. Zooph. p. 231, pl. lvi. fig. 5.
,,	,,	Bronn, 1848, Nomencl. p. 613.
,,	,,	Bronn, 1849, Enum. p. 129.
,,	,,	D'Orbigny, 1849, Prod. Pal. t. i. p. 289.
,,	,,	Bronn and Römer, 1851, Leth. Geogn. ed. 3, Bd. ii. Th. 4, p. 84.
Spiropora	,,	Haime, 1854, *op. cit.* p. 196.
,,	,,	Ferry, 1862, Bajoc. Maçon, pt. i.: *Mém. Soc. linn. Norm.* t. xii. p. 42.
,,	,,	E. E. Deslongchamps, 1865, Jur. inf. Norm.: *ibid.* t. xiv. p. 151.
,,	,,	Vine, 1883, *op. cit.* p. 265.
,,	,,	Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 54.
Laterotubigera	,,	D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 715.
Entalophora	,,	D'Orbigny, 1852, *op. cit.* t. v. p. 779.
,,	,,	Pictet, 1857, *op. cit.* p. 134.
,,	,,	Vine, 1884, 4th Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1883, p. 188.
Pustulopora	*tenuis*,	Waagen, 1868, Zone *Amm. sowerbyi*: *Geogn. Pal. Beitr.* Bd. i. Ht. 3, p. 641.

DIAGNOSIS:

Zoarium growing in dense tufts of long, slender, cylindrical branches. These dichotomize repeatedly, and occasionally anastomose.

Zoœcia regularly cylindrical. Peristomes slightly raised. Three or four orifices seen on each side of a branch. Peristomal rows very oblique, and crowded, therefore giving the apertures an apparently quincuncial arrangement. At the ends of branches the peristomes are irregular and low (form *cæspitosa*, Lamx. and Mich., *non* Haime).

DISTRIBUTION.

BRITISH:

Forest Marble: Wiltshire.
Great Oolite: Hampton; Bradford, Wiltshire.
Inferior Oolite: Nutgrove, Cheltenham.

Foreign :

Bathonian: Ranville; Luc; Lebisey; Langrune; Marquise, near Boulogne.

Bajocian: Gorze, Plappeville, and St. Quentin, near Metz; St. Floxel, near Bayeux.

Calcaire à entroques: Maçon (*fide* Ferry).

Zone of *Sonninia sowerbyi*: Gingen, Würtemberg; Jungingen, Hohenzollern.

Description of Figure.—Pl. VIII. Fig. 6. Part of terminal branches, × 17 dia. Forest Marble: Wiltshire. Cunnington Coll. **24770**.

Affinities.—This species differs from *S. elegans*, Lamx., and *S. annulosa*, Mich., by having fewer zoœcia in the branches, and by having the peristomes arranged irregularly or obliquely, and not in horizontal rows. I include Michelin's *S. cæspitosa* here, as specimen **60231** shows both the type of that form and the normal, regular *S. bajocensis* (Defr.); but I exclude Haime's *S. cæspitosa*, as in that the branches are stouter and contain more zoœcia, and as the peristomes are on the type of *S. annulosa*, Mich., of which I regard it as a synonym. The *S. bajocensis* is an eroded form.

LIST OF SPECIMENS.

24770. Forest Marble. Wiltshire. Cunnington Coll.

60231. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll. Illustrates the normal form and that of *S. cæspitosa*, Mich.

60232. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll.

26243, B. 4564. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll.

5. Spiropora richmondiensis (Vine), 1884.

Synonymy :

Entalophora richmondiensis, Vine, 1884, Polyz. Richmond boring: *Quart. Journ. Geol. Soc.* vol. xl. p. 791, fig. 3.

,, ,, var., Walford, 1889, Bry. Shipton, pt. i.: *ibid.* vol. xlv. p. 571.

Spiropora ,, Gregory, 1896, Rev. pt. v.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 198.

Terebellaria? *increscens*, Vine, 1884, *op. cit.* p. 793, fig. 4.

Diagnosis :

Zoarium of thin, bifurcating stems, from 1 to 2 mm. in diameter.

Zoœcia numerous, in regular spirals. Below the points of bifurcation the rows of peristomes become less oblique, and rise to ten in number. Elsewhere seven or eight zoœcia can be seen in a single row across one face of the stem. Zoœcia are short and cylindrical; peristomes well raised.

Fig. 10.—Longitudinal section through half of zoarium of *Spiropora richmondiensis* (Vine), × 22 dia. Great Oolite: Richmond boring. **D. 1929.**

DISTRIBUTION.

Great Oolite: Richmond boring (1205 ft. deep).
Inferior Oolite: Dorset (*fide* Walford).

Description of Figure.—Pl. IX. Fig. 2. Part of Vine's type, × 17 dia. Great Oolite: Richmond boring. Presented by Prof. J. W. Judd, C.B., F.R.S. **D. 1935.**

Affinities.—This well-marked species resembles *E. cæspitosa*, Lamx., by the thinness of its branches, but from this it differs by the greater number of zoœcia in these, and consequently the greater number of apertures in a series. It differs from *S. elegans*, Lamx., and *S. annulosa*, Mich., by having the rows of apertures spiral instead of horizontal. It resembles *S. abbreviata* by the elevation of the peristomes and the closeness of the apertures. But in the Richmond species the branches are thinner, and the rows more regular: these seem to entitle it to a specific distinction; but it must be placed as a close ally of *S. abbreviata*.

LIST OF SPECIMENS.

D. 1935. Great Oolite. Richmond boring (1205 ft.). Vine's type. Figd. Pl. IX. Fig. 12.

D. 1897–8, D. 1907, D. 1929–30, D. 1932. Richmond boring (1205 ft.).

6. Spiropora tetragona, Lamx., 1821.

SYNONYMY :

Spiropora tetragona, Lamouroux, 1821, Expos. Méth. p. 85, pl. lxxxii. figs. 9, 10.
,, ,, Haime, 1854, Bry. jurass. : *Mém. Soc. géol. France*, sér. 2, t. v. p. 197.
,, ,, E. E. Deslongchamps, 1865, Jur. inf. Norm. : *Mém. Soc. linn. Norm.* t. xiv. p. 151.
,, ,, Gregory, 1896, Rev. pt. v. : *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 198.
Cricopora ,, Blainville, 1830, Dict. Sci. nat. t. lx. p. 386.
,, ,, Blainville, 1834, Man. Act. p. 421.
,, ,, M. Edwards, 1836, in Lamarck, Anim. s. Vert. éd. 2, t. ii. p. 453.
,, ,, Michelin, 1846, Icon. Zooph. p. 235, pl. lv. fig. 12.
,, ,, Bronn, 1848, Nomencl. p. 348.
,, ,, Bronn, 1849, Enum. p. 140.
,, ,, Huxley and Etheridge, 1865, Cat. Foss. M.P.G. p. 223.
Entalophora ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 318.
,, ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 779.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 134.
,, ,, Vine, 1888, Polyz. Caen: *Journ. Northptn. Nat. Hist. Soc.* vol. v. p. 10.
Spiropora tetraquetra, Lamouroux, 1821, *op. cit.* p. 47.
Cricopora ,, Bronn, 1837, Leth. Geogn. ed. 2, Bd. i. p. 247.
,, ,, Bronn and Römer, 1851, Leth. Geogn. ed. 3, Bd. ii. Th. 4, p. 90.
non Bisidmonea tetragona (Lamx.), Walford, 1889, Bry. Shipton, pt. i. : *Quart. Journ. Geol. Soc.* vol. xlv. p. 571, pl. xix. figs. 7–9.
,, *antiqua*, D'Orbigny, 1852, *op. cit.* p. 720, pl. DCCLXII. figs. 10–12.

DIAGNOSIS :

Zoarium composed of thick tetragonal stems, which dichotomize repeatedly, but irregularly; they form a loose tuft.

Zoœcia short. Peristomes slightly raised, arranged in alternate horizontal series (as in *Idmonea*). On each face of a stem there occur two rows of apertures, placed alternately on the left and right sides of the face. The distance between two rows on the same side is of medium length.

DISTRIBUTION.

BRITISH :

Inferior Oolite : ? Gloucestershire.

FOREIGN :

Bathonian : Ranville ; Luc ; Lebisey ; Langrune.

Description of Figure.—Pl. IX. Fig. 1. Part of a branch, × 8 dia. Inferior Oolite. Loc.? Presented by F. Harford, Esq. **B. 3829.**

Affinities.—This species may be readily distinguished from any Jurassic species by the Idmoniiform arrangement of the peristomes. It is the type species of *Bisidmonea* of D'Orbigny, and this may be worthy of recognition as a subgenus. But there is only the one species, and the Idmoniiform arrangement of the apertures is not constant throughout the whole zoarium in the Museum specimens.

LIST OF SPECIMENS.

B. 3829. Inferior Oolite. Loc.? Presented by F. Harford, Esq. Figd. Pl. IX. Fig. 1.

60212–3. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll.

B. 210. ,, ,, ,, ,, Pres. by B. Bright, Esq.

D. 2097. ,, ,, ,, ,, Tesson Coll.

SPECIES INDETERMINABLE OR NOT REPRESENTED IN COLLECTION.

1. *Spiropora diadema.*

Syn. *Cricopora diadema*, Huxley and Etheridge, 1865, Cat. Foss. M.P.G. p. 223.

Distribution.—Inferior Oolite: England.

2. *Spiropora liassica*, Tate, 1875.

Syn. *Spiropora liassica*, Tate, 1875: *Geol. Mag.* new ser. dec. 2, vol. ii. p. 205, fig. 1.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 260.
Entalophora ,, Vine, 1884, 4th Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1883, p. 188.

Distribution.—Lias: England.

3. *Spiropora sarthacensis* (D'Orbigny).

Syn. *Entalophora sarthacensis*, D'Orbigny, 1849, Prod. Pal. t. i. p. 289.
Clausa ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 894.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 140.
Spiropora ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 198.
? *Entalophora bajocina*, D'Orbigny, 1849, *op. cit.* t. i. p. 289.
? ,, ,, D'Orbigny, 1852, *op. cit.* t. v. p. 779.

? *Spiropora bessinensis*, Haime, 1854, *op. cit.* p. 198.
,, *bessina*, E. E. Deslongchamps, 1857, Syst. ool. inf. Calvados: *Bull. Soc. linn. Norm.* t. ii. p. 328.

Distribution.—Bajocian: France.

HAPLOŒCIA, Gregory.

From ἁπλους 'simple' and οἰκος 'a house.'

[Gregory, Rev. pt. v.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 199.]

SYNONYMY:

Cricopora, *pars*, Morris, *et auct.*
Entalophora, *pars*, D'Orbigny, *et auct.*
Melicertites, *pars*, Römer, *non* Pergens.
Escharites, *pars*, Hagenow.

Diagnosis.—Entalophoridæ in which the zoœcia are short, and angular in form. The peristomes are never greatly raised; the orifices are small; and they are arranged either lineally or quincuncially.

Type species.—*Haploœcia straminea* (Phillips), 1829.

Affinities.—The genus *Melicertites* was founded by Römer in 1840 for three species from the Cretaceous. Of these, the first was the *Ceriopora gracilis* of Goldfuss,[1] a species founded on a worn fragment, which is generically indeterminable. The species has, however, been accepted, and again figured by Römer[2] and Von Hagenow.[3] According to the former it is a Cheilostomatous form, closely allied with the typical species of his genus *Escharites*. Hagenow, impressed by this resemblance, merged the two genera; but his figures (notably 15*f* and 15*h*) show that his form is truly Cyclostomatous, and is probably a *Spiropora*. The type species must therefore be left quite uncertain, as the ultimate type is indeterminable, Römer's being Cheilostomatous, and Hagenow's being indistinguishable from *Spiropora*.

Römer's two other species are of a very different character, and both belong to the Entalophoridæ with hexagonal zoœcia and small apertures. His[4] figures of his *M. porosa*, and the third species,

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[1] Petref. Germ. p. 35, pl. x. fig. 11.
[2] Verst. norddeut. Kreidegeb. p. 18, pl. v. fig. 13.
[3] Bryoz. Maastr. Kreideb. 1851, p. 56, pl. i. figs. 15*a–h*.
[4] Römer. *Op. cit.* p. 18, pl. v. fig. 12.

M. römeri (Hag.),[1] are both typical members of this group. Reuss[2] has used the term in this sense, as has also Zittel.[3] It might be convenient to accept *Melicertites* for this group of species, in spite of the uncertainty as to the type form; but the confusion in which that genus is involved is inextricable; and as the genus was based on an erroneous interpretation of facts, it seems advisable to drop it. Pergens has recently used the term in another sense, and the one figure he gives of a member of this group appears to me to be that of a *Spiropora*.

The most important point to be determined in connection with this genus is whether the form and position of the apertures, on which the group of Melicertitina is based, are characters of any great value. Some allied species have been referred to the Cheilostomata, while Pergens places them in a distinct group of Cyclostomata. In the first place, in regard to the lateral position of the aperture: this does not seem to me a point of more than generic value, even if it be always worthy of recognition to that extent. In some species of *Stomatopora*, such as *Stomatopora dichotoma*, Lamx. (see Pl. I. Fig. 2), the aperture is as truly lateral and as restricted in size as it is in many of the Bryozoa referred to the *Melicertites* group. The form of the aperture appears to be due to the oblique truncation of the raised peristomes.

In order to illustrate this point, two figures are given of different parts of the same zoarium of a specimen from Ranville: Fig. 11*a*

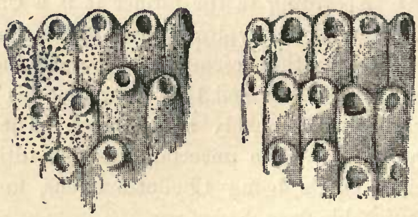

Fig. 11.—Two parts of one zoarium of *Haploœcia straminea* (Phil.), × 10 dia. Calcaire à polypiers: Ranville. **B. 4566.** Showing worn and unworn conditions.

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[1] *Ceriopora römeri*, Hagenow, Mon. Rug. Kreide-Verst.: *Neues Jahrb.* (1839), p. 285, pl. v. fig. 7.

[2] In Geinitz. Das Elbthalgebirge in Sachsen. Th. 1, pt. iv. Palæont. Bd. xx. Th. 1, p. 120.

[3] Handb. Palæont. Bd. i. Lf. 4 (1880), p. 606.

is a normal *Haplowcia straminea*; Fig. 11*b* is a worn fragment, where the apertures are triangular.

1. Haploœcia straminea (Phillips), 1829.

SYNONYMY:

Millepora straminea, Phillips, 1829, Geol. Yorks. pt. i. pp. 144, 149, pl. ix. fig. 1.
,, ,, Bean, 1839, Cat. Foss. Cornbr. Scarb.: *Mag. Nat. Hist.* ser. 2, vol. iii. p. 58.
,, ,, Buvignier, 1852, Stat. géol. dép. Meuse, p. 184.
,, ,, Quenstedt, 1858, Der Jura, p. 368, pl. lx. fig. 3.
Haploœcia ,, Gregory, 1896, Rev. pt. v.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 199.
Cricopora ,, Morris, 1843, Cat. Brit. Foss. p. 34.
,, ,, Bronn, 1848, Nomencl. p. 348.
,, ,, Bronn, 1849, Enum. p. 140.
,, ,, Morris, 1854, Cat. Brit. Foss. ed. 2, p. 121.
,, ,, Huxley and Etheridge, 1865, Cat. Coll. Foss. M.P.G. p. 228.
,, ,, Phillips, 1871, Geol. Oxford, p. 239.
,, ,, Hudleston, 1874, Yorks. Ool.: *Proc. Geol. Assoc.* vol. iii. p. 309.
,, ,, Keeping and Middlemiss, 1883, Sections at Cave: *Geol. Mag.* 1883, p. 216.
non Intricaria ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 289.
non Laterotubigera straminea, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 715.
Entalophora straminea, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 779.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 134.
,, ,, Vine, 1884, 4th Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1883, p. 188.
,, ,, Fox-Strangways, 1892, Jurass. Rks. Britain, Yorks. vol. ii. p. 148.
non Spiropora ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 196, pl. ix. fig. 6.
,, ,, Wright, 1860, Subdiv. Inf. Ool.: *Quart. Journ. Geol. Soc.* vol. xvi. pp. 12, 28.
,, ,, Judd, 1875, Geol. Rutland, p. 277.
,, ,, Witchell, 1882, Geol. Stroud, p. 48.
,, ,, Walford, 1883, Relation Northptn. Sd.: *Quart. Journ. Geol. Soc.* vol. xxxix. pp. 227, 239.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 260.
Pustulopora ,, Gregory, 1893, Cat. Jur. Bry. York Mus.: *Rep. Yorks. Phil. Soc.* 1893, p. 60, fig. 2.
Melicertites rhomboidalis, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 617.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 122.

Pustulopora quenstedti, Waagen, 1868, Zone *Amm. sowerbyi*: *Geogn. Pal. Beitr.* Bd. i. Ht. 3, p. 641, pl. xxxii. fig. 10.
,, ,, Lepsius, 1875, Beitr. Juraf. Unter-Elsass, p. 28.
,, ,, Branco, 1879, Unt. Dogger Deut. Loth.: *Abh. geol. Specialk. Elsass-Loth.* Bd. ii. Ht. 1, p. 154.

DIAGNOSIS:

Zoarium tufted, loose, and irregular. Branches of medium thickness.

Zoœcia in regular, horizontal, closely adjoining series. Usually hexagonal and bisymmetrical, but variations in growth pressure render some irregularly polygonal. Aperture transversely elliptical. Peristomal area slightly raised. Front wall punctate.

DISTRIBUTION.

BRITISH:

Cornbrash: Islip (*fide* Phillips).
Forest Marble: Islip (*fide* Phillips).
Bathonian—Millepore Limestone: Gristhorpe, Lyon's Nab, Westow, etc.
Inferior Oolite: loc. ? Holl Coll.; near Stroud (*fide* Witchell); Coombe Hill, near Banbury.

FOREIGN:

Bathonian: Ranville, Calvados.
Bajocian—Zone of *Sonninia sowerbyi*: Elsass.
Zone of *Harpoceras humphriesianus*: Mietesheim, Elsass.

Affinities.—This species was figured so imperfectly by Phillips, that it has been variously interpreted by foreign authors. The figure (No. 12), from a specimen in the York Museum, shows its

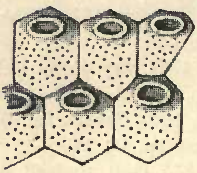

FIG. 12.—Part of zoarium of type specimen of *Haploœcia straminea* (Phil.). York Museum.

hexagonal zoœcia and small orifices. Haime has referred to this species a specimen which is here regarded as a *Spiropora annulosa*, Mich.

The figures (Fig. 11, p. 158) from a specimen from Ranville show the typical characters of this species, and also the varying aspect presented by the branches when eroded. The greater width of the apertures in the specimen figured in the Catalogue of the Bryozoa of the York Museum (Fig. 12), is due to the wearing away of the raised peristomes.

LIST OF SPECIMENS.

D. 750. Millepore Limestone. Near Scarboro'. Bean Coll.
D. 751. ,, ,, ,, ,,
B. 4875. Inferior Oolite. Loc. ? Holl Coll.
B. 4566. Bathonian—Calcaire à polypiers. Ranville. Fig. 11, p. 158.
B. 4867. Lower Oolite. France? Mantell Coll.
D. 2109. Millepore Limestone. Gristhorpe. Presented by J. W. Gregory (a slide with three specimens, of which one shows the zoœcial characters).
D. 2202. In block of limestone. Millepore Limestone. Gristhorpe. Brodie Coll.
D. 2203. In pieces of limestone. ,, ,, ,, ,,
D. 2204. Fragments and slide. ,, ,, ,, ,,
D. 2191. Inferior Oolite. Near Leckhampton. Brodie Coll.

2. Haplooecia irregulare, Gregory, 1896.

[Rev. pt. v.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 200.]

DIAGNOSIS:

Zoarium composed of small, cylindrical stems, which dichotomize irregularly, and usually at short intervals.

Zoœcia usually hexagonal, but occasionally heptagonal or pentagonal; often irregular. Zoœcia irregularly quincuncial in arrangement. Apertures large, circular (or, when worn, transversely elongate). Front wall coarsely punctate.

DISTRIBUTION.

BRITISH:

Great Oolite: Ancliff, near Bath.
Lincolnshire Limestone: Stamford.

FOREIGN:

Bathonian: Normandy.

Description of Figure.—Pl. IX. Fig. 3. Fragment, × 24 dia. Lincolnshire Limestone: Stamford. S. Sharpe Coll. **D. 44.**

Affinities.—This species is separated from the former one by the irregularly quincuncial arrangement of the zoœcia.

LIST OF SPECIMENS.

D. 27–9. Great Oolite. Ancliff, near Bath. Daniells Coll.
D. 40. ,, ,, ,, Cunnington Coll.
D. 44–7. Lincolnshire Limestone. Stamford. S. Sharpe Coll. Figd. Pl. IX. Fig. 3.
D. 1830. Bathonian. Normandy.
D. 2228. Great Oolite Limestone. Skillington. Presented by J. W. Gregory.
D. 2181. ,, ,, ,, Hampton, near Bath. Brodie Coll.

INDETERMINABLE RECORD.

Haplœcia? bathonica (D'Orbigny).
Syn. *Melicertites bathonica,* D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 617.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 122.

Distribution.—Bathonian: Calvados, France.

CERIOCAVA, D'Orbigny.

Synonymy:

Ceriopora, pars, Goldfuss, *et auct.*
Cava, pars, D'Orbigny.
Nodicava, pars, D'Orbigny.
Reptomulticava, pars, D'Orbigny.
Reptonodicava, D'Orbigny.

Diagnosis.—Entalophoridæ in which the zoarium consists of thick, massive stems, each of which is composed of a large number of zoœcia. The zoœcia are funnel-shaped. The apertures crowded; the peristomes flush. The axis of the zoarium consists of fine zoœcia, densely packed. The outer zone consists of zoœcia which are usually reflexed and of much greater diameter.

Type species.[1]—*Ceriocava corymbosa* (Lamouroux), 1821.

Affinities.—This genus includes a series of erect, thick, dendroid bryozoa, usually included in *Ceriopora.* The latter genus, however, must be taken as defined by Blainville; and thus the Cretaceous *C. micropora,* Goldf., is the type. This species is a massive form,

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[1] D'Orbigny does not mention any species as typical. He included thirteen species in the genus. I therefore take the first recognizable species in his list, as it is the oldest and best known.

with short zoœcia and abundant diaphragms, and is here placed among the Trepostomata.

Microscopic study of the branching forms shows that they are of much the same type as the thicker species of *Entalophora* and *Spiropora.* Comparison of Fig. 10 with Fig. 13 shows that the zoœcia are fundamentally the same, and are arranged on the same plan. Hence these massive branching forms must be included in the Entalophoridæ. Their thick, irregularly branching habit enables them to be readily separated from either *Entalophora* or *Spiropora*, even when the external layer and the peristomes are not shown.

The genus differs from *Entalophora*, as in the latter there is no separation into a central axis of narrow tubes, and a peripheral zone of broader tubes.

1. **Ceriocava corymbosa** (Lamouroux), 1821.

Millepora corymbosa, Lamouroux, 1821, Expos. Méth. p. 87, pl. lxxxiii. figs. 8, 9.
non Ceriopora ,, Michelin, 1846, Icon. Zooph. p. 246, pl. lvii. fig. 9.
non ,, ,, Bronn, 1848, Nomencl. p. 261.
non ,, ,, Bronn, 1849, Enum. p. 143.
,, ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 323.
Ceriocava ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 1016.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 157.
,, ,, Gregory, 1896, Rev. pt. v.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 200.
Heteropora ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 212.
Ceriopora neptuni, D'Orbigny, 1849, *op. cit.* p. 324.
Ceriocava ,, D'Orbigny, 1852, *op. cit.* p. 1016.
Ceriopora conifera (*non* Lamx.), Michelin, 1846, *op. cit.* p. 245, pl. lvii. fig. 8.
,, ,, (*non* Lamx.), Bronn, 1848, Nomencl. p. 261.
,, ,, (*non* Lamx.), Bronn, 1849, Enum. p. 143.
,, *dumetosa*, Michelin, 1846, *op. cit.* p. 245, pl. lvii. fig. 7.
,, ,, Bronn, 1848, Nomencl. p. 261.
,, ,, Bronn, 1849, Enum. p. 143.
,, ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 323.
Cava ,, D'Orbigny, 1852, *op. cit.* t. v. p. 1019.
,, ,, Pictet, 1857, *op. cit.* p. 157.
Ceriopora pustulosa, Michelin, 1846, Icon. Zooph. p. 245, pl. lvii. fig. 6.
,, ,, M'Coy, 1848, New Mesoz. Rad.: *Ann. Mag. Nat. Hist.* ser. 2, vol. ii. p. 418.
,, ,, Bronn, 1848, Nomencl. p. 143.
,, ,, Bronn, 1849, Enum. p. 261.

Ceriopora pustulosa, M'Coy, 1854, Contrib. Brit. Pal. p. 66.
,, ,, Morris, 1854, Cat. Brit. Foss. ed. 2, p. 120.
,, ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 59.
Monticulipora ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 323.
Nodicava ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 1014.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 159.
Heteropora ,, *pars*, Brauns, 1879, Bry. mittl. Jura Metz: *Zeit. deut. geol. Ges.* Bd. xxxi. p. 336.

Diagnosis:

Zoarium dendroid, erect; growing in thick, solid branches, which anastomose occasionally. The branches are regularly cylindrical or compressed (form *dumetosa*). The surface is level, or raised into pustules (var. *pustulata*).

Zoœcia thin-walled; diaphragms numerous. Aborted zoœcia scattered irregularly through the zoarium.

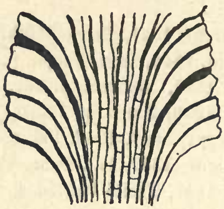

Fig. 13.—Longitudinal section of zoarium of *Ceriocava corymbosa* (Lamx.) to show central axis and marginal zoœcia. × 10 dia. Bathonian—Calcaire à polypiers: Ranville. **60233.**

DISTRIBUTION.

England:

Cornbrash: Thornboro', Bucks.
Great Oolite: Bath.

Foreign:

Bathonian—Calcaire à polypiers: Ranville and Bernières, in Calvados.

LIST OF SPECIMENS.

D. 2149. Cornbrash. Thornboro', Bucks. Brodie Coll.

? D. 33, D. 39. Fragments on slides. Great Oolite. Ancliff, Bath. Cunnington Coll.

D. 2264. Bathonian. Loc. ? Holl Coll.

60233.	Var. *dumetosa*, Mich., *non* Lamx. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll. Section. Fig. No. 13, p. 164.
B. 181.	Specimen and section. Bathonian—Calcaire à polypiers. Ranville. Presented by B. Bright, Esq.
60211.	Specimen, section, and fragment on slide. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll.
D. 2238.	Specimen and section. Bathonian—Calcaire à polypiers. Ranville.
B. 4526.	Var. *pustulosa*, with section. Bathonian—Calcaire à polypiers. Tesson Coll.
60230.	Bathonian—Calcaire à polypiers. Ranville. Tesson Coll.
D. 2241.	,, ,, ,, ,,
D. 2229.	,, ,, ,, ,,
D. 2234.	,, ,, ,, Pres. by B. Bright, Esq.
D. 2230.	,, ,, Bernières, Calvados.
D. 2261.	Fragment on slide. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll.

YOUNG ZOARIA, THE *Reptonodicava* OF D'ORBIGNY.

B. 4870.	Inferior Oolite. Bredon. Holl Coll.
B. 4869.	,, Loc. ?
D. 17.	On *Aulacothyris carinata* (Lam.). Inferior Oolite. Crickley.
67667.	On *Rhynchonella obsoleta*, Sow. Bradford Clay. Bradford.

2. Ceriocava laxata, Gregory, 1896.

SYNONYMY:

Ceriocava laxata, Gregory, 1896, Rev. pt. vi.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 201.

Diagnosis.—Zoarium with branches fairly regularly cylindrical. Peristomes irregular in shape, size, and arrangement. Number of zoœcia in a branch comparatively limited. Those of the central axis few, and forming a rather loose bundle.

FIG. 14.—Longitudinal section of zoarium of *Ceriocava laxata*, Greg. × 12 dia. Inferior Oolite: Leckhampton. **51130.**

Distribution.—Inferior Oolite: Leckhampton.

Description of Figures.—Pl. X. Fig. 6. Part of a zoarium showing worn and unworn conditions, × 12 dia. Inferior Oolite: Leckhampton. **51130.** Fig. 14. Longitudinal section through part of the same, × 12 dia.

Affinities.—This species is most nearly allied to *Ceriocava corymbosa* (Lamx.). The differences can be clearly seen when a longitudinal section is examined. The central axis has far fewer zoœcia, and these are not so tightly packed. It is not easy to separate the specimens of the two species by the external characters, but the regularity of the apertures in *C. corymbosa* enables this to be done. A comparison of Fig. 13 and Fig. 14 shows the difference between the two species.

SPECIMEN.

51130. Specimen and section. Inferior Oolite. Leckhampton. Figd. Pl. X. Fig. 6; and Fig. 14, p. 165.

Family FASCIGERIDÆ, D'Orbigny.

SYNONYMY:

Fascigeridæ, *pars*, D'Orbigny.
Theonoidæ, *pars*, Busk.
Cerioporidæ, *pars*, Busk.
Cerioporina, *pars*, Hagenow.
Frondiporidæ, Smith, Busk, MacGillivray.
Corymboporidæ, Smith.
Fascip oridæ, Pergens and Meunier.

Diagnosis.—Cyclostomata Tubulata in which the zoœcia are simple, open tubes. These arise from a small cupuliform or discoid base (the *Pelagia* or *Defrancia* stage). The zoœcia are monomorphic and greatly elongate. The zoarium consists of tufts, and the apertures all occur at the ends of the tufts.

Affinities.—As its name implies, this family consists of Bryozoa of which the zoœcia are grouped in tufts. It differs from the Osculiporidæ by the fact that the apertures are always at the ends of the tufts, instead of in clusters along them. It differs from the Theonoidæ by having the zoœcia in more or less disconnected tufts instead of upon the summits of fairly regular, continuous ridges.

The most primitive genus in the family has a small funnel-shaped zoarium. The first advance consists in the upward growth of the zoœcia into stem-like branches (*Fasciculipora*). In the next stage these stems grow into tufts, which may become so crowded as to form hemispherical masses (*Apsendesia*). In another type the zoarium consists of irregular, encrusting, branching ridges.

FASCICULIPORA, D'Orbigny,[1] 1846.

Diagnosis.—Fascigeridæ in which the zoarium consists of long, tubular zoœcia, grouped into bundles which branch irregularly. These form a loose, open, tufted zoarium, for the bundles are not connected by platforms, nor do they anastomose. The apertures are at the ends of the branches, and never on the sides, and occur in isolated groups.

Type species.—*F. ramosa*, D'Orbigny, 1839–1846.

Affinities.—This genus differs from *Apsendesia* by having the tufts of zoœcia free, instead of grouped into masses. The open, tufted form of the zoarium distinguishes it from *Fascicularia* (*Macandropora*, D'Orb.), as it has no platforms, and the branches do not unite into a dense, massive zoarium. The absence of groups of apertures on the sides of branches distinguishes it from *Cyrtopora.*

Fasciculipora waltoni, Haime.

SYNONYMY:

Fasciculipora waltoni, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 200, pl. x. fig. 4.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 127.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, pp. 262, 265.
,, ,, Woods, 1891, Cat. Type Foss. Woodw. Mus. p. 46.
,, ,, Gregory, 1896, Rev. pt. vi.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 287.

[1] D'Orbigny. Voyage dans l'Amérique Méridionale, t. v. pt. iv. Zooph. plates, 1839; text, 1846, p. 20.

Diagnosis.—The branches of the zoarium each contain about 30 zoœcia. The branches are marked externally by longitudinal ridges. The branching is irregular.

Distribution.—Great Oolite: Hampton, near Bath.

Affinities.—This species is not represented in the British Museum, and the only known specimen is in the Walton Collection at Cambridge. Fragments of *Apsendesia* might be mistaken for it, but Haime's figure 4*a* seems sufficient to show that the specimen on which he founded the species is a true *Fasciculipora,* and not a broken fragment of *Apsendesia.*

APSENDESIA,[1] Lamouroux, 1821.

[Lamouroux, Expos. Méth. p. 81. The name is spelt *Apseudesia* by some authors.]

SYNONYMY:

Pelagia, Lamouroux.
Defrancia, pars, Bronn.
Discotubigera, D'Orbigny.

Diagnosis.—Fascigeridæ in which the zoarium rises from a cup-shaped disc. The bundles of zoœcia in the adult are long, and are grouped into long, irregularly sinuous series. There are no platforms. The zoœcia all open upon the summits of the ridges, and never upon their sides. The under side of the zoarium is covered by an epitheca.

Type species.—*A. cristata*, Lamouroux.

Affinities.—This genus differs from *Fasciculipora,* D'Orb., by the branches being densely crowded, so that the zoarium is massive; the groups of apertures occur in long, irregular series, and not completely isolated. It differs from *Fascicularia,* M. Edw., by the absence of platforms or lateral anastomoses, so that the zoarium is open. The fact that the zoœcia all open on the surface of the zoarium, separates it from *Cyrtopora,* D'Orb., and its allies.

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[1] The spelling of this name is accepted as Lamouroux wrote it. Blainville, Agassiz, Bronn, and Römer have corrected it to *Apseudesia*, regarding the original spelling as only a misprint. Bronn and Römer, however, admit (Leth. Geogn. 1851, ed. 3, Bd. ii. p. 94) that though this alteration gives the word a possible etymology, it does not give it a meaning when applied to this genus. It seems therefore advisable to accept *Apsendesia* as a senseless name.

1. Apsendesia cristata, Lamouroux, 1821.

SYNONYMY:

Apsendesia cristata, Lamouroux, 1821, Expos. Méth. p. 82, pl. lxxx. figs. 12–14.
,, ,, Bronn, 1825, Pflanzenth. p. 18, pl. v. fig. 7.
,, ,, Defrance, 1826, Dict. Sci. nat. t. xlii. p. 391, pl. xliii. fig. 3.
,, ,, Blainville, 1834, Man. Act. p. 409, pl. lxv. fig. 3.
,, ,, M. Edwards, 1836, in Lamarck, Hist. Nat. Anim. s. Vert. éd. 2, t. ii. p. 290.
,, ,, Bronn, 1837, Leth. Geogn. ed. 2, Bd. i. p. 248, pl. xv. fig. 7.
,, ,, Morris, 1843, Cat. Brit. Foss. p. 30.
,, ,, Michelin, 1846, Icon. Zooph. p. 230, pl. lv. fig. 5.
,, ,, Bronn, 1848, Nomencl. p. 88.
,, ,, Bronn, 1849, Enum. p. 145.
,, ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 318.
,, ,, Bronn and Römer, 1851, Leth. Geogn. ed. 3, Bd. ii. Th. 4, p. 94, pl. xv. fig. 7.
,, ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 683.
,, ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 201, pl. vii. figs. 6*a–k*.
,, ,, Morris, 1854, *op. cit.* ed. 2, p. 119.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 129, pl. xci. fig. 5.
,, ,, E. E. Deslongchamps, 1865, Jur. inf. Norm.: *Mém. Soc. linn. Norm.* t. xiv. p. 151.
,, ,, Brauns, 1879, Bry. mittl. Jura Metz: *Zeit. deut. geol. Ges.* Bd. xxxi. p. 318.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 265.
,, ,, Woods, 1891, Cat. Type Foss. Woodw. Mus. p. 45.
,, ,, Bigot, 1892, Esq. géol. Basse-Norm.: *Bull. Lab. Géol. Caen*, Ann. 2, p. 24.
,, ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 55.
,, ,, Gregory, 1896, Rev. pt. vi.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 288.
Discotubigera ,, Vine, 1888, Polyz. Caen: *Journ. Northptn. Nat. Hist. Soc.* vol. v. p. 19.
Apsendesia clypeata, E. E. Deslongchamps, 1865, *op. cit.* p. 151.
,, ,, Brauns, 1879, *op. cit.* p. 319.
,, ,, Vine, 1883, *op. cit.* p. 265.
,, ,, Walford, 1883, Relations Northptn. Sd.: *Quart. Journ. Geol. Soc.* vol. xxxix. p. 239.
Pelagia ,, D'Orbigny, 1849, *op. cit.* t. i. p. 317.
Discotubigera ,, Vine, 1888, *op. cit.* p. 19.
Defrancia ,, Bronn, 1848, Nomencl. p. 405.
,, ,, Bronn, 1849, Enum. p. 145.

Defrancia clypeata, Bronn and Römer, 1851, *op. cit.* ed. 3, Bd. ii. Th. 4, p. 94, pl. xvi. fig. 18.
" " Pictet, 1857, *op. cit.* p. 129.

Diagnosis.—Zoarium small, dense, and hemispherical. It grows from a low, funnel-shaped, central disc; from this arise the radiating bundles, which unite into irregular, twisted laminæ. The apertures occur in series, or in isolated teeth.

DISTRIBUTION.

ENGLAND:
- Forest Marble: Wiltshire.
- Bradford Clay: Bradford.
- Great Oolite: Burford; Bath.
- Inferior Oolite: near Leckhampton; Coombe Hill (*fide* Walford).

FOREIGN:
- Bathonian: Ranville, Lebisey, and Luc, Calvados; Marquise, near Boulogne.
- Bajocian: Montvaux, near Metz; Les Moutiers.

Description of Figures.—Pl. IX. Fig. 4. Part of a zoarium, × 6 dia., showing the Fasciculiporoidal appearance of the individual tufts, and their serial arrangement. Forest Marble: Wiltshire. Cunnington Coll. **24770**. Pl. IX. Fig. 5. A young zoarium in the *Defrancia* stage, × 5 dia. Great Oolite: Burford, Wiltshire. **38596**.

Affinities.—This is the type species of the genus. Its nearest ally is a Neocomian species, *Apsendesia neocomiensis*, D'Orb.[1]; this differs from it by the elongate, ovoid shape of the zoarium, and by having most of the apertures in regular, isolated bundles, though these are in places connected by bands formed of series.

The main problem in connection with this species is whether the Bryozoa which Lamouroux described under the names *Apsendesia cristata* and *Pelagia clypeata* belong to the same species, and even to the same genus. Most authors have accepted them as distinct, and Bronn substituted the name *Defrancia* for *Pelagia* owing to the prior use of the latter by Peron. Haime, however, merged the two genera, in spite of their striking differences of form. There is fortunately a good series of specimens in the

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[1] D'Orbigny. Prod. Pal. t. ii. p. 87; Pal. franç. Terr. crét. t. v. p. 683, pl. DCCXLIII. figs. 12–14.

Cambridge Museum, and these leave no doubt as to the correctness of Haime's conclusion. Haime, however, kept the species distinct, apparently regarding those in which the radial crests do not reach the centre of the zoarium, as the young of another species. Six specimens in the Museum collection (**D. 2227**) show that this distinction does not hold, and that therefore the *Pelagia clypeata* of Lamouroux is the young stage of *Apsendesia cristata.*

LIST OF SPECIMENS.

24770.	Forest Marble. Wiltshire. Cunnington Coll. Figd. Pl. IX. Fig. 4.
D. 23.	Bradford Clay. Bradford, Wilts.
D. 1761.	Great Oolite. Bath. Gray Coll.
38596.	The *Defrancia* stage. Great Oolite. Burford, Wilts. J. Wood Coll. Figd. Pl. IX. Fig. 5.
D. 2185.	Inferior Oolite. Near Leckhampton. Brodie Coll.
D. 2206.	,, ,, ,, ,,
D. 2227.	The *Defrancia* stage. Bathonian. Ranville. Tesson Coll.
D. 2118.	Just beyond the *Defrancia* stage. Bathonian. Ranville. Tesson Coll.
D. 2226.	Bathonian. Ranville. Tesson Coll.
60369.	With *Entalophora cellarioides*, etc. Bathonian. Ranville. Tesson Coll.
60364.	Bajocian. Les Moutiers, Vienne. Tesson Coll.

2. **Apsendesia parvecristata** (Waagen), 1868.

Synonymy:

Theonoa? parvecristata, Waagen, 1868, Zone *Amm. sowerbyi*: *Geogn. Pal. Beitr.* Bd. i. Ht. 3, p. 613, pl. xxxii. fig. 11.

Diagnosis.—Zoarium massive, encrusting. The zoœcia open in small groups, each of about three or four zoœcia in number. These are irregularly arranged.

DISTRIBUTION.

Foreign:

Bajocian—Zone of *Sonninia sowerbyi*: Gingen, Würtemberg.
? ,, ,, ,, Flacé, near Maçon.

Affinities.—This species is characterized by the small, irregularly distributed groups of zoœcia, which at once distinguish it from all the Jurassic species. It is not represented in the British Museum Collection.

Family OSCULIPORIDÆ.

SYNONYMY:

Osculiporidæ, Marsson.
Fasciculiporidæ, Pergens and Meunier.
Fascigeridæ, *pars*, D'Orbigny.

Diagnosis. — Cyclostomata Tubulata in which the zoœcia are simple, elongate, open tubes, which pass (? always) through a *Defrancia* stage. The zoœcia are monomorphic and very long. They are grouped into stems. The apertures open in clusters at intervals along the stem.

Affinities.—This family is allied to the Fascigeridæ and the Theonoidæ. It differs from the former by having clusters of apertures at intervals along the stems, instead of having them all terminal in position. It differs from the latter by having the apertures in clusters, instead of along ridges.

The family contains many important Cretaceous genera, such as *Desmeopora*, *Osculipora*, and *Cyrtopora*. The only Jurassic Bryozoan which appears to be referable to this family is a fragment figured by Quenstedt. His figure is clear, but the magnification is low, and I feel doubtful about accepting it. Nevertheless, if the figure is to be trusted, the specimen is certainly an Osculiporoid Bryozoan.

TETRAPORA, Quenstedt, 1858.

This generic name was used without diagnosis for the following species:—

Tetrapora suevica, Quenstedt.

SYNONYMY:

Tetrapora suevica, Quenstedt, 1858, Der Jura, p. 666, pl. lxxxi. figs. 77–8.

Distribution.—Weisser Jura, γ: Bollert, Würtemberg.

Family THEONOIDÆ, Busk, emended.

SYNONYMY:

Theonoidæ, *pars*, Busk.
Radioporidæ, *pars*, Marsson.
Tubigeridæ, *pars*, D'Orbigny.

Diagnosis. — Cyclostomata Tubulata in which the zoœcia are simple, short, open tubes. They pass through a *Defrancia* stage (? always). The zoœcia are monomorphic. The apertures occur along raised ridges.

Affinities.—This family is here accepted for a series of forms which have the apertures occurring along raised ridges, instead of in disconnected tufts, as in the Fascigeridæ. The character of the young zoœcia (as in **B. 2295**) shows that the zoarium of *Theonoa* begins with typical, Tubulate zoœcia; while D'Orbigny's[1] figure of a member of this group shows that it passes through an *Apsendesia* stage. The simplest form of the zoarium is a flat, adnate disc, which agrees with *Lichenopora*, except for the absence of cancelli: that this form arises from a *Defrancia* larva cannot be proved; but Haime's figure of *Actinopora phillipsi*, with its central depression and its radiating ridges, presents such a striking resemblance to the *Pelagia* or *Defrancia* stage of *Apsendesia cristata*, Lamx., that this is highly probable. To produce *Actinopora* from "*Pelagia clypeata*," we have only to thicken the epitheca so as to give the zoarium an attached habit, and then allow of the formation of the peripheral selvage by further growth.

In the Theonoidæ as here defined, *Actinopora* is the primitive form. The first advance from this is a compound zoarium of many Actinoporoid discs growing into an encrusting sheet. This is the genus *Kololophos.* By a further development, erect, frondose zoaria are produced—the genus *Theonoa.* Growth into masses forms the genus *Multitubigera.*

ACTINOPORA, D'Orbigny, 1852.

[Pal. franç. Terr. crét. t. v. p. 762.]

SYNONYMY:

Lichenopora, Haime, *non* Defrance.
Defrancia, pars, Hagenow, *non* Bronn.
Tubulipora, pars, M. Edwards.

Diagnosis.—Theonoidæ in which the zoarium is a flat, simple, adnate disc. The zoarium consists of a central depression; a rim crossed by radiating ridges; and usually a flat, peripheral selvage.

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[1] D'Orbigny. Pal. franç. Terr. crét. t. v. pl. DCCLXIII. figs. 10–12.

Type species.—*Actinopora regularis*, D'Orbigny, 1852.

Affinities.—This is the simplest type of the family Theonoidæ. It differs from *Kololophos* by having the zoarium simple and not multiple. In its general form it resembles *Lichenopora*, from which it differs by the absence of cancelli.

1. Actinopora phillipsi (Haime).

SYNONYMY:

Lichenopora phillipsi, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 206, pl. x. fig. 10.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 151, pl. xci. fig. 30.
? ,, ,, Wright, 1860, Subdiv. Inf. Ool.: *Quart. Journ. Geol. Soc.* vol. xvi. p. 12.
? ,, ,, Witchell, 1882, Geol. Stroud, p. 48.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 265.
,, ,, Vine, 1884, Polyz. Richmond boring: *Quart. Journ. Geol. Soc.* vol. xl. p. 794.
? ,, ,, Vine, 1887, Jur. Polyz. Northptn.: *Journ. Northptn. Nat. Hist. Field Club*, vol. iv. p. 209.
,, ,, Woods, 1891, Cat. Type Foss. Woodw. Mus. p. 48.

Diagnosis.—Zoarium regular and circular. Radial ridges about 22 in number, straight, regular, unbranched; the apertures are biserial. New ridges arise from the interradial valleys. A broad expansion surrounds the zoarium: this is low and flat, and is not crossed by the radial ridges.

DISTRIBUTION.

Great Oolite: Hampton, near Bath.
? ,, ,, Richmond boring, 1205 ft.

Affinities.—This species is represented in the British Museum only by a doubtful specimen from the Richmond boring. It is also known to me by two specimens in the Cambridge Museum, one of which was Haime's type.

The species differs from the type species of the genus by the greater size of the central depression, and the smaller number of radial ridges.

D. 1894. ? *Actinopora phillipsi*. Great Oolite. Richmond boring, 1205 ft. Presented by Prof. J. W. Judd, C.B., F.R.S.

2. Actinopora diplopora (Branco), 1879.

SYNONYMY:

Defrancia diplopora, Branco, 1879, Unt. Dogger Deut. Loth.: *Abh. geol. Specialk. Elsass-Loth.* Bd. ii. Ht. 1, p. 131, pl. vi. fig. 9.

Actinopora ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 57.

,, ,, Gregory, 1896, Rev. pt. vi.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 289.

Diagnosis.—Zoarium large and thin, and several often grow together into a semi-confluent encrustation. The ridges are from 35 to 50 in number. They are very thin, irregular, and high, and extend to the margin of the zoarium. They sometimes branch. No peripheral selvage. In some zoaria—var. *alta*—the ridges are very high, and the central depression accordingly very deep.

DISTRIBUTION.

ENGLAND:

Great Oolite: near Bath.

Inferior Oolite: near Stroud, and near Leckhampton.

FOREIGN:

Zone of *Sonninia sowerbyi*: Ars and Montvaux, near Metz.

Description of Figure.—Pl. IX. Fig. 6. Part of a zoarium, × 12 dia., and the whole zoarium natural size. Great Oolite: near Bath? **B. 2295.**

Affinities.—This species is most closely allied to *A. phillipsi* (Haime), of which I at first regarded it as a large variety. It differs from this, however, by three characters: (1) it has no flat margin, as the ridges reach to the edge of the zoarium; (2) the ridges are thinner, more distant, and nearly twice as numerous; (3) the ridges are irregular, being sinuous, and often not continuous. These characters appear sufficient to demonstrate the distinctness of this species.

This may be the *Defrancia ranvilliana*, D'Orb.,[1] but D'Orbigny's diagnosis is so short that his species is quite indeterminable.

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[1] D'Orbigny. Prod. Pal. t. i. (1849) p. 317.

LIST OF SPECIMENS.

B. 2295. Great Oolite. Near Bath (?).
B. 2296. On *Terebratula perovalis*, J. de C. Sow. Inferior Oolite. Dorset?
D. 18. On ,, *curvifrons*, Oppel. ,, Marl. Probably near Stroud. Wright Coll. This specimen contains two young zoaria, 4 mm. in dia., which are more nearly allied to *A. phillipsi* than the adults.
D. 22. On *Terebratula globata*, J. de C. Sow. Inferior Oolite. Stroud. S. P. Woodward Coll.
D. 19. On *Terebratula perovalis*, J. de C. Sow. Inferior Oolite. Loc.? Wright Coll.
D. 21. On *Terebratula buckmani*, Dav. Inferior Oolite. Stroud. S. P. Woodward Coll.
D. 1805. On *Terebratula curvifrons*, Oppel. Inferior Oolite.
D. 1788. On ,, *maxillata*, J. de C. Sow. ,,
D. 1838. Inferior Oolite—Pea Grit. Cleeve Hill. Holl Coll.
D. 2190. Inferior Oolite. Crickley. Brodie Coll.
D. 2127. ,, Near Leckhampton. ,,
D. 2184. ,, Cleeve. ,,
B. 4525. On shell fragment. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll.
D. 1792. On *Terebratula maxillata*, J. de C. Sow. Bajocian. France?

Var. alta.

D. 1951. On *Perna quadrata*, Sow. Inferior Oolite. Cold Comfort. Holl Coll.
D. 2205. ,, ,, ,, Leckhampton. ,,
D. 1791. On *Terebratula curvifrons*, Oppel. Inferior Oolite. Leckhampton.
D. 20. On *Aulacothyris carinata* (Lam.). ,, Gloucestershire. Wright Coll.

INDETERMINABLE SPECIES.

1. *Actinopora orbignyi* (Étallon), 1860.

   Lichenopora orbignyi, Étallon, 1860, Jura Graylois: *Ann. Sci. phys. nat. Lyon*, sér. 3, t. iv. p. 162.

   Distribution.—Callovian: Orain and Percey-le-Grand.

2. *Actinopora*, sp.

   White Lias: Itchington; Shipston-on-Stour. B. M. Coll. No. **67485**.

KOLOLOPHOS, Gregory, 1896.

From κόλος 'broken' and λόφος 'a ridge.'

[In *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 289.]

SYNONYMY:

Constellaria, 1854, *non* Dana, 1848.
Radiopora, *pars*, Pictet, *non* D'Orbigny, 1852.

Diagnosis.—Theonoidæ in which the zoarium consists of flat, encrusting sheets, formed of numerous radial groups of zoœcia. The radial ridges are broken up into groups, the arrangement of which is irregularly linear.

Type species.—*Kololophos terquemi* (Haime), 1854.

Affinities.—The type species of this genus was referred by Haime to Dana's genus *Constellaria*, which at that time was misunderstood. The American fossil has been redescribed by Ulrich,[1] and it is quite different from this species. There is a certain superficial resemblance, due to the prominence of radial, nonporiferous lines; but in *Constellaria* these lines are solid "maculæ" (of Ulrich), and in *Kololophos* they are depressions between zoœcial ridges.

The nearest ally of this genus is *Actinopora*. From this it differs by the confluence of several radial groups into one sheet, and the broken, interrupted character of the ridges.

Kololophos terquemi (Haime), 1854.

SYNONYMY:

Constellaria	*terquemi*,	Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 207, pl. x. fig. 6.
,,	,,	Terquem, 1855, Pal. dép. Moselle (sep. copy), p. 26.
,,	,,	Terquem, 1868, in Jacquot, Descr. géol. dép. Moselle, p. 290.
,,	,,	Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 265.
,,	,,	Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 56.
Radiopora	,,	Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 153.
Kololophos	,,	Gregory, 1896, Rev. pt. vi.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 289.

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[1] E. O. Ulrich. Palæont. Illinois, pt. ii. sect. vi. Palæozoic Bryozoa: *Geol. Surv. Ill.* vol. viii. 1890, p. 374.

Diagnosis.—Zoarium formed of several confluent discs. Radial ridges broad and compact; broken up into short groups or bands. The bands have from 2–4 zoœcia in breadth.

DISTRIBUTION.

ENGLAND:

Inferior Oolite: Birdlip Hill and Leckhampton.

FOREIGN:

Bajocian: Plappeville, near Metz (*fide* Friren); Moselle (*fide* Terquem).

Description of Figure.—Pl. X. Fig. 1. Part of a zoarium encrusting *Terebratula globata*, J. de C. Sow., × 12 dia. Inferior Oolite: Birdlip. **67613.**

Affinities.—This is the type and only known species of the genus. Its nearest ally is *Actinopora diplopora* (Brauns), in which a tendency to the breaking up of the radial ridges can be seen. In *K. terquemi* (Haime), however, this is carried to an extreme; the ridges are broader, closer, and flatter, and less numerous.

LIST OF SPECIMENS.

67613. On *Terebratula globata*, J. de C. Sow., var. *birdlipensis*, Walk. Inferior Oolite. Birdlip.

D. 2189. On *Terebratula globata*, J. de C. Sow. Inferior Oolite. Near Leckhampton. Brodie Coll.

D. 1802. On *Terebratula perovalis*, J. de C. Sow. Inferior Oolite.

THEONOA, Lamouroux, 1821.

SYNONYM: *Tilesia*, *pars*, Lamouroux.

Diagnosis.—Theonoidæ in which the zoarium is massive, and consists either of dense, rounded masses, thick encrustations, or erect, thick fronds. The surface is crossed by broad, well-marked ridges. The ridges may expand in some species into broad, tabular elevations.

Type species.—*T. clathrata*, Lamouroux, 1821.

Affinities.—Lamouroux, in 1821, founded the two genera *Tilesia* and *Theonoa*. Haime, in 1854, merged these, retaining for the genus the name *Theonoa*, though this was the later in description. As the two genera were published simultaneously, it would be absurd to return to *Tilesia*, especially as the type species of *Theonoa* is far more characteristic of the genus than that on which *Tilesia* was based.

Theonoa is allied to *Actinopora* and *Kololophos*, from which it differs in having the zoarium either massive or in erect, thick fronds, instead of in thin, unilaminar sheets.

1. **Theonoa clathrata**,[1] Lamouroux, 1821.

SYNONYMY:

Theonoa clathrata, Lamouroux, 1821, Expos. Méth. p. 82, pl. lxxx. figs. 17, 18.
,, ,, Bronn, 1825, Pflanzenth. p. 21, pl. vi. fig. 20.
,, ,, Defrance, 1828, Dict. Sci. nat. t. liii. p. 470.
,, ,, Blainville, 1830, *ibid.* t. lx. p. 373, pl. xlv. fig. 2.
,, ,, Blainville, 1834, Man. Act. p. 408, pl. lxvii. fig. 2.
,, ,, M. Edwards, 1836, in Lamarck, Hist. Nat. Anim. s. Vert. éd. 2, t. ii. p. 318.
,, ,, Bronn, 1837, Leth. Geogn. ed. 2, Bd. i. p. 250, pl. xvi. fig. 14.
,, ,, Morris, 1843, Cat. Brit. Foss. p. 45.
,, ,, Michelin, 1846, Icon. Zooph. p. 233, pl. lv. fig. 6.
,, ,, Bronn, 1848, Nomencl. p. 1268.
,, ,, Bronn, 1849, Enum. p. 145.
,, ,, Bronn and Römer, 1851, Leth. Geogn. ed. 3, Bd. ii. Th. 4, p. 92, pl. xvi. fig. 14.
,, ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 204, pl. x. fig. 1.
,, ,, Morris, 1854, *op. cit.* ed. 2, p. 129.
,, ,, Terquem, 1855, Pal. dép. Moselle (sep. copy), p. 26.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 130.
,, ,, Ferry, 1862, Bajoc. Maçon, pt. i.: *Mém. Soc. linn. Norm.* t. xii. p. 14.
,, ,, E. E. Deslongchamps, 1865, Jur. inf. Norm.: *Mém. Soc. linn. Norm.* t. xiv. p. 151.
,, ,, Waagen, 1868, Zone *Amm. sowerbyi*: *Geogn. Pal. Beitr.* Bd. i. Ht. 3, p. 643.
,, ,, Terquem, 1868, in Jacquot, Descr. géol. dép. Moselle, p. 290.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 265.
,, ,, Vine, 1888, Polyz. Caen: *Journ. Northptn. Nat. Hist. Soc.* vol. v. p. 20.

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[1] Lamouroux spelt the name *chlatrata*, and this spelling has been adopted by many later authors. As this, however, is meaningless, and is clearly a misprint for *clathrata* (or lattice-like), the correction proposed by Michelin is here accepted.

Theonoa clathrata, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 55.
,, ,, Gregory, 1896, Rev. pt. vi.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 290.

Diagnosis.—Zoarium dense, massive; roughly spherical. The surface of the zoarium is broken into ridges, which are short, broad, and blunt. They never rise into high, bilaminate sheets. Four or five apertures occur together, in one width of a ridge.

DISTRIBUTION.

England:

Great Oolite: Bath (*fide* Morris).

Foreign:

Bathonian: Ranville; Lebisey; Caen; Oustreham and St. Aubin (*fide* Michelin).

Bajocian: Plappeville-lès-Metz and Montvaux; Flacé, near Maçon, Haut-Saône.

Affinities.—This is the best known species of the genus, of which it is the type. It reminds one, by its low, blunt ridges, and the structure of the zoarium, of *Alveolaria semiovata*, Busk, of the Crag; but the ridges do not unite into such sharply angular closed figures, and have no well-marked central lamina.

LIST OF SPECIMENS.

B. 4561. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll.
60237. ,, ,, ,, ,, ,,

2. Theonoa bowerbanki, Haime.

Synonymy:

Theonoa bowerbanki, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 205, pl. x. fig. 3.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 130.
,, ,, Wright, 1860, Subdiv. Inf. Ool.: *Quart. Journ. Geol. Soc.* vol. xvi. p. 12.
,, ,, Witchell, 1882, Geol. Stroud, p. 48.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 265.
,, ,, Woods, 1891, Cat. Type Foss. Woodw. Mus. p. 49.
,, ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 56.
,, ,, Gregory, 1896, Rev. pt. vi.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 290.

Diagnosis.—Zoarium composed of many erect, irregular sheets. The sheets are tall, irregularly sinuous, and branched, having loose, funnel-shaped cavities between them. The zoarium is roughly hemispherical in form.

The radial ridges are long and fairly continuous. The summits are flat, and contain generally three or four apertures in width; but in places they expand, and contain six or seven in width. The ridges occur on both sides of the sheets.

DISTRIBUTION.

ENGLAND:

Inferior Oolite: Postlip, near Cheltenham; Cleeve Hill.

FOREIGN:

Bajocian: Montvaux and Vittonvillé, near Metz (*fide* Friren).

Affinities.—This species is very well marked by its erect, thick fronds or sheets. It was well figured by Haime, and the British Museum contains some fine specimens belonging to the Brodie Collection.

LIST OF SPECIMENS.

D. 2117. Inferior Oolite. Cleeve. Brodie Coll.
D. 2197. Young form. Inferior Oolite. Cleeve. Brodie Coll.
D. 2128, D. 2134, D. 2187. Near Leckhampton. Brodie Coll.
D. 2129. Inferior Oolite. England. Brodie Coll.

3. **Theonoa distorta** (Lamouroux), 1821.

SYNONYMY:

Tilesia distorta, Lamouroux, 1821, Expos. Méth. p. 42, pl. lxxiv. fig. 6 (*non* fig. 5).
,, ,, Bronn, 1825, Pflanzenth. pp. 21, 42, pl. vi. fig. 5.
,, ,, Defrance, 1829, Dict. Sci. nat. t. liv. p. 365.
,, ,, Blainville, 1830, *ibid.* t. lx. p. 380, pl. xli. fig. 5.
,, ,, Blainville, 1834, Man. Act. p. 415, pl. lxiii. fig. 5.
,, ,, M. Edwards, 1836, in Lamarck, Hist. Nat. Anim. s. Vert. éd. 2. t. ii. p. 316.
non ,, ,, Michelin, 1846, Icon. Zooph. p. 232, pl. lv. fig. 7.
,, ,, *ex. syn.* Bronn, 1848, Nomencl. p. 1264.
,, ,, Bronn, 1849, Enum. p. 143.
,, ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 316.

Tilesia distorta, Bronn and Römer, 1851, Leth. Geogn. ed. 3, Bd. ii. Th. 4, p. 92, pl. xv. fig. 8.

non ,, ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 205, pl. x. fig. 2.

,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 130.

Theonoa ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 267.

? ,, ,, Vine, 1888, Polyz. Caen: *Journ. Northptn. Nat. Hist. Soc.* vol. v. p. 21.

,, ,, Gregory, 1896, Rev. pt. vi.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 290.

Diagnosis.—A thick encrustation. The surface is covered by numerous irregular ridges, the width of which usually contains two or three apertures. The depressions between the ridges are deep, and usually as wide or a little wider than the ridges.

DISTRIBUTION.

ENGLAND:

Inferior Oolite: near Leckhampton.

FOREIGN:

Bathonian: near Caen, France.

Description of Figure.—Pl. X. Fig. 2. Part of zoarium, × 14 dia. Inferior Oolite: near Leckhampton. Brodie Coll. **D. 2186.**

Affinities.—Lamouroux figured two specimens as the types of this species, but, as Haime pointed out, their characters are not the same. Michelin, however, figured a specimen which is certainly a *Theonoa*, and is possibly the same species as that of the second of Lamouroux's figures (pl. lxxiv. fig. 6). Haime accepted and refigured Michelin's specimen as the type of Lamouroux's species; and as it is clearly a *Theonoa*, he merged the genus *Tilesia* within this.

Lamouroux's type specimens have been lost, and his figures are not so satisfactory as they generally are. His figure 5 probably represents a specimen of *Chrysaora spinosa*, Mich.; and we may take No. 6 as the type of *Tilesia distorta*, as Michelin and Haime have done so. I doubt, however, whether their interpretation of this species is correct, for their specimen has broad, continuous areas occupied by apertures. There is a specimen in the Brodie Collection which agrees exactly with Lamouroux's figure: this I take as *Theonoa distorta*. It has narrow, irregular ridges. The form with broadened ridges I feel bound to separate as a distinct species, and it may well be named after the author who first described it, *T. michelini.*

SPECIMEN.

D. 2186. Inferior Oolite. Near Leckhampton. Brodie Coll. Figd. Pl. X. Fig. 2.

4. Theonoa michelini, n.sp.

SYNONYMY:

Theonoa distorta (*non* Lamx.), Michelin, 1846, Icon. Zooph. p. 232, pl. lv. fig. 7.

,, ,, (*non* Lamx.), Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France,* sér. 2, t. v. p. 205, pl. x. fig. 2.

Diagnosis.—Zoarium massive; roughly cylindrical. The zoœcia open on the upper surface, in great groups, which occupy a broad expanse of the surface.

Distribution.—Bathonian: Langrune, near Caen.

Affinities.—This species is accepted on the authority of the figures of Michelin and Haime. It differs from *Th. distorta,* Lamx., by occurring in cylindrical masses instead of being encrusting, and by having the apertures in broad sheets instead of narrow ridges. It differs from *T. clathrata,* to which it is more nearly allied, by the form of the zoarium, and by having the depressions between the apertures as a few broad areas instead of many small, disconnected, round patches.

INDETERMINABLE SPECIES.

Theonoa? sulcata, Ferry.

Theonoa sulcata, Ferry, 1862, Bajoc. Maçon, pt. i.: *Mém. Soc. linn. Norm.* t. xii. p. 14.

,, ,, Waagen, 1868, Zone *Amm. sowerbyi*: *Geogn. Pal. Beitr.* Bd. i. Ht. 3, p. 643, pl. xxxii. fig. 11.

Distribution.—Bajocian: Flacé, Saône-et-Loire.

Affinities.—Ferry's description suggests the possibility of this form being an *Actinopora,* but Waagen remarks that it may be the same as his *Theonoa* (*Apsendesia?*) *parvecristata.*

Suborder DACTYLETHRATA.

Diagnosis. — Cyclostomata in which the normal zoœcia are elongate, simple tubes, of the same general character as those of the Tubuliporidæ. Dimorphism occurs, and the zoarium consists of normal zoœcia, separated by numerous dactylethræ, which often form the major part of the zoarium. Zoarium usually large and complex.

Family CLAUSIDÆ, D'Orbigny, *em.*

Synonymy:

Clausidæ, pars, D'Orbigny.
Tubuliporidæ, pars, Haime.
Idmoniidæ, pars, Marsson.

Diagnosis.—Cyclostomata Dactylethrata with a stout, branching zoarium. The zoœcia open on all sides of the zoarium. The dactylethræ are collected into zones, or are scattered regularly or irregularly among the zoœcia.

MULTICLAUSA, D'Orbigny, 1852.

[D'Orbigny. Pal. franç. Terr. crét. t. v. p. 899.]

Diagnosis. — Clausidæ in which the zoarium is thick and arborescent. The apertures occur irregularly or quincuncially scattered over the surface of the zoarium. Dactylethræ very numerous.

Type species.—*M. compressa*, D'Orbigny, 1852.

Affinities.—D'Orbigny's type species has the apertures arranged quincuncially, but in the case of the Clausidæ it does not seem necessary to place the regular and irregular forms in different genera.

1. **Multiclausa haimei,** Gregory, 1896.

Synonymy:

Multiclausa haimei, Gregory, 1896, Rev. pt. vi.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 291.

Berenicea lucensis, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France,* sér. 2, t. v. p. 180, pl. vii. fig. 4.

Berenicea lucensis (Haime, *non* D'Orb.), E. E. Deslongchamps, 1865, Jur. inf. Norm.: *Mém. Soc. linn. Norm.* t. xiv. p. 155.
Berenicea (*Multisparsa*) *lucensis, pars* (Haime, *non* D'Orb.), Brauns, 1879, Bry. mittl. Jura Metz: *Zeit. deut. geol. Ges.* Bd. xxxi. p. 328.
Diastopora lucensis, pars (Haime, *non* D'Orb.), Reuss, 1867, Bry. braun. Jura Balin: *Denk. k. Akad. Wiss. Wien.* Bd. xxvii. p. 9.
,, ,, (Haime, *non* D'Orb.), Vine, 1884, 4th Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1883, p. 187.
non Bidiastopora lucensis, D'Orbigny, 1849, Prod. Pal. t. i. p. 317.
non Multisparsa luceana, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 870, pl. DCCLXI. figs. 1–3.
non ,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 137.
Diastopora diluviana, pars, M. Edwards, 1838, Mém. Cris.: *Ann. Sci. nat. Zool.* sér. 2, t. ix. pl. xiv. fig. 4.

Diagnosis.—Zoarium branching repeatedly and irregularly, and sometimes anastomosing. Branches stout. Zoœcia long, cylindrical. Apertures distant and irregularly placed. Peristomes low. Walls with thin, sinuous ridges.

DISTRIBUTION.

ENGLAND:

Cornbrash: Laycock.
Bradford Clay: Pound Pill.
Great Oolite: near Bath; Bradford.

FOREIGN:

Bathonian: Caen; Marquise, near Boulogne; Balin, Austria.
? Bajocian: St. Quentin, near Metz (*fide* Haime).

Description of Figures.—Pl. X. Fig. 3. Part of a branch, × 12 dia. Great Oolite: Hampton. Holl Coll. **B. 4874.** Fig. 15. Part of a longitudinal section of a zoarium to show the central axis and peripheral Berenecoid layers, × 12 dia. Bradford Clay: Bradford. **D. 2268.**

FIG. 15.—Part of longitudinal section through zoarium of *Multiclausa haimei*, Greg. × 12 dia. Bradford Clay: Bradford. **D. 2268.**

Affinities.—This species was founded by D'Orbigny for a dendroid Bryozoan, which Milne Edwards had regarded as only an arborescent *Berenicea.* D'Orbigny named it *M. luceana*, and made it the type of the genus *Multisparsa.* There is a specimen in the Tesson Collection (No. **D. 2114**) which agrees exactly with D'Orbigny's figure; and this shows that his type is a Tubulate form, and is, in fact, a specimen of *Diastopora lamellosa*, Mich. Haime redescribed the form originally figured by Milne Edwards, which is here taken as altogether distinct from that of D'Orbigny, and is named after the palæontologist whose careful figures enable its affinities to be determined.

LIST OF SPECIMENS.

D. 2268. Bradford Clay. Bradford. Fig. 15, p. 185.
B. 4874. Great Oolite. Hampton. Holl Coll. Figd. Pl. X. Fig. 3.
D. 2179, D. 2164. Great Oolite. Bath. Brodie Coll.
24768. Great Oolite. Bradford. Cunnington Coll.
B. 4879. ,, Hampton. Holl Coll.
D. 36. ,, Ancliff. ,,
B. 2283. Inferior Oolite. Loc. ?
D. 2237. Thick variety. Bathonian—Calcaire à polypiers. Ranville.
60355. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll.
60375. Specimen and section. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll.

2. **Multiclausa jellyæ,** Gregory, 1896.

SYNONYMY:

Multiclausa jellyæ, Gregory, 1896, Rev. pt. vi.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 292.

Diagnosis.—Zoarium growing in large dense tufts of thick, irregular branches. Zoœcia cylindrical, long; peristomes raised. Surface punctate. Apertures arranged irregularly, not very distant, and often in irregular lines.

DISTRIBUTION.

ENGLAND:

Bradford Clay: Bradford; Box Tunnel; Tetbury Road.
Inferior Oolite.

FOREIGN:

Bathonian: Ranville.

Description of Figure.—Pl. X. Fig. 4. Part of a branch, × 14 dia. Bradford Clay: Box, Wilts. Holl. Coll. **B. 4872.**

Affinities.—This species is allied to *M. haimei*, Greg., but differs from it by the greater elevation of the peristomes, and by having the zoœcia more crowded, and the apertures closer, and often in irregular lines. The differences are shown by the two figures (Pl. X. Figs. 3 and 4).

LIST OF SPECIMENS.

D. 1764. Cornbrash. Woodstock. Brodie Coll.
D. 2175. Forest Marble. Kellington, Oxfordshire. Brodie Coll.
B. 4872. Bradford Clay. Box Tunnel, Wilts. Holl Coll. Figd. Pl. X. Fig. 4.
B. 4873. Bradford Clay. Box Tunnel, Wilts. Holl Coll. Large tuft, 5½ inches in diameter.
B. 2305. Bradford Clay. Loc.?
D. 1824. ,, Bradford, Wilts.
D. 1819, D. 1820. Bradford Clay. Tetbury Road, Wilts.
D. 2156, D. 2161. ,, Bradford, Wilts. Brodie Coll.
D. 1784. Inferior Oolite. Gloucestershire.
D. 2212. Bathonian. Ranville. Tesson Coll.

TEREBELLARIA, Lamouroux, 1821.

[Lamouroux. Expos. Méth. p. 84.]

Diagnosis.—Clausidæ in which the zoarium is arborescent and thick. Zoarial growth is by the addition of Berenecoid colonies on to the ends of the branches; each colony sends an expansion downward around the stem. (Hence growth is acropetal and exogeneous.) The zoœcia are reflexed. The apertures occur in zones separated by interzones of dactylethræ.

Type species.—*T. ramosissima*, Lamouroux, 1821.

Affinities.—This genus differs from *Multiclausa* by having the apertures in regular zones instead of scattered throughout the zoarium. It differs from *Spiroclausa*, D'Orb., by the mode of growth, for in that form (which probably belongs to the Tubulata) the zoœcia curve upward and outward, instead of downward.[1]

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[1] The species named *T. increscens*, Vine, 1884, is an *Entalophora* with gonocysts: see p. 153.

Terebellaria ramosissima, Lamouroux, 1821.

SYNONYMY:

Terebellaria ramosissima, Lamouroux, 1821, Expos. Méth. p. 84, pl. lxxxii. fig. 1.
,, ,, Conybeare and Phillips, 1822, Geol. England, p. 214.
,, ,, Fleming, 1828, Brit. Anim. p. 531.
,, ,, Defrance, 1828, Dict. Sci. nat. t. liii. p. 112, pl. xlv. fig. 5.
,, ,, Blainville, 1830, Dict. Sci. nat. t. lx. p. 374.
,, ,, Blainville, 1834, Man. Act. p. 409, pl. lxvii. fig. 5.
,, ,, M. Edwards, 1836, in Lamarck, Anim. s. Vert. éd. 2, t. ii. p. 318.
,, ,, Bronn, 1837, Leth. Geogn. ed. 2, Bd. i. p. 246, pl. xvi. fig. 12.
,, ,, Morris, 1843, Cat. Brit. Foss. p. 45.
,, ,, Michelin, 1846, Icon. Zooph. p. 231, pl. lv. fig. 10.
,, ,, Bronn, 1848, Nomencl. p. 1225.
,, ,, Bronn, 1849, Enum. p. 146.
,, ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 318.
,, ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 885.
,, ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 173, pl. vi. fig. 13.
,, ,, Morris, 1854, Cat. Brit. Foss. ed. 2, p. 129.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 141, pl. xci. fig. 17.
,, ,, Huxley and Etheridge, 1865, Cat. Foss. M.P.G. p. 227.
,, ,, E. E. Deslongchamps, 1865, Jur. inf. Norm.: *Mém. Soc. linn. Norm.* t. xiv. p. 151.
,, ,, Phillips, 1871, Geol. Oxford, p. 302.
,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 254.
,, ,, Bigot, 1892, Esq. géol. Basse-Norm. pt. iii.: *Bull. Lab. Géol. Caen*, Ann. 2, p. 24.
,, ,, Fox-Strangways, 1892, Jur. Yorks. vol. ii. p. 200.
,, ,, Gregory, 1894, Cat. Jur. Bry. York Mus.: *Rep. Yorks. Phil. Soc.* 1893, p. 60.
,, ,, Gregory, 1896, Rev. pt. vi.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 292.

Terebellaria antilope, Lamouroux, 1821, *op. cit.* p. 84, pl. lxxxii. figs. 2, 3.
,, ,, Bronn, 1825, Pflanzenth. p. 20, pl. vi. fig. 13.
,, ,, Defrance, 1828, *op. cit.* t. liii. p. 112, pl. xlv. fig. 6.
,, ,, Blainville, 1830, *op. cit.* p. 374.
,, ,, Blainville, 1834, *op. cit.* p. 409, pl. lxvii. fig. 6.
,, ,, Edwards, 1836, *op. cit.* p. 318.
,, ,, Bronn, 1837, *op. cit.* p. 246, pl. xvi. fig. 12.

Terebellaria antilope,		Michelin, 1846, *op. cit.* p. 232, pl. lv. fig. 11.
? ,,	,,	M'Coy, 1848, New Mesoz. Rad.: *Ann. Mag. Nat. Hist.* ser. 2, vol. ii. p. 419.
,,	,,	Bronn, 1848, Nomencl. p. 145.
,,	,,	Bronn, 1849, Enum. p. 1225.
,,	,,	D'Orbigny, 1849, *op. cit.* t. i. p. 318.
,,	,,	Bronn, 1851, Leth. Geogn. ed. 3, Bd. ii. Th. 4, p. 93, pl. xvi. fig. 12.
,,	,,	D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 885, pl. DCCLXIII. figs. 14–18.
? ,,	,,	M'Coy, 1854, Contrib. Brit. Pal. p. 67.
,,	,,	Morris, 1854, *op. cit.* ed. 2, p. 129.
Millepora	sp.	Wm. Smith, 1816, Strata ident. p. 30, pl. xvii. fig. 5.
Terebellaria	*tenuis*,	D'Orbigny, 1849, *op. cit.* t. i. p. 318.
,,	,,	D'Orbigny, 1852, *op. cit.* p. 885.

Diagnosis.—Zoarium massive, branching irregularly. Apertures in rows of from 3–5; the lower limit is straight, but the upper is very irregular. Apertures in these bands crowded and quincuncial. Peristomes slightly raised.

DISTRIBUTION.

BRITISH:

Cornbrash: Stanton.
Forest Marble: Islip.
Bradford Clay: Bradford; Box; Fairford; Tetbury Road.
Great Oolite: Bath; Hampton; Bradford.
Fuller's Earth: Fairleigh; Hungerford.
Inferior Oolite: Cleeve Hill, near Leckhampton.

FOREIGN:

Bathonian: Caen, Ranville, Lebisey, Langrune, Luc, Benouville, St. Aubin, etc., in Calvados.

Description of Figures.—Pl. X. Fig. 5. Part of a branch, with zones of zoœcia and interzones of dactylethræ, × 12 dia. Bradford Clay: Box, Wilts. Buy Coll. **23857**. Figs. No. 16 and 17. Longitudinal and transverse sections of a specimen from the Great Oolite, Bath, × 10 dia. **D. 1762**.

Affinities.—As this is the type and only known species of the genus, it is unnecessary to discuss its affinities. Its structure is of great interest, and is illustrated by the accompanying figures. Fig. 17 shows a transverse section across part of the central axis of a colony, surrounded by concentric layers of zoœcia. The mode of growth of these is shown in the longitudinal section (Fig. 16): upon the summit is a layer of young tubular zoœcia, which in section agree with those of a *Reptomultisparsa*. Below this the

FIG. 16.—Longitudinal section through end of branch of *Terebellaria ramosissima*, Lamx. × 10 dia. Great Oolite: Bath. **D. 1762.**

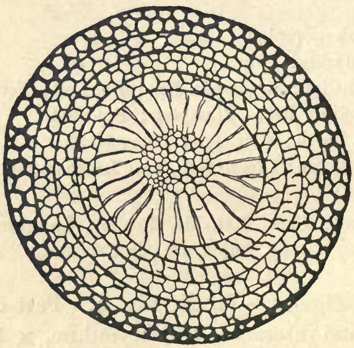

FIG. 17.—Transverse section across branch of *Terebellaria ramosissima*, Lamx. × 10 dia. Great Oolite: Bath. **D. 1762.**

section passes longitudinally along the zoœcia: it shows them to be simple, *Berenicea*-like tubes, which are sharply reflexed downwards around the stem. Many of these zoœcia are cut off by the overgrowth of the layer next above them, and are thus aborted into dactylethræ.

LIST OF SPECIMENS.

23857. Bradford Clay. Box. Buy Coll. Figd. Pl. X. Fig. 5.
D. 1762. Longitudinal and transverse sections. Great Oolite. Bath. Figd. Nos. 16 and 17.
B. 2281. Bradford Clay. Wiltshire.
11510. Great Oolite. Loc.?
B. 4648. ,, Bathampton. H. B. Holl Coll.
B. 4880. ,, Hampton. H. B. Holl Coll.
51344. ,, Near Bath.
24768. ,, Bradford. W. Cunnington Coll.
D. 2165. ,, Hampton, near Bath. Brodie Coll.
B. 4645, B. 4646. Bradford Clay. Bradford.
D. 1812, D. 1823. ,,
32495. Bradford Clay. Fairford.
B. 4647. ,, Box.
24958. ,, Wiltshire.
D. 25. ,, Loc.? Baber Coll.
D. 2155. ,, Bradford, Wilts. Brodie Coll.
D. 2160. (7 specimens.) Bradford Clay. Bradford, Wilts. Brodie Coll.
D. 2169, D. 2170. Bases of zoaria. Bradford Clay. Bradford, Wilts. Brodie Coll.
B. 4649. Inferior Oolite. Cleeve. H. B. Holl Coll.
B. 2281. Lower Oolite. Loc.?
B. 4518 (with *E. cellarioides*, Lamx.). Bathonian—Calcaire à polypiers. Ranville. Tesson Coll.
60382. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll.
B. 4517, 60214, 60215, 60240, 60361, D. 2214, D. 2240. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll.
D. 2110, D. 2111. Bathonian—Calcaire à polypiers. Ranville.
D. 2112. Bathonian—Calcaire à polypiers. Luc.
B. 163. ,, ,, ,, Ranville. Pres. by B. Bright, Esq.

INDETERMINABLE SPECIES.

Terebellaria cervicornis, D'Orbigny, 1849, Prod. Pal. t. i. p. 289.

Distribution.—Bajocian: France.

Terebellaria gracilis, D'Orbigny, 1849, *op. cit.* p. 289; Pal. franç. Terr. crét. t. v. (1852) p. 884.

Distribution.—Bajocian: France.

Family RETICULIPORIDÆ.

SYNONYMY:

Crisinidæ, pars, D'Orbigny.
Tubuliporidæ, pars, Haime.
Idmonidea, pars, Marsson.

Diagnosis.—Cyclostomata Dactylethrata with a branching zoarium composed of a central lamina, upon each side of which are crowded zoœcia and dactylethræ. The zoœcia open only on one face of the zoarium.

Affinities.—This family differs from the Clausidæ by having the zoœcia opening only on one side of the zoarium. It thus occupies the same relation to the Clausidæ in the Dactylethrata, that the Idmoniidæ do to the Entalophoridæ in the Tubulata.

RETICULIPORA, D'Orbigny, *pars*, 1849.

[Rev. Mag. Zool. sér. 2, t. i. 1849, p. 501.]

SYNONYMY:
Apsendesia, *pars*, Blainville.
Retelea, D'Orbigny.

Diagnosis.—Reticuliporidæ in which the zoarium consists of long, compressed branches, consisting of a vertical zoarial lamina, on each side of which are many short, closely packed zoœcia and dactylethræ. The zoarium is erect, and may be retiform or composed of radial branches.

Type species.—*Reticulipora dianthus* (Blainville), 1834.

Reticulipora dianthus (Blainville), 1834.

SYNONYMY:

Apsendesia dianthus, Blainville, 1834, Man. Act. p. 409, pl. lxix. fig. 2.
" " M. Edwards, 1836, in Lamarck, Hist. Nat. Anim. s. Vert. éd. 2, t. ii. p. 290.
" " Michelin, 1846, Icon. Zooph. p. 230, pl. lv. fig. 4.
" " Bronn, 1848, Nomencl. p. 88.
" " Bronn, 1849, Enum. p. 145.
Reticulipora " D'Orbigny, 1849, Prod. Pal. t. i. p. 316.
" " D'Orbigny, 1849, Genr. nouv. Bry.: *Rev. Mag. Zool.* sér. 2, t. i. p. 501.
" " Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 192, pl. ix. figs. 4*a–d*.
" " E. E. Deslongchamps, 1865, Jur. inf. Norm.: *Mém. Soc. linn. Norm.* t. xiv. p. 151.
" " Vine, 1888, Polyz. Caen: *Journ. Northptn. Nat. Hist. Soc.* vol. v. p. 18.
Retelea transversa, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 635.

Diagnosis.—Zoarium irregularly branching; branches dichotomize. The branches are all in approximately the same plane. The central lamina is erect, and there are two or three series of closely packed, subpolygonal apertures on either side. Below this are from six to ten rows of dactylethræ.

Distribution.—Bathonian: Ranville, Lebisey, in Calvados, France.

LIST OF SPECIMENS.

D. 2116.	Bathonian—Calcaire à polypiers.		Ranville.		Tesson Coll.
60228.	,,	,,	,,	,,	,,
60379.	,,	,,	,,	,,	,,
B. 178.	,,	,,	,,	,,	Presented by B. Bright, Esq.

Order TREPOSTOMATA, Ulrich.

Bryozoa in which the zoarium consists of prismatic or cylindrical zoœcia, which are arranged parallel to one another. The zoarium is either massive or composed of encrusting or erect laminæ. The zoœcia are either closely packed or separated by mesopores or by interzoœcial vesicles. The zoœcia begin as thin, simple, immature, cyclostomatoid tubes. Diaphragms are generally present. Generally dimorphic.

Family CERAMOPORIDÆ, Ulrich.

Diagnosis.—Zoaria encrusting, massive, or foliaceous. Zoœcia provided with lunarium. Walls formed of irregular, laminated material. No interzoœcial vesicular tissue. Diaphragms few and horizontal.

Remarks.—This family has not hitherto been used to include any forms found later than the Devonian.

CHILOPORA, Haime, 1854.

Diagnosis.—Zoarium erect, of thick, flat, bilaminate fronds. Mesopores numerous, in rings completely separating the apertures of the zoœcia. Lunaria simple, lip-shaped, slightly reflexed. Aperture somewhat transversely elliptical.

Type species.—*C. guernoni*, Haime.

Affinities.—This genus was founded by Haime on a single specimen from the Bathonian of Ranville. It is very closely allied to *Chiloporella*, Ulrich, from the Cincinnati group of Ohio. I cannot point to any character that will separate the two genera.

Chilopora guernoni, Haime, 1854.

SYNONYMY:

Chilopora guernoni, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 213, pl. x. fig. 5.

,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 162, pl. xcii. fig. 10.

,, ,, E. E. Deslongchamps, 1865, Jur. inf. Norm.: *Mém. Soc. linn. Norm.* t. xiv. p. 151.

,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 265.

Diagnosis.—Zoarium flat, frondose. Thickness of frond about twice as great as that of an ordinary *Diastopora.* Surface irregular, but not definitely pustulate. Mesopores large; very irregular in distribution, but generally abundant. Apertures generally circular; often oval or irregular through crowding; a crescentic lunarium on the lower margin.

Distribution.—Bathonian: Ranville.

Affinities.—This species is represented in the British Museum by two specimens, one of which was sent in the Tesson Collection identified as such. The lunaria, however, were not shown in the specimen, and thus it agreed in its characters with *Heterotrypa*, as a new species of which I was inclined to regard it. Its general appearance so closely resembled Haime's *Chilopora guernoni*, that I felt it was probably the same species, though, as matters stood, I was bound to put them into separate families. A second specimen has since been found in the collection which reconciles the former with Haime's figures. In some parts of the zoarium the lunaria can be recognized, though in the rest of it they have been worn away; thus such parts are reduced to the condition of *Heterotrypa.*

LIST OF SPECIMENS.

60235. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll.

60355. ,, ,, ,, ,, ,,

Family AMPLEXOPORIDÆ.

Diagnosis.—Trepostomata in which the zoœcia are simple, prismatic, or subcylindrical, with a well-marked divisional line between the walls of adjoining cells. Mesopores absent. (Aborted zoœcia occur and sometimes resemble mesopores.) Diaphragms horizontal.

Affinities.—The family Amplexoporidæ has hitherto been regarded as exclusively Palæozoic. It was defined by Ulrich to include the genera *Amplexopora*, *Monotrypella*, *Petalotrypa*, etc.; but I cannot see any definite character whereby to separate from it the Jurassic species of *Ceriopora*.

CERIOPORA, Goldf., 1827.

Diagnosis. — Amplexoporidæ with prismatic or subcylindrical zoœcia. Mesopores absent. Acanthopores probably absent. Walls of zoœcia thin. Diaphragms horizontal, numerous. Zoarium massive or branching.

Type species.—*C. micropora*, Goldfuss, 1827.

1. Ceriopora globosa, Michelin, 1846.

Ceriopora globosa, Michelin, 1846, Icon. Zooph. p. 246, pl. lvii. fig. 5.
,, ,, M'Coy, 1848, New Mesoz. Rad.: *Ann. Mag. Nat. Hist.* ser. 2, vol. ii. p. 418.
,, ,, Bronn, 1848, Nomencl. p. 261.
,, ,, Bronn, 1849, Enum. p. 143.
,, ,, Buvignier, 1852, Stat. géol. dép. Meuse, p. 184.
,, ,, Quenstedt, 1852, Handb. Petref. p. 641, pl. lvi. fig. 43.
,, ,, M'Coy, 1854, Contrib. Brit. Pal. p. 66.
,, ,, Morris, 1854, Cat. Brit. Foss. ed. 2, p. 120.
,, ,, Quenstedt, 1867, *op. cit.* ed. 2, p. 769, pl. lxxiii. fig. 43.
,, ,, Waagen, 1868, Zone *Amm. sowerbyi*: *Geogn. Pal. Beitr.* Bd. i. Ht. 3, pp. 534, 644.
?[1] ,, cf. ,, Brauns, 1874, Ob. Jura im nordwest. et Deutsch. p. 95.
?[1] ,, ,, Struckmann, 1878, Ob. Jura Umgegend Hannover, pp. 26–7.
,, ,, Quenstedt, 1885, *op. cit.* ed. 3, p. 989, pl. lxxix. fig. 60.
,, ,, Schlippe, 1888, Fauna Bath. oberrh. Tiefl.: *Abh. geol. Specialk. Elsass-Loth.* Bd. iv. livr. 4, p. 98.

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[1] These references are probably based on *Ceriopora tuberosa*, Quenst.

Ceriopora globosa, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 58.
,, ,, Gregory, 1894, Cat. Jur. Bry. York Mus.: *Rep. Yorks. Phil. Soc.* 1893, p. 61.
,, ,, Gregory, 1896, Rev. pt. vi.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 293.
Monticulipora globosa, D'Orbigny, 1849, Prod. Pal. t. i. p. 323.
Reptonodicava ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 1015.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 159.

Diagnosis.—Zoarium massive; either spherical or of irregular lobed masses, generally with a broad base, protected by epitheca. The surface is level and ornamented with irregularly scattered tubercles. [These are only seen in well-preserved specimens, as in Pl. XI. Fig. 5; they may be acanthopores.] Diaphragms abundant. Young zoœcia are fairly abundant, and being smaller in size resemble mesopores.

DISTRIBUTION.

ENGLAND:
Bradford Clay: Tetbury.
Great Oolite: Hampton, near Bath.
Inferior Oolite: near Leckhampton; Ravensgate Hill.

FOREIGN:
Bathonian: Ranville, France; Buchsweiler.
Bajocian—Zone of *Sonninia sowerbyi*: Gingen, Würtemberg; Flacé, Saône-et-Loire; Plappeville.

Description of Figures.—Pl. XI. Fig. 5. Part of a spherical zoarium, × 22 dia. Great Oolite: Hampton Down. **B. 4248.** Fig. 18*a*. Part of longitudinal section through marginal zoœcia, × 12 dia. Inferior Oolite. Holl Coll. **D. 2267.** Fig. 18*b*.

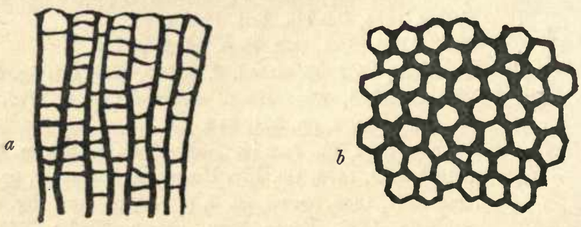

FIG. 18.—Sections through *Ceriopora globosa* (Mich.). × 12 dia. Fig. 18*a*: Longitudinal section through marginal zoœcia, showing diaphragms. Fig. 18*b*: Transverse section through central zoœcia. Inferior Oolite. **D. 2267.**

Part of a transverse section through central zoœcia of same specimen.

LIST OF SPECIMENS.

D. 2173. Bradford Clay. Tetbury Road, Wilts. Brodie Coll.
B. 4877. Globular form. Inferior Oolite. Cold Comfort, near Leckhampton. Holl Coll.
D. 2267. Globular form. Loc. ? Holl Coll. Fig. No. 18.
D. 2. ,, Inferior Oolite. Holl Coll.
D. 1841. ,, ,, Gloucestershire. Holl Coll.
60347. ,, Bathonian. Ranville. Tesson Coll.
60377. ,, ,, ,, ,,

FORM MASSIVE, BUT SOMEWHAT IRREGULAR.

B. 4248. Great Oolite. Hampton Down, near Bath. Figd. Pl. XI. Fig. 5.
B. 4886. Inferior Oolite. Loc. ? Holl Coll. Specimen with broad base and epitheca.
B. 4868. Inferior Oolite—Pea Grit. Cleeve Hill.
B. 4887, D. 9. ,, Loc. ? Holl Coll.
B. 4882. ,, Pea Grit. Cleeve Hill. Holl Coll.
D. 2243. (5 specimens.) Inferior Oolite. Near Leckhampton. Brodie Coll.
D. 1765, D. 1766. Inferior Oolite. Chipping Campden. Bravender Coll.
D. 1767. Inferior Oolite. Dover's Hill, near Chipping Campden. Bravender Coll.

2. **Ceriopora arborescens,** Waagen, 1868.

SYNONYMY:

Ceriopora arborescens, Waagen, 1868, Zone *Amm. sowerbyi*: *Geogn. Pal. Beitr.* Bd. i. Ht. 3, p. 644, pl. xxxiii. fig. 2.
,, ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 59.
,, ,, Gregory, 1896, Rev. pt. vi.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 293.

Diagnosis.—Zoarium of thick, massive branches or irregularly lobed masses. Zoœcia very long; walls thin. Diaphragms numerous near distal end. Apertures irregular. No acanthopores.

DISTRIBUTION.

ENGLAND:

Great Oolite: Bradford.
Inferior Oolite: Crickley Hill; Leckhampton.

FOREIGN:

Bathonian: Ranville.
Bajocian: Montvaux, near Metz; Gingen and Jungingen, Hohenzollern.

Description of Figure.—Pl. XI. Fig. 6. Part of massive, thick-branched zoarium, × 16 dia. Inferior Oolite. Loc.? **B. 2286.**

Affinities.—The figures of sections of this species clearly show that it is a true *Ceriopora.* It has been previously regarded as only a massive form of the species called *Ceriopora corymbosa* (Lamx.), which has been here referred to the genus *Ceriocava.*

The species differs from *C. globosa*, Mich., by its erect habit and the absence of the tubercles around the apertures.

Worn fragments cannot be absolutely separated from *Ceriocava corymbosa* (Lamx.) by external characters; but the examination of microscopic sections at once enables them to be distinguished. As a rule, the general aspect of the zoarium enables the two species to be distinguished, as the branches of *Ceriopora arborescens* are more massive, lobed, and irregular. Those of *Ceriocava corymbosa* are thinner and more regularly cylindrical.

LIST OF SPECIMENS.

B. 2286.	Inferior Oolite. Cotteswolds. Figd. Pl. XI. Fig. 6.
B. 2287.	,, ,, Crickley Hill.
D. 2163.	Great Oolite. Bradford, Wilts. Brodie Coll.
B. 4888.	Inferior Oolite. Leckhampton. Holl Coll.
D. 2252.	Bathonian—Calcaire à polypiers. Ranville.
D. 2253.	,, ,, ,, ,,
D. 2262.	,, ,, ,, ,,
D. 2235.	Specimens and section. Bathonian—Calcaire à polypiers. Ranville.
? 60377.	Bathonian—Calcaire à polypiers. Ranville.

INDETERMINABLE SPECIES AND RECORDS.

1. Ceriopora clavata, Goldfuss, *et auct.*

A *Neuropora.*

2. Ceriopora compacta, Quenstedt, 1858.

SYNONYMY:

Ceriopora compacta, Quenstedt, 1858, Der Jura, p. 665, pl. lxxxi. figs. 62–3.
,, ,, Oppel, 1866, Zone *Amm. transversarius*: *Geogn. Pal. Beitr.* Bd. i. Ht. 2, p. 296.

Distribution.—Zone of *Peltoceras bimammatus*: Bollärt. Lower Oxfordian—*Peltoceras transversarius*: Oberbuchsiten, Switzerland.

Affinities.—This is probably a *Neuropora.*

3. Ceriopora compressa, D'Orbigny, 1852.

SYNONYMY:

Nodicava compressa, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 1014.
Heteropora ,, Haime, 1854, *Mém. Soc. géol. France,* sér. 2, t. v. p. 212.

Distribution.—Bathonian: Calvados.

4. Ceriopora corallina, D'Orbigny, 1849.

SYNONYMY:

Polytrema corallina, D'Orbigny, 1850, Prod. Pal. t. ii. p. 41.
Reptomulticava corallina, D'Orbigny, 1852, Pal. franç. Terr. crét. p. 1033.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 158.
Heteropora ,, Haime, 1854, *op. cit.* p. 212.

Distribution.—Corallian: Tonnerre, Sainpuits, in Yonne.

5. Ceriopora fibrosa, Münst. MS.

SYNONYMY:

Ceriopora fibrosa, M'Coy, 1848, New Mesoz. Rad.: *Ann. Mag. Nat. Hist.* ser. 2, vol. ii. p. 418.
,, ,, M'Coy, 1854, Contrib. Brit. Pal. p. 66.

Distribution.—Great Oolite: Minchinhampton.

6. Ceriopora grandipora, Münst. MS.

SYNONYMY:

Ceriopora grandipora, M'Coy, 1848, *op. cit.* p. 418.
,, ,, M'Coy, 1854, *op. cit.* p. 66.

Distribution.—Great Oolite: Minchinhampton.

7. Ceriopora leda, D'Orbigny.

SYNONYMY:

Ceriopora leda, D'Orbigny, 1849, Prod. Pal. t. i. p. 222.
Ceriocava ,, D'Orbigny, 1852, *op. cit.* t. v. p. 1016.
Heteropora ,, Haime, 1854, *op. cit.* p. 212.

Distribution.—Sinemurian: Villefranche, Saône-et-Loire.

8. Ceriopora mutabilis, Münst. MS.

Synonymy:

Ceriopora mutabilis, M'Coy, 1848, *op. cit.* p. 418.
,, ,, M'Coy, 1854, *op. cit.* p. 66.

Distribution.—Great Oolite: Minchinhampton.

9. Ceriopora radiciformis, Goldfuss, 1827.

Synonymy:

Ceriopora radiciformis, Goldfuss, 1827, Petref. Germ. p. 34, pl. x. fig. 8.
,, ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 387.
,, ,, Oppel, 1866, *op. cit.* p. 297.
,, ,, Quenstedt, 1867, Handb. Petref. p. 765, pl. lxxiii. fig. 13.
,, ,, Quenstedt, 1885, *op. cit.* ed. 3, p. 984, pl. lxxix. fig. 30.
Heteropora ,, Haime, 1854, *op. cit.* p. 212.

Distribution.—Callovian (Lower Oxfordian)—Zone of *Peltoceras transversarius*: Oberbuchsiten, Solothurn, and St. Claude, Jura. Weisser Jura, γ: Bollärt.

10. Ceriopora ramulifera, Étallon, 1861.

Synonymy:

Heteropora ramulifera, Étallon, 1862, Étud. Haut-Jura Cor.: *Mém. Soc. Émul. Doubs.* sér. 3, t. vi. p. 214.

Distribution.—Diceratian: Valfin, Haut-Jura.

11. Ceriopora sarthacensis, D'Orbigny, 1849.

Synonymy:

Ceriopora sarthacensis, D'Orbigny, 1849, Prod. Pal. t. i. p. 293.
Ceriocava ,, D'Orbigny, 1852, *op. cit.* t. v. p. 1016.
Heteropora ,, Haime, 1854, *op. cit.* p. 212.

Distribution.—Bajocian: Conlie, Sarthe.

12. Ceriopora subcompressa, D'Orbigny, 1849.

Synonymy:

Ceriopora subcompressa, D'Orbigny, 1849, Prod. Pal. t. i. p. 324.
Cava ,, D'Orbigny, 1852, *op. cit.* p. 1020.

Distribution.—Bathonian: St. Aubin, France.

13. **Ceriopora tenuissima**, Étallon, 1861.

SYNONYMY:

Heteropora tenuissima, Étallon, 1862, *op. cit.* sér. 3, t. vi. p. 214.

Distribution.—Diceratian: Valfin and Septmoncel, Haut-Jura.

Family HETEROTRYPIDÆ, Ulrich.

Diagnosis.—Trepostomata in which the zoœcia are simple, prismatic, or cylindrical, with a well-marked divisional line between the walls of adjacent zoœcia. Mesopores present. Diaphragms numerous and horizontal. Neither cystiphragms nor interzoœcial vesicles present.

HETEROPORA, Blainville, 1834.

SYNONYMY:

Millepora, pars, Lamouroux, etc.
Ceriopora, pars, Goldfuss, etc.
Monticulipora, pars, D'Orbigny.
Spiropora, pars, Defrance.
Cricopora, pars, Blainville.
Reptomulticrescis, D'Orbigny.
Multicrescis, D'Orbigny.
Crescis, D'Orbigny.
Polytrema, D'Orbigny.
Nodicrescis, D'Orbigny.

Diagnosis. — Heterotrypidæ with prismatic or subcylindrical zoœcia. Mesopores numerous. Acanthopores absent. Walls of zoœcia thin. Diaphragms horizontal; numerous. Zoarium branching or massive.

Type species.—Heteropora cryptopora (Goldfuss), 1827.

Affinities.—This genus was originally included by Goldfuss under his genus *Ceriopora*. Blainville separated it for those *Ceriopora*-like forms in which the zoœcia are of two distinct sizes. As a rule, most subsequent palæontologists have accepted the genus; the most important exception is Haime, who denied that the dimorphism was even of specific value.

Instead of this, I am constrained to place them in distinct families. *Heteropora* takes its place in the family Heterotrypidæ, which has not hitherto been recognized, except in the Palæozoic. The genus is most closely allied to the genus *Heterotrypa*, Nicholson, from which it differs by the absence of acanthopores.

D'Orbigny made a most unnecessary number of genera for this group of Bryozoa, and of these I regard no less than five as synonyms of *Heteropora*.

1. Heteropora conifera (Lamouroux), 1821.

SYNONYMY:

Millepora conifera, Lamouroux, 1821, Expos. Méth. p. 87, pl. lxxxiii. figs. 6, 7.

,, ,, Defrance, 1824, Dict. Sci. nat. t. xxxi. p. 84.

Heteropora ,, M. Edwards, 1836, in Lamarck, Hist. Nat. Anim. s. Vert. éd. 2, t. ii. p. 318.

,, ,, Morris, 1843, Cat. Brit. Foss. p. 39.

,, ,, Morris, 1854, Cat. Brit. Foss. ed. 2, p. 124.

,, ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. pp. 208–9, pl. xi. figs. 1α–ζ, except 1x, 1γ, 1β, 1η.

,, ,, Wright, 1860, Subdiv. Inf. Ool.: *Quart. Journ. Geol. Soc.* vol. xvi. p. 12.

,, ,, Ferry, 1862, Bajoc. Maçon: *Mém. Soc. linn. Norm.* t. xii. p. 14.

,, ,, E. E. Deslongchamps, 1865, Jur. inf. Norm.: *Mém. Soc. linn. Norm.* t. xiv. p. 151.

,, ,, Reuss, 1867, Bry. braun. Jura Balin: *Denk. k. Akad. Wiss. Wien.* Bd. xxvii. p. 12, pl. i. figs. 10–12; pl. ii. fig. 1 (? fig. 2).

,, ,, Terquem and Jourdy, 1871, Bath. Moselle: *Mém. Soc. géol. France*, sér. 2, t. ix. p. 156.

,, ,, *pars*, Brauns, 1879, Bry. mittl. Jura Metz: *Zeit. deut. geol. Ges.* Bd. xxxi. p. 337.

,, ,, Witchell, 1882, Geol. Stroud, p. 48.

,, ,, Walford, 1883, Northptn. Sd. of N. Oxon: *Quart. Journ. Geol. Soc.* vol. xxxix. p. 242.

,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 265.

,, ,, *pars*, Vine, 1884, Polyz. Richmond boring: *Quart. Journ. Geol. Soc.* vol. xl. p. 794.

,, ,, Vine, 1888, Polyz. Caen: *Journ. Northptn. Nat. Hist. Soc.* vol. v. p. 22.

,, ,, Schlippe, 1888, Fauna Bath. oberrh. Tiefl.: *Abh. geol. Specialk. Elsass-Loth.* Bd. iv. livr. 4, p. 98.

,, ,, Woods, 1891, Cat. Type Foss. Woodw. Mus. p. 47.

,, ,, Gregory, 1896, Rev. pt. vi.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 294.

non Ceriopora conifera, Michelin, 1846, Icon. Zooph. p. 245, pl. lvii. fig. 8.
Ceriopora conifera, D'Orbigny, 1849, Prod. Pal. t. i. p. 324.
,, ,, Waagen, 1868, Zone *Amm. sowerbyi*: *Geogn. Pal. Beitr.* Bd. i. Ht. 3, p. 644.
Multicrescis ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 1074.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 160.
Millepora dumetosa, Lamouroux, 1821, *op. cit.* p. 87, pl. lxxxii. figs. 7, 8.
Spiropora ,, Defrance, 1827, Dict. Sci. nat. t. L. p. 300.
Cricopora ,, Blainville, 1830, *ibid.* t. lx. p. 386.
,, ,, Blainville, 1834, Man. Act. p. 421.
,, ,, Bronn, 1848, Nomencl. p. 348.
,, ? ,, Bronn, 1849, Enum. p. 140.
Heteropora ,, M. Edwards, 1836, *op. cit.* t. ii. p. 308.
,, ,, Morris, 1843, *op. cit.* p. 39.
,, ,, Morris, 1854, *op. cit.* p. 125.
non Ceriopora dumetosa, Michelin, 1846, *op. cit.* p. 245, pl. lvii. fig. 7.
,, ,, M'Coy, 1848, New Mesoz. Rad.: *Ann. Mag. Nat. Hist.* ser. 2, vol. ii. p. 418.
non ,, ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 323.
,, ,, Buvignier, 1852, Stat. géol. dép. Meuse, p. 224.
,, ,, M'Coy, 1854, Contrib. Brit. Pal. p. 66.
,, ,, Morris, 1854, Cat. Brit. Foss. ed. 2, p. 120.
Crescis dumetosa, D'Orbigny, 1852, *op. cit.* t. v. p. 1072.
,, ,, Pictet, 1857, *op. cit.* t. iv. p. 161.
? *Millepora pyriformis*, Lamouroux, 1821, *op. cit.* p. 87, pl. lxxxiii. fig. 5.
? ,, ,, Morris, 1843, *op. cit.* p. 41.
Heteropora ,, Michelin, 1846, *op. cit.* p. 244, pl. lvii. fig. 3.
,, *piriformis*, Bronn, 1848, Nomencl. p. 586.
,, ,, Bronn, 1849, Enum. p. 142.
Polytrema ,, D'Orbigny, 1849, *op. cit.* t. i. p. 323.
Multicrescis ,, D'Orbigny, 1852, *op. cit.* t. v. p. 1074.
,, ,, Pictet, 1857, *op. cit.* t. iv. p. 160.
"Ramose milleporite," Parkinson, 1808, Organic Rem. vol. ii. p. 71, pl. viii. figs. 3, 11.
Millepora ramosa, Fleming, 1828, Brit. Anim. p. 529.
,, ,, Morris, 1843, Cat. Brit. Foss. p. 41.
,, ,, Mantell, 1850, Atlas Foss. Remains, p. 99, pl. xl. figs. 3, 11.
Heteropora ,, (*non M. ramosa*, Fleming), Michelin, 1846, *op. cit.* p. 244, pl. lvii. fig. 4.
non ,, ,, Römer, 1840, Verst. norddeut. Kreidegeb. p. 24.
,, ,, M'Coy, 1848, New Mesoz. Rad.: *Ann. Mag. Nat. Hist.* ser. 2, vol. ii. p. 419.
,, ,, Bronn, 1848, Nomencl. p. 142.
,, ,, Bronn, 1849, Enum. p. 586.
,, ,, Quenstedt, 1852, Handb. Petref. p. 641, pl. xlvi. figs. 42–3.
,, ,, D'Orbigny, 1852, *op. cit.* p. 1069.

Heteropora ramosa, Quenstedt, 1852, Handb. Petref. p. 641, pl. lvi. fig. 42.
,, ,, Morris, 1854, Cat. Brit. Foss. ed. 2, p. 125.
,, ,, Pictet, 1857, *op. cit.* t. iv. p. 160, pl. xcii. fig. 6.
,, ,, Quenstedt, 1867, *op. cit.* ed. 2, p. 769, pl. lxxiii. fig. 42.
,, ,, Quenstedt, 1885, *op. cit.* ed. 3, p. 989, pl. lxxix. fig. 59.
,, ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 59.
,, *reticulata*, Haime, 1854, *op. cit.* p. 211, pl. ix. fig. 9.
,, ,, Terquem, 1855, Pal. dép. Moselle (sep. copy), p. 26.
,, ,, Ferry, 1862, *op. cit.* p. 14.
,, ,, Waagen, 1868, *op. cit.* p. 644.
,, ,, Terquem, 1868, in Jacquot, Descr. géol. dép. Moselle, p. 290.
,, ,, Vine, 1883, *op. cit.* p. 265.
Ceriopora ramosa, D'Orbigny, 1849, Prod. Pal. t. i. p. 323.
Heteropora ficulina, Michelin, 1846, *op. cit.* p. 244, pl. lvii. fig. 2.
,, ,, Bronn, 1848, Nomencl. p. 586.
,, ,, Bronn, 1849, Enum. p. 142.
,, ,, Friren, 1893, Bry. ool. inf. Metz: *Bull. Soc. Hist. nat. Metz*, sér. 2, t. vi. p. 60.
,, ,, Gregory, 1894, Cat. Jur. Bry. York Mus.: *Rep. Yorks. Phil. Soc.* 1893, p. 61.
Polytrema ,, D'Orbigny, 1849, Prod. Pal. t. i. p. 323.
Reptomulticrescis ficulina, D'Orbigny, 1852, *op. cit.* t. v. p. 1079.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 161.
? *Heteropora calycina*, Bruder, 1881, Juraabl. Sternberg: *Sitz. k. Akad. Wiss. Wien.* Bd. lxxxiii. Abth. 1, p. 89, pl. ii. fig. 6.
,, n.sp., Gregory, 1894, *op. cit.* p. 61.

Diagnosis. — Zoarium of erect branches, which are generally cylindrical, and either grow in irregular, stumpy branches (typical form), or expand into thick, pyriform masses (var. *pyriformis*), or into lobed, alcyonium-shaped masses (var. *ficulina*), or regular cylindrical branches (var. *ramosa*). The branches dichotomize, and may sometimes anastomose (var. *reticulata*). The surface is level. Zoœcia crowded. Diaphragms numerous. Mesopores irregular in distribution; frequently only at the angles between the zoœcia, but sometimes completely surrounding these.

DISTRIBUTION.

ENGLAND:
Great Oolite: Bath; Minchinhampton; Richmond boring; boring at Meux's Brewery, Tottenham Court Road.
Inferior Oolite: Dorset?; Crickley; Otley Hill.

FOREIGN:

? Callovian: Maucourt, Meuse (*fide* Buvignier); Sternberg, Bohemia (*fide* Bruder).

Bathonian: Ranville, Bernières, Calvados; Longwy, Moselle (*fide* Terquem); Buchsweiler and Niederweiler (*fide* Schlippe); Egger (*fide* Quenstedt).

Bajocian: Montvaux and Génivaux, near Metz (*fide* Friren); Flacé, etc., Saône-et-Loire; Pommer, Franconia (*fide* Waagen).

Description of Figures.—Pl. XI. Fig. 1. Zoœcia and mesopores, × 22 dia. Inferior Oolite. Loc.? Holl Coll. **B. 4881.** Fig. 19. Longitudinal and transverse sections, × 12 dia. Inferior Oolite. Holl Coll. **B. 4885.** Fig. 20. Two parts of same zoarium, showing varying arrangement of mesopores, × 12 dia. Bathonian: Ranville. **D. 2209.**

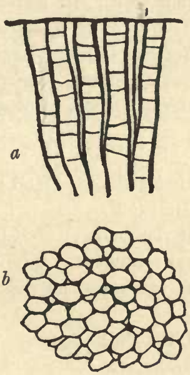

FIG. 19.—Sections through *Heteropora conifera* (Lamx.). × 12 dia. Fig. 19*a*: Longitudinal section through marginal zoœcia, showing diaphragms and mesopores. Fig. 19*b*: Transverse section through central zoœcia. Inferior Oolite. **B. 4885.**

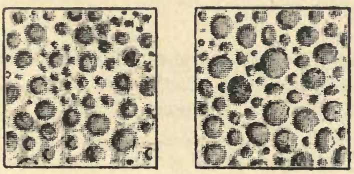

FIG. 20.—Two parts of same zoarium of *Heteropora conifera* (Lamx.), to show irregularity in distribution of mesopores. × 12 dia. Bathonian—Calcaire à polypiers. Ranville. **D. 2209.**

LIST OF SPECIMENS.

B. 4883. Great Oolite. Minchinhampton. Holl Coll.

D. 1890. Three young specimens with rare mesopores. Great Oolite. Richmond boring, 1205 ft. deep. Presented by Prof. J. W. Judd, C.B., F.R.S.

D. 1891, D. 1892, D. 1893. Three slides with fragments. Great Oolite. Richmond boring, 1205 ft. deep. Presented by Prof. J. W. Judd, C.B., F.R.S.

D. 1938. Two specimens. Great Oolite. Boring at Meux's Brewery, 1000-64 ft. deep. Presented by Prof. J. W. Judd, C.B., F.R.S.

D. 211, D. 1902, D. 1903. Three slides with fragments. Great Oolite. Richmond boring. Vine Coll.

D. 34, D. 35. Two slides with fragments. Great Oolite. Ancliff. Cunnington Coll.

56778. Three young specimens with rare mesopores. Great Oolite. Bath?

D. 1798. Inferior Oolite. Loc.? With *S. dichotomoides* (D'Orb.).

B. 4881. (Typical form.) Inferior Oolite. England. Holl Coll.

B. 2299. Var. *ramosa*. Three specimens. Inferior Oolite. Dorset?

B. 4871. Var. *ficulina*. Inferior Oolite. Cotteswolds. Wright Coll.

B. 4881. (Typical form.) ,, ,, Holl Coll. Figd. Pl. XI. Fig. 1.

B. 4885. Var. *ficulina*. Inferior Oolite. Holl Coll. Fig. No. 19.

D. 4884. Inferior Oolite. Holl Coll.

D. 2266. Var. *ficulina*. Inferior Oolite. Holl Coll.

B. 2287. ,, ,, Four specimens. Inferior Oolite. Crickley Hill.

B. 2287. ,, ,, One specimen and slide. Inferior Oolite. Crickley Hill.

D. 1768. Inferior Oolite. Chipping Campden. Bravender Coll.

60363. (Typical form.) Bathonian—Calcaire à polypiers. Ranville. Tesson Coll.

60362. (Typical form.) ,, ,, ,, ,, Tesson Coll.

B. 4570. (,, ,,) ,, ,, ,, ,,

60374. (,, ,,) ,, ,, ,, ,, Tesson Coll.

D. 2236. (,, ,,) ,, ,, ,, ,,

D. 1836. (,, ,,) ,, ,, ,, ,,

D. 2250. Var. *piriformis*. ,, ,, ,, ,, Tesson Coll.

D. 2251. Var. *reticulata*. ,, ,, ,, ,, ,,

D. 2209. Bathonian—Calcaire à polypiers. Ranville. Fig. No. 20.

D. 1778, D. 1780. (Typical form.) Bathonian. Ranville.

D. 2232. Calcaire à polypiers. Bernières, Calvados.

D. 2231. ,, ,, ,,

D. 2248, D. 2249. Two specimens and sections. Calcaire à polypiers. Ranville.

D. 2265. Five specimens and two sections. Calcaire à polypiers. Ranville.

2. Heteropora pustulosa, Haime.

SYNONYMY:

Heteropora pustulosa, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, p. 210, pl. xi. figs. 2*g*, *h*, *j*, *l*; *non* 2*i*, *m*; ? 2*a–f*, *h*; also *ex. syn.*

,, ,, Terquem, 1855, Pal. dép. Moselle (sep. copy), pp. 26, 28, 30.

non ,, ,, Busk, 1859, Crag Polyz. p. 122, pl. xx. fig. 1; pl. xix. fig. 6.

,, ,, Wright, 1860, Subdiv. Inf. Ool.: *Quart. Journ. Geol. Soc.* vol. xvi. p. 12.

,, ,, Ferry, 1862, Bajoc. Maçon: *Mém. Soc. linn. Norm.* t. xii. pp. 14, 23.

,, ,, E. E. Deslongchamps,' 1865, Jur. inf. Norm.: *Mém. Soc. linn. Norm.* t. xiv. p. 151.

,, ,, Terquem, 1868, in Jacquot, Descr. géol. dép. Moselle, pp. 290, 292, 296.

,, ,, Terquem and Jourdy, 1871, Bath. Moselle: *Mém. Soc. géol. France*, sér. 2, t. ix. pp. 156, 164.

non ,, ,, *ex. syn.* Brauns, 1879, Bry. mittl. Jura Metz: *Zeit. deut. geol. Ges.* Bd. xxxi. p. 336.

? ,, ,, Witchell, 1882, Geol. Stroud, p. 48.

,, ,, Vine, 1883, 3rd Rep. Foss. Polyz.: *Rep. Brit. Assoc.* 1882, p. 265.

? ,, ,, Vine, 1887, Jur. Polyz. Northptn.: *Journ. Northptn. Nat. Hist. Field Club*, vol. iv. p. 209, pl. i. figs. 22–3.

,, ,, *pars*, Vine, 1888, Polyz. Caen: *ibid.* vol. v. p. 22.

Monticulipora inæqualis, D'Orbigny, 1849, Prod Pal. t. i. p. 323.

Nodicrescis ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 1065.

,, ,, Pictet, 1857 Traité Pal. éd. 2, t. iv. p. 162, pl. xcii. fig. 2.

Diagnosis.—Zoarium arborescent, of thick, massive branches, which fork occasionally. Surface covered by numerous small pustules.

DISTRIBUTION.

Bathonian: Ranville.

Bajocian: St. Quentin, near Metz; Flaçé, Solutré, etc., near Maçon (*fide* Ferry); Longwy, Clapes, Moselle (*fide* Terquem).

Affinities.—This species is mainly characterized by the raised pustulation, which clearly separates it from *H. conifera.* Busk gave the same name to a species from the Crag; the Jurassic form, however, differs from the Crag species by the greater closeness of the zoœcia, and greater disparity between the zoœcia.

SPECIMEN.

60210. Bathonian—Calcaire à polypiers. Ranville. Tesson Coll.

3. **Heteropora laminata,** Gregory.

Synonymy:

Heteropora laminata, Gregory, 1896, Rev. pt. vi.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 295.

Diagnosis.—Zoarium encrusting, growing in layers, superposed into thick masses. The surface of the zoarium is level or raised into monticules. Mesopores irregular in distribution; generally numerous.

Distribution. — Bradford Clay: Bradford. Inferior Oolite: Dorset.

Description of Figures.—Pl. XI. Fig. 2. Zoœcia and mesopores, × 22 dia. Inferior Oolite: Dorset. **B. 2300.** Pl. XI. Fig. 3. Part of zoarium, × 18 dia. Inferior Oolite: Dorset. **D. 2255.**

Affinities.—This species differs from *H. conifera* mainly by zoarial characters, though the mesopores are generally more numerous. The fact that the mesopores are useless as specific guides is shown by Fig. 20, of which both parts are drawn from the same specimen. The left-hand figure exhibits abundant mesopores almost surrounding the zoœcia; while in the other figure mesopores are rare, and occur only in the angles between the zoœcia. This shows that Haime was correct as to the variability in the number of these structures, though by his refusal to admit any value to their complete absence, he underrated their significance.

LIST OF SPECIMENS.

B. 2300. Inferior Oolite. Dorset? Figd. Pl. XI. Fig. 2.
D. 2255. ,, ,, Dorset. Figd. Pl. XI. Fig. 3.
D. 1826. Bradford Clay. Bradford. Variety with prominent monticules.

4. Heteropora capilliformis (Michelin).

SYNONYMY:

Chætetes capilliformis, Michelin, 1844, Icon. Zooph. p. 112, pl. xxvi. fig. 2.
Polytrema ,, D'Orbigny, 1849, Prod. Pal. t. ii. p. 41.
Reptomulticava ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 1033.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 158.
Heteropora ,, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 212.
,, ,, Étallon, 1862, Étud. Haut-Jura Cor.: *Mém. Soc. Émul. Doubs*. sér. 3, t. vi. p. 213.
Chætetes polyporus, Quenstedt, 1852, Handb. Petref. p. 643, pl. lvi. fig. 55.
Heteropora capilliformis, Pillet and Fromentel, 1875, Geol. Lémenc.: *Mém. Acad. Sav*. sér. 3, t. iv. p. 148.

Diagnosis.—Zoarium massive; generally in hemispherical or ovoid masses. Fixed by a broad flat base, covered by epitheca. Surface covered by raised, irregular, cerebriform ridges and valleys. Zoœcia very long, straight, and thin, so that broken surfaces resemble *Chætetes*. Mesopores numerous; irregular in distribution.

DISTRIBUTION.

ENGLAND:
Inferior Oolite: Gloucestershire.

FOREIGN:
Corallian: Nièvre; Yonne; Dép. de la Meuse.
Diceratian: Valfin, Haute-Saône.
Bathonian: Ranville.

LIST OF SPECIMENS.

D. 1846. Inferior Oolite. Gloucestershire. Holl Coll.
B. 4887. ,, ,, Loc.? Holl Coll.
D. 2213. Bathonian. Ranville. Tesson Coll.

5. Heteropora oviformis, Gregory, 1896.

SYNONYMY:

Heteropora oviformis, Gregory, Rev. pt. vi.: *Ann. Mag. Nat. Hist.* ser. 6, vol. xvii. p. 295.

Diagnosis.—Zoarium small, free, ovate masses. Zoœcia short. Surface of zoarium covered with large, scattered pustules. Mesopores few.

Distribution.—Bradford Clay: Bradford, Wiltshire.

Description of Figure.—Pl. XI. Fig. 4. Zoarium natural size, with part, × 16 dia. Bradford Clay: Bradford. **D. 2176.**

SPECIMENS.

D. 1948.	Bradford Clay.	Holl Coll.	
D. 2176.	,, ,,	Brodie Coll.	Figd. Pl. XI. Fig. 4.

INDETERMINABLE SPECIES.

1. **Heteropora complicata** (D'Orbigny), 1849.

SYNONYMY:

Ceriopora complicata, D'Orbigny, 1849, Prod. Pal. t. i. p. 324.
Crescis ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 1072.

Distribution.—Bathonian: Chatel-Censoir, France.

2. **Heteropora gradata,** Étallon, MS. 1860.

SYNONYMY:

Heteropora gradata, Étallon, 1860, Jura Graylois: *Ann. Sci. phys. nat. Lyon*, sér. 3, t. iv. p. 175. (Name only.)

Distribution.—Diceratian: Marmay, Haute-Saône.

3. **Heteropora hettangensis,** Haime, 1854.

SYNONYMY:

Heteropora hettangensis, Haime, 1854, Bry. jurass.: *Mém. Soc. géol. France*, sér. 2, t. v. p. 212.
,, ,, Terquem, 1855, Pal. dép. Moselle (sep. copy), p. 13.

Distribution.—Lower Lias: Hettange, France.

4. **Heteropora incrustans** (D'Orbigny), 1849.

SYNONYMY:

Monticulipora incrustans, D'Orbigny, 1849, Prod. Pal. t. i. p. 323.
Multinodicrescis subincrustans, D'Orbigny, 1852, *op. cit.* t. v. p. 1068.
,, *subinornata*, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 162.

Distribution.—Bathonian: St. Aubin, Luc, in Calvados.

5. Heteropora lorieri (D'Orbigny).

Synonymy:

Ceriopora lorieri, D'Orbigny, 1849, Prod. Pal. t. i. p. 293.
Heteropora ,, D'Orbigny, 1852, *op. cit.* t. v. p. 1069.
,, ,, Haime, 1854, *op. cit.* p. 212.
,, ,, E. E. Deslongchamps, 1857: *Bull. Soc. linn. Norm.* t. ii. p. 328.
,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 160.

Distribution. — Bajocian: Guéret, Sarthe; Port-en-Bessin, Calvados.

6. Heteropora ramosissima (D'Orbigny), 1849.

Synonymy:

Ceriopora ramosissima, D'Orbigny, 1849, Prod. Pal. t. i. p. 324.
Heteropora ,, D'Orbigny, 1852, *op. cit.* t. v. p. 1069.
,, ,, M'Coy, 1854, Contrib. Brit. Pal. p. 66.

Distribution.—Bathonian: Calvados.

7. Heteropora ranvillensis, D'Orbigny, 1852.

Synonymy:

Heteropora ranvillensis, D'Orbigny, 1852, *op. cit.* p. 1069.

Distribution.—Bathonian ?: France.

8. Heteropora ? subincrustans (D'Orbigny), 1849.

Synonymy:

Polytrema subincrustans, D'Orbigny, 1849, Prod. Pal. t. i. p. 323.
Reptomulticrescis subincrustans, D'Orbigny, 1852, *op. cit.* t. v. p. 1079.

Distribution.—Bathonian: Luc, Langrune, Ranville, etc., France.

Order CHEILOSTOMATA.

Suborder ATHYRIATA.

[Gregory. The British Palæogene Bryozoa: *Trans. Zool. Soc.* vol. xiii. pt. vi. 1893, p. 223.]

Diagnosis.—Cheilostomata with the front wall uncalcified or incompletely calcified.

Family MEMBRANIPORIDÆ.

Diagnosis.—Athyriata with the front wall mainly membranous and occupied by an opesial aperture, which does not correspond to the operculum. The opesium is surrounded by a raised margin. External oœcia.

Genus **MEMBRANIPORA**, Blainville, 1834.

Diagnosis.—Membraniporidæ in which the zoarium is a simple erect or adnate sheet. The opesial aperture is generally of a simple form, and the lamina is absent or but slightly developed.

Membranipora jurassica, Gregory, 1894.

Membranipora jurassica, Gregory, 1894, Jur. Cheil.: *Geol. Mag.* dec. 4, vol. ii. p. 62, fig. 1.

DIAGNOSIS:

Zoarium erect, foliaceous, bilaminate.

Zoœcia regularly quincuncial, form hexagonal, slightly irregular. Opesia very large. Aperture occupying the whole of the opesium and markedly clithridiate in shape. Rim apparently plain, highest on the margin of the aperture, and sloping thence to the inter-zoœcial sutures. Front wall very small in extent, consisting only of a narrow space at the upper end of the zoœcium, sometimes replaced by oœcium.

Oœcium cucullate, reniform in shape, surrounded by a low rim. The oœcia are sparsely scattered over the zoarium.

Avicularia usually a pair at the upper corners of the zoœcium, but sometimes there is only one. The aperture is oval. They are medium in size.

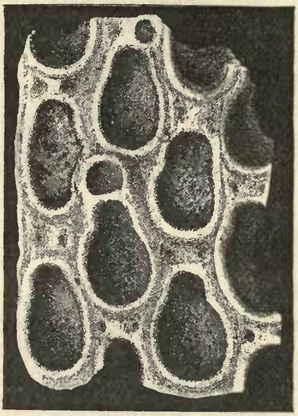

FIG. 21.—*Membranipora jurassica*, Gregory.

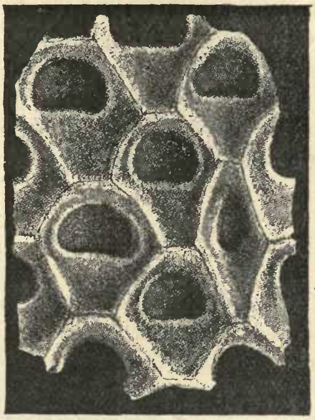

FIG. 22.—*Onychocella flabelliformis* (Lamx.).

Dimensions.—Length of a zoœcium 1·3 mm.; breadth 0·85 mm.

Distribution.—Bathonian—Calcaire à polypiers: Ranville, France.

Type.—Brit. Mus. **D. 180.**

Affinities of the species.—This species belongs to a group which is well represented in the Cretaceous, and it is advisable to compare it with the following seven species. From *Membranipora bipunctata* (Goldf.)[1] it differs in that in the latter the aperture is oval, the zoœcia are less regular, and there is but one avicularium; the species are allied in general aspect and the structure of the rim. *M. velamen* (Goldf.)[2] resembles the new species in the shape of the aperture, but it has a more extensive front wall, larger (and possibly vicarious) avicularia, and the shape of the zoœcia is different. *M. cypris*, D'Orb.,[3] agrees in the

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[1] *Cellepora bipunctata*, Goldfuss, Petref. Germ. Bd. i. Ht. 1, 1827, p. 27, pl. ix. fig. 7; and Hagenow, Die Bryozoen der Maastrichter Kreidebildung, 1851, p. 76, pl. ix. fig. 9.

[2] *Cellepora velamen*, Goldfuss, *op. cit.* p. 26, pl. ix. fig. 4; and Hagenow, *op. cit.* p. 97, pl. xii. fig. 1, in which the type is refigured.

[3] Pal. franç. Terr. crét. t. v. p. 551, pl. DCVII. figs. 11, 12.

Flustrina regularis, D'Orb., *ibid.* p. 306, pl. DCCII. figs. 17, 19. *Flustrina elegans*, p. 302, pl. DCCI. figs. 17–19, appears to be only a worn variety of this species.

shape of the zoœcia and the character of the rim, but has an oval aperture and no avicularia. *M. regularis* (D'Orb.) agrees in the structure of the avicularia, but the other characters show that the species are clearly different. *M. tuberosa*, Novak,[1] agrees in its general characters, but it possesses numerous vibracularia and is more ornamented. Marsson's figure[2] of *M. lyra* (Hag.) shows that this Maestricht species belongs to the same group, but it may be easily distinguished from *M. jurassica* by its oval aperture.

Family MICROPORIDÆ.

Diagnosis.—Athyriata with a calcified front wall. Zoœcia surrounded by raised margins. No internal diaphragms. Oœcia external.

ONYCHOCELLA, Jullien, 1881.

Diagnosis.—Microporidæ with large, vicarious avicularia scattered over the zoarium.

Onychocella flabelliformis (Lamouroux), 1821.

SYNONYMY:

Flustra flabelliformis, Lamouroux, 1821, Expos. Méth. p. 113, footnote, pl. lxxvi. figs. 11–13.
Eschara ,, Bronn, 1848, Nomencl. p. 470.
,, ,, Bronn, 1849, Enum. p. 134.
,, ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 343.
non ,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 98, pl. xc. fig. 5.
Onychocella bathonica, Gregory, 1894, Jur. Cheil.: *Geol. Mag.* dec. 4, vol. ii. p. 63, fig. 2.

DIAGNOSIS:

Zoarium encrusting; an extensive thick crust.

Zoœcia skittle-shaped, the lower part being like half a hexagon, closed above by a well-rounded arc. Aperture ovato-deltoid with

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[1] Novak. Beitrag zur Kenntniss der Bryozoen der böhmischen Kreideformation: *Denk. k. Akad. Wiss. Wien.* Bd. xxxvii. Abth. 2, 1877, p. 92, pl. i. figs. 1–3.

[2] Th. Marsson. Die Bryozoen der weissen Schreibkreide der Insel Rügen. Pal. Abth. Bd. iv. Ht. 1, 1887, p. 59, pl. v. fig. 17.

a blunt upper end; the lower margin is entire and but slightly curved, and has a somewhat raised thin margin; the aperture is large. Front wall small, triangular, depressed; minutely granular. Raised rim, plain, non-crenulate.

Avicularia large, vicarious; long, tapering at each end; irregularly scattered over the zoœcium. Apertures obovate. A small, triangular front wall both above and below the aperture.

Dimensions.—Length of a zoœcium 1 mm.; breadth 0·8 mm.

Distribution. — Bathonian — Calcaire à polypiers: Ranville, France.

Description of Figure.—Fig. 22. Part of zoarium, × 17 dia. **D. 181.**

Affinities.—Lamouroux gave a rather unsatisfactory figure of a Bryozoan, which I feel no doubt is the same species as that which I described in 1894. I had noticed Lamouroux's figure, but overlooked the fact that he had named and described it, as he only did this in a footnote to the explanation of the plates. Lamouroux's figure was so indefinite that Pictet gave a figure of a form, which he referred to this species, but which was really a *Diastopora lamellosa.* But for the British Museum specimen, I should not have been able to determine the genus, for Lamouroux's figure is not sufficiently precise.

The closest allies of this species are four from the Cretaceous, which have been described under other generic names. It is unfortunate that there is some doubt about its nearest ally, a Maestrichtien species, described by Hagenow: in his monograph he has given two figures[1] which he assigns to the species *Cellepora* (*Discopora*) *koninckiana*; but the structure of the aperture is so different in the two, that I feel bound to assign them to different species: in his first figure the aperture is mucronate and is small; in the second (fig. 11) the aperture is elliptic, with the longer axis longitudinal, the lower margin is entire, the aperture occupies twice as large an area as in the former, and the avicularia are much larger. I therefore make Hagenow's second figure (fig. 11) into a new species under the name of *Onychocella hagenowi.* This is the nearest ally of *O. flabelliformis*, but it differs in the larger size of both the avicularian and zoœcial apertures.

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[1] Hagenow. *Op. cit.* p. 95, pl. xi. figs. 10, 11.

Onychocella piriformis (Goldf.)[1] is another ally, but has a lower zoœcial aperture, while the avicularian aperture is larger and the front wall occurs only above and not on both sides of this. *O. santonensis* (D'Orb.)[2] has a smaller mouth and longer avicularia; *O. solea* (Novak)[3] a semi-elliptical aperture with a mucronate lower margin.

SPECIMENS.

D. 181. Frond. Bathonian. Ranville. Tesson Coll. Figd. No. 22.

D. 480. Fragment mounted on slide. Bathonian. Ranville. Tesson Coll.

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[1] *Eschara piriformis*, Goldfuss, *op. cit.* p. 24, pl. viii. fig. 10; Hagenow, *op. cit.* p. 75, pl. ix. fig. 6; pl. xi. fig. 6.

[2] *Eschara santonensis*, D'Orbigny. *Op. cit.* p. 109, pl. DCIII. figs. 1–3; pl. DCLXXIII. fig. 4.

[3] *Biflustra solea*, Novak. *Op. cit.* pp. 94–5, pl. iii. figs. 12–16.

APPENDIX A.

MISCELLANEOUS RECORDS.

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1. *Bullopora rostrata*, Quenstedt, 1858, Der Jura, p. 580, pl. lxxiii. fig. 28.

Probably not a Bryozoon.

2. *Ceriopora michelini*, D'Orbigny, 1849, Prod. Pal. t. i. p. 324.
3. *Entalophora proboscidea*, Vine (? D'Orb.), 1888, Polyz. Caen: *Journ. Northptn. Nat. Hist. Soc.* vol. v. p. 23.
4. *Escharites rhombifer*, Waagen, 1868, Zone *Amm. sowerbyi*: *Geogn. Pal. Beitr.* Bd. i. Ht. 3, p. 642, pl. xxxiii. fig. 6.

? *Ceriocava.*

5. *Homœosolen jurensis*, Étallon, 1861, Étud. Haut-Jura Cor.: *Mém. Soc. Émul. Doubs.* sér. 3, t. vi. p. 215.

? *Reticulipora.*

6. *Hornera infra-oolithica*, Waagen, 1868, *op. cit.* p. 642, pl. xxxiii. figs. 9, 10.
7. *Inversaria milleporacea*, Vine (? Hag.), 1888, Polyz. Caen: *Journ. Northptn. Nat. Hist. Soc.* vol. v. p. 23.
8. *Millepora macrocaule*, Lamouroux, 1821, Expos. Méth. p. 86, pl. lxxxiii. fig. 4.

Syn. *Ceriopora macrocaulis*, D'Orbigny, 1849, Prod. Pal. t. i. p. 324.
Multicrescis ,, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 1074.

Affinity.—Probably a sponge.

9. *Pavotubigera minuta*, Reuss, 1867, Bry. braun. Jura Balin: *Denk. k. Akad. Wiss. Wien.* Bd. xxvii. p. 3, pl. ii. fig. 8.
10. *Reptomulticava gradata*, D'Orbigny, 1852, Pal. franç. Terr. crét. t. v. p. 1034.
    ,, ,, Pictet, 1857, Traité Pal. éd. 2, t. iv. p. 158.
11. *Semimulticlausa orbignyi*, Terquem and Piette, 1865, Lias inf. Est France: *Mém. Soc. géol. France*, sér. 2, t. viii. p. 124, pl. xviii. figs. 7–9.

? *Ceriopora.*

12. *Spathipora incerta*, Fischer, 1866, Ét. Bry. perf. Térébriporides: *Nouv. Arch. Mus. Hist. nat. Paris*, t. ii. p. 310.

Probably not a Bryozoon.

13. *Terebripora antiqua*, D'Orbigny, 1849, Prod. Pal. t. i. p. 318.

,, ,, Fischer, 1866, Et. Bry. perf. Térébriporides: *Nouv. Arch. Mus. Hist. nat. Paris*, t. ii. p. 304.

14. ,, *arachne*, Fischer, 1866, *op. cit.* p. 303.

15. ,, ? *michelini* (Terquem), Fischer, 1866, *op. cit.* p. 305.

Wurmlöcher, Quenstedt, 1858, Der Jura, p. 48, pl. iv. figs. 1, 2.

Vioa michelini, Terquem, 1855, Pal. Hettange: *Mém. Soc. géol. France*, sér. 2, t. v. p. 334, pl. xxvi. fig. 6.

Haimeina michelini, Terquem, 1868, Lias inf. Est France: *Mém. Soc. géol. France*, sér. 2, t. viii. p. 134.

16. ,, *producta*, Fischer, 1866, *op. cit.* p. 303.

17. ,, *propinqua*, Fischer, 1866, *op. cit.* p. 304.

18. ,, ? *quenstedti*, Fischer, 1866, *op. cit.* p. 306.

[The above species (13–18) of *Terebripora* are often included among the Bryozoa; but the author sees no sufficient reason to regard them as such.]

19. *Tubipora acervalis*, Bean, 1839, Cat. Foss. Cornbr. Scarb.: *Mag. Nat. Hist.* ser. 2, vol. iii. p. 58.

,, ,, Wright, 1860, Subdiv. Inf. Oolite: *Quart. Journ. Geol. Soc.* vol. xvi. p. 28.

20. ,, *incrustans*, Bean, 1839, *op. cit.* p. 58.

,, ,, Wright, 1860, *op. cit.* p. 28.

21. ,, *strues*, Fleming, 1828, Brit. Anim. p. 529. [Not Jurassic as stated.]

APPENDIX B. LIST OF SPECIES AND DISTRIBUTION.*

			England.												Foreign.								
			Lias.	Inferior Oolite.	Fuller's Earth.	Great Oolite.	Bradford Clay.	Forest Marble.	Cornbrash.	Kelloway.	Oxford Clay.	Corallian.	Kimeridge Clay.	Portland.	Lias.	Bajocian.	Bathonian.	Callovian.	Oxfordian.	Argovian.	Corallian.	Kimeridgian.	Portlandian.
	Stomatopora	Bronn	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1.	*dichotoma*	(Lamx.)	M. L.	x	x	x	x	—	x	—	—	—	—	—	F.G.	G.	F.G.	—	?F.	?G.	?F.	G.	—
2.	*dichotomoides*	(D'Orb.)	—	x	x	x	—	—	x	—	—	x	—	—	—	F.G.	A.F.	F.	F.	—	F.	—	—
3.	*waltoni*	Haime	—	x	x	—	x	—	x	—	—	—	—	—	—	F.	—	—	—	—	—	—	—
4.	*smithi*	(Phill.)	—	—	—	—	—	—	x	—	—	—	—	—	—	—	—	—	—	—	—	—	—
5.	*intermedia*	(Münst.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	G.	—	—
	Proboscina	Aud.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6.	*eudesi*	Haime	—	x	—	x	—	—	—	—	—	—	—	—	—	G.	F.	—	—	—	—	—	—
7.	*jacquoti*	,,	—	x	—	—	—	—	x	—	—	—	—	—	—	F.G.	—	—	—	—	—	—	—
8.	*desoudini*	(Haime)	—	x	—	—	—	—	x	—	—	—	—	—	—	F.	F.	—	—	—	—	—	—
9.	*cunningtoni*	Greg.	—	—	x	—	—	—	x	—	—	—	—	—	—	—	—	—	—	—	—	—	—
10.	*rigauxi*	(Sauv.)	—	—	—	—	—	—	x	—	—	—	—	—	—	—	F.	—	—	—	—	—	—
11.	*morinica*	(,,)	—	x	—	—	—	—	x	—	—	—	—	—	—	—	—	—	F.	—	—	—	—
12.	*spatiosa*	Walf.	—	x	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
13.	*liassica*	(Quenst.)	M.	x	—	—	—	—	—	—	—	—	—	—	G.	G.	—	—	—	—	—	—	—
	Berenicea	Lamx.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
14.	*allaudi*	(Sauv.)	—	x	x	—	—	—	—	—	—	—	—	—	—	F.	—	F.	F.	—	—	—	—
15.	*compressa*	(Goldf.)	U. M.	x	—	x	x	—	x	—	—	x	—	—	G.	G.	A.	—	—	—	G.	—	—
16.	*normani*	(D'Orb.)	—	—	—	—	—	—	—	—	—	—	—	—	—	F.	—	—	—	—	—	—	—
17.	*sauvagei*	Greg.	U.	—	—	—	x	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

	Berenicea	Lamx. ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
18.	*portlandica*	Greg.	—	—	—	—	—	—	—	—	—	—	—	x	—	—	—	—	—	—	—	—	—
19.	*striata*	Haime ...	L.	x	—	—	—	—	—	—	—	—	—	—	B.F.G.	—	—	—	—	—	—	—	—
20.	*spatiosa*	(Walf.) ..	—	x	x	—	—	—	—	—	—	—	—	—	—	—	F.G.	—	—	—	—	—	—
21.	*denticulata*	Terq. and J.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	F.	—	—	—	—	—	—
22.	*tenuis*	(D'Orb.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	F.
23.	*diluviana*	Lamx. ...	M.	x	x	x	x	—	x	—	x	x	—	—	—	F.G.	F.G	—	—	F.	—	—	—
24.	*parvitubulata*	Greg.	—	—	—	x	x	—	x	—	—	—	—	—	—	—	—	—	—	—	—	—	—
25.	*boloniensis*	(Sauv.) ...	—	—	—	—	x	—	—	—	—	—	—	—	—	—	—	—	—	F.G.	F.	—	—
26.	*archiaci*	Haime ...	M.	x	—	x	x	—	x	—	x	—	—	—	G.	F.G.	—	—	—	G.	—	—	—
27.	*exilis*	Reuss	—	x	—	x	—	—	x	—	—	—	—	—	—	—	A.F.	—	—	—	—	—	—
28.	*verrucosa*	(M. Edw.)	—	x	—	x	x	—	x	—	—	—	—	—	—	G.	A.F.	F.	F.S.	—	F.G.	G.	—
29.	*concatenata*	Reuss	—	—	—	—	—	—	—	—	—	—	—	—	—	—	F.	—	—	—	—	—	—
30.	*scobinula*	(Mich.) ...	—	—	—	—	x	—	x	—	—	—	—	—	—	F.G.	A.	—	—	—	F.	—	—
31.	*coartata*	Greg.	—	x	—	x	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Reptomultisparsa	D'Orb. ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
32.	*microstoma*	(Mich.) ...	—	—	—	—	—	—	—	—	—	—	—	—	—	F.	F.	—	—	—	—	—	—
33.	*undulata*	(,,) ...	—	—	—	x	x	—	—	—	—	—	—	—	—	F.G.	G.	—	—	—	—	—	—
	Diastopora...............	Lamx. ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
34.	*foliacea*	,, ...	—	x	—	x	—	—	x	—	—	—	—	—	—	G.	F.	—	—	—	—	—	—
35.	*davidsoni*	Haime ...	—	x	—	x	—	—	x	—	—	—	—	—	—	F.G.	F.	—	—	—	—	—	—
36.	*michelini*	(Blainv.)	—	x	—	x	—	x	—	—	—	—	—	—	—	G.	A.F.	—	—	—	—	—	—
37.	*lamellosa*	Mich.	—	?	—	x	x	—	—	—	—	—	—	—	—	G.	A.F.	—	—	—	—	—	—
38.	*calloviensis*	(D'Orb.)	—	x	—	—	—	—	—	—	—	—	—	—	—	—	F.	F.	—	—	—	—	—
39.	*lamourouxi*	M. Edw.	—	x	—	—	—	—	—	—	—	—	—	—	—	G.	A.F.	—	—	—	—	—	—
40.	*retiformis*	Haime ...	—	—	—	—	—	—	—	—	—	—	—	—	—	G.	—	—	—	—	—	—	—
	Idmonea	Lamx. ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
41.	*triquetra*	,, ...	—	—	—	x	x	—	—	—	—	—	—	—	—	—	F.	—	—	—	—	—	—
	Entalophora	,, ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
42.	*cellarioides*	,, ...	—	x	—	x	—	—	—	—	—	—	—	—	—	—	F.	—	—	—	—	—	—
43.	*nidulata*	(Walf.) ...	—	x	—	x	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
44.	*magnipora*	,, ...	M.	x	—	x	—	—	—	—	—	—	—	—	—	? F.	—	—	—	—	—	—	—
	Spiropora	Lamx. ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
45.	*elegans*	,, ...	—	—	—	x	—	—	—	—	—	—	—	—	—	—	F.	—	—	—	—	—	—

* In the column for Lias, L. = Lower; M. = Middle; U. = Upper. In the Foreign columns, A. = Austria; B. = Belgium; F. = France; G. = Germany; S. = Switzerland.

APPENDIX B. LIST OF SPECIES AND DISTRIBUTION* (*continued*).

			England.												Foreign.								
			Lias.	Inferior Oolite.	Fuller's Earth.	Great Oolite.	Bradford Clay.	Forest Marble.	Cornbrash.	Kelloway.	Oxford Clay.	Corallian.	Kimeridge Clay.	Portland.	Lias.	Bajocian.	Bathonian.	Callovian.	Oxfordian.	Argovian.	Corallian.	Kimeridgian.	Portlandian.
	Spiropora	Lamx. ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
46.	*annulosa*	(Mich.) ...	—	x	—	x	—	—	—	—	—	—	—	—	—	F.G.	F.	—	—	F.	—	—	—
47.	*abbreviata*	(,,) ...	—	—	—	—	—	—	—	—	—	—	—	—	—	F.G.	F.	—	—	—	—	—	—
48.	*cæspitosa*	Lamx. ...	—	x	—	x	—	x	—	—	—	—	—	—	—	F.G.	F.	—	—	—	—	—	—
49.	*richmondiensis*	(Vine) ...	—	x	—	x	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
50.	*tetragona*	Lamx. ...	—	?	—	—	—	—	—	—	—	—	—	—	—	—	F.	—	—	—	—	—	—
	Haploœcia	Greg. ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
51.	*straminea*	(Phill.) ...	—	x	—	x	—	x	x	—	—	—	—	—	—	G.	F.	—	—	—	—	—	—
52.	*irregulare*	Greg.	—	—	—	x	—	—	—	—	—	—	—	—	—	—	F.	—	—	—	—	—	—
	Ceriocava	D'Orb. ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
53.	*corymbosa*	(Lamx.) ...	—	—	—	x	—	—	x	—	—	—	—	—	—	—	F.	—	—	—	—	—	—
54.	*laxata*	Greg.	—	x	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Fasciculipora...........	D'Orb. ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
55.	*waltoni*	Haime ...	—	—	—	x	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Apsendesia	Lamx. ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
56.	*cristata*	,,	—	x	—	x	x	x	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
57.	*parvecristata*	(Waag.) ...	—	—	—	—	—	—	—	—	—	—	—	—	—	F.G.	—	—	—	—	—	—	—
	Tetrapora	Quenst. ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
58.	*suevica*	,,	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	G.	—	—
	Actinopora	D'Orb. ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
59.	*phillipsi*	(Haime) ...	—	—	—	x	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
60.	*diplopora*	(Branco) ...	—	x	—	x	—	—	—	—	—	—	—	—	—	G.	—	—	—	—	—	—	—

	Kololophos	Greg.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
61.	*terquemi*	(Haime)...	—	x	—	—	—	—	—	—	—	—	—	—	—	G.	—	—	—	—	—	—	—
	Theonoa..	Lamx. ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
62.	*clathrata*	,,	—	—	—	x	—	—	—	—	—	—	—	—	—	F.G.	F.	—	—	—	—	—	—
63.	*bowerbanki*	Haime ...	—	x	—	—	—	—	—	—	—	—	—	—	—	G.	—	—	—	—	—	—	—
64.	*distorta*	(Lamx.) ...	—	x	—	—	—	—	—	—	—	—	—	—	—	—	F.	—	—	—	—	—	—
65.	*michelini*	Greg.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	F.	—	—	—	—	—	—
	Multiclausa	D'Orb. ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
66.	*haimei*	Greg.	—	—	—	x	x	—	x	—	—	—	—	—	—	? G.	A.F.	—	—	—	—	—	—
67.	*jellyæ*	,, ...	—	x	—	—	x	—	—	—	—	—	—	—	—	—	F.	—	—	—	—	—	—
	Terebellaria	Lamx. ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
68.	*ramosissima*	,,	—	x	x	x	x	x	x	—	—	—	—	—	—	—	F.	—	—	—	—	—	—
	Reticulipora	D'Orb. ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
69.	*dianthus*	(Blainv.)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	F.	—	—	—	—	—	—
	Chilopora	Haime ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
70.	*guernoni*	,,	—	—	—	—	—	—	—	—	—	—	—	—	—	—	F.	—	—	—	—	—	—
	Ceriopora	Goldf. ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
71.	*globosa*	Mich.	—	x	—	x	x	—	—	—	—	—	—	—	—	F.G.	F.G.	—	—	—	—	—	—
72.	*arborescens*	Waagen ...	—	x	—	x	—	—	—	—	—	—	—	—	—	G.	F.	—	—	—	—	—	—
	Heteropora	Blainv. ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
73.	*conifera*	(Lamx.) ...	—	x	—	x	—	—	—	—	—	—	—	—	—	F.G.	F.G.	A. ?F.	—	—	—	—	—
74.	*pustulosa*	Haime ...	—	—	—	—	—	—	—	—	—	—	—	—	—	F.G.	F.	—	—	—	—	—	—
75.	*laminata*	Greg.	—	x	—	—	x	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
76.	*capilliformis*	(Mich.) ...	—	x	—	—	—	—	—	—	—	—	—	—	—	—	F.	—	—	F.	F.	—	—
77.	*oviformis*	Greg.	—	—	—	—	x	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Membranipora	Blainv. ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
78.	*jurassica*	Greg.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	F.	—	—	—	—	—	—
	Onychocella	Jullien	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
79.	*flabelliformis*........	(Lamx.) ..	—	—	—	—	—	—	—	—	—	—	—	—	—	—	F.	—	—	—	—	—	—

* In the Foreign columns, A. = Austria; F. = France; G. = Germany.

APPENDIX C.

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EXPLANATION OF PLATES.

PLATE I.

FIG. 1. *Stomatopora dichotoma*, Lamx. Encrusting *Apiocrinus elegans* (Defr.). Bradford Clay: Bradford. Zoarium nat. size, and part, × 25 dia. [B. 4833.]

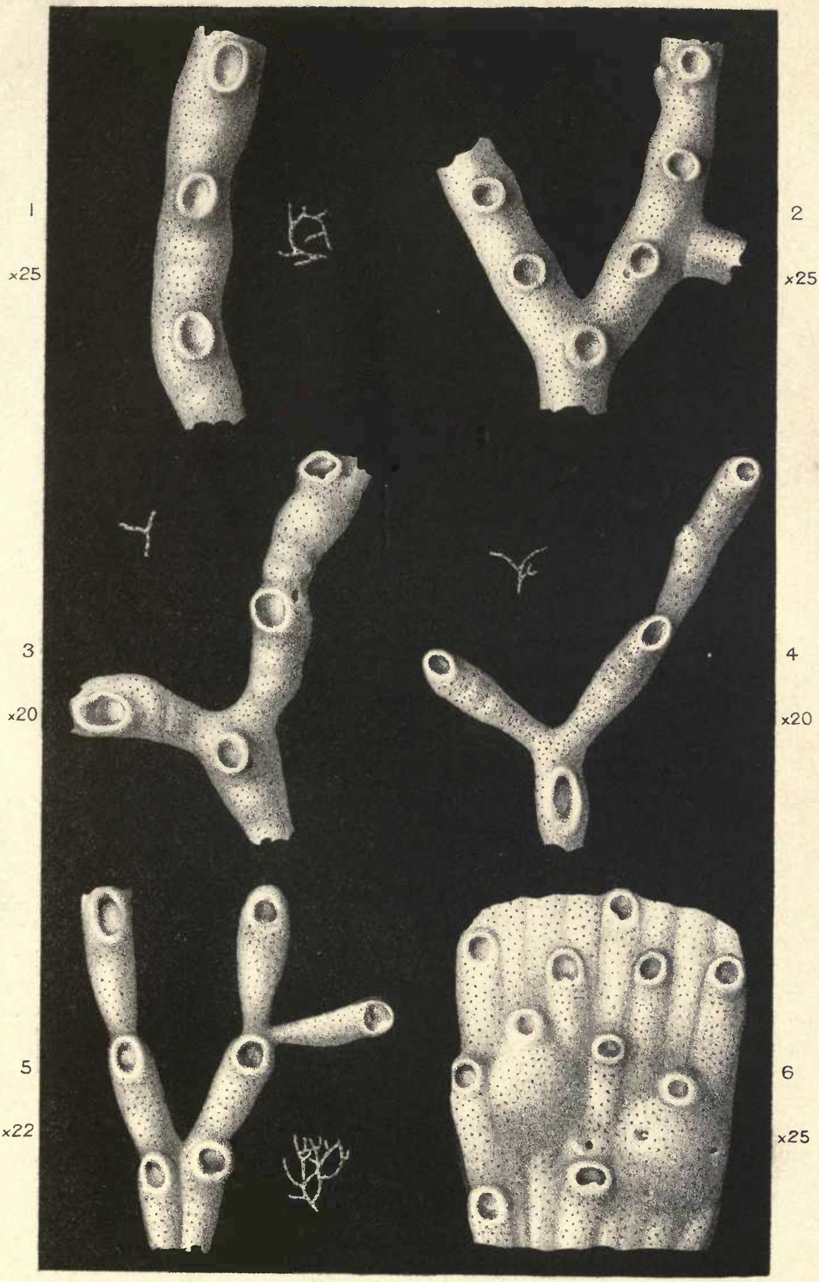
FIG. 2. *Stomatopora dichotoma*, Lamx. Bradford Clay: Box, Wiltshire. Part of zoarium, × 25 dia. Holl Coll. [B. 4860.]

FIG. 3. *Stomatopora dichotomoides* (D'Orb.). Great Oolite: Hamcastle, near Bath. Part of zoarium encrusting *Multiclausa*, sp., × 20 dia. [B. 4249.]

FIG. 4. *Stomatopora dichotomoides* (D'Orb.), var. *attenuata* (Walf.). Cornbrash: Thrapston, Northamptonshire. × 20 dia. Vine Coll. [D. 927.]

FIG. 5. *Stomatopora waltoni*, Haime. Fuller's Earth: Gloucestershire. Zoarium encrusting *Terebratula* aff. *plicata*, Buckm., nat. size, and some zoœcia, × 22 dia. Presented by G. R. Waterhouse, Esq. [97083.]

FIG. 6. *Proboscina jacquoti*, Haime, var. *expansa*. Cornbrash: Thrapston. Part of zoarium encrusting *Nucleolites orbicularis* (Phil.), showing gonocysts, × 25 dia. Type of *P. ornata*, Vine. Figd. Proc. Yorks. Geol. Soc. vol. xii. (1893) pl. xiii. fig. 10. Vine Coll. [D. 2063.]



G.M. Woodward del. et lith. West, Newman imp.

Stomatopora & Proboscina.

R

PLATE II.

FIG. 1. *Proboscina eudesi*, Haime. Inferior Oolite — Pea Grit: Gloucestershire. × 20 dia. Holl Coll. [D. 1843.]

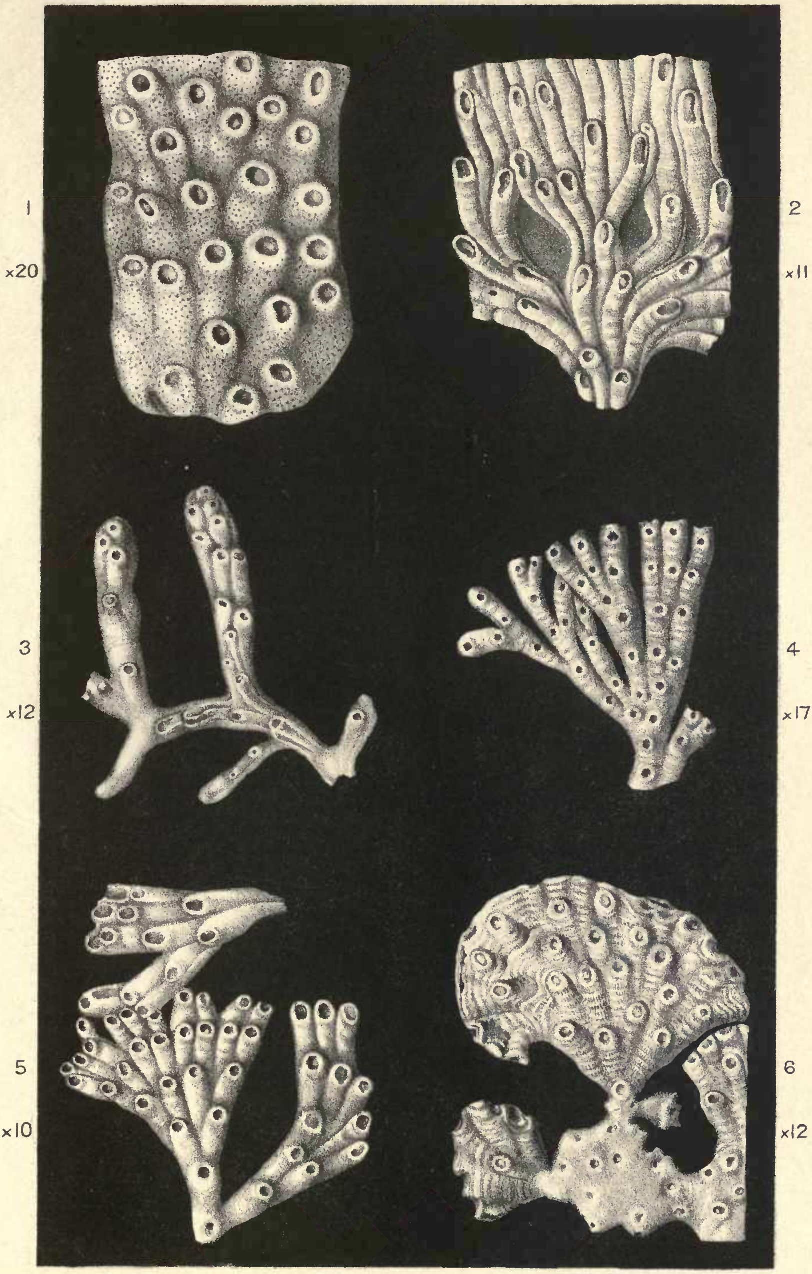
FIG. 2. *Proboscina jacquoti*, Haime, var. *expansa*. Cornbrash: Thrapston. Encrusting *Nucleolites orbicularis* (Phil.), × 11 dia. Vine Coll. [D. 921.]

FIG. 3. *Proboscina desoudini*, Haime. Cornbrash: Thrapston. Encrusting *Nucleolites orbicularis* (Phil.), × 12 dia. Vine Coll. [D. 1010.]

FIG. 4. *Proboscina cunningtoni*, Gregory. Fuller's Earth: Bruton. Part of a zoarium encrusting *Zeilleria ornithocephala* (J. de C. Sow.), × 17 dia. Cunnington Coll. [88742]

FIG. 5. *Proboscina cunningtoni*, Gregory. Cornbrash: Corsham, Wilts. Part of a worn zoarium encrusting *Terebratula maxillata*, J. de C. Sow., var. *submaxillata*, Morr., to show tufted ends of branches, × 10 dia. W. Buy Coll. [23852.]

FIG. 6. *Proboscina rigauxi* (Sauv.). Cornbrash: Rushden. Part of a zoarium encrusting *Terebratula intermedia*, J. de C. Sow., × 12 dia. [B. 4846.]



G.M.Woodward del. et lith. West, Newman imp.

Proboscina.

PLATE III.

FIG. 1. *Berenicea spatiosa* (Walf.). Great Oolite: Hampton, near Bath. × 22 dia. Holl Coll. [D. 30.]

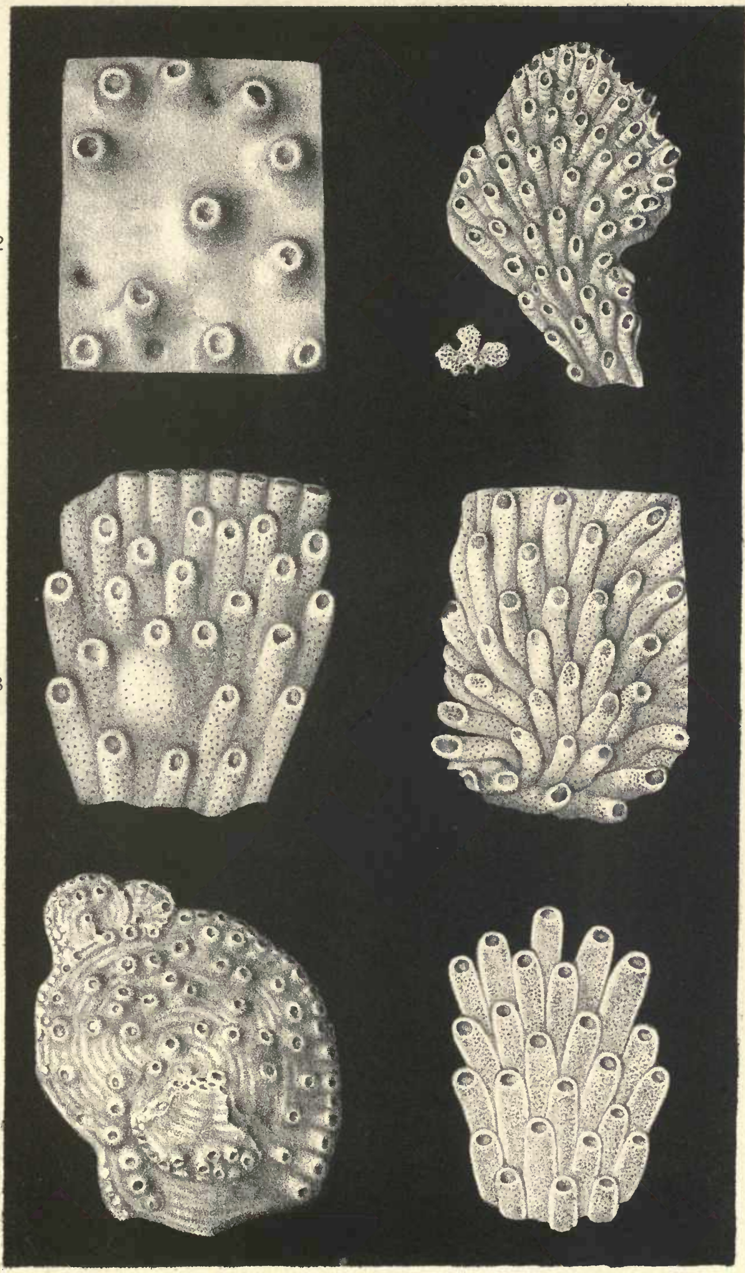
FIG. 2. *Berenicea compressa* (Goldf.). Bradford Clay: Bridgewater Quarry, Bradford. × 12 dia. [D. 1782.]

FIG. 3. *Berenicea compressa* (Goldf.). Cornbrash: Thrapston. Part of a zoarium with gonocyst, × 18 dia. Vine Coll. [D. 924.]

FIG. 4. *Berenicea sauvagei*, Greg. Bradford Clay: Bradford. Part of zoarium encrusting *Apiocrinus*. Some worn zoœcia show the perforated diaphragms. × 15 dia. Presented by Benj. Bright, Esq. [B. 194.]

FIG. 5. *Berenicea portlandica*, Greg. Portland Oolite: Tisbury, Wiltshire. × 12 dia. Presented by J. W. Gregory. [D. 1853.]

FIG. 6. *Berenicea allaudi* (Sauv.). Inferior Oolite. Loc. ? Part of a worn zoarium encrusting *Terebratula plicata*, Buckm., × 16 dia. [D. 1795.]



1 ×22

2 ×12

3 ×18

4 ×15

5 ×12

6 ×16

G M Woodward del et lith. West, Newman imp

Berenicea.

PLATE IV.

Fig. 1. *Berenicea archiaci*, Haime. Bradford Clay: Bradford, Wiltshire. Part of a zoarium with gonocyst growing on root of *Apiocrinus*, × 6 dia. J. Sharp Coll. Whole zoarium shown natural size. [51342.]

Fig. 2. *Berenicea archiaci*, Haime. Cornbrash: Thrapston. Zoarium encrusting *Ostrea*, sp., × 7 dia. With gonocysts. Vine Coll. [D. 919.]

Fig. 3. *Berenicea archiaci*, Haime. Cornbrash: Thrapston. Encrusting *Nucleolites orbicularis* (Phil.). Zoarium without gonocysts, × 11 dia. Vine Coll. [D. 920.]

Fig. 4. *Berenicea diluviana*, Lamx. Bradford Clay: Box Tunnel, Wiltshire. Encrusting *Terebratula maxillata*, J. de C. Sow. Part of zoarium, × 13 dia. [B. 4251.]

Fig. 5. *Berenicea parvitubulata*, Greg. Great Oolite: Richmond boring. Part of zoarium with gonocysts, × 18 dia. Presented by Prof. J. W. Judd, C.B., F.R.S. [D. 1912.]

Fig. 6. *Berenicea parvitubulata*. Part of worn zoarium encrusting *Terebratula intermedia*, J. de C. Sow., with gonocysts, × 16 dia. Cornbrash: Rushden. Cunnington Coll. [60535.]

1 ×6

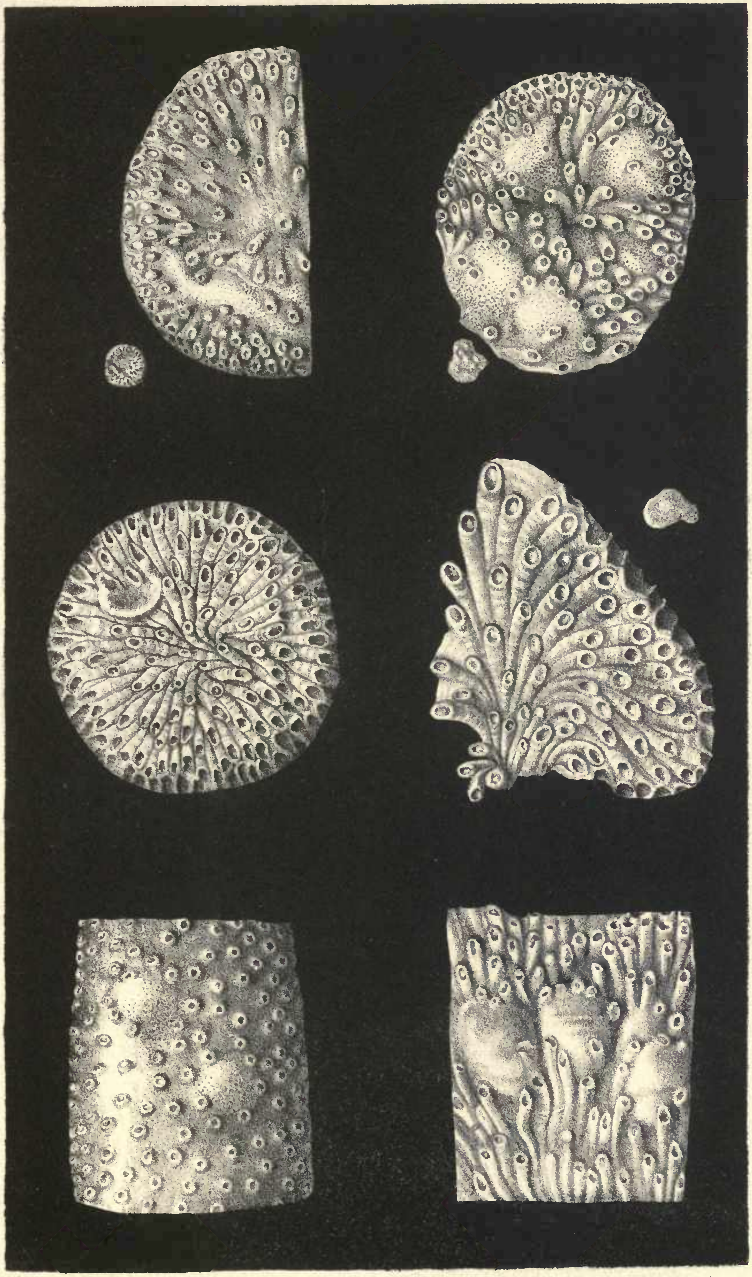
2 ×7

3 ×11

4 ×13

5 ×18

6 ×16



G. M. Woodward del. et lith.

West, Newman imp.

Berenicea.

PLATE V.

FIG. 1. *Berenicea boloniensis* (Sauv.). Bradford Clay : Busfield. Part of zoarium encrusting *Terebratula maxillata*, J. de C. Sow., × 18 dia. [50777.]

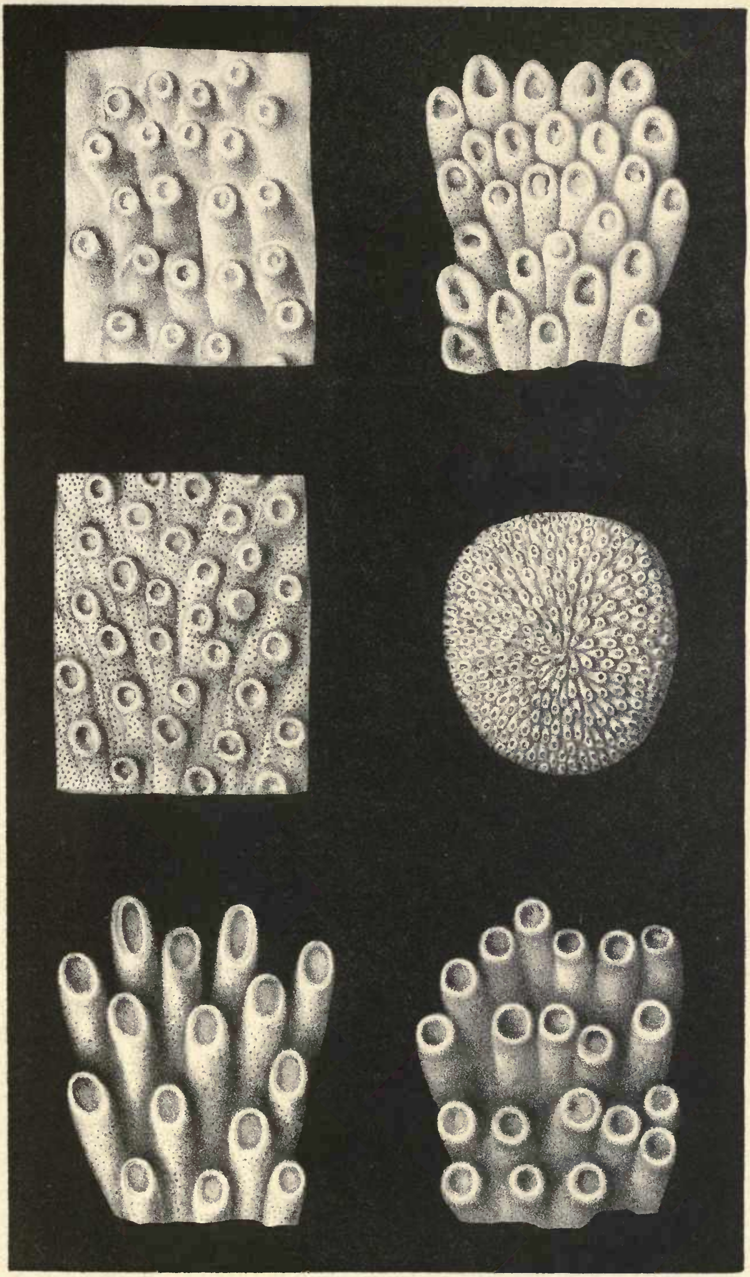
FIG. 2. *Berenicea coartata*, Greg. Inferior Oolite : Crickley. Part of zoarium encrusting *Terebratula plicata*, Buckm., × 18 dia. [67553.]

FIG. 3. *Berenicea scobinula* (Mich.). Bradford Clay : Box, Wiltshire. Part of zoarium encrusting *Oxytoma costata* (Smith), × 16 dia. Holl Coll. [B. 4858.]

FIG. 4. *Berenicea verrucosa* (M. Edw.). Inferior Oolite : Broad Winsor. Zoarium encrusting *Holectypus hemisphæricus* (Ag.), × 4 dia. [B. 2284.]

FIG. 5. *Berenicea verrucosa* (M. Edw.). Bradford Clay : Bradford. Part of zoarium encrusting *Apiocrinus*, × 18 dia. [B. 4867.]

FIG. 6. *Berenicea exilis*, Reuss. Great Oolite : Hampton Common. Part of zoarium encrusting limestone, × 18 dia. [B. 2301.]



1 ×18

2 ×18

3 ×16

4 ×4

5 ×18

6 ×18

G. M. Woodward del. et lith.

West, Newman imp.

Berenicea.

PLATE VI.

FIG. 1. *Berenicea exilis*, Reuss. Inferior Oolite : near Leckhampton. Part of zoarium, × 18 dia. Brodie Coll. [D. 2217.]

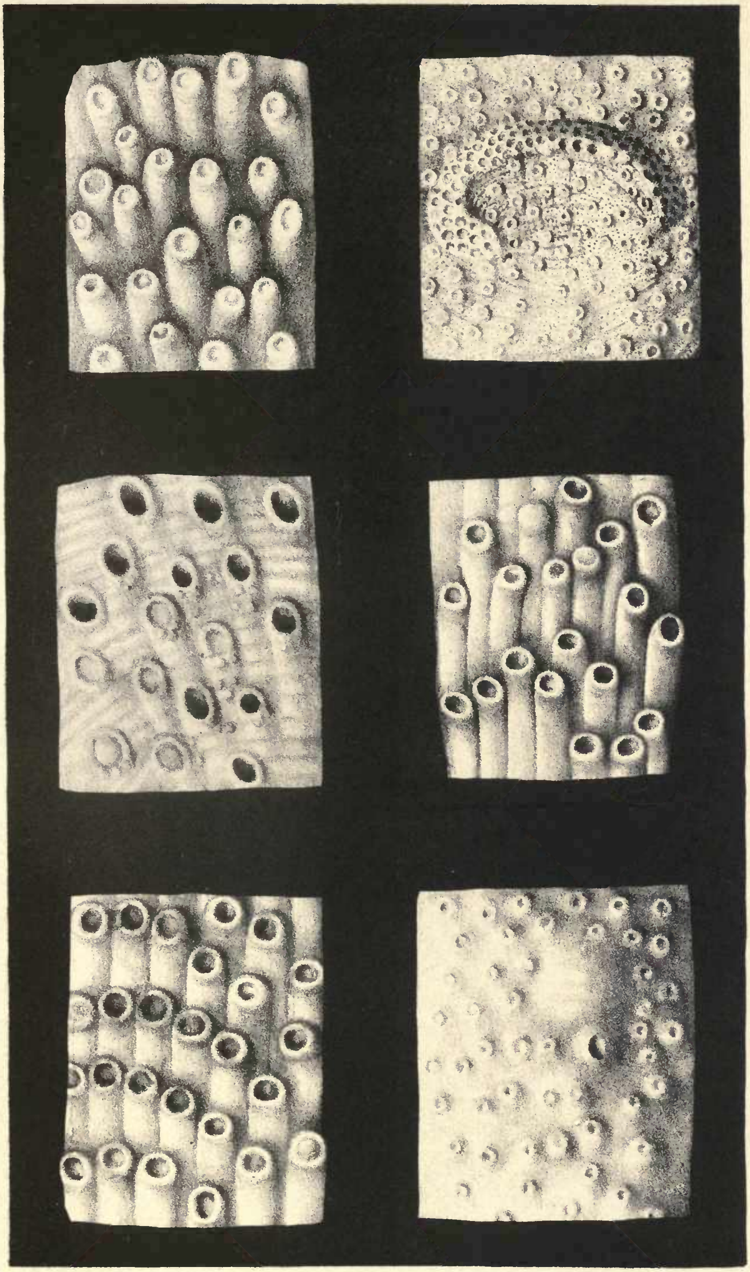
FIG. 2. *Reptomultisparsa undulata* (Mich.). Lower Oolite. Loc. ? Part of zoarium, × 10 dia. [B. 4850.]

FIG. 3. *Reptomultisparsa undulata* (Mich.). Bradford Clay : Wiltshire. × 18 dia. J. Wood Coll. [35250.]

FIG. 4. *Diastopora foliacea*, Lamx. Inferior Oolite. Loc. ? Part of zoarium, × 15 dia. Holl Coll. [D. 5.]

FIG. 5. *Diastopora davidsoni*, Haime. Great Oolite: Hampton Common. Normal forms. Zoœcia, × 18 dia. [B. 2302.]

FIG. 6. *Diastopora davidsoni*, Haime. (Form *wrighti.*) Inferior Oolite : near Leckhampton. Part of base of a zoarium, with gonocyst, × 18 dia. Brodie Coll. [D. 2142.]



1 ×18 — 2 ×10

3 ×18 — 4 ×15

5 ×18 — 6 ×18

G. M. Woodward del. et lith. West, Newman imp.

Berenicea Reptomultisparsa & Diastopora.

PLATE VII.

FIG. 1. *Proboscina morinica* (Sauv.). Inferior Oolite: Cleeve, near Leckhampton. × 18 dia. Brodie Coll. [D. 1840.]

FIG. 2. *Diastopora michelini* (Blainv.). Forest Marble: Wiltshire. Part of zoarium, × 17 dia. Cunnington Coll. [24770.]

FIG. 3. *Diastopora lamellosa*, Mich. Great Oolite: Ancliff, near Bath. Fragment, × 17 dia. [24521.]

FIG. 4. *Diastopora lamourouxi*, M. Edw. Inferior Oolite: near Leckhampton. Part of funnel-shaped end of zoarium, × 17 dia. Brodie Coll. [D. 2194.]

FIG. 5. *Diastopora calloviensis* (D'Orb.). Bathonian — Calcaire à polypiers: Ranville. Part of tufted zoarium, × 13 dia. Tesson Coll. [60368.]

FIG. 6. *Idmonea triquetra*, Lamx. Great Oolite: Minchinhampton. Part of a young zoarium, × 32 dia. Byne Coll. [20730.]

1 ×17

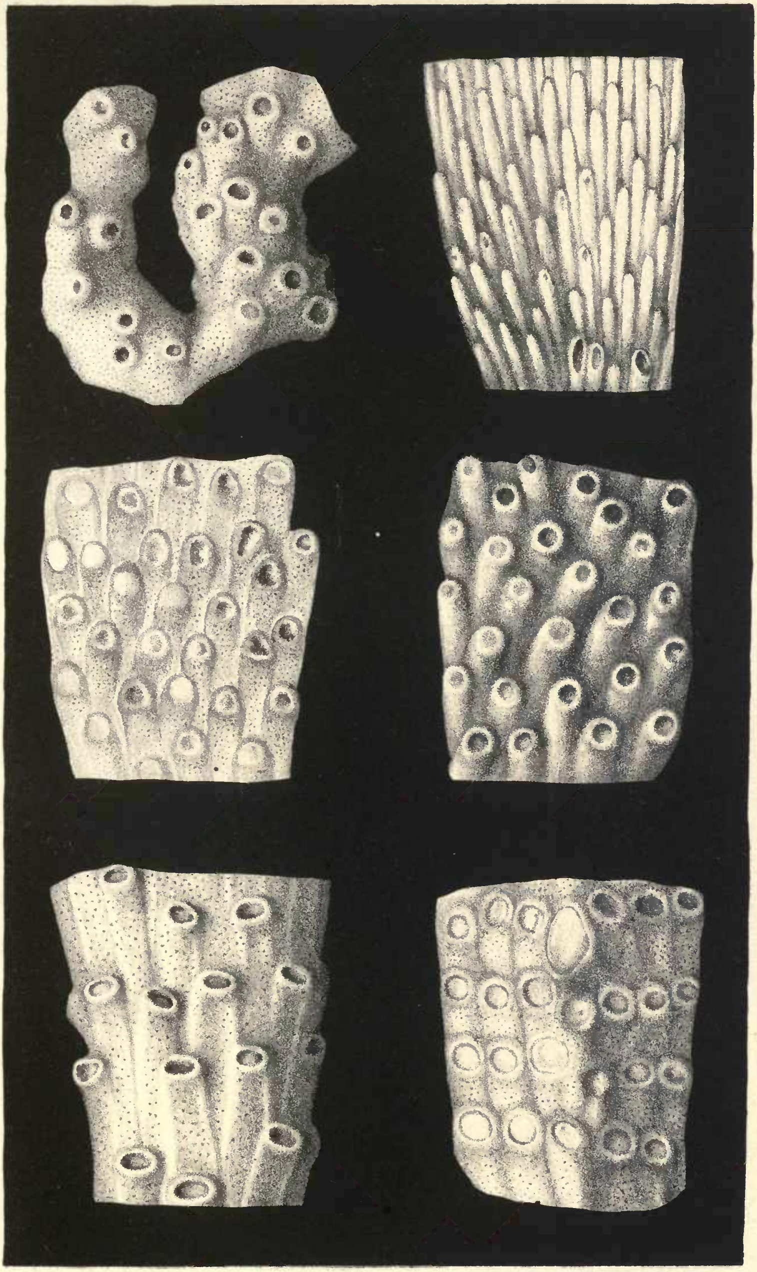
2 ×17

3 ×17

4 ×17

5 ×13

6 ×32



G.M.Woodward del. et lith. West, Newman imp.

Proboscina Diastopora & Idmonea.

PLATE VIII.

Fig. 1. *Entalophora cellarioides*, Lamx. Bathonian — Calcaire à polypiers : Ranville. × 17 dia. Tesson Coll. [D. 2257.]

Fig. 2. *Entalophora nidulata* (Walf.). Great Oolite : Richmond boring. Presented by Prof. J. W. Judd, C.B., F.R.S. Young zoarium, × 26 dia. [D. 1931.]

Fig. 3. *Entalophora magnipora* (Walf.). Great Oolite : near Bath. Presented by J. W. Gregory. × 17 dia. [D. 2098.]

Fig. 4. *Spiropora elegans*, Lamx. Great Oolite : Bath. Branch, × 17 dia. [60173.]

Fig. 5. *Spiropora annulosa*, Mich. Inferior Oolite : Bredon. Part of branch, × 26 dia. Holl Coll. [B. 4864.]

Fig. 6. *Spiropora cæspitosa*, Lamx. Forest Marble : Wiltshire. Branch, × 17 dia. Cunnington Coll. [24770.]

1 ×17

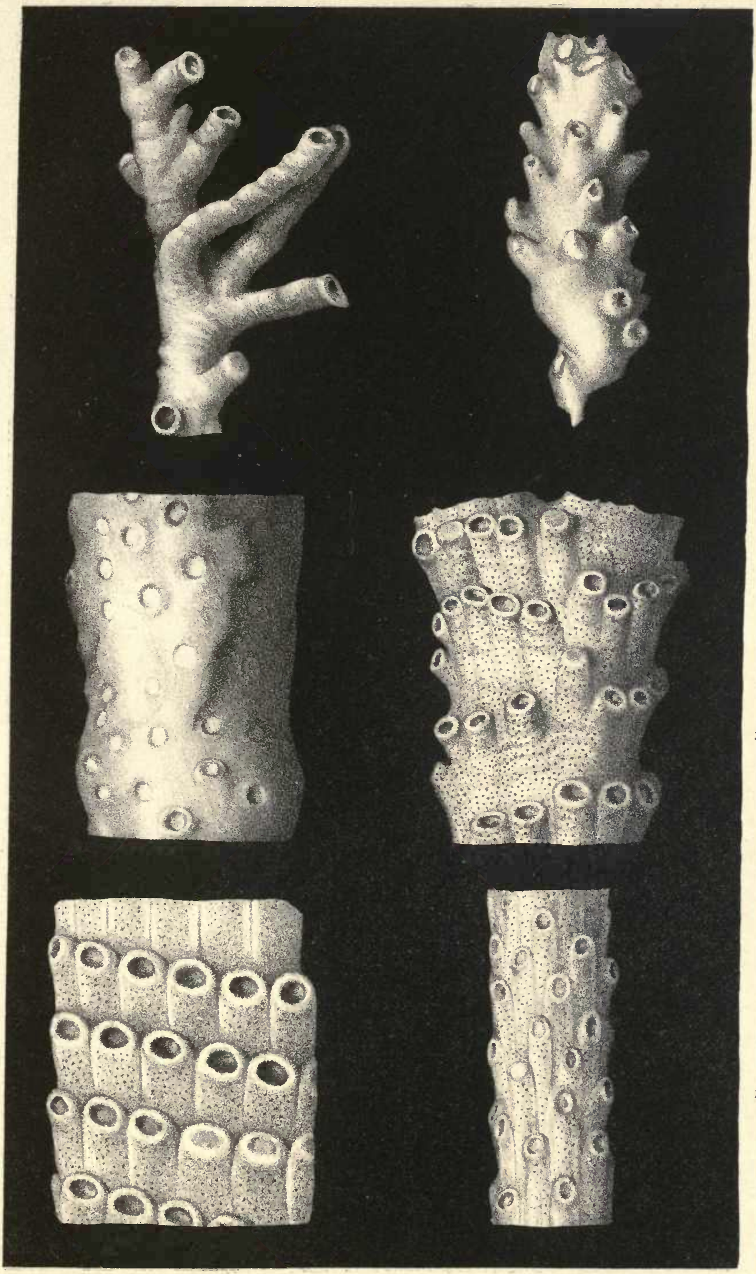
2 ×26.

3 ×17

4 ×17

5 ×26

6. ×17



G.M. Woodward del et lith. West, Newman imp.

Entalophora & Spiropora.

PLATE IX.

FIG. 1. *Spiropora tetragona*, Lamx. Inferior Oolite. Loc.? Part of branch, × 8 dia. Presented by F. Harford, Esq. [B. 3829.]

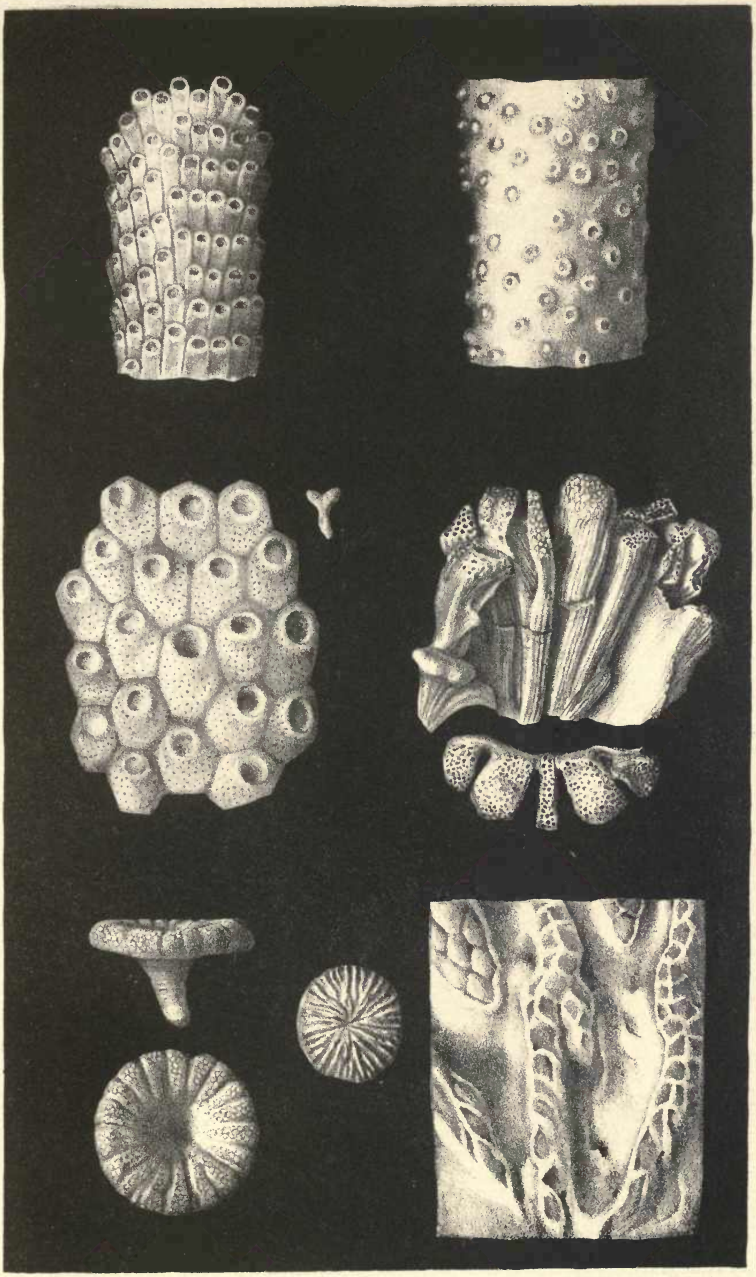
FIG. 2. *Spiropora richmondiensis*, Vine. Great Oolite: Richmond boring. Vine's type. Presented by Prof. J. W. Judd, C.B., F.R.S. × 17 dia. [D. 1935.]

FIG. 3. *Haploœcia irregulare*, Gregory. Lincolnshire Limestone: Stamford. × 24 dia. S. Sharpe Coll. [D. 44.]

FIG. 4. *Apsendesia cristata*, Lamx. Forest Marble: Wiltshire. Part of zoarium, × 6 dia., showing the Fasciculiporoid shape of the tufts, and their serial arrangement. Cunnington Coll. [24770.]

FIG. 5. *Apsendesia cristata*, Lamx. Great Oolite: Burford, Wiltshire. Young zoarium in the *Defrancia* stage, × 5 dia. [38596.]

FIG. 6. *Actinopora diplopora*, Brauns. Great Oolite: near Bath? Part of a zoarium, × 12 dia.; and the whole zoarium nat. size. [B. 2295.]



G. M. Woodard del. et lith. West, Newman imp.

Spiropora, Haplooecia, Apsendesia & Actinopora.

PLATE X.

FIG. 1. *Kololophos terquemi* (Haime). Inferior Oolite: Birdlip. Part of a zoarium encrusting *Terebratula*, × 12 dia. [67613.]

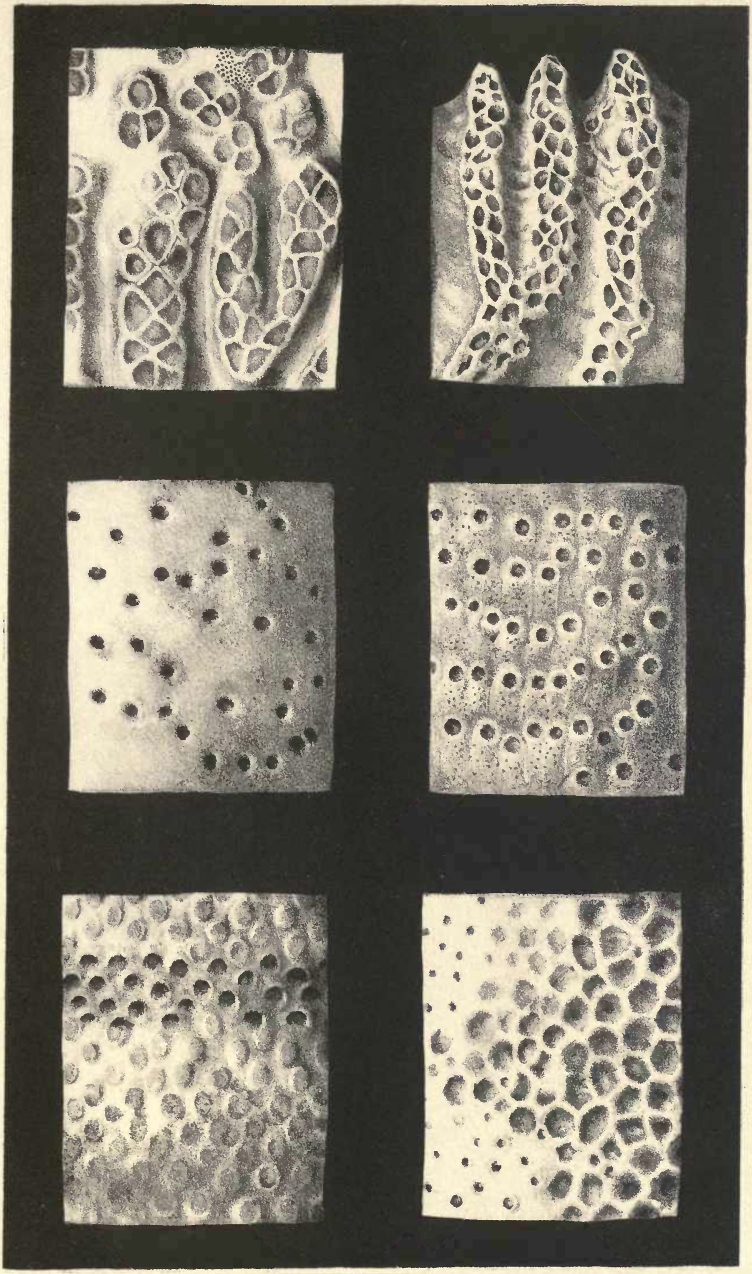
FIG. 2. *Theonoa distorta* (Lamx.). Inferior Oolite: near Leckhampton. Part of a zoarium, × 14 dia. Brodie Coll. [D. 2186.]

FIG. 3. *Multiclausa haimei*, Greg. Great Oolite: Hampton. Part of a branch, × 12 dia. Holl Coll. [B. 4874.]

FIG. 4. *Multiclausa jellyæ*, Greg. Bradford Clay: Box, Wiltshire. Part of a branch, × 14 dia. Holl Coll. [B. 4872.]

FIG. 5. *Terebellaria ramosissima*, Lamx. Bradford Clay: Box, Wiltshire. Part of a branch with zones of zoœcia and interzones of dactylethræ, × 12 dia. Buy Coll. [23857.]

FIG. 6. *Ceriocava laxata*, Greg. Inferior Oolite: Leckhampton. Part of a zoarium showing worn and unworn conditions, × 12 dia. [51130.]



1 ×12

2 ×14

3 ×12

4 ×14

5 ×12

6 ×12

G.M. Woodward del. et lith. West, Newman imp.

Kololophos, Theonoa, Multiclausa, Terebellaria & Ceriocava.

PLATE XI.

FIG. 1. *Heteropora conifera* (Lamx.). Inferior Oolite. Loc. ? Zoœcia and mesopores, × 22 dia. Holl Coll. [B. 4881.]

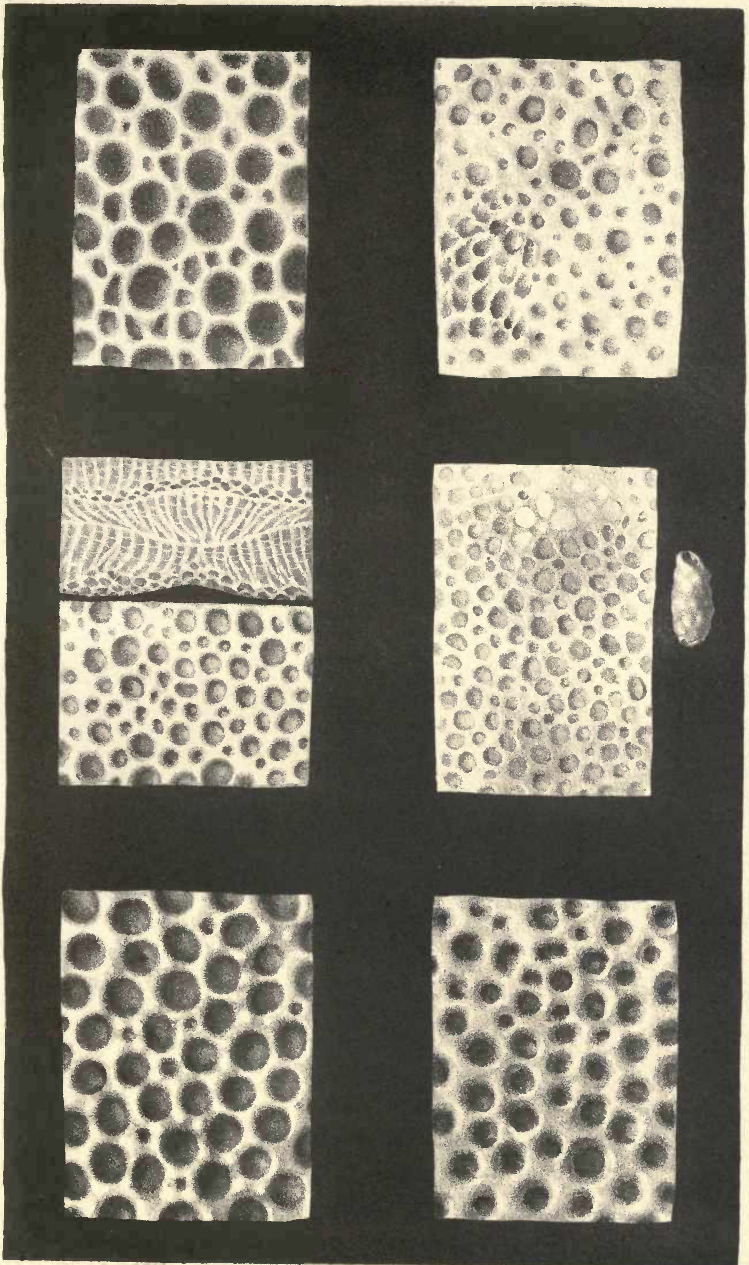
FIG. 2. *Heteropora laminata*, Greg. Inferior Oolite : Dorset ? Zoœcia and mesopores, × 22 dia. [B. 2300.]

FIG. 3. *Heteropora laminata*, Greg. Inferior Oolite : Dorset ? Surface of part of zoarium, × 18 dia. ; transverse section, × 13 dia. [D. 2255.]

FIG. 4. *Heteropora oviformis*, Greg. Bradford Clay : Bradford. × 16 dia. [D. 2176.]

FIG. 5. *Ceriopora globosa*, Mich. Great Oolite : Hampton Down. × 22 dia. [B. 4248.]

FIG. 6. *Ceriopora arborescens*, Waagen. Inferior Oolite. Loc. ? Part of massive, thick-branched zoarium, × 16 dia. [B. 2286.]



1 ×22 2 ×22

3.b ×13. 3.a ×18 4 ×16

5 ×22 6 ×16

G.M.Woodward del et lith. West, Newman imp.

Heteropora & Ceriopora.