STUDIES ON THE CYCLOSTOMATOUS BRYOZOA.

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During our studies of the North American Early Tertiary cyclostomatous Bryozoa, published as a part of our monograph of 1920,[1] we had occasion to extend our researches to many additional species, both living and fossil, for purposes of comparison and in order to test our classification. Our efforts were particularly directed to specimens bearing ovicells, as it is upon the function of reproduction that our classification is based in part. Species showing no ovicells, however, were also studied, often by means of thin sections, to determine the method of gemmation and the occurrence and variation in structure of the several kinds of adventitious and accessory tubes. Our notes upon these additional specimens contain so many new observations upon both described and undescribed species that we thought it advisable to publish them in a series of papers under the above general title.

1. FOSSIL AND RECENT PARALLELATA AND RECTANGULATA.

We have found Waters' two subdivisions of the Cyclostomata, the Parallelata, and Rectangulata to be not only convenient but valuable in classification. The present paper deals with both recent and fossil species of the Parallelata and Rectangulata genera listed on the following pages. A second paper now in preparation, discusses the Lower Cretaceous Cyclostomatous Bryozoa from the two classic localities, Farringdon, England, and Sainte Croix, Switzerland.

The researches herein recorded were made possible through a grant from the American Association for the Advancement of Science, for which assistance we are highly grateful.

[1] 1920, Canu and Bassler. North American Early Tertiary Bryozoa, Bull. 106 U. S. National Museum (2 vols.), 879 pages, 162 pls.

The classification of the ovicelled cyclostomatous bryozoa so far as our investigations have gone is expressed in the following table. It will be noted that many frequently cited genera are omitted from this classification. In such cases these genera either show no ovicells or, at least, ovicells have not been found in their genotypes so that they cannot at present be placed in a natural classification. In a future paper we hope to give a complete list of cyclostomatous genera indicating the status of each.

The student is referred to our monograph of 1920 for a discussion of the general structure of the Cyclostomata and a description of the various kinds of tubes, their methods of gemmation, the forms of zoarial growth and the types of ovicells developed. The present paper is supplementary to that work, which should be consulted in connection with it.

In these studies we employ the same terms of nomenclature as in our Early Tertiary monograph. All of these are self-evident except two measurement, which should be noted. There are (1) the separation of the tubes or peristomes, meaning the distance between two tubes opening at the same height, or, in other words, opposite each other and thus separated by another tube, and (2) the distance between the peristomes, indicating the measurement lengthwise along a single tube. These measurements include both peristomes concerned in the first instance and only the one belonging to the tube measured in the second.

Order CYCLOSTOMATA Busk.

Division OVICELLATA.

Subdivision PARALLELATA Waters, 1887.

Family ONCOUSOECIIDAE Canu, 1918.

**Oncousoecia* Canu, 1918; *Peristomoecia* Canu and Bassler, 1920; *Filisparsa* D'Orbigny, 1853.

Family CRISIIDAE Johnston, 1847.

Crisia Lamouroux, 1816; *Crisidia* Milne Edwards, 1838.

Family MACROECIIDAE Canu, 1918.

**Macroecia* Canu, 1918; **Atractosoecia*, new genus.

Family MECYNOECIIDAE Canu, 1918.

**Mecynoecia* Canu, 1918; **Trigonoecia*, new genus; **Cardioecia*, new genus; *Nematifera*, new genus; **Microecia* Canu, 1918; **Brachysoecia*, new genus; **Bisidmonea* D'Orbigny, 1852; *Entalophora* Lamouroux, 1821; *Exochoecia* Canu and Bassler, 1920.

Family PLAGIOECIIDAE Canu, 1918.

**Plagioecia* Canu, 1918; **Notoplagioecia*, new genus; *Desmeplagioecia* Canu and Bassler, 1920; **Terebellaria* Lamouroux, 1821, **Cavaria* Hagenow, 1851; **Cea* D'Orbigny, 1852; **Laterocea* D'Orbigny, 1852; **Stathmepora*, new genus.

Family DIAPEROECIIDAE Canu, 1918.

**Diaperoecia* Canu, 1918; **Diplosolen* Canu, 1918; **Stigmatoechos* Marsson, 1887; *Desmediaperoecia* Canu and Bassler, 1920; *Lekythionia* Canu and Bassler, 1920; *Crisulipora* Roberston, 1910.

Family TUBULIPORIDAE Johnston, 1838.

Tubulipora Lamarck, 1816; **Platonea* Canu and Bassler, 1920; *Centronea* Canu and Bassler, 1920; *Mesonea* Canu and Bassler, 1920; *Erkosonea* Canu and Bassler, 1920; **Pleuronea* Canu and Bassler, 1920; *Tretonea* Canu and Bassler, 1920; *Idmonea* Lamouroux, 1821; *Idmidronea* Canu and Bassler, 1920; **Tennysonia* Busk, 1867.

Family TERVIIDAE Canu and Bassler, 1920.

Tervia Jullien, 1882; *Lagonoecia* Canu and Bassler, 1920; *Prosthenoecia* Canu, 1918.

Family HORNERIDAE Gregory, 1899.

Hornera Lamouroux, 1821; *Crassohornera* Waters, 1887; *Phormopora* Marsson, 1887.

Family FRONDIPORIDAE Busk, 1875.

Frondipora Imperato, 1599; *Fasciculipora* D'Orbigny, 1846; *Discofascigera* D'Orbigny, 1852; *Apsendesia* Lamouroux, 1821.

Family CYTISIDAE D'Orbigny, 1854.

**Cyrtopora* Hagenow, 1851; **Plethopora* Hagenow, 1851; *Plethoporella*, new genus; *Retenoa* Gregory, 1909; *Cartecytis*, new genus; **Osculipora* D'Orbigny, 1849; **Diplodesmopora*, new genus; **Homoeosolen* Lonsdale, 1850; **Truncatula* Hagenow, 1851; **Discocytis* D'Orbigny, 1854; **Supercytis* D'Orbigny, 1854; **Unicytis* D'Orbigny, 1854; **Semicytis* D'Orbigny, 1854; **Desmepora* Lonsdale, 1850.

Genera marked * are considered in this paper.

Family THEONOIDAE Busk.

Theonoa Lamouroux, 1821; *Actinopora* D'Orbigny, 1853; *Multitubigera* D'Orbigny, 1853; *Radiofascigera* D'Orbigny, 1853; *Multifascigera* D'Orbigny, 1853; *Lopholepis* Hagenow, 1821; *Serietubigera* D'Orbigny, 1853.

Subdivision RECTANGULATA Waters, 1887.

Family LICHENOPORIDAE Smitt, 1866.

**Lichenopora* Defrance, 1823; *Orosopora* Canu and Bassler, 1920; *Trochiliopora* Gregory, 1909; *Conocava* Calvet, 1911.

LOBOSOECIIDAE new family.

**Lobosoecia*, new genus.

Family ELEIDAE D'Orbigny, 1852.

**Meliceritites* Roemer, 1840; **Cyclocites*, new genus.

CERIOCAVIDAE, new family.

**Ceriocava* D'Orbigny, 1852; **Ripisoecia*, new genus; **Grammecava*, new genus; **Spiroclausa* D'Orbigny, 1852; **Haplooecia* Gregory, 1896.

Family LEIOSOECIIDAE Canu and Bassler, 1920.

**Leiosoecia* Canu and Bassler, 1920; *Parleiosoecia* Canu and Bassler, 1920; **Ditaxia* Hagenow, 1851; **Chilopora* Haime, 1854.

Family TRETOCYCLOECIIDAE Canu, 1919.

**Tretocycloecia* Canu, 1919; *Partretocycloecia* Canu, 1919; **Alveolaria* Busk, 1859; *Telopora* Canu and Bassler, 1920; **Psilosolen*, new genus.

Family ASCOSOECIIDAE Canu, 1919.

**Ascosoecia* Canu, 1919; **Polyascosoecia* Canu and Bassler, 1920; **Parascosoecia* Canu, 1919; **Sulcocava* D'Orbigny, 1854; **Reteporidea* D'Orbigny, 1852; **Grammascosoecia*, new genus; **Crisina* D'Orbigny, 1850; **Cavarinella* Marsson, 1887; **Grammanotosoecia*, new genus; **Filicrisina* D'Orbigny, 1852; *Coelocochlea* Hagenow, 1851; *Laterocavea* D'Orbigny, 1852; *Siphodictyum* Lonsdale, 1849.

Family CORYMBOPORIDAE Smitt, 1866.

Corymbopora Michelin, 1845; *Fungella* Hagenow, 1851.

Subdivision PARALLELATA Waters, 1887.

The subdivision Parallelata, in which the axis of the ovicell parallels the zooecial axis, includes the majority of families of the Cyclostomata in which ovicells have been discovered and represents the most typical development of the order. The Rectangulata, on the other hand, where the ovicell axis is at right angles to the zooecial axis, embraces the "heteroporoid" genera, placed at one time in the Paleozoic order Trepostomata, but now known to be Cyclostomata, particularly on account of their ovicell structure.

Family ONCOUSOECIIDAE Canu, 1918.

1918. *Oncousoeciidae* CANU, Les ovicelles des bryozoaires cyclostomes, Bulletin Société Geologique de France, ser. 4, vol. 16, p. 325.—1920. CANU and BASSLER, North American Early Tertiary Bryozoa, Bull. 106, U. S. National Museum, p. 687.

The axis of the ovicell is parallel to that of the tubes. The ovicell is developed at the same time as the adjacent tubes, which are not disarranged in their respective positions.

The known genera of this family are *Oncousoecia*, Canu, 1918, in which the ovicell is a dilation of the entire exterior part of the tube, and *Peristomoecia* Canu and Bassler, 1920, where the peristomie alone forms the ovicell.

Genus ONCOUSOECIA Canu, 1918.

1918. *Oncousoecia* CANU, Les ovicelles des bryozoaires cyclostomes, Bulletin Société Geologique de France, ser. 4, vol. 16, p. 325.—1920. CANU and BASSLER, North American Early Tertiary Bryozoa, Bull. 106, U. S. National Museum, p. 687.

The ovicell is a dilation of the entire exterior visible part of the tube. The oeciostome is not turned toward the base. Fourteen tentacles.

Genotype.—*Tubulipora lobulata* Hincks, 1880.

Range.—Cretaceous (Maastrichtian)—Recent.

The type of this genus is an incrusting form, but included in the genus is a number of species with the erect ramose manner of growth hitherto referred in part to *Filisparsa* and *Entalophora*. The genotype of *Filisparsa* D'Orbigny, 1852, *F. neocomiensis* D'Orbigny, 1852, shows no ovicell, but other species with the same zoarial growth exhibit several distinct types of ovicell. The position of *Filisparsa* in a natural classification, therefore, can not at present be determined.

and it is believed best to retain the name for species showing no ovicell, but with the zoarial form of growth consisting of erect ribbon-like branches with the zooecia opening on one face only. For convenience the zoarial form *Filisparsa* can be included in the Oncousoeciidae.

ONCOUSOECIA BIFURCATA Ulrich and Bassler, 1907.

Plate 1, fig. 1.

1907. *Filisparsa bifurcata* ULRICH and BASSLER, Geological Survey of New Jersey, Cretaceous, Paleontology, vol. 4, p. 322, pl. 22, fig. 8.

Measurements.—

Diameter of peristome	0.26–0.28	mm.
Zooecial width	.36– .40	mm.
Distance between orifices	.90	mm.
Separation of peristomes	.90	mm.
Dimensions of oeciostome	.34 by 0.18	mm.

We have been fortunate in discovering the ovicell of this *Filisparsa* and find that it is identical with that of *Oncousoecia varians* Reuss, 1869, and with that of *Oncousoecia quinqueseriata* Canu and Bassler, 1920, but it is more distinct from the genotype *Oncousoecia* (*Tubulipora*) *lobulata* Hincks, 1880. On the other hand, its oeciostome which is transverse and wider than a peristome, is of a quite divergent type and well characterizes the species. Exactly analogous oeciostones occur in *Macroecia*, but in this genus the ovicell is enormous and causes the abortion of a number of neighboring tubes.

Occurrence.—Cretaceous (Vincentown marl): Vincentown, New Jersey.

Cotypes.—Cat. No. 52594, U.S.N.M.

ONCOUSOECIA ACCUMULATA, new species.

Plate 1, figs. 2–5.

Description.—The zoarium is formed of discoid subcolonies *accumulated* upon each other; it is irregularly cylindrical and narrowed laterally from place to place. The tubes are cylindrical (?), recurved toward the periphery, restricted to each subcolony; the peristome is thin, salient, sharp. The ovicell is globular, elliptical, transverse, and aborts the adjacent tubes; the oeciostome is an ordinary peristome, little salient and placed somewhat eccentrically.

Structure.—The structure of this species is quite remarkable. Externally it resembles somewhat *Spiropora*, but the windings of the spire are in reality only the discoid subcolonies piled on top of each other. Each of them appears to grow from the center of the inferior subcolony. Nevertheless the calcification of the tubes may not be produced very regularly, for often there are tubes which pass across the superior subcolonies. Our specimens are not numerous enough to prepare sufficient thin sections to thoroughly understand this species, so that its structure still remains doubtful. They had been identified as *Ceriopora radiciformis* Goldfuss, 1827 [2] but they are certainly quite different from Goldfuss's figures 8*a–c*, although it is possible that his figures 8*d*, *e* represent the present species.

Occurrence.—Jurassic: Birmenstorf, etc., Germany.

Cotypes.—Cat. No. 32195, U.S.N.M.

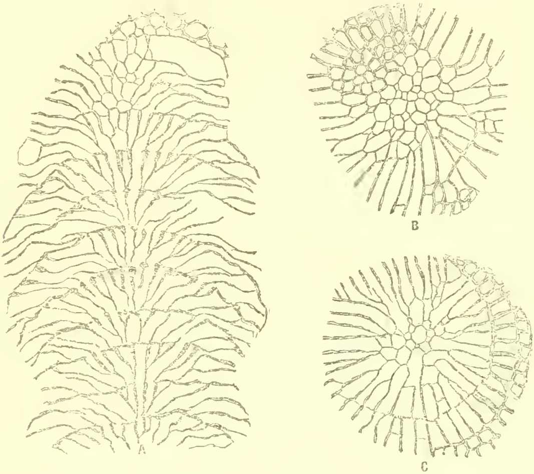

FIG. 1.—Oncousoecia accumulata, new species.

A. Longitudinal section, × 12, showing the accumulation of the subcolonies. An ovicell is visible near the top.

B. Transverse section, × 12, through one of the constricted parts of the zoarium.

C. Transverse section, × 12, through a dilated portion.

Jurassic of Germany.

Family MACROECIIDAE Canu, 1918.

1918. *Macroeciidae* CANU, Les ovicelles des bryozoaires cyclostomes, Bulletin Société Geologique de France, ser. 4, vol. 16, p. 328.—1920. CANU and BASSLER, North American Early Tertiary Bryozoa, Bull. 106, U. S. National Museum, p. 722.

The longitudinal axis of the ovicell is parallel to the axis of the tubes whose order and arrangement are disarranged. The oeciostome is immense and terminal.

[2] Petrefacta Germanicae, p. 34, pl. 10, figs. 8*a–e*.

This family is characterized by the size of its larva which, although unknown, is established by the unusual size of the oeciostome. Although similar to the Oncousoeciidae in the arrangement of the ovicell parallel with the tubes, it differs in its formation before the calcification of the near-by tubes.

Genus MACROECIA Canu, 1918.

1918. *Macroccia* Canu, Les ovicelles des bryozoaires cyclostomes, Bulletin Société Geologique de France, ser. 4, vol. 16, p. 328.—1920. Canu and Bassler, North American Early Tertiary Bryozoa, Bull. 106, U. S. National Museum, p. 722.

The ovicell is elongate, elliptical, very salient. The oeciostome is not turned toward the bottom.

Genotype.—Macroecia (*Diastopora*) *lamellosa* Michelin, 1846, Jurassic.

MACROECIA LAMELLOSA Michelin, 1846.

1896. *Diastopora lamellosa* Gregory, Catalogue of the Jurassic Bryozoa in the British Museum, p. 126, fig. 35 (p. 17) pl. 7, fig. 3 (bibliography and geologic distribution).

1920. *Macroecia lamellosa* Canu and Bassler, North American Early Tertiary Bryozoa, Bull. 106, U. S. National Museum, p. 723, fig. 235*A–D*, *F–I* (Not fig. 235 *E* or 227 *H*=***Atractosoecia edwardsi*** Canu, 1913).

The structure of this species is still little understood. In longitudinal sections the tubes are short, enlarged at the middle, with thick walls; the gemmation is triparietal on the zooecia of the opposite pseudolamella. In transverse section there is no basal lamella. The tubes are polygonal, with thick walls, nonsymmetrically arranged on each side of the median axis.

This structure in this species is remarkable and quite unexpected. The fronds are not formed by lamellae approaching each other or by the tubes developing from each side of a median lamella, but it is a foliaceous structure. The tubes are not at the same height in the transverse section and on the two zoarial faces; each tube of one side serves as a support to a more elevated tube on the other side.

Gregory in 1896 has published a longitudinal section of a multilamellar specimen. This same structure is here apparent; moreover the exterior lamellae appear to have a basal lamella. The transverse section in an analogous specimen figured by Haime, 1854, indicates a median lamella. These two sections need confirmation, for they do not seem to correspond. However, the dissymetrical character of the sections is clearly apparent.

Canu and Bassler in 1920 as noted in the synonymy above, included a figure of *Atractosoecia edwardsi* Canu, 1913, in their illustrations of this species. Further studies are still necessary upon this interesting Jurassic bryozoan.

Occurrence.—Jurassic (Bathonian): Ranville, etc. (Calvados), and Occaignes (Orne), France.

Plesiotypes.—Cat. No. 68900, U.S.N.M.

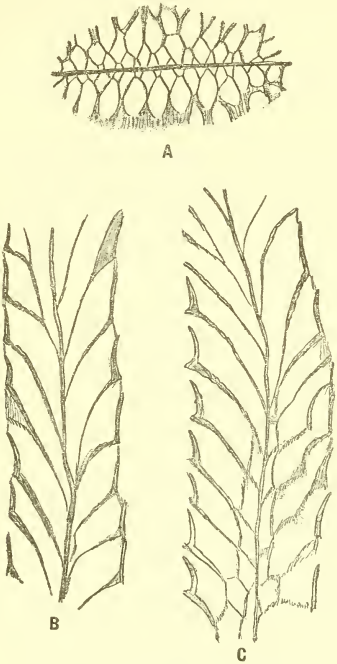

FIG. 2.—Macroecia lamellosa Michelin, 1846.

A. Transverse thin section, × 16, of a thick, much calcified frond. The two basal lamellae are united together to form a unique median lamella.

B. Longitudinal section, × 16, illustrating that the two lamellae are not symmetrically placed.

C. A longitudinal section, × 16, showing that all the zoaria of a lamella are not oriented alike.

Jurassic (Bathonian): Ranville (Calvados), France.

ATRACTOSOECIA, new genus.

Greek: *Atractos*, spindle, in allusion to the form of the ovicell.

The ovicell is a very long fusiform sack; the oeciostome is terminal, elliptical, transverse, larger than the other peristomes. The tubes are cylindrical.

Genotype.—*Atractosoecia* (*Berenicea*) *edwardsi* Canu, 1913. Bathonian. In 1920 we classed the genotype in *Macroecia*, but the discovery of a new species having an identical ovicell made it advisable to create this new genus in which the form of the ovicell is very constant and different from that of *Macroecia lamellosa* Michelin, 1846.

ATRACTOSOECIA WALFORDIANA, new species.

Plate 4, fig. 8.

Description.—The zoarium encrusts shells forming expansions of some width. The tubes are distinct, separated by a furrow, somewhat convex, cylindrical; the peristomes are salient, thin, orbicular, arranged in quincunx. The ovicell is very long, fusiform, smooth; the oeciostome is terminal, salient, elliptical, transverse, a little larger than an ordinary peristome.

Measurements.—	Diameter of peristome	0.12 mm.
	Diameter of orifice	.09 mm.
	Distance of tubes	.50 mm.
	Separation of tubes	.40 mm.
	Length of ovicell	1.20 mm.
	Width of ovicell	.40 mm.

Affinities.—This fine species is named in honor of Mr. Edwin A. Walford, of Banbury, England, in appreciation of his excellent studies upon the Jurassic faunas. It differs from *Atractosoecia edwardsi* Canu, 1913, in its smaller micrometric dimensions and in the relatively more elongated ovicell.

Occurrence.—Jurassic (Bathonian): Shipton Gorge, Dorset, England.

Holotype.—Cat. No. 68901, U.S.N.M.

ATRACTOSOECIA EDWARDSI Canu, 1913.

Plate 4, fig. 7.

1913. *Berenicea edwardsi* CANU, Contributions à l'étude des Bryozoaires fossiles, XIII, Bulletin Société Geologique de France, ser. 4, vol. 13, p. 270 (bibliography and geologic distribution).

This species has been confused for a long time with *Trigonoecia* (*Berenicea*) *diluviana* Lamouroux, 1821, but Canu in 1913 revised the bibliography of the two species. Although the ovicell was known since 1852, for D'Orbigny figured it, we believe it useful to give a new photograph for comparative purposes. The ovicell is very long, sack shaped, oval, very narrow at the base, convex, transversely striated. The oeciostome is orbicular, salient, much larger than an ordinary peristome, and opening in a different direction from that of the tubes.

Measurements.—

Diameter of peristome	0.16 mm.
Diameter of orifice	.14 mm.
Diameter of tubes	.24 mm.
Distance of tubes	.64–0.80 mm.
Separation of tubes	.56–0.64 mm.
Length of ovicell	3.30 mm.
Width of ovicell	1.60 mm.

In our North American Early Tertiary Bryozoa the figure[3] of this species was inadvertently labeled *Macroecia lamellosa* Michelin, 1845.

Occurrence.—Jurassic (Bathonian): Ranville, Luc sur Mer, etc. (Calvados), France.

Family MECYNOECIIDAE Canu, 1918.

1918. *Mecynoeciidae* CANU, Les ovicelles des bryozoaires cyclostomes, Bulletin Société geologique de France, ser. 4, vol. 16, p. 326.—1920. CANU and BASSLER, North American Early Tertiary Bryozoa, Bull. 106, U. S. National Museum, p. 722.

The ovicell is developed parallel to the tubes. It is formed before them and disarranges their respective positions. The oeciostome is anterior and nonterminal.

The genera now referred to this family are *Mecynoecia* Canu, 1918, *Trigonoecia*, new genus, *Cardioecia*, new genus, *Nematifera*, new genus, *Microecia* Canu, 1918, *Exochoecia* Canu and Bassler, 1920, *Brachysoecia*, new genus, and *Bisidmonea* D'Orbigny, 1852.

Genus MECYNOECIA Canu, 1918.

1918. *Mecynoecia* CANU, Les ovicelles des bryozoaires cyclostomes, Bulletin Société Geologique de France, ser. 4, vol. 16, p. 326.—1920. CANU and BASSLER, North American Early Tertiary Bryozoa, Bull. 106, U. S. National Museum, p. 722.

The ovicell developed parallel to the tubes, is symmetrical and with indefinite outlines. The oeciostome is elliptical, transverse, turned toward the base, generally supported by a tube.

Genotype.—*Mecynoecia* (*Entalophora*) *delicatula* Busk, 1875.

The wide-spread and abundant species *Entalophora proboscidea* Milne-Edwards, 1836, was cited as the type of the genus by Canu in 1918, but we have changed the genotype for the reason that several species with different kinds of ovicells are undoubtedly included under this name and it is perhaps impossible at present to determine which one Milne-Edwards described.

[3] Bull. 106, U. S. National Museum, p. 689, fig. 227 *H*, and p. 723, fig. 235 *E*.

Various forms of growth are represented in the species with the ovicell of *Mecynoecia*, but the majority have the *Entalophora* zoarial form—that is, an erect ramose growth with the zooecial tubes opening on all sides. Other species of *Entalophora*, however, have ovicells characteristic of two other families, and still others show no ovicell at all. The ovicell of the genotype of *Entalophora*, *E. cellarioides* Lamouroux, 1821, is unknown, so, following our custom, we retain the name *Entalophora* as a zoarial form for species showing no ovicell.

MECYNOECIA GRACILIS, new species.

Plate 4, fig. 4.

Description.—The zoarium is free, unilamellar; the zone of growth is thin and narrow. The tubes are distinct, separated by a small furrow, somewhat convex, *slender*, terminated by a rather long peristomie; the aperture is elliptical, or orbicular; the peristomes are thin, little separated from each other. The ovicell is small, elongated, convex, smooth; the oeciostome is somewhat smaller than a peristome.

Measurements.—	Diameter of aperture----------	0.08– .10 mm.
	Diameter of peristome (=zooecial) --------------------	.16 mm.
	Distance of peristomes---------	.64– .80 mm.
	Separation of peristomes------	.56 mm.

Affinities.—In the general aspect of its tubes this species resembles *Trigonoecia verrucosa* Milne Edwards, 1838, but it differs in its smaller micrometric measurements, in its free zoarium, and in the form of its ovicell.

We owe the figured specimen to the kindness of Mr. Edwin A. Walford of Banbury, England.

Occurrence.—Jurassic (Bathonian): Shipton Gorge, Dorset, England.

Holotype.—Cat. No. 68902, U.S.N.M.

MECYNOECIA OBESA, new species.

Plate 1, figs. 6–8.

Description.—The zoarium has the cylindrical, branching *Entalophora* form of growth enlarged at the bifurcations. The tubes are thin, long, cylindrical, regular, convex, striated transversally, terminated at their extremity by a peristomie somewhat upward bent and very salient. The oeciostome is thin, orbicular, oblique. The ovicell is *enormous*, very globular, elongate, elliptical, striated transversally by large wrinkles; the oeciostome is transverse, elliptical, orthogonal, somewhat wider than the tubes.

Measurements.—	Diameter of tube and of peristome----------------------	0.14 mm.
	Distance between orifices------	0.58–1.00 mm.
	Separation of peristomes-------	.66 mm.

Affinities.—The exterior aspect is absolutely that of *Entalophora delicatula* Busk, 1875, but the present species differs not only in the form of the ovicell, but in its larger micrometric dimensions.

Occurrence.—Recent; Sulade (Sulu Archipelago), Philippine Islands (*Albatross* station D. 5147).

Cotypes.—Cat. No. 7373, U.S.N.M.

MECYNOECIA LONGIPORA MacGillivray, 1895.

Plate 1, figs. 9–11.

1895. *Entalophora longipora* MACGILLIVRAY, A Monograph of the Tertiary Polyzoa of Victoria, Transactions of the Royal Society of Victoria, vol. 4, p. 140, pl. 20, fig. 14.

Measurements.—	Oeciostome	.16–.20 by .12 mm.
	Distance between orifices	1.25–1.42 mm.
	Diameter of peristome and of tube	.16 mm.
	Separation of orifices	.80– .90 mm.

Structure.—The ovicell is placed in the vicinity of a bifurcation. It is elongated, elliptical, salient, very finely porous. The oeciostome is terminal, elliptical, transverse, little salient; the oeciopore is parallel to the meridian zoarial plane.[4]

The tubes are slightly convex, often flat and bordered by a somewhat salient thread. The latter character is not indicated on MacGillivray's figure, but it is described in the text.

The scale of magnification of MacGillivray's figures is not good, and we can not be perfectly certain of our determination in the absence of typical specimens.

Occurrence.—Recent; Anima Sola (between Burias and Luzon) Philippine Islands (*Albatross* Station D. 5217).

Geological distribution.—Miocene of Australia.

Plesiotypes.—Cat. No. 7374, U.S.N.M.

MECYNOECIA (?) VERTICILLATA Goldfuss, 1827.

Plate 1, figs. 16, 17.

1827. *Ceriopora verticillata* GOLDFUSS, Petrefacta Germaniae, vol. 1, p. 36, pl. 11, fig. 1.

1899. *Spiropora verticillata* GREGORY, Catalogue of the fossil Bryozoa in the British Museum, Cretaceous, vol. 1, p. 256, pl. 11, fig. 5 (Cites bibliography and geologic distribution).

The ovicell of this species is very rare. It is a greatly elongated, convex sac, longer than three verticells and terminated by an ellip-

[4] Often the oeciostome appears to be directed toward the bottom, but this is an optical illusion. In reality the orifice is exactly parallel to the direction of the tube itself and the oeciostome is perpendicular to it. It is therefore difficult for the larva to fasten itself upon the zoarium. The term "orthogonal" indicates this arrangement.

tical, transverse, reflected oeciostome. It results from the development of the peristomie of a tube belonging to a verticell. The species is therefore a *Mecynoecia.*

Waters long ago expressed his doubts about the reality of the genus *Spiropora* Lamouroux, 1821. The discovery of the ovicell confirms his opinion, since the genus *Mecynoecia* contains a number of species with the zoarial form of both *Entalophora* and *Spiropora.* Nevertheless as this species and two or three others show in transverse section a spiral arrangement of the tubes, it is possible that Lamouroux's genus may still be retained.

Occurrence.—Cretaceous (Coniacian): Villedieu (Loir-et-Cher). France, and many other localities and horizons.

Plesiotypes.—Cat. No. 68905, U.S.N.M.

MECYNOECIA RAMOSISSIMA D'Orbigny, 1851.

Plate 1, figs. 12, 13.

1845. *Pustulopora echinata* MICHELIN (not Roemer), Iconographie zoophytologique, p. 211, pl. 53, fig. 5.

1851. *Entalophora vendinnensis* D'ORBIGNY, Paleontologie française, Terrain Crétacé, p. 871, pl. 617, figs. 15–17.

1851. *Entalophora ramosissima* D'ORBIGNY, Paleontologie française, Terrain Crétacé, pl. 619, figs. 6–9.

1851. *Laterotubigera cenomana* D'ORBIGNY, Paleontologie française, Terrain Crétacé, p. 785, pl. 618, figs. 1–5.

1899. *Entalophora vendinnensis* GREGORY, Catalogue of the Cretaceous Bryozoa in the British Museum, vol. 1, p. 241 (not Canu 1897-*Mecynoecia stipata*, new species).

1899. *Entalophora ramosissima* GREGORY, Catalogue of the Cretaceous Bryozoa in the British Museum, vol. 1, p. 244.

Measurements.—	Diameter of peristome	0.14–0.18 mm.
	Zoœcial width	.24 mm.
	Distance between orifices	.30 – .50 mm.
	Separation of orifices	.60 mm.

Variations.—Gregory has reported this species under three distinct names, the material in the British Museum appearing insufficient to determine the variations. In 1889 Pergens had not united *Entalophora vendinnensis* with *Entalophora ramosissima*, for he still gave more importance to the exterior aspect. In 1897, Canu, deceived by the aspect of a related species, maintained the same differences, but his *Entalophora vendinnensis* is a different species (see *M. stipata*) on account of its different measurements and ovicell.

In comparing numerous specimens in the Canu collection it is not possible to maintain the former distinctions; there is but a single species with varied aspects in which however the ovicell is the same. It is not rare to find on a single specimen the two forms *Entalophora* with the tubes in quincunx and *Laterotubigera* having tubes in transverse verticells.

The ovicell is short, elliptical, somewhat elongate and cordiform. The oeciostome is transverse, elliptical, turned toward the bottom; it is isolated or adherent to a tube; it is anterior and not terminal with the ovicell prolonged a little above it.

The verticelled specimens are the lowest branches of the zoarium; they are larger and almost always poorly preserved and broken. The specimens referred to *E. vendinnensis*, are the upper branches. The number of branches of a zoarium must be very considerable; we are still ignorant of the form of the base and mode of fixation.

In transverse section the tubes are polygonal, very small and very numerous at the center, large at the circumference, all indicative of very long tubes.

In longitudinal section the tubes are very long, quite thin at the base, and much expanded at their extremity. The walls increase gradually in thickness.

Geologic distribution.—Cretaceous (Cenomanian): Le Mans (Sarthe), France.

Cretaceous (Turonian): St. Calais, Les Janières, and Ruillé Poncé (Sarthe), France.

Plesiotypes.—Cat. No. 68906, U.S.N.M.

MECYNOECIA STIPATA, new species.

Plate 1, figs. 14, 15.

1897. *Entalophora vendinnensis* CANU (not D'Orbigny, 1851), Les Bryozoaires du Turonien des Janières, Bulletin Société Géologique France, ser. 3, vol. 25, p. 152.

1897. *Entalophora vendinnensis* CANU, Les Bryozoaires du Turonien de St. Calais, Bulletin Société Géologique de France, ser. 3, vol. 25, p. 744.

Description.—The zoarium is cylindrical, bifurcated. The tubes are little distinct, upward bent and salient at their extremities, arranged in quincunx, quite *close* to one another; the peristome is round and thin. The ovicell is elliptical, elongate, globular; the oeciostome is as wide as a tube, elliptical, transverse, isolated, turned toward the bottom.

Measurements.—

Diameter of peristome	0.14 mm.
Zooecial width	.24 mm.
Distance between orifices	.36 mm.
Separation of the orifices	.60 mm.
Diameter of branches	1.00–1.50 mm.

Affinities.—This species is quite constant in its exterior characters; only the peristomie is more or less long. It differs from *Mecynoecia ramosissima* D'Orbigny, 1851, in its larger micrometric dimensions, its more globular and more salient ovicell and its almost terminal oeciostome. Rare and slender in the Cenomanian, it is vigorous and abundant in the Turonian.

Geological distribution.—Cretaceous (Cenomanian): Le Mans (Sarthe), Montlouet (Maine-et-Loire), France.

Cretaceous (Turonian): Les Janières and St. Calais (Sarthe), Ruillé Poncé (Loir-et-Cher) and Parnay (Indre-et-Loire), France.

Cotypes.—Canu collection and Cat. No. 68907, U.S.N.M.

MECYNOECIA MICROPORA D'Orbigny, 1853.

Plate 2, fig. 1.

1853. *Laterotubigera micropora* D'ORBIGNY, Paleontologic française, Terrain Crétacé, p. 719, pl. 754, figs. 12–14.

1889. *Spiropora macropora* var. *micropora* PERGENS, Revision des Bryozoaires du Crétacé figures par D'Orbigny, Memoirs de la Société Belge de Géologie de Paléontologie et d'Hydrologie, Bruxelles, vol. 3, p. 365.

1890. *Spiropora macropora* var. *micropora* PERGENS, Nouveaux bryozoaires Cyclostomes du Crétacé, Bulletin de la Société Belge de Géologie, vol. 4, Mémoires, p. 205.

Affinities.—In 1890 Pergens identified *Laterotubigera micropora* D'Orbigny, 1853, with *Semilaterotubigera annulata* of the same author. This was an error which was occasioned by the the great confusion which existed in the tubes of specimens in D'Orbigny's collection and the poor illustrations of the French author. Consideration of the ovicells permits us to clear up this confusion.

The peristome is orbicular (and not transverse); it measures only 0.14 mm. in dimension (and never 0.18 or 0.20 mm.). The transversal diameter is only 0.20 mm. (and not 0.26 mm.). The ovicell is an elongated and quite large sac, of which unfortunately we have not observed the oeciostome.

This is the smallest of the species in which the tubes are grouped in transversal rows.

Geological distribution.—Crétaceous (Coniacian) Villedieu (Loir-et-Cher), Tours and St. Paterne (Indre-et-Loire), and Fécamp (Seine inferieure), France.

Plesiotypes.—Cat. No. 68908, U.S.N.M.

MECYNOECIA (?) ANNULOSA Michelin, 1847.

Plate 2, fig. 2–10.

1896. *Spiropora annulosa* GREGORY, Catalogue Jurassic Bryozoa in British Museum, p. 146, pl. 8, fig. 5 (Bibliography).

1898. *Spiropora annulosa* CANU, Étude sur les ovicelles des Bryozoaires du Bathonian d'Occaignes, Bulletin de la Société géologique de France ser. 3, No. 26, p. 281, figs. 16, 17, 18, 19, 20.

1914. *Entalophora (Spiropora) annulosa* WATERS, The marine fauna of British East Africa and Zanzibar, Proceedings of the Zoological Society of London, p. 842.

In 1898, Canu gave the principal variations of the ovicell, which is sacciform (fig. 3), cordiform (fig. 4), or pyriform (fig. 5). Unfortunately his figures only represent specimens with peristomes arranged in quincunx. In 1914 Waters, in verifying the species, wrote: "Canu does not figure the spiral zooecia or regular, therefore, why does he call it *Spiropora*"? and he made the generic correction indicated in our bibliography.

In reality this species affects the two forms, *Entalophora* and *Spiropora*, and the two arrangements of the peristomes are often visible on the same specimens (fig. 7). There is, therefore, no error in the determination. The identity of the ovicell of a branch with verticells (fig. 6) with that of a branch without verticells (fig. 5) is another very convincing proof. The most extraordinary variations affect also the diameter of the peristome, which varies from 0.14 (fig. 8) to 0.20 (fig. 9). Thus detailed study of this species confirms the perfect uselessness of the two supposed genera *Entalophora* and *Spiropora*, based on the arrangement of the peristomes.

Occurrence.—Jurassic (Bathonian); Occaignes (Orne), France.

Plesiotype.—Cat. No. 68910, U.S.N.M.

MECYNOECIA VARIABILIS Hagenow, 1851.

Plate 2, fig. 14.

1851. *Pustulopora variabilis* HAGENOW, Die Bryozoen der Maastrichter Kreidebildung, p. 19, pl. 1, fig. 9.

We have found a fragment of this species bearing an ovicell which shows that, without doubt, it is a *Mecynoecia.* Our photograph is quite similar to Hagenow's figure, and we do not understand how Gregory, in 1899, could class the species in *Clausa.* The section, which he illustrates, must certainly have been made from a badly determined specimen. Pergens, in 1888, classed the species with certainty in *Entalophora.*

Occurrence.—Cretaceous (Maastrichtian): Maastricht, Holland.

Plesiotype.—Cat. No. 68910, U.S.N.M.

TRIGONOECIA, new genus.

The ovicell is pyriform, symmetrical, convex, wrinkled transversely. The oeciostome is small, salient, terminal, median, on the same plane as the ordinary peristomes. The tubes are cylindrical, with triparietal gemmation on a basal lamella.

Genotype.—*Trigonoecia* (*Mesenteripora*) *michelini* Blainville, 1830.

Range.—Jurassic (Bajocian-Albian).

TRIGONOECIA MICHELINI Blainville, 1830.

Plate 2, figs. 12, 13.

1896. *Diastopora michelini* GREGORY, Catalogue of the Jurassic Bryozoa in the British Museum, p. 124, pl. 7, fig. 2 (cites bibliography and geologic distribution).

1898. *Diastopora michelini* CANU, Études sur les ovicelles des Bryozoaires du Bathonien d'Occaignes, Bulletin Société geologique de France, ser. 3, vol. 26, p. 277, figs. 10, 11.

Measurements.—	Diameter of aperture	0.13–0.14 (max.=0.17) mm.
	Diameter of peristome	0.17–.21 mm.
	Diameter of zooecium	.21–.28 mm.
	Distance of peristomes	.75–.85 mm.

Structure.—In longitudinal section the tubes are rather short, cylindrical, with triparietal gemmation on a median lamella (=basal); their inferior part is narrowed according to the rule in this case.

In transverse section the tubes are polygonal with thin adjacent walls. As the greater part of the fronds are undulated, the median lamella is never rectilinear and one side is always thicker than the other. The tubes adjacent to the median lamella are smaller than the others because they represent the inferior part of the tubes.

It will be observed in the present article that all the Diastoporas of the older authors have not this structure and that their ovicells are not at all identical. *Diastopora* is only a zoarial form and by no means a natural genus.

Occurrence.—Jurassic (Bathonian and Bajocian): Ranville (Calvados), Occaignes (Orne), etc., France.

Plesiotype.—Cat. No. 68911, U.S.N.M.

TRIGONOECIA VERRUCOSA Milne Edwards, 1838.

Plate 4, fig. 5.

1898. *Diastopora verrucosa* CANU, Etude sur les ovicelles des Bryozoaires du Bathonien d'Occaignes, Bulletin Société geologique de France ser. 3, vol. 26, p. 269 (bibliography).

Measurements.—	Diameter of aperture	0.14 mm.
	Zooecial diameter	.20 mm.
	Distance between peristomes	.60 mm.
	Separation of peristomes	.70 mm.

Structure.—The measurements are a little different from those of Canu, 1898, but they are close enough. In the *Berenicea* growth forms it is impossible to obtain measurements in absolute agreement.

The ovicell is globular, triangular, transverse, wrinkled transversely. The oeciostome is very long (0.16 mm.); it is supported on an ordinary tube. Its diameter is small (0.10 mm.), and its orifice measures 0.06 mm., as in all the species of this genus.

We are indebted to Mr. Edwin A. Walford for the figured specimen.

Occurrence.—Jurassic (Bathonian): Shipton Gorge, Dorset, England.

Plesiotype.—Cat. No. 68912, U.S.N.M.

TRIGONOECIA TRANSVERSA, new species.

Plate 4, figs. 1, 2.

Description.—The zoarium encrusts shells; it is orbicular; the zone of growth is narrow but thick. The tubes are visible, quite convex, very salient, rectilinear, cylindrical. The peristomes are orbicular, oblique, thin, very close together but never adjacent. The ovicell is triangular, transverse, convex, decorated with two transverse salient wrinkles; the oeciostome is orbicular, little salient, opening on the same plane as that of the peristomes.

Measurements.—	Diameter of orifice	0.12 mm.
	Diamter of peristome	0.16–0.18 mm.
	Distance between tubes	.40– .48 mm.
	Separation of tubes	.64– .72 mm.
	Diameter of oeciostome	0.07 mm.
	Diameter of zoarium	6.00 mm.

Affinities.—This beautiful species which has been discovered by Mr. Walford in the English Bathonian has external resemblances to *Trigonoecia* (*Berenicea*) *verrucosa* Milne Edwards, 1838, in which the tubes are equally rectilinear; it differs in its peristomes which are much closer together and in the thickness of the marginal borders. It differs from *Berenicea exilis* Reuss, 1867, in the regular arrangement of its peristomes and in its smaller micrometric measurements.

The regular and very symmetrical form of the ovicell does not permit of confusion with that of *Plagioecia.*

Occurrence.—Jurassic (Bathonian): Shipton Gorge, Dorset, England.

Holotype.—Cat. No. 68913, U.S.N.M.

CARDIOECIA, new genus.

The ovicell is triangular, transverse, cordiform, little convex, smooth, symmetrical; the oeciostome is small, salient, median. The tubes are club shaped with triparietal gemmation on a basal lamella.

Genotype.—*Cardioecia* (*Bidiastopora*) *neocomiensis* D'Orbigny, 1853. Lower Cretaceous (Neocomian, Aptian).

The ovicell is less salient and more expanded than in *Trigonoecia.*

The tubes are larger and club shaped. The latter character is clearly visible in transverse sections which show a large number of tubes increasing regularly from the center to the circumference.

We have observed only the free forms of growth, but encrusting forms are quite possible.

The oeciostome always measures 0.10 mm. and the oeciopore 0.06 mm. No exceptions to this have been found. The genotype *Bidiastopora neocomiensis* D'Orbigny, 1852 (pl. 4, fig. 3), from the Lower Cretaceous (Valangian) of Switzerland will be described in our next paper.

NEMATIFERA, new genus.

The ovicell is an elongated sack, subsymmetrical, irregular, scarcely convex; the oeciostome is terminal, very small, hardly salient. All of the tubes are bordered with salient threads exteriorly. The tubes are short, cylindrical, polygonal; the gemmation is triparietal on a basal lamella.

Genotype.—Nematifera (*Elea*) *reticulata* D'Orbigny, 1853. Lower Cretaceous (Neocomian, Urgonian).

The ovicells so far discovered are little distinct, but clearly different from those of *Trigonoecia*, although the structure in sections in these two genera is very similar. The tubes are bordered exteriorly by a salient thread, which never occurs in *Trigonoecia*.

According to the exterior resemblances, this genus ought to have Jurassic representatives. The genotype (pl. 4, fig. 6) is described in detail in our paper on the Lower Cretaceous faunas of Switzerland now in preparation.

ENTALOPHORA (NEMATIFERA?) ROEMERI Levinsen, 1912.

Plate 13, figs. 11–13.

1840. *Meliceritites gracilis* Roemer, Die Versteinerungen des norddeutschen Kreidegebirges, p. 18, pl. 5, fig. 13.

1912. *Entalophora roemeri* Levinsen, Studies on the Cyclostomata operculata, Memoires de l' Academie R. des Science et des Lettres de Danemark, ser. 7, vol. 10, p. 29, pl. 7, figs. 25, 26.

Levinsen's original description is as follows:

The hexagonal zooecia, which are only half as long as broad, are provided with a very concave frontal area and divided by strongly developed marginal ridges. The aperture which takes up the larger part of the breadth in the distal part of the zooecium, and together with the peristome about half the length of the whole zooecium, is triangularly rounded, broader than high, and provided with a strongly developed peristomial thickening, the proximal part of which forms an obliquely or even vertically ascending under lip. The fragments examined are elongated clavate, rounded or a little compressed and increasing gradually in thickness toward the lip, which is about double as thick as the proximal end.

Like Levinsen, we have found our specimen in a lot of *Meliceritites gracilis* Goldfuss, 1827. It appears to us more poorly preserved than Levinsen's example, but as it preserves a kind of eleocellarium we figure it. On the greater part of the zoarium the peristome is much thinner than that figured by Levinsen.

Occurrence.—Cretaceous (Cenomanian): Essen, Germany.

Plesiotype.—Cat. No. 68914, U.S.N.M.

Genus MICROECIA Canu, 1918.

1918. *Microccia* CANU, Les ovicelles des bryozoaires cyclostomes, Bulletin Société Géologique de France, ser. 4, vol. 16, p. 326.—1920. CANU and BASSLER, North American Early Tertiary Bryozoa, Bull. 106, U. S. National Museum, p. 722.

The ovicell is very small, and it is spread between only four tubes; the oeciostome is small and hardly salient.

Genotype.—*Berenicea sarniensis* Norman, 1864.

MICROECIA DENISI, new species.

Plate 2, fig. 11.

Description.—The zoarium is cylindrical, bifurcated. The tubes are indistinct; the peristomes are thin, orbicular, arranged in regular quincunx, little salient. The ovicell is small, somewhat elongate, nonsalient, finely punctate, the oeciostome is quite small, terminal, nonsalient, placed in the vicinity of the peristome.

Measurements.—	Diameter of peristome	0.18–0.20 mm.
	Distance between orifices	0.40 mm.
	Separation of orifices	.80–1.00 mm.
	Diameter of branches	2.5 mm.

Affinities.—The micrometric measurements of this species are much larger than those of *Mecynoecia stipata* and *Mecynoecia ramosissima* D'Orbigny, 1851. Its ovicell is of a very different type. It is smaller than a tube, turned toward the bottom, perforated at its base by a sort of spiramen.

It is important to note the amount of the separation of the orifices. More often the distance between the orifices and the separation are very similar. Here, on the contrary, they are quite different.

We dedicate this species to the young French naturalist, Marcel Denis, to encourage him in the study of the bryozoa.

Geological distribution.—Cretaceous (Turonian): Ruillé-Poncé (Loir-et-Cher), France.

Holotype.—Canu collection.

BRACHYSOECIA, new genus.

Greek.—Brachys, short, in allusion to the slight length of the ovicell.

The ovicell is longitudinal, very short. The oeciostome is transverse, reflexed, adjacent to a tube and of a smaller diameter than the peristome. The tubes are expanded with walls somewhat dilated at their extremity. Gemmation is peripheral, regular, around an axial tube. The tubes are closed by a facette (zooecial area) perforated by an orbicular aperture.

Genotype.—Brachysoecia convexa, new species. Cenomanian.

This genus differs from *Microecia* Canu, 1916, in the presence of facettes. It differs from *Lobosoecia*, new genus in which the aperture is also rounded, in the nature of the ovicell and in the absence of salient threads around the facette.

BRACHYSOECIA CONVEXA, new species.

Plate 3, figs. 1–5.

Description.—The zoarium is free, cylindrical, dichotomously branched, borne on a discoid base. The facettes are hexagonal, elongated, separated by a furrow of little depth. The aperture is circular, distal, bordered by a thin salient thread. In section, the tubes are expanded (=funnel-shaped), with walls somewhat dilated at their extremity; gemmation is peripheral, regular, around an axial tube. On the zone of growth the tubes are deprived of facettes. The ovicell is short; the oeciostome is smaller than a peristome, transverse, adjacent to a tube.

Measurements.—	Diameter of branch	1.5 mm.
	Zooecial diameter	.13–0.16 mm.
	Distance between apertures	.40– .50 mm.

Structure.—The structure of this species is rather unexpected. The facettes not being bordered as in *Melicertites*, it was difficult to discover them on the exterior. However they appear clearly in longitudinal sections where also the expanded form of the tubes, their mode of peripheral gemmation and the presence of the axial tube are apparent. The occurrence of an axial tube seems to indicate the existence of other, although lamellar, species. In the transverse sections this tube appears clearly at the center of the zoarium in the form of a polygonal tube larger than the adjacent ones.

The occurrence of tubes with facettes is to be noted also in the following families characterized, however, by different ovicells; Melicerititidae and Lobosoeciidae with bordered facettes, Plagioeciidae with incomplete or rudimentary facettes and the Mecynoeciidae with the facettes not bordered.

Occurrence.—Cretaceous (Cenomanian); Le Mans (Sarthe), France.

Cotypes.—Canu collection and Cat. No. 68915, U.S.N.M.

Genus BISIDMONEA D'Orbigny, 1852.

1852. *Bisidmonea* D'ORBIGNY, Paleontologie francaise, Terrain Crétacé, vol. 5, p. 720.

The ovicell is a long convex sack located on the zoarial crest and deranging all the adjacent tubes; the oeciostome is terminal, placed on the median axis, somewhat salient, not reflexed, of the size of an ordinary peristome, somewhat transverse. The tubes are arranged in irregular fascicles, much expanded, with method of gemmation doubtful, closed by a zooecial area (metopoporinan) which is perforated by the orbicular aperture.

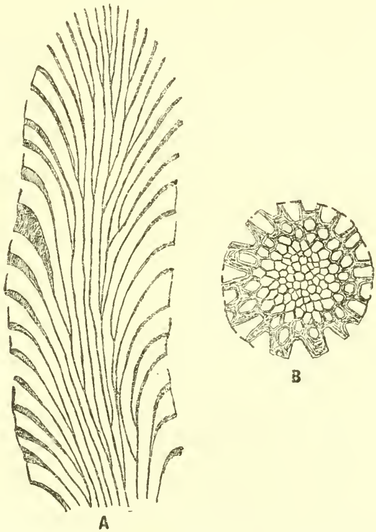

FIG. 3.—Brachysoecia convexa, new species.

A. Longitudinal section, × 16, showing the axial tube, the zooecial apertures and facette.

B. The same features as seen in a transverse section, × 16.

Cretaceous (Cenomanian): Le Mans (Sarthe), France.

Genotype.—Bisidmonea antiqua D'Orbigny, 1852 (=*Spiropora tetragona* Lamouroux, 1821). Bathonian.

Historical.—The character upon which this genus was formed by D'Orbigny was the special arrangement and the alternation of the rows of tubes on tetragonal zoaria. The general aspect is that of two specimens of *Idmonea* united together by their dorsal. Haime in 1854 and Gregory in 1896 have established that the genotype *B.*

antiqua D'Orbigny, 1852 is synonymous with *Spiropora tetragona* Lamouroux, 1821. Finally Gregory in 1896 noted that the idmoneiform arrangement of the apertures is not constant throughout the whole zoarium.

The consideration of the ovicell causes the classification of this genus in the Mecynoeciidae. Examination of thin sections which shows the very unexpected metopoporinan nature of the tubes, permits us to maintain D'Orbigny's name but with a very different diagnosis. According to the section, *Spiropora richmondensis* Vine, 1884, belongs probably to this genus. We may here again note that the exterior aspect and the arrangement of the tubes of the zoarium can not furnish important characters for classification. For example, *Bisidmonea gabbiana* Ulrich and Bassler, 1904, and *B. johnstruppi* Pergens and Meunier belongs to the Plagioeciidae, the type species *B. tetragona* Lamouroux. 1821, to the Mecynoeciidae and *B. ? globuloecia*, new species to still another family.

BISIDMONEA TETRAGONA Lamouroux, 1821.

Plate 3, fig. 6.

1821. *Spiropora tetragona* LAMOUROUX, Exposition methodique, p. 85, pl. 82, figs. 9, 10.

1846. *Ceriopora tetragona* MICHELIN, Iconographie zoophytologique, p. 235, pl. 55, fig. 12.

1852. *Bisidmonea antiqua* D'ORBIGNY, Paleontologie francaise, Terrain Crétacé, p. 720, pl. 762, figs. 10–12.

1896. *Spiropora tetragona* GREGORY, Catalogue of the Jurassic Bryozoa in the British Museum, p. 155, pl. 9, figs. 1 (Cites bibliography and geological distribution).

Structure.—The zoarial aspect is that of two specimens of *Idmonea* joined by their dorsal but longitudinal sections show a very different structure from typical *Idmonea.* The tubes are subcylindrical in a part of their course, but they become very much expanded in their terminal portion; their walls are vesicular and they are closed by a facette (zooecial area) clearly limited exteriorily by salient threads. We may mention again that the tubes with facettes, for which the group Metopoporina was proposed, exist in almost all families of Cyclostomata.

Our specimens are small, and we have not been able to verify the method of budding. As the transverse section shows at its center very large tubes without interstitial tubes, peripheral gemmation is not probable. The entire absence of the median lamella confirms the fact that the zoarium is not formed of two *Idmoneas* joined by their dorsal. The aperture is circular and placed entirely above the zooecial area. The figure given by D'Orbigny is entirely too regular.

The tetragonal aspect of the zoarium is more an optical effect resulting from the arrangement of the tubes, for it does not show very clearly in transverse sections.

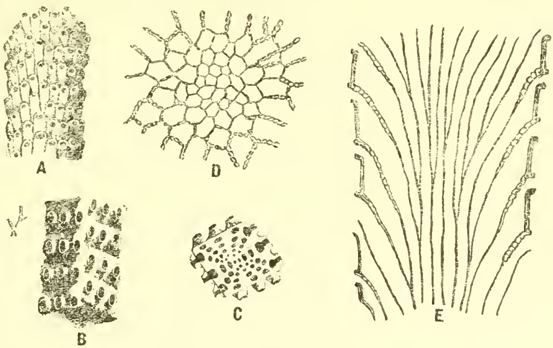

FIG. 4.—Bisidmonea tetragona Lamouroux.

A. Part of a branch, × 4, showing arrangement of the tubes. (After Gregory, 1896.)

B, C. D'Orbigny's diagrammatic views of a branch and a cross section, emphasizing the tetragonal shape.

D. Transverse section, × 16.

E. Longitudinal section, × 16. The walls are vesicular in the expanded parts of the tubes. The latter are closed by a facette perforated by the aperture.

Jurassic (Bathonian): Ranville (Calvados), France.

Occurrence.—Jurassic (Bathonian): Ranville (Calvados), France.

Plesiotypes.—Cat. No. 68916, U.S.N.M.

BISIDMONEA? GLOBULOECIA, new species.

Plate 3, figs. 7–10.

Description.—The zoarium is quadrangular and formed as if two specimens of *Idmonea* were joined by their dorsal; the fascicles are formed of three tubes and arranged alternately on each side of the zooecial area. The figure given by D'Orbigny is entirely too regular. thread; the peristome is thin, elliptical, salient. The ovicell is a large orbicular sack, quite *globular*, smooth, very salient, broad as a zoarial face: the oeciostome is anterior and little transverse.

Measurements.—	Diameter of peristome	0.17 mm.
	Distance between fascicles	.32 mm.
	Width of branches	.60 mm.
	Diameter of ovicell	.35 mm.

The number of specimens has not permitted us to verify the sections. The aspect of the ovicell is similar to that in the Eleidae, so that the classification of this species is doubtful.

Occurrence.—Cretaceous (Cenomanian): Montlouet (Maine-et-Loire), France.

Holotype.—Canu collection.

Family PLAGIOECIIDAE Canu, 1918.

1918. *Plagioeciidae* CANU, Les ovicelles des bryozoaires cyclostomes, Bulletin Société Geologique de France, ser. 4, vol. 16, p. 327.—1920. CANU and BASSLER, North American Early Tertiary Bryozoa, Bull, 106, U. S. National Museum, p. 707.

The longitudinal axis of the ovicell is at right angles to the zooecial axis. The ovicell is formed before the calcification of the neighboring tubes, the formation of which it hinders. The oeciostome is small.

The genera exhibiting this type of ovicell are *Plagioecia* Canu, 1918, *Desmeplagioecia* Canu and Bassler, 1920, *Notoplagioecia*, new genus, *Terebellaria* Lamouroux, 1821, *Cea* D'Orbigny, 1852, *Laterocea* D'Orbigny, 1852, *Stathmepora*, new genus, and *Cavaria* Hagenow, 1851.

Genus PLAGIOECIA Canu, 1918.

1918. *Plagioecia* CANU, Les ovicelles des bryozoaires cyclostomes, Bulletin Société Geologique de France, ser. 4, vol. 4, vol. 16, p. 327.—1920. CANU and BASSLER, North American Early Tertiary Bryozoa, Bull. 106, U. S. National Museum, p. 707.

The ovicell is a long transverse sack obliterating a certain number of zooecial tubes and developed in the vicinity of the zoarial margins. The oeciostome is small, equal to or less than the zooecial diameter. The tubes are isolated from each other. No adventitious tubes.

Genotype.—*Plagioecia* (*Tubulipora*) *patina* Lamarck, 1816.

This genus well exemplifies the variation in methods of growth shown in a group of species all agreeing in their ovicell and zooecial structure. The species we have selected for description illustrate the *Berenicea*, *Discosparsa*, *Mesenteripora Entalophora*, and *Reticulipora* growths, although all of these same methods may occur in other genera and families.

PLAGIOECIA VARIANS Ulrich, 1901.

Plate 3, fig. 12.

1901. *Discosparsa varians* ULRICH, Maryland Geological Survey, Eocene, Bryozoa, p. 205, pl. 59, fig. 3.

1907. *Discosparsa varians* ULRICH and BASSLER, Geological Survey of New Jersey, Paleontology, vol. 4, p. 315, pl. 21, figs. 1, 2.

Measurements.—Diameter of the peristome____________ 0.14 mm.

Structure.—The tubes are large; their orifices are very close to each other. The ovicell is transverse, long and narrow. Its outlines are indistinct. The marginal tubes are supported on its convexity. The oeciostome is small, very narrow, subterminal. The basal lamella is very short and the zone of growth is quite visible.

Occurrence.—Cretaceous (Vincentown marl): Vincentown, New Jersey.

Geologic distribution.—Lowest Eocene (Bryozoan bed at base of Aquia formation): Upper Marlboro, Maryland.

Plesiotypes.—Cat. No. 52593, U.S.N.M.

PLAGIOECIA DIVAGANS Canu and Bassler, 1920.

Plate 10, fig. 6.

1920. *Plagioecia divagans* CANU and BASSLER, North American Early Tertiary Bryozoa, Bull. 106, U. S. National Museum, p. 712, pl. 121, figs. 1–7.

On plate 10, we figure the ovicell of this interesting species, which structure, although known, has hitherto not been illustrated.

Occurrence.—Jacksonian and Vicksburgian, various localities in Mississippi and other southern States.

Plesiotype.—Cat. No. 68917, U.S.N.M.

PLAGIOECIA AMERICANA Ulrich and Bassler, 1907.

Plate 3, figs. 13–15.

1907. *Berenicea americana* ULRICH and BASSLER, Bryozoa, Geological Survey of New Jersey, Paleontology, vol. 4, p. 315, pl. 20, fig. 7.

Measurements.—	Diameter of peristome	0.10 mm.
	Zooecial width	.12 mm.
	Distance between tubes	.50–0.80 mm.
	Separation of orifices	.36– .44 mm.

Structure.—The tubes are but slightly convex, almost flat. The peristome is elliptical or oval often acuminated distally. They are shorter (fig. 15) in the vicinity of the ancestrula (0.50 mm.) and longer on the zoarial margins (fig. 14), where they measure almost 0.80 mm. The separation is much more constant (about 0.40 mm.).

The ovicell is elliptical, transverse, little globular, little expanded; as shown in our figures it is almost orbicular. The oeciostome is of the same size as the peristome; it is turned toward the center of the zoarium.

Occurrence.—Cretaceous (Vincentown marl): Vincentown, New Jersey.

Holotype and plesiotypes.—Cat. No. 52586, U.S.N.M.

PLAGIOECIA COMPRESSA Goldfuss, 1827.

Plate 5, figs. 1, 2.

1827. *Ceriopora compressa* GOLDFUSS, Petrefacta Germaniae, Bryozoa, vol. 1, p. 37, pl. 9, fig. 4.

1853. *Mesenteripora compressa* D'ORBIGNY, Paleontologie française, Terrain Crétacé, p. 811, pl. 756, figs. 10–13.

1899. *Diastopora compressa* GREGORY, Catalogue of the Cretaceous Bryozoa in the British Museum, vol. 1, p. 132.

We believe this is the species that Pergens has identified incorrectly with *Mesenteripora meandrina* Wood, 1856. Gregory has already limited the species to Cretaceous specimens alone. In fact, the ovicell is not of the same nature as that of the specimens from the English Crag and of the recent specimens of the coast of California.

This species is a typical *Plagioecia.* The ovicell is very long and elliptical; it often results from the fusion of two or three secondary ovicells, and it is not rare to see two or three very small perforations representing the oeciostomes.

A character which renders the determination of this species easy is the fluting which ornaments the tubes. The zoarium is a *Mesenteripora;* that is to say, a bilamellar zoarium with undulated fronds. It is sometimes multilamellar.

Occurrence.—Cretaceous (Neocomian): St. Croix, Switzerland.

Cretaceous (Turonian): Fontaine d'Antoigne, near Chatellerault (Vienne), Les Janières, St. Calais and Duneau (Sarthe), Luynes (Loir-et-Cher), and Parnay (Indre-et-Loire), France.

Cretaceous (Coniacian): Tours (Indre-et-Loire), Villedieu (Loir-et-Cher), and Les Phelippeaux (Charente), France.

Cretaceous (Santonian): Houssaye and Vendome (Coulommiers). (Loir-et-Cher), and Bedocheau (Charente), France.

Cretaceous (Maastrichtian): Maastricht, Holland.

Cretaceous (Danian): Möen, Denmark.

PLAGIOECIA CLYPEIFORMIS D'Orbigny, 1853.

Plate 3, fig. 11.

1853. *Discosparsa clypeiformis* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 824, pl. 758, figs. 6–9.

Ovicelled specimens of this species are quite rare. The ovicell is long and thin, salient and parallel to the zoarial margins. The species is rather easy to determine in the French material and D'Orbigny's figure is exact. The zoarium has the *Discosparsa* form of growth.

Occurrence.—Cretaceous (Turonian): Fontaine d'Antoigné near Chatellerault (Vienne), France.

PLAGIOECIA OBLIQUA D'Orbigny, 1851.

Plate 5, figs. 9–12.

1851. *Reticulipora obliqua* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 906, pl. 610, figs. 1–5; pl. 768, figs. 1, 2.

1899. *Crisina* (*Reticrisina*) *obliqua* GREGORY. Catalogue of the Cretaceous Bryozoa, p. 178, pl. 8, figs. 8, 9, and fig. 13 (cites bibliography and geological distribution).

Structure.—*Reticulipora* is a very curious zoarial form, long considered as generic; it results from a folding of a primitively Berenicoid zoarium and of the turning toward the top of the folded fronds. The ovicells observed indicate that this zoarial form may be produced in very different families.

Here the ovicell is elliptical or fusiform, quite long, transverse, arranged parallel to the zoarial margins, and obliquely to the tubes. It is located among the tubes, the development of which it retards, but it may be placed on the margin itself of the zoarium. We give some illustrations which show its variations in size, form, and position.

This species is common in the European Cretaceous and specimens with ovicells are not rare. In the American Tertiary (Vicksburgian) we have a species with a *Reticulipora* zoarium belonging to *Exochœcia* a genus of the Mecynoeciidae.

Occurrence.—Cretaceous (Coniacian): Tours (Indre-et-Loire), France.

NOTOPLAGIOECIA, new genus.

Greek: *Notos*, back, dorsal.

The ovicell is an irregular convex capsule replacing many peristomes. The tubes are short, clubshaped with thick moniliform walls at their extremities. The gemmation is *dorsal*. There is no basal lamella.

Provisional genotype.—*Notoplagioecia farringdonensis*, new species.

Range.—Cretaceous (Aptian-Coniacean).

In the genus *Plagioecia* Canu, 1917, there are species provided with a basal lamella and others that are deprived of it. The first group has triparietal gemmation while the second has dorsal gemmation. It is convenient to regard the second group as a distinct genus. In this new genus, *Notoplagioecia*, it is necessary to classify the following species in addition to the new species here described, *Laterotubigera flexuosa* D'Orbigny, 1853, and *L. annulata* D'Orbigny, 1853.

Many other species of the genus *Laterotubigera* D'Orbigny, 1853, appear to belong to this new genus. Perhaps it will ultimately be found that D'Orbigny's genus *Laterotubigera*, possesses the same characters of ovicell and gemmation, but at present this genus can not be recognized.

NOTOPLAGIOECIA FARRINGDONENSIS, new species.

Plate 1, fig. 18.

Description.—The zoarium is free, cylindrical or compressed. The tubes are indistinct, very little convex, smooth. The peristomes are orbicular, thin, arranged in quincunx or in transverse rows. The zone of growth is an elevated cone. The ovicell is an irregular sack covering many adjacent tubes.

Measurements.—

Diameter of aperture	0.16 mm.
Diameter of peristome	.20 mm.
Distance of peristome	.48–0.56 mm.
Separation of peristomes	.72 mm.
Diameter of branches	3.00 mm.

Structure.—In longitudinal sections the tubes are short, club shaped, much expanded at their terminal parts, sometimes showing pseudofacettes. The gemmation is dorsal, although triparietal in appearance because of the little length of the tubes. The walls are moniliform, much widened at their extremity.

In transverse sections the tubes are rounded, much smaller at the center than at the circumference, with very thick vesicular walls, especially at the periphery.

Occurrence.—Lower Cretaceous (Aptian): Farringdon, England.

Cotypes.—Cat. No. 68718, U.S.N.M.

NOTOPLAGIOECIA MAGNIPORA, new species.

Plate 5, figs. 3, 4.

Description.—The zoarium is free, cylindrical, bifurcated (*Entalophora* form of growth). The tubes are indistinct, large, open in quincunx, not raised at their extremity; the peristome is very thin and scarcely salient. The ovicell is enormous, very convex, covering half of the zoarium; the oeciostome is much smaller than a zooecium, somewhat salient and placed at the distal extremity.

Measurements.—

Diameter of peristome	0.25–0.30 mm.
Distance of orifices	.83– .85 mm.
Separation of orifices	.83– .85 mm.
Diameter of branches	2.10 mm.

Affinities.—In the size of the peristomes, this species can only be compared to *Entalophora grandipora* Vine, 1885, of the English Coniacian, but it differs in its nonvisible tubes and in its lesser distance between the orifices.

In species of *Plagioecia* we rarely find the oeciostome because it is very small and is confused with the secondary perforations of the surface. Here, however, it is quite visible, although remaining very small in comparison with the tubes.

Occurrence.—Cretaceous (Coniacian): Tours (Indre-et-Loire), France.

Cotypes.—Canu collection.

NOTOPLAGIOECIA FLEXUOSA D'Orbigny, 1853.

Plate 5, fig. 5.

1853. *Laterotubigera flexuosa* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 715, pl. 754, figs. 2–4.

Affinities.—In its small dimensions this species is quite close to *Mecynoecia micropora* D'Orbigny, 1853, but its peristome is always elliptical and transverse. This difference is quite important and moreover the ovicell is of an absolutely different type. In spite of appearances the two species do not belong to the same family.

The peristome measures 0.14 by 0.20 mm. and the diameter of the tubes is 0.20 mm. Almost all the peristomes are adjacent to each other.

It differs from *Notoplagioecia* (*Semilaterotubigera*) *annulata* D'Orbigny, 1853, in which the peristome is also transverse in its micrometric dimensions.

Geologic distribution.—Cretaceous (Turonian): Angouleme (Charente), France.

Cretaceous (Coniacian): Tours (Indre-et-Loire) and Villedieu (Loir-et-Cher), France.

Cretaceous (Santonian): Barbezieux (Charente), France.

NOTOPLAGIOECIA ANNULATA D'Orbigny, 1853.

1853. *Semilaterotubigera annulata* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 750, pl. 762, figs. 13–15.

We have not yet discovered the ovicell of this rather common species, which, nevertheless, is easily distinguished by its micrometric dimensions from *Mecynoecia micropora* D'Orbigny, 1853, and from *Notoplagioecia flexuosa* D'Orbigny, 1853. This is the largest species of the three; the transversal diameter of the peristome is from 0.18–0.20 mm. and that of the tubes from 0.26–0.30 mm.

The tubes are bent upward at their extremity and the peristome is slightly oblique. Illuminated from below, the latter appears transverse, but it appears orbicular when lighted from above. This peculiarity is the cause of the disorder which exists in D'Orbigny's specimen tubes and of his somewhat erroneous figure.

The zoaria are generally hollow and are terminated at their extremity by a solid part, as has been well figured by Pergens. They are often quite large and attain one centimeter in width.

One must not confound this species with *Laterotubigera macropora* D'Orbigny, 1853, in which the dimensions are much larger (peristome=0.30 mm. and transversal diameter=0.40 mm.). The bibliography of this species given by Gregory in 1899 is absolutely false.

Geological distribution.—Cretaceous (Coniacian): Tours (Indre-et-Loire), St. Paterne and Connerre (Sarthe), Villedieu (Loir-et-Cher), and Les Phelippeaux (Charente), France.

Cretaceous (Santonian): Vendome (Coulommiers) and Bedocheau (Charente), France.

Cretaceous (Maastrichtian): D'Archiac (Charente), France.

Genus CAVARIA Hagenow, 1851.

1851. *Cavaria* HAGENOW, Die Bryozoen der Maastrichter Kreidebildung. p. 53.

Plagioeciidae in which the ovicell is globular, transverse, arranged perpendicularly to the zooecial axis and aborting many of the tubes. The tubes are cylindrical, with peristome, and with dorsal gemmation on the basal lamella. The zoarium is cylindrical, hollow, often with diaphragms irregularly placed in the interior.

Genotype.—*Cavaria pustulosa* Hagenow, 1851.

Range.—Maastrichtian, Danian.

Historical.—Hagenow applied the term *Cavaria* to zoaria, which were hollow and had diaphragms in the interior. This characteristic is very inconstant and may be often observed in *Entalophora* forms of growth and more frequently in the Ascosoeciidae. Quite often, especially on little complete zoaria, this character is only partially developed. This zoarial form probably corresponds to some kind of symbiosis on a marine alga.

The first species described by Hagenow is *Cavaria ramosa*, which was chosen in 1887 by Marsson as the type of his genus *Cavarinella*, referred by us to the Ascosoeciidae. Gregory was therefore in error in 1899 when he chose this species as the type of the genus *Cavaria*. Moreover, the section which he publishes does not conform to that of Marsson. The second species, *Cavaria pustulosa*, here chosen as the genotype, has afforded characters upon which we have established the above diagnosis. Gregory in 1899 classed the genus in the Ditstoporidae, which, however, is not a natural family.

CAVARIA PUSTULOSA Hagenow, 1851.

Plate 5, figs. 6–8.

1851. *Cavaria pustulosa* HAGENOW, Die Bryozoen der Maastrichter Kreidebildung, p. 54, pl. 6, fig. 2.

1887. *Cavaria pustulosa* MARSSON, Die Bryozoen der weissen Schreibkreide der Insel Rügen, Palaeontologische Abhandlungen, vol. 4, p. 18. pl 1, fig. 5.

1899. *Cavaria pustulosa* GREGORY, Catalogue of Bryozoa in Department of Geology of British Museum, The Cretaceous Bryozoa, vol. 1, p. 137 (cites bibliography and geologic distribution).

Structure.—Our specimens from Faxe correspond to Hagenow's figures and those from Herfolge to the illustrations given by Marsson. Nevertheless in these two aspects the ovicell is the same. The oeciopore appears to be represented by one or two very small pores, as is usual in the family.

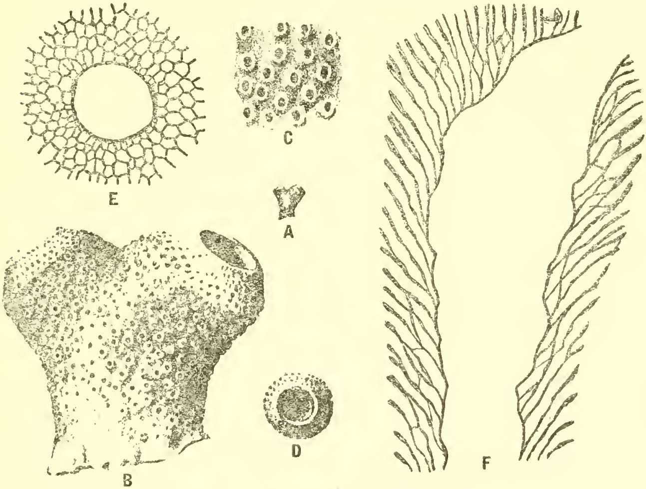

FIG. 5.—Cavaria pustulosa Hagenow, 1851.

A–D. Hagenow's figures showing a branch natural size (A), a portion enlarged (B), the surface further enlarged (C), and the end of the hollow branch (D).

E. Transverse section, × 12, showing the central zoarial cavity and the thick basal lamella.

F. The same features as shown in a longitudinal section, × 12.

Cretaceous; Maastricht. Holland (A–D) (Maastrichtian); Herfolge, Denmark (E, F) (Danian).

The longitudinal section indicates short, cylindrical tubes with dorsal gemmation. The transverse section indicates a thick basal lamella. The tubes are so short that the gemmation could be considered as triparietal if the basal lamella was calcified before the tubes.

Occurrence.—Cretaceous (Danian): Faxe and Herfolge (Seeland), Denmark. Also Maastrichtian at Maastricht, Holland.

Plesiotypes.—Cat. Nos. 68919, 68920, U.S.N.M.

Genus TEREBELLARIA Lamouroux, 1821.

1821. *Terebellaria* LAMOUROUX, Exposition méthodique des generes de l'order des Polypiers, p. 84.

The ovicell is long, convex, salient, transverse. The oeciostome is round, salient, distal, turned toward the base.

According to Gregory, the zoarial growth is by the addition of Berenicoid colonies on the ends of the branches; each colony sends an expansion downward around the stem. The zooecia are reflexed. The apertures occur in zones separated by interzones of dactylethrae.

Genotype.—*Terebellaria ramosissima* Lamouroux, 1821. Range, Jurassic, Cretaceous.

TEREBELLARIA RAMOSISSIMA Lamouroux, 1821.

Plate 10, figs. 7–10.

1899. *Terebellaria ramosissima* GREGORY. Catalogue Fossil Bryozoa in British Museum, Jurassic, p. 188, pl. 10, fig. 5 (cities bibliography).

This well known and frequently quoted bryozoan, described in detail by Gregory, has still never been located in a natural classification. Our discovery of the *Plagioecia*-like ovicell now enables its position to be determined.

Occurrence.—Jurassic of France and England.

Plesiotypes.—Cat. No. 32286, U.S.N.M.

THE CEIDAE OF D'ORBIGNY.

1852. CEIDAE D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 1000.—1889. PERGENS, Revision des Bryozoaires du Crétacé figurés par d'Orbigny, Bulletin Société belge de géologie, vol. 3, p. 310, fig. 23.—1899. CANU, Les ovicelles des Céidees, Bulletin de la Société géologique du France, ser. 3, vol. 27, p. 326.—1907. FILLIOZAT, Bryozaires crétacés de Vendôme, Bulletin de la Société géologique de France, ser. 4, vol. 7, p. 397.

Structure.—D'Orbigny characterized this family as follows: "Cellules centrifugineé [Cyclostomes], foraminées [without peristome] dont l'ouverture est evasée exterieurement."

We have prepared quite a number of sections in an endeavor to determine the structure of these fossils and have noted, first, that the tubes are conical, without peristome, oriented, with triparietal gemmation; second, the extremity of the tubes has dilated walls; third, a small oral tongue gives to the orifice its funnel-shaped form.

This form of the tube, club-shaped and without peristome, is not peculiar to the Cretaceous formations, as we possess Tertiary forms, and even recent ones not yet described, which have this structure. According to Pergens, *Cinctipora elegans* Hutton is a living representative; but this species has not yet been studied in detail.

The mode of gemmation is analogous to that of all the species with oriented zooecia. We have observed some interesting peculiarities.

The zooecia are shorter and in the lamellar forms they are detached from the basal lamella at a much greater angle. This phenomenon is observed frequently in the Paleozoic genera of the Order Cryptostomata and represents triparietal gemmation.

In the cylindrical forms the zoarial axis is a long tube serving as a much reduced basal lamella for all the other zooecia. This tube branches many times in its length, and its ramifications themselves serve as basal lamella to the adjacent zooecia.

The dilation of the zooecial walls at their extremity has been mentioned by Pergens, 1889. In the median axis of this dilation we observe a sort of linear or moniliform canal, a lumen rather apparent communicating with the exterior. We have not had the chance to observe "les petits canaux, ordinairement simples, quelquefois bi- ou trifurqués, traversant la partie epaissie, en rayonnant autour de la cavité centrale" (pl. 6, fig. 9), noted by Pergens; probably our sections are not thin enough. About the central lumen we have observed a lamellar structure slightly resembling that which Cumings and Galloway have noted at the base of the acanthopores in the Paleozoic genus *Dekayia* and analogous to that which Ulrich, 1890, has figured in *Rhombopora*.

The funnel-shaped form of the orifice is caused by the presence of a small calcareous tongue of variable size, which is often even absent. It is sometimes transformed into a true perforated diaphragm (=closure of Levinsen); the zooecia have then the aspect of the zooecia in the Eleidae and constitute the ectocystal zooecia of Filliozat; their orifice is orbicular and not semilunar.

The physiologic rôle of this tongue-diaphragm is absolutely unknown, like that of the ornamented closure in the Eleidae. Perhaps the tentacles were less numerous or much finer than in the other species of Cyclostomata.

The tubes of the Ceidae have therefore a very special form and quite characteristic between the conical, ordinary tubes without peristome and the tubes of the Eleidae.

The ovicells have been discovered by Pergens in 1893; Canu in 1899 and Filliozat in 1907 have described some forms. Their nature and their mode of formation classifies them among the Plagioeciidae. They are not parallel to the zoarial margins, except in the case of the union of many adjacent ovicells; they are more or less orbicular, globular and smooth; their contours are irregular and poorly defined. The oeciostome is a very minute pore placed in the proximal region; one ovicell may bear many oeciostomes. The identity with the ovicell of the genus *Plagioecia* is therefore not perfect, but the resemblances are sufficient to justify the classification of the two in the same family.

The genera *Cea*, *Semicea*, and *Filicea* of D'Orbigny are distinguished only by zoarial differences and ought to be united into a single genus. The genus *Reptocea* requires further examination. The genus *Laterocea* is peculiar for its tubes are cylindrical and not

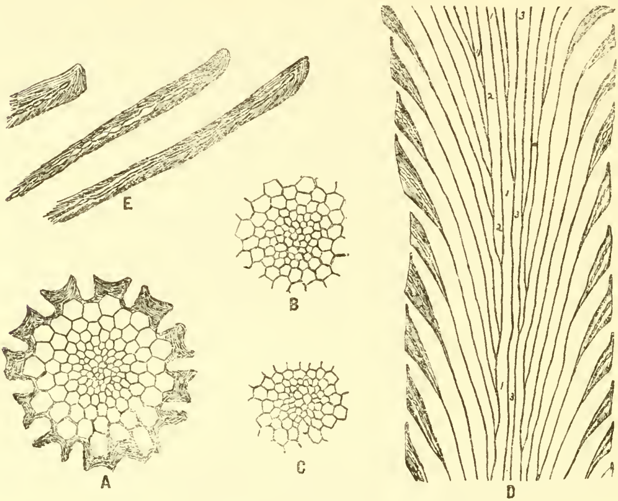

FIG. 6.—Cea (Filicea) regularis D'Orbigny, 1852.

A. Transverse section, × 16, showing the thick zoarial walls. The section cuts the branch a little above the bifurcation of the central tube which is thus represented by a small pore.

B. Central part of a transverse section, × 16, showing the central tube replacing the basal lamella.

C. Another transverse section, × 16, with the central tube surrounded by a circle of tubes of the same diameter, all of which replace the basal lamella.

D. Longitudinal section, × 16, there are two central tubes (1, 3). Tube 1 divides to form tube 2 which in turn gives rise to tube 4. The cross section of figure B is along the line through the middle of the section while that of figure C is through the top part. The walls are much thickened at their extremity and bear an oval projection which may be transformed into a perforated diaphragm.

E. Structure of the zooecial walls at the extremity × 50, showing a moniliform, central, clear space surrounded by laminated tissue.

Cretaceous (Coniacian); Villedieu (Loir-et-Cher), France.

club-shaped. The study which we have made of this genus, in which the ovicell is identical with that of *Cea*, shows at once that the form of the tubes is only a generic character. Following are the new generic diagnoses.

Genus CEA D'Orbigny, 1852.

1852. *Cea* D'ORBIGNY, Paléontologie française, Terrain Cétacé. vol. 5, p. 1004.

The oeciopore is a very minute pore. Gemmation is triparietal. The tubes are club-shaped, oriented and without peristome: the extremity of the walls is dilated: a small oral tongue very irregularly developed gives to the orifice a quite variable funnel-shaped form.

Genotype.—*Cea rustica* D'Orbigny, 1852. Cretaceous.

The species belonging to this genus are:

Cea rustica D'Orbigny, 1852 (pl. 6, figs. 1, 2.)
Cea compressa D'Orbigny, 1852 (=*C. subcompressa* Pergens, 1885, and *C. digitata* D'Orbigny, 1852 (pl. 6, figs. 3–9).
Cea lamellosa D'Orbigny, 1852 (pl. 6, fig. 10).
Cea tuberculata Canu, 1897.
Cea (*Filicea*) *regularis* D'Orbigny, 1852 (pl. 7, figs. 7–10).
Cea velata Hagenow, 1839.
Cea subcompressa D'Orbigny, 1852 (pl. 6, figs. 12–14.)
Cea rhomboidalis D'Orbigny, 1852.
Cea obliqua D'Orbigny, 1852.
Cea (*Semicea*) *tubulosa* D'Orbigny, 1852 (pl. 6, fig. 11).
Cea (*Semicea*) *lamellosa* D'Orbigny, 1852.

CEA SUBCOMPRESSA D'Orbigny, 1853.

Plate 6, figs. 12–14.

1853. *Filicea subcompressa* D'Orbigny, Paléontologie francaise, Terrain Crétacé. vol. 5, p. 1001, pl. 786, figs. 5, 7.

We have been fortunate enough to discover two ovicelled specimens of this species, which is not rare in France. The ovicell in one is convex, but in the other is flat and embedded in the zoarium. However, it is quite rare that the ovicells of the same species and even of the same zoarium resemble each other exactly in size and form.

The oeciopore is very small. One of our specimens bears two oeciopores. The presence of these small pores is so constant that they can scarcely be interpreted otherwise.

The synonomy of this species is cited by Pergens in 1889 and by Gregory in 1899. We have not enough data for comparison, and we prefer simply to preserve D'Orbigny's name.

Occurrence.—Cretaceous (Santonian): Vendome (Loir-et-Cher), France.

Plesiotypes.—Cat. No. 68921, U.S.N.M.

Genus LATEROCEA D'Orbigny, 1852.

1852. *Laterocea* D'ORBIGNY, Paleontologie française, Terrain Crétaée, vol. 5. p. 1003.

The oeciopore is a very small pore. The tubes are cylindrical, branched, dilated at their distal extremity; the walls are thick at their extremity.

Genotype.—Laterocea simplex D'Orbigny, 1852. Cretaceous (Senonian).

LATEROCEA SIMPLEX D'Orbigny, 1852.

Plate 7, fig. 6.

1852. *Laterocea simplex* D'ORBIGNY, Paleontologie française, Terrain Crétacé, vol. 5, p. 1004, pl. 786, figs. 14–16.

Structure.—Exteriorly the zooecia of *Laterocea simplex* are arranged in transverse rows, the feature upon which D'Orbigny founded

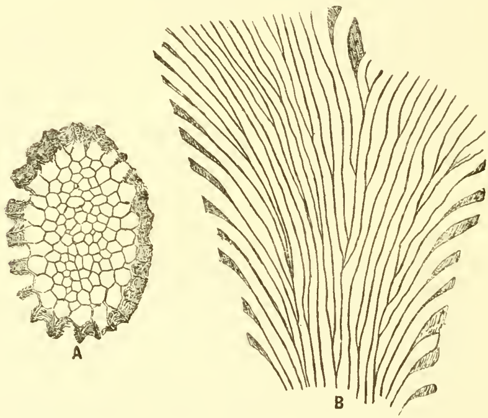

FIG. 7.—Lateroсea simplex D'Orbigny, 1852.

A. Transverse section, × 16.

B. Longitudinal section, × 16. The tubes are cylindrical and have their terminal walls thickened.

Cretaceous (Coniacian): Villedieu (Loir et Cher), France.

the genus, but this character is rather variable and can not be generic.

In transverse section we note that the tubes are almost of the same diameter, as in all the species with cylindrical tubes. The zoarial margins are very thick, which implies a considerable thickness of the extremity of the zooecial walls.

In longitudinal section the tubes are cylindrical in the greater part of their length; they are not oriented, but are dichotomously branched. This mode of gemmation gives to the zoaria a great irregularity. The extremity of the zooecial walls is strongly dilated like a club in the genus *Cea*. We are not certain of the presence of an oral tongue.

Occurrence.—Cretaceous (Coniacian): Villedieu (Loir-et-Cher), France.

Plesiotypes.—Cat. No. 60404, U.S.N.M.

STATHMEPORA, new genus.

This genus is characterized by the arrangement of the peristomes into linear fascicles and by an ovicell formed somewhat before the consolidation of the fascicles. The peristomies of the fascicles cease therefore to be adjacent in the ovicelled portion of the zoarium; they are isolated since they are consolidated at the same time as the ovicell. The oeciopore is a very minute perforation placed near the first tube of a linear fascicle.

Genotype.—*Stathmepora flabellata*[5] new species from the Pleistocene of California.

In *Plagioecia* the tubes are never grouped into linear fascicles. Generally the ovicell has been consolidated before the peristomes which brings about the abortion of a certain number of tubes. Still sometimes the peristomes have been consolidated before the ovicell and thus brings about their abortion. This phenomenon is readily observed in *Plagioecia* (*Berenicea*) *diluviana* Lamouroux, 1821, of which Canu, 1900, has given several ovicell variations.

Bisidmonea johnstrupi Pergens, 1886, and *Bisidmonea gabbiana* Ulrich and Bassler, 1907, belong to this new genus whose geologic range dates from the Danian.

The zoarium of *Stathmepora flabellata*, new species, from the Pleistocene at Santa Monica, California, has the zoarial form of *Mesenteripora*.

The ovicell of *Bisidmonea antiqua* D'Orbigny, 1852, the genotype of *Bisidmonea* proves to be of the type characterizing the Mecynoeciidae, in which family we have placed this genus.

STATHMEPORA GABBIANA Ulrich and Bassler, 1907.

Plate 7, figs. 4, 5.

1907. *Bisidmonea gabbiana* Ulrich and Bassler, Bryozoa, Cretaceous Paleontology of New Jersey, Geological Survey of New Jersey, Paleontology, vol. 4, p. 320, pl. 22, figs. 1, 2.

The authors of this species have figured the ovicell, but they did not describe it. We are reproducing the types with a greater magnification.

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[5] Described and illustrated in our monograph on the Later Tertiary and Quaternary Bryozoa of North America, now in press.

The oeciopore is a small proximal pore placed in the vicinity of a peristome.

The ovicell is a globular sac, developed transversally, and probably arising from a tube coming from the vicinity of the ancestrula. In its formation it disarranges the peristomie of the tubes which then cease to be adjacent to each other, and some of which are even aborted. The ovicell is therefore formed a little before the complete development of the peristomies. Their formation is almost simultaneous.

In longitudinal section the tubes are cylindrical, with triparietal gemmation, and developed on a basal lamella. The meridian section,

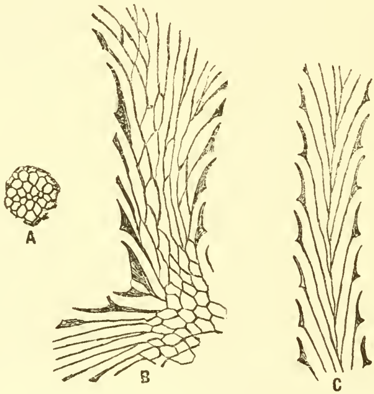

Fig. 8.—Stathmepora gabbiana, Ulrich and Bassler, 1907.

A. Transverse section, × 16. The tubes are cylindrical.
B. Meridian section, × 16.
C. Longitudinal section, × 16, illustrating the triparietal gemmation.
Cretaceous (Vincentown): Vincentown, N. J.

made near this lamella, shows the usual lozenge shaped areas characteristic of dorsal gemmation.

Occurrence.—Cretaceous (Vincentown marl): Vincentown, New Jersey.

Cotypes.—Cat. No. 52588, U.S.N.M.

STATHMEPORA JOHNSTRUPI Pergens, 1886.

Plate 7, figs. 1–3.

1886. *Bisidmonea johnstrupi* Pergens, La faune des Bryozoaires Garumniens de Faxe, Annales de la Société Royal Malacologique de Belgique, Bruxelles, vol 21, pp. 37, 219, pl. 12, figs. 1–6.

1892. *Bisidmonea johnstrupi* Hennig, Studier öfver Bryozoerna i Sveriges Kritsystom, I Cheilostomata, Lunds Universitets Arsskrift, vol. 28, No. 11, p. 19.

We have been able to secure ovicells of this remarkable species and have chosen the two which differ the most for illustration. They are similar to the ovicell of *Stathmepora* (*Bisidmonea*) *gabbiana*. Ulrich and Bassler, 1907. Most of the tubes in lines are aborted, but there persists always at least one which opens above the convexity of the ovicell. One of the tubes is perhaps the oeciostome, but we have not cared to dissect our specimens. As in the American species, there is a simultaneity in the calcification of the ovicell and all the peristomies of the tubes.

Geological distribution.—Cretaceous: Danian of Denmark; Senonian of Switzerland.

Family DIAPEROECIIDAE Canu, 1918.

1918. *Diaperoeciidae* CANU, Les ovicelles des Bryozoaires Cyclostomes, Bulletin Société Géologique de France, ser. 4, vol. 16, p. 329.—1920. CANU and BASSLER, North American Early Tertiary Bryozoa, Bull. 106, U. S. National Museum, p. 738.

The ovicell is formed after the calcification of the distal tubes. It is an irregular, subglobular elevation placed among many tubes, which are not disarranged from their respective position but project on the ovicell itself. The oeciostome is submedian transverse, salient, often isolated, generally proximally directed.

The genera at present referred to this family are *Diaperoecia* Canu, 1918, *Diplosolen* Canu, 1918, *Lekythionia* Canu and Bassler, 1920, *Crisulipora* Robertson, 1910, *Desmediaperoecia* Canu and Bassler, 1920, and *Stigmatoechos* Marsson, 1887.

Genus DIAPEROECIA Canu, 1918.

1918. *Diaperoecia* CANU, Les ovicelles des Bryozoaires Cyclostomes. Bulletin Société Géologique de France, ser. 4, vol. 16, p. 329.—1920, CANU and BASSLER, North American Early Tertiary Bryozoa, Bull. 106, U. S. National Museum, p. 740.

DIAPEROECIA POLYSTOMA Roemer, 1839.

Plate 7, fig. 11.

1839. *Cellepora polystoma* ROEMER, Die Versteinerungen des norddeutschen Oolithen-Gebirges Hannover, (1836) Nachtrag, p. 14, pl. 16, fig. 6.
1899. *Berenicea polystoma* GREGORY, Catalogue of the Cretaceous Bryozoa in the British Museum, vol. 1, p. 10, pl. 5, fig. 5; pl. 6, fig. (Bibliography).

This little species is not rare. One recognizes it quite often in the Neocomian fossils in France, Germany, and Switzerland. More recently Gregory claimed to have rediscovered it in the Coniacian at Chatham, England, but he did not figure the ovicell.

Our ovicelled specimen indicates that this species is a *Diaperoecia;* unfortunately the oeciostome is not visible.

Occurrence.—Cretaceous (Neocomian); Gross Wahlberg, Germany, etc.

DIAPEROECIA PAPILLOSA Reuss, 1846.

Plate 7, fig. 12.

1846. *Diastopora papillosa* Reuss, Die Versteinerungen der böhmischen Kreideformation, pt. 2, p. 65, pl. 15, figs. 44, 45, p. 65 (*pusilla*); pl. 14, fig. 15.

1851. *Berenicea grandis* d'Orbigny Paléontologie française, Terrain Crétacé, vol. 5, p. 866, pl. 639, fig. 4, 5.

1851. *Berenicea echinata* d'Orbigny, Paléontologie française, Terrain Crétacé, vol. 5, p. 868, pl. 641, figs. 1. 2.

1889. *Diastopora papillosa*, Pergens, Révision des Bryozoaires du Crétacé figures par D'Orbigny, Mémoires de la Société Belge de Géologie, de Paléontologie et d'Hydrologie, vol. 3, p. 334, pl. 12, fig. 1.

1899. *Berenicea papillosa* Gregory, Catalogue of the British Museum, Cretaceous Bryozoa, p. 81, pl. 5, figs. 6, 7. 8, 9 (Bibliography and Geological distribution).

1911. *Diastopora* (*Berenicea*) *papillosa* Canu, Iconographie des Bryozoaires fossiles de l'Argentine, Anales del Musee National de Buenosayres, vol. 21, p. 269, pl. 10, figs. 1 to 11 (not 4).

Gregory has figured the ovicell of this species. We have not been fortunate enough to discover the oeciostome. This ovicell is fusiform much elongated and always near the zoarial margins.

Geological distribution.—To the localities cited by Gregory it is necessary to add the following French localities from the Canu collection. Turonian at Duneau and Connerré (Sarthe) and Fontaine d'Antoigne near Chatellerault (Vienne); Coniacian at Les Phelippeax (Charente), Tours (Indre-et-Loire), and Fécamp (Seine Inferieure); Santonian at Piaud (Charente) and Romorantin (Loir-et-Cher); Campanian at Montomoreau (Charente); Maastrichtian at Deviat (Dordogne); Rocanian of Argentina.

DIAPEROECIA TURONICA, new species.

Plate 8, figs. 1-6.

Description.—The zoarium is a bushy *Mesenteripora* composed of undulated and distorted lamellae on which the peristomes are arranged in quincunx or in oblique lines, as in *Reticulipora*. The tubes are visible, almost flat, straight, bordered laterally by two very thin threads hardly salient: the apertura is elliptical, the peristome is thin and little salient. The zone of growth is wide and visible. The ovicell is large, globular, quite convex, elliptical, perforated by as many as 15 peristomes.

Measurements.—		
	Diameter of peristomes	0.12 mm.
	Distance between peristomes	0.50–0.64 mm.
	Separation of peristomes	.36– .44 mm.

Affinities.—This species differs from *Plagioecia compressa* D'Orbigny, 1852, not only in the nature of the ovicell, but also in the absence of a median furrow on the tubes; the zoarial aspect is identical and confusion between the two species is always possible without attentive observation.

Very often the distance and separation of the peristomes are very close measurements. Here on the contrary they are quite different, the visible length of the tubes being very large. It is the same in *Diaperoecia laxipora* D'Orbigny, 1852. *D. turonica* differs however from this species in its larger peristome (0.12 instead of 0.10 mm.) and in its less zooecial length never attaining 0.70 mm.

There are some specimens affecting the zooecial arrangement of *Reticulipora:* this is the result of the distorting of the lamellae, the growth being always exterior.

Occurrence.—Cretaceous (Turonian); Ruillé Poncé (Loir-et-Cher), France.

Cotypes.—Canu collection and Cat. No. 68922, U.S.N.M.

DIAPEROECIA LAXIPORA D'Orbigny, 1853.

1853. *Mesenteripora laxipora* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 812, pl. 756, figs. 14–17.

1890. *Mesenteripora laxipora* PERGENS, Révision des Bryozoaires du Crétacé figurés par D'Orbigny, Bulletin de la Société belge de Géologie, vol. 3, p. 369.

Measurements.—	Diameter of peristomes	0.10 mm.
	Distance between peristomes	0.70–0.80 mm.
	Separation of peristomes	.40 mm.

Affinities.—We have discovered the ovicell of this species and find it is identical with that of *Diaperoecia turonica*, but with somewhat smaller dimensions; we do not believe it is of any use to figure it.

This species is perfectly characterized by its great zooecial length, twice the separation of the peristomes. The zooecia are little distinct; however, it is not rare that they are bordered laterally by a thin salient thread which causes them to resemble those of *Diaperoecia turonica.* Confusion between the two species is not possible because of the great micrometric differences.

Occurrence.—Cretaceous (Santonian): Romorantin (Loir-et-Cher), France.

Geological distribution.—Coniacian of France (D'Orbigny). The Maestrichtian locality of Royan is cited in the Paleontologie française, but Canu has not found this species there.

DIAPEROECIA SAILLANS, new species.

Plate 8, figs. 12.

Description.—The zoarium is flabelliform or orbicular; and incrusts bryozoa (*Coscinopleura*). The tubes are large, little visible in their lower part; they are upward bent at their extremity, developing a long *salient* peristomie; the peristome is round, thin. The ovicell is very large, elliptical, transverse, very globular, traversed by the tubes.

Measurements.—

Diameter of peristome	0.14 mm.
Zooecial width	.20 mm.
Distance between orifices	.50 mm.
Separation of orifices	.50 mm.
Length of peristomie	.20 mm.

Affinities.—This beautiful species is quite well characterized by the length of its peristomie and its enormous ovicell. Unfortunately our specimen had no oeciostome. It differs from *Diplosolen lineatum* in the absence of the zooeciules. It differs from *Plagioecia americana* in the thickness of its convex tubes (0.14 and not 0.10 mm.) and in the different ovicell.

Occurrence.—Cretaceous (Vincentown marl): Vincentown, New Jersey.

Holotype.—Cat. No. 68923, U.S.N.M.

DIAPEROECIA PUNCTATA, new species.

Plate 8, figs. 8–10.

Description.—The zoarium is cylindrical, entalophoroid. The tubes are little distinct, somewhat convex, swollen, contracted at their extremity, ornamented with two large *punctations* irregularly placed in the vicinity of the apertura. The peristome is little salient, rather thick; the apertures are arranged in regular quincunx. The ovicell is large, elliptical, very convex, traversed by the tubes and very often by their adventitious punctations.

Measurements.—

Diameter of peristome	0.14 mm.
Diameter of tubes	.15 mm.
Distances of orifices	.74 mm.
Separation of tubes	.44 mm.
Length of ovicell	1.65 mm.
Width of ovicell	1.00 mm.
Diameter of branches	1.00 mm.

Occurrence.—Cretaceous (Danian): Herfolge (Seeland), Denmark.

Holotype.—Cat No. 68924, U.S.N.M.

DIAPEROECIA TRANSVERSATA, new species.

Plate 8, fig. 7.

Description.—The zoarium is free; the branches are compressed and narrowed at their extremity. The tubes are indistinct; the peristomes are salient, thin, irregularly placed, adjacent or scattered. The ovicell is large, convex, elliptical, arranged *transversally.*

Measurements.—

Separation of tubes	0.50 mm.
Diameter of branches	2.00 mm.
Width of ovicell	1.90 mm.
Length of ovicell	.75 mm.

Affinities.—In the genus *Diaperoecia* the large axis of the ovicell is generally arranged in the direction of the zoarial axis. Here the width is greater than the length and we have believed it useful to note this exception.

Occurrence.—Cretaceous (Danian): Herfolge (Seeland), Denmark.

Holotype.—Cat. No. 68925, U.S.N.M.

DIAPEROECIA COMPRESSA, new species.

Plate 9, figs. 1–5.

Description.—The branches of the zoarium are of bifoliate lamellae much *compressed*. The zooecia are distinct, flat, separated by a quite salient thread; the peristomes are thin, somewhat salient, arranged in irregular quincunx and always orbicular. The ovicell is globular, quite convex, elongated, traversed by tubes which are almost always closed by lamellae.

Measurements.—

Diameter of peristome	0.12 mm.
Zooecial width	.16 mm.
Zooecial distance	.55 to 0.64 mm.
Separation of tubes	.44 to .48 mm.
Width of branches	1.25 mm.
Length of ovicell	1.20 to 1.60 mm.
Width of ovicell	.60 to .70 mm.

Affinities.—In its exterior aspect and the salient separating threads of the tubes this species much resembles *Mesenteripora vaudensis* D'Orbigny 1852 of the Swiss Neocomian. Unfortunately we are ignorant of the ovicell of this species, and the type itself is missing from the Paris Museum. Comparison is therefore very difficult, but according to D'Orbigny's figures the branches appear much wider than those of our specimens.

Occurrence.—Cretaceous (Danian): Herfolge (Seeland), Denmark.

Cotypes.—Cat. No. 68926, U.S.N.M.

DIAPEROECIA DISTANS Hagenow, 1851.

Plate 9, fig. 19.

1851. *Escharites distans* HAGENOW, Die Bryozoen der Maastrichter Kreidebildung, p. 56, pl. 1, figs. 16 *a–e*, *g*, *k*, *m* (not *f*, *h*, *i*, *l*, and fig. 17).

Our ovicelled specimen has much resemblance to that figured by Hagenow in 1851, but this author appears to have confused two species, not only of different genera, but also of very different families. We accept the interpretation of Pergens, 1887.

The arrangement of the tubes is as in *Peripora* and this is the first time that we have discovered an ovicelled specimen.

Gregory, in 1899, gives a long synonymy of this species. This appears premature to us and we can maintain it only when we have discovered in France ovicelled specimens of the different species of *Peripora* described by D'Orbigny.

Occurrence.—Cretaceous (Danian): Herfolge (Seeland), Denmark. Also in the Maastrichtian at Maastricht, Holland.

Plesiotype.—Cat. No. 68927, U.S.N.M.

DIAPEROECIA? AMERICANA Gabb and Horn, 1862.

Plate 9, figs. 6–10.

1862. *Fascipora americana* GABB and HORN, Journal Academy of Natural Sciences, Philadelphia, ser. 2, vol. 5, p. 165, pl. 21, fig. 54.

Description.—The zoarium is free, cylindrical, in the *Entalophora* form with the branches clavate, short, and bifurcated. The tubes are little distinct, very little convex, sometimes bordered; the peristome is thin, little salient, orbicular. The ovicell is large, elliptical, transverse, globular, salient, perforated by the widely separated tubes. The zone of growth is terminal and very thick.

Measurements.—		
	Diameter of peristome	0.14–0.16 mm.
	Distance between peristomes	0.50 mm.
	Separation of peristomes	0.50 mm.
	Smallest diameter of branches	1.4 mm.
	Greatest diameter of branches	2.00 mm.

Affinities.—This species is quite well characterized by the clavate form of its branches; the upper part is wider and often is occupied by the ovicell. The tubes are sometimes flat and bordered with a very salient thread; generally they are little distinct. We have figured a branch in which the lower tubes are not pointed in the same direction as the upper tubes. We are unable to explain this curious growth.

At the base of the branches the length of the tubes varies from 0.90 to 1.00 mm. The ovicell is often almost analogous with *Plagioecia.* In reality this seems to be an intermediate type between *Plagioecia* and *Diaperoecia.* The discovery of the oeciostome will permit an exact generic classification.

Occurrence.—Cretaceous (Vincentown marl): Vincentown, New Jersey.

Plesiotypes.—Cat. No. 68928, U.S.N.M.

Genus DIPLOSOLEN Canu, 1918.

This genus is like *Diaperoecia* save that adventitious tubules (zooeciules) are developed.

Genotype.—*Diplosolen* (*Berenicea*) *obelium* Johnston, 1847.

Range.—Cretaceous—Recent.

DIPLOSOLEN LINEATUM Gabb and Horn, 1862.

Plate 9, fig. 20.

1862. *Diastopora lineata* GABB and HORN, Monograph of the fossil Polyzoa of the Secondary and Tertiary formations of North America, Journal Academy of Natural Sciences of Philadelphia, ser. 2, vol. 5, p. 172, pl. 21, fig. 62.

1868. *Diastopora lineata* ULRICH and BASSLER, Bryozoa, Cretaceous Paleontology of New Jersey, Geological Survey of New Jersey, Paleontology, vol. 4, p. 316, pl. 21, figs. 3, 4.

Measurements.—	Diameter of peristome	0.12 mm.
	Distance between orifices	.50 mm.
	Separation of orifices	.54 mm.

The zoarium is hollow and subcylindrical; it therefore probably incrusted delicate algae at their bifurcation. The zooeciules are small, very constant; their diameter is a fourth of that of the ordinary tubes. They escaped the observation of Gabb and Horn, who do not mention them in their description.

The ovicell is quite large, very salient, globular, elliptical, with well defined outlines. Unfortunately our specimen has no oeciostome.

A certain number of tubes are closed by a diaphragm; the orifices are elliptical; the zone of growth is short; it is therefore very probable that the tubes bear a very long, salient, and quite fragile peristomie.

Occurrence.—Cretaceous (Vincentown marl): Vincentown, Timber Creek and Mullica Hill, New Jersey.

Plesiotypes.—Cat. No. 68929, U.S.N.M.

DIPLOSOLEN ENTALOPHOROIDEA, new species.

Plate 9, figs. 21, 22.

Description.—The zoarium is free, cylindrical, entalophoroid, bifurcated. The tubes are distinct, separated by a little salient thread and scattered. The surface is almost smooth. The peristomes are little salient, thin, orbicular, arranged in regular quincunx. The zooeciules are small, distinct, and their aperture is generally placed in the vicinity of the zooecial orifice. The ovicell is very large, globular, elongated elliptical, traversed by the tubes and by the zooeciules, wider than the branches.

Measurements.—	Diameter of peristome	0.08 mm.
	Zooecial width	.10 mm.
	Distance of tubes	.32 mm.
	Separation of tubes	.48 mm.
	Diameter of branches	.75 mm.
	Width of ovicell	1.25 mm.
	Length of ovicell	2.00 mm.

Affinities.—The species of this genus are generally incrusting but this is the second species known having free branches.

Occurrence.—Cretaceous (Danian): Faxe, Denmark.

Holotype.—Cat. No. 68730, U.S.N.M.

Genus STIGMATOECHOS Marsson, 1887.

1887. *Stigmatoechos* MARSSON, Die Bryozoen der weissen Schreibkreide der Insel Rügen, Palaeontologische Abhandlungen, vol. 4, p. 32.

STIGMATOECHOS PUNCTATUS Marsson, 1887.

Plate 9, figs. 11–18.

1887. *Stigmatoechos punctatus* MARSSON, Die Bryozoen der weissen Schreibkreide der Insel Rügen, Palaeontologische Abhandlungen, vol. 4, p. 32, pl. 2, fig. 3.

The ovicell is an enormous hemispherical sack traversed by the tubes, arranged laterally on the anterior (cellular) face; the orifice of the tubes of the ovicell is often closed by a calcareous lamella. This structure is eminently that of the Diaperoeciidae.

On the anterior face the tubes are in quincunx but on the sides of the zoarium they are grouped in transverse rows.

The posterior, noncellular face is smooth and thickened. It does not present the characteristic sulci of the Horneridae, as Marsson believed.

Occurrence.—Cretaceous (Danian): Faxe, Denmark; Rugen, Germany.

Plesiotypes.—Cat. No. 68931, U.S.N.M.

Family TUBULIPORIDAE Johnston, 1838.

This family and its genera have been discussed at some length in our monograph on the Early Tertiary Bryozoa. Our purpose in the present connection is to give descriptions of several species showing variations in growth forms of several genera and to illustrate the structure of the genus *Tennysonia* Busk, 1867, which proves to be a member of the family.

The genera of this family with range are as follows:

Tubulipora Lamarck, 1816. Eocene (Midwayan)–Recent.
Platonea Canu and Bassler, 1920. Oligocene (Vicksburgian)–Recent.
Centronea Canu and Bassler, 1920. Eocene.
Idmonea Lamouroux, 1821. Cretaceous–Recent.
Idmidronea Canu and Bassler, 1920. Cretaceous, Eocene.
Mesonea Canu and Bassler, 1920. Eocene–Recent.
Pleuronea Canu and Bassler, 1920. Eocene–Pliocene.
Tretonea Canu and Bassler, 1920. Eocene.
Erkosonea Canu and Bassler, 1920. Eocene.
Tennysonia Busk, 1867. Recent.

Genus PLATONEA Canu and Bassler, 1920.

1920. *Platonea* CANU and BASSLER, North American Early Tertiary Bryozoa, Bull, 106, U. S. National Museum, p. 759.

The type of this genus, *Reptotubigera phillipsae* Harmer, 1915, is an incrusting species with the ovicell spread out between the fascicles over the entire zoarial width. The following new species are interesting because they exhibit the same ovicell structures in the erect forms of growth. Under the old classification these two species and the incrusting type would be assigned to three quite different genera.

PLATONEA SCALARIA, new species.

Plate 11, figs. 1–5.

Description.—The zoarium has the *Idmonea* form of growth, somewhat enlarged at the bifurcations. The fascicles are salient, close together, alternate or opposite, formed of 3 or 4 tubes. The tubes are little distinct, hardly convex; the peristome is thin, orbicular or rectangular. The ovicell is large, convex, wide spread between the fascicles over the whole zoarial width; the oeciostone is elliptical, transverse, provided distally with a sort of raised lip, less wide than a tube, hardly salient and orthogonal.

Measurements.—	Zooecial diameter	0.20 mm.
	Width of fascicles	.25 mm.
	Distance between fascicles	.40 mm.
	Dimensions of oeciostome	.26 by 0.14 mm.
	Zoarial width	1.20 mm.

Variations.—This species is well characterized by its fascicles regularly arranged *according to scale* and quite close together, and also by the form of its ovicell. We have been rather fortunate in finding many ovicells and to recognize among them some variations. They are enlarged at the bifurcations. The oeciostome is absent or isolated or adjacent to a tube. In the last case the oeciostome is turned toward the bottom, although the orifice placed at the base of the peristomie must be in the habitual position. The form bent back toward the base of the oeciostome appears therefore to be due to the closeness of the distal tube.

Occurrence.—Sirun (Sulu Archipelago, Tawi Tawi group); Philippine Islands (*Albatross* station D. 5151).

Cotypes.—Cat. No. 7375, U.S.N.M.

PLATONEA HIRSUTA, new species.

Plate 11, figs. 6, 7.

Description.—The zoarium is a short, claviform *Filisparsa*. The tubes are little distinct, short, terminated by a very long peristomie, raised almost vertically. The ovicell is suborbicular, convex, subsymmetrical; the oeciostome is elliptical, transverse, subcentral, orthogonal.

Measurements.—	Diameter of tubes and of peristomes	0.26 mm
	Dimensions of oeciostome	.33 by 0.16 mm

The general aspect is quite irregular and does not permit of constant micrometric measurements; it appears like a club bristling with spines.

Occurrence.—Sirun (Sulu Archipelago, Tawi Tawi group); Philippine Islands (*Albatross* station D. 5151).

Holotype.—Cat. No. 7376, U.S.N.M.

Genus IDMONEA Lamouroux, 1821.

IDMONEA MAGNA Canu and Bassler, 1920.

Plate 8, fig. 11.

1920. *Idmonea magna* CANU and BASSLER, North American Early Tertiary Bryozoa, Bull. 106, U. S. National Museum, p. 772, pl. 137, figs. 1–18.

This very abundant Early Tertiary bryozoan is an excellent example of the number of specimens which must be examined before an ovicell is discovered. In this case literally thousands of specimens were glanced over before the ovicelled one here figured was found. Fortunately the ovicell is not necessary in the identification of the species.

Occurrence.—Eocene (Jacksonian): Atlantic and Gulf States.

Genus PLEURONEA Canu and Bassler, 1920.

PLEURONEA FENESTRATA Busk, 1859.

Plate 10, figs. 1–5.

1920. *Pleuronea fenestrata* CANU and BASSLER, North American Early Tertiary Bryozoa, Bull. 106, U. S. National Museum, p. 766, pl. 114, figs. 1–18 (bibliography and distribution).

We have had the good fortune to discover many ovicelled specimens of this species, whereby we were able to study its variations. They are as numerous as in the genus *Tubulipora.* The ovicell appears symmetrical and median (fig. 3) on certain specimens; in others, it is sometimes a little developed on one side (fig. 1); finally it may surround a part of the zoarium and be developed on the frontal (fig. 2).

The dorsal of this species presents the most varied aspects. We have discovered some specimens on which the tergopores open at the bottom of pseudosulci (fig. 5). These latter are branched, irregular, and undulate, in which they differ from true longitudinal sulci.

The genus *Pleuronea* resembles the genus *Crisina* D'Orbigny 1850 very much, but it differs in the presence of tergopores (and not vacuoles), in the quite different ovicell, and in its salient oeciostome.

Occurrence.—Eocene (Jacksonian) Jackson, Mississippi.

Plesiotypes.—Cat. No. 68934, U.S.N.M.

Genus TENNYSONIA Busk, 1867.

1867. *Tennysonia* Busk, Zoophytology, Quarterly Journal Microscopic Science, vol. 7, p. 240, pl. 36.

Tubuliporidae bearing mesopores on the frontal.

Genotype.—Tennysonia stellata Busk, 1867. Recent.

TENNYSONIA STELLATA Busk, 1867.

Plate 11, figs. 8–10.

1875. *Tennysonia stellata* Busk, Catalogue Marine Polyzoa in British Museum, pt. 3, Cyclostomata, p. 34, pl. 31, fig. 6.

We have not discovered the ovicell in this interesting generic type but have found it in the closely allied *Idmonea contorta* Busk. The

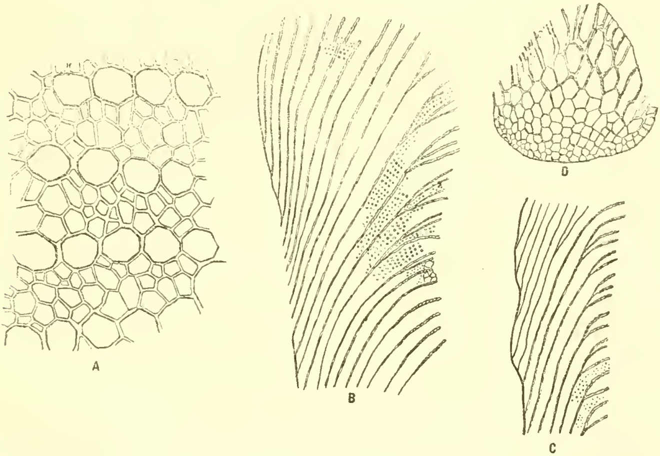

Fig. 9.—Tennysonia stellata Busk, 1867.

A. Tangential section, × 25.

B, C. Two vertical sections, × 12, illustrating the thick basal lamella, the vesicular walls and the formation of the mesopores, as well as the minute pores of the walls.

D. Transverse section, × 12.

Recent: Port Elizabeth, South Africa.

internal structure of both these species is essentially as shown in the accompanying figures.

Occurrence.—Recent: Algoa Bay and Port Elizabeth, South Africa.

TENNYSONIA CONTORTA Busk, 1875.

Plate 11, figs. 11–14.

1875. *Idmonea contorta* Busk, Catalogue Marine Polyzoa in British Museum, pt. 3, Cyclostomata, p. 12, pl. 8.

1887. *Idmonea contorta* Waters, Tertiary Bryozoa from New Zealand, (Cyclostomata) Quarterly Journal Geological Society, vol. 43, p. 339.

Measurements.—

Interfascicular distance (in rectilinear branches	0.20 mm.
Width of fascicles	.12–0.18 mm.
Diameter of salient peristomes	.12–0.16 mm.
Diameter of larger zooecia	.20 mm.
Maximum zoarial diameter	2.00 mm.
Number of tubes to fascicle	7 to 8.

The specimens which we have studied were determined and sent to us by Miss Jelly. They are a little different from Busk's figured type, which does not show adventitious tubes, although, as shown on plate 11, figure 12, the mesopores are not always closed.

The fascicles are very salient and quite close together. Most often the first tube is the larger; rarely it is the second. The peristomes are not always adjacent; the first two or three only are joined together. The tubes are visible longitudinally on the posterior face of the zoarium, which is in addition striated transversally.

On the anterior face the two or three interfascicular mesopores are more often closed by a calcareous lamella, finely perforated.

The ovicell is large and finely punctated; it surrounds at least six fascicles over the whole width of the zoarium. The oeciostome appears to be a larger tube than the others; but we are not certain. One of our specimens is supported on a *Retepora* by very solid calcareous processes.

Occurrence.—Recent: Port Elizabeth, South Africa (Busk, Miss Jelly).

Family CYTISIDAE D'Orbigny, 1854.

The ovicell is a vesicle limited, elliptical, globular with special walls. It is parallel to the zooecial axis and formed after the consolidation of the subjacent peristomes.

Historical.—D'Orbigny, 1852 has classified the divers genera of this family in his two familites of the Cytisidae and Fascigeridae, according to the form of the tubes. This character was for him fundamental and characteristic. Pergens, 1889, adopted the classification of D'Orbigny. Gregory, 1909, has distributed the same genera in the three families of Osculiporidae Marsson, 1887, Zonatulidae Gregory, 1909, and Desmeporidae Gregory, 1909, according to the nature of the adventitious pores. Of all these names those of

D'Orbigny are the oldest; as all the genera of the Cytisidae are comprised in the family as here adopted we employ this name.

The study of this family shows that the mode of gemmation itself is not a family character as in the Cheilostomata.

The form of the apertura is a good generic character; it is certainly in rapport with the disposition of the tentacles and of the retractor muscles of the polypide. But the oblique and elongated form of *Cytis* and its allies is found again in other families and can not in any case be considered as an exclusive character.

DICHOTOMOUS KEY SHOWING STRUCTURE OF GENERA.

1.	Gemmation triparietal	*Cyrtopora.*
	Gemmation biparietal	2.
2.	Tubes with peristome	3.
	Tubes without peristomes	5.
3.	Tubes expanded, grouped in linear fascicles	*Discocytis.*
	Tubes cylindrical	4.
4.	Tubes grouped in linear fascicles on anterior face of zoarium	*Osculipora.*
	Tubes in orbicular zones around zoarium; nematopores	*Plethopora.*
	No adventitious pores	*Plethoporella*
5.	Tubes expanded, neither mesopores nor nematopores	*Homoeosolen.*
	Tubes cylindrical	6.
6.	Large ovicell, zoarium discoid	*Discocytis.*
	Small ovicell, zoarium arborescent	7.
7.	Vacuoles all around zoarium	*Desmepora.*
	Nematopores dorsal	8.
8.	Mesopores frontal	*Semicytis.*
	No frontal mesopores	9.
9.	One row of pinnules	*Unicytis.*
	Two rows of pinnules; one face smooth	*Truncatula.*

KEY FOR DETERMINATION OF GENERA.

1.	Aperture orbicular	2.
	Aperture elongated, without peristome	5.
2.	Tubes in linear fascicles	3.
	Tubes grouped in orbicular zones	4.
3.	Tubes increasing from the dorsal to the frontal in transverse section (expanded tubes)	*Diplodesmopora.*
	Tubes of the same size in the transverse section (cylindrical tubes)	*Osculipora.*
4.	No adventitious pores	*Plethoporella.*
	Nematopores	*Plethopora.*
5.	Zoarium discoid	*Discocytis.*
	Zoarium arborescent	6.
6.	One face smooth	7.
	No face smooth	8.
7.	Convex face smooth, no nematopores	*Homoeosolen.*
	Concave face smooth, dorsal nematopores. Apertures at the extremity of the pinnules	*Truncatula.*
8.	One row of pinnules	*Unicytis.*
	Two rows of pinnules	9.
9.	Tubes on the trunk and on the pinnules. Frontal mesopores	*Semicytis.*
	Tubes at the extremity of the pinnules; vacuoles all around zoarium	*Desmepora.*

Genus CYRTOPORA Hagenow, 1851.

1851. *Cyrtopora* HAGENOW, Die Bryozoen der Maastrichter Kreidebildung, p. 21.

The ovicell is an ovoid protuberance near the end of the zoarium (Gregory). The tubes are cylindrical short, with fasciculate per-

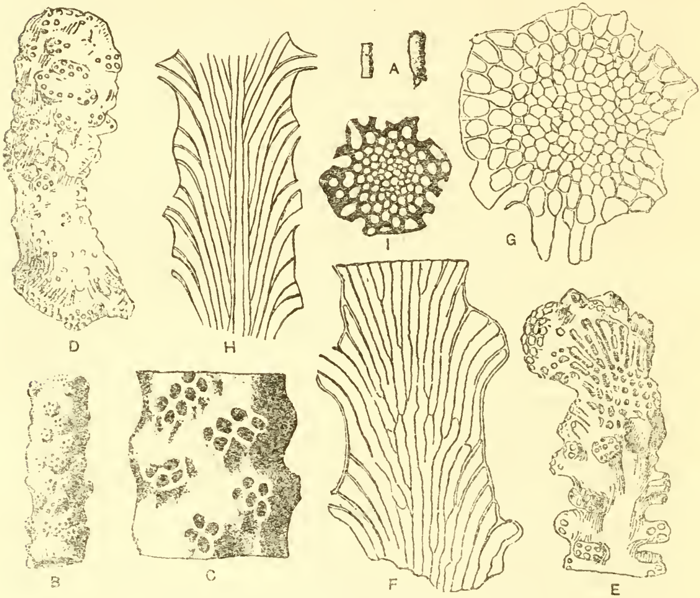

FIG. 10.—Cyrtopora elegans Hagenow, 1851.

A, B. Zoarium natural size and × 5.

C. A portion more enlarged. (A–C, after Hagenow.)

D. A small clavate zoarium, × 8, with slightly expanded base.

E. Upper part of a zoarium, × 8, with the ovicell developed.

F, G. Longitudinal and transverse sections, × 14 and × 18. (D–G, after Gregory.)

H. Longitudinal section, × 16, showing the cylindrical tubes with triparietal gemmation, arranged around a central bundle.

I. Transverse section, × 16. The tubes of the central bundle are wider than the adjacent ones.

Cretaceous (Maastrichtian): Maastricht, Holland.

istomes; the gemmation is triparietal around a central bundle formed of three or four tubes.

Genotype.—*Cyrtopora elegans* Hagenow, 1851.

Affinities.—This genus is close to *Osculipora* in which the tubes are also cylindrical, short and fasciculated; it differs from it in the absence of nematopores and in the presence of an initial bundle (central in the present case) with long tubes.

Gregory's figure is not clear but it appears to us however to represent the habitual ovicell of the genera in the family Osculiporidae. We have discovered a specimen preserving a fragmentary ovicell which indicates this genus belongs to another family, possibly the Diaperoeciidae.

CYRTOPORA ELEGANS Hagenow, 1851.

1909. *Cyrtopora elegans* GREGORY, Catalogue Fossil Bryozoa in British Museum, Cretaceous, vol. 2, p. 53, figs. 18, 19, 20, 21 (Bibliography Geological distribution).

Structure.—In transverse section, there are three larger tubes at the center forming the central bundle. They are surrounded by smaller tubes representing the base of short tubes and characterizing the triparietal gemmation. In longitudinal section the tubes are irregular, in general aspect cylindrical but slightly widened towards their extremity. They are short and arranged around the central bundle formed of three long tubes branching at divers heights to engender new branches. Their gemmation is triparietal.

The number of tubes in the central bundle does not appear to be constant; on Gregory's figures there is only one central tube. With this difference they are identical with our specimens.

Occurrence.—Cretaceous (Maastrichtian). Maastricht, Holland.

Plesiotypes.—Cat. No. 98979, U.S.N.M.

Genus PLETHOPORA Hagenow, 1851.

1851. *Plethopora* HAGENOW, Die Bryozoen der maastrichter Kreidebildung, p. 45.

The tubes are cylindrical, without peristome, with orbicular orifice, grouped in salient bundles. The nematopores occur all around the zoarium.

Genotype.—*Plethopora verrucosa* Hagenow, 1851. Aptian- Maastrichtian.

Affinities.—Gregory, 1909, placed this genus in his family Zonatulidae. This is not natural as the structure of *Plethopora* is entirely different from that of *Zonatula* which we have figured in the family Ascosoeciidae. D'Orbigny, 1852, has correctly placed this genus with *Truncatula*, *Semicytis*, etc.

PLETHOPORA VERRUCOSA Hagenow, 1851.

1851. *Plethopora verrucosa* HAGENOW, Die Bryzoen der Maastrichter Kreidebildung, p. 45, pl. 5, fig. 10.

1851. *Plethopora truncata* HAGENOW, Die Bryozoen der Maastrichter Kreidebildung, p. 46, pl. 5, fig. 11.

1909. *Plethopora verrucosa* GREGORY, Catalogue Fossil Bryozoa in British Museum, Cretaceous, p. 228 (Bibliography, geologic distribution).

We have not yet discovered the ovicell of this species and following D'Orbigny, class the genus with *Truncatula*, *Semicytis*, etc. The internal structure will be figured in our next paper.

Occurrence.—Cretaceous (Maastrichtian): Maastricht, Holland.

PLETHOPORELLA, new genus.

The ovicell is elliptical, elongated, large, little convex, smooth. The tubes are cylindrical, without peristome, with orbicular orifice; their walls are moniliform; they are curved at their extremity. The gemmation is peripheral around a bundle of axial tubes. No adventious tubes.

Genotype.—*Plethoporella* (*Plethopora*) *ramulosa* D'Orbigny 1847.

Range.—Campanian, Maastrichtian.

Historical.—D'Orbigny was in error in allying the genotype with *Plethopora verrucosa* Hagenow, 1851, for the internal structure is quite different since there are no nematopores and the tuberosities which ornament the zoarial surface are not bundles of tubes. Illustrations of the internal structure of the genotype will be given in our next publication on this subject.

PLETHOPORELLA RAMULOSA D'Orbigny, 1855.

Plate 23, figs. 12–16.

1855. *Plethopora ramulosa* D'ORBIGNY, Paleontologie Française, Terrain Crétacé, vol. 5, p. 1045, pl. 799, figs. 1–3.

A full description of this species is reserved for our next publication and we will only remark here that the internal structure is that of *Ceriopora* where we would have classed the species if we had not discovered the ovicell, which shows its relationship to the Cytisidae.

Occurrence.—Cretaceous (Campanian): Montmoreau, Brossac, Draullard, St. Aulais, Echebrune and Daviat (Charente), France.

Cretaceous (Maastrichtian): Royan (Charente inferieure), Manie Roux and St. Lheurine (Dordogne), France.

Plesiotypes.—Canu collection and Cat. No. 68980, U.S.N.M.

Genus OSCULIPORA D'Orbigny, 1849.

1849. *Osculipora* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 6.

The ovicell is globular, limited more or less salient, placed on the frontal or on the dorsal. The tubes are cylindrical, fasciculated, with peristomes in linear fascicles; the gemmation is dorsal in each fascicle, and peripheral at the plane of each fascicle. The zoarium has no basal lamella; it bears on the dorsal a wall formed of short nematopores with very thick walls.

Genotype.—*Osculipora* (*Retepora*) *truncata* Goldfuss, 1827 (pl. 23, figs. 1–6).

Range.— Cretaceous (Campanian-Danian.)

The known species belonging to this genus in addition to the genotype are:

Osculipora repens Hagenow, 1851. Maastrichtian, Danian.

Osculipora houzeaui Pergens, 1894. Maastrichtian.

Osculipora royana D'Orbigny, 1850. Maastrichtian, Campanian.

Affinities.—The place of the ovicell is not constant; it may be lateral, frontal, or dorsal; but the nature of the tubes is always the same. Exteriorly this genus very much resembles *Diplodesmopora*; it differs from it in its cylindrical and nonwidened tubes. It differs from *Desmepora* Lonsdale, 1850, in the absence of adventitious pores on the frontal and in its cylindrical tubes.

OSCULIPORA REPENS Hagenow, 1851.

Plate 23, fig. 7.

1851. *Truncatula repens* HAGENOW, Die Bryozoen der Maastrichter Kreidebildng, p. 36, pl. 3, fig. 1.

1909. *Osculipora repens* GREGORY, Catalogue Fossil Bryozoa in British Museum, Cretaceous, p. 61, figs. 22, 23 (Bibliography).

Structure.—We have not enough specimens of the genotype to make sections, but there is no doubt of the generic identity of the present species with the genotype. However the ovicell is placed here on the frontal between the fascicles; it is less globular than in the other species.

In transverse section the tubes are almost of the same size; they are therefore cylindrical; the walls of the exterior tubes are thick. The dorsal wall of the zoarium is very thick and perforated by small pores corresponding to the nematopores. When the transverse section is made at the level of the fascicles, these appear cylindrical.

In longitudinal section the tubes are cylindrical, fasciculated with adjacent peristomes; they are separated by a small interzooecial canal. They bifurcate at all heights and in the vicinity of the dorsal. The tubes of the same fascicle grow successively by dorsal gemmation. The nematopores are short; their walls are very thick in the branches, but they are much less so at their extremity.

The posterior face (dorsal) is smooth and covered by a very thin epitheca; this disappears at the least wear and the nematopores appear; they are directed from below upward according to the rule of their formation. Gregory 1909 has made the same observation in *Osculipora truncata* Goldfuss, 1827.

Affinities.—This species differs from *Osculipora truncata* in the wider zoarium, the transverse fascicles (and noncylindrical) and in the more scattered fascicles.

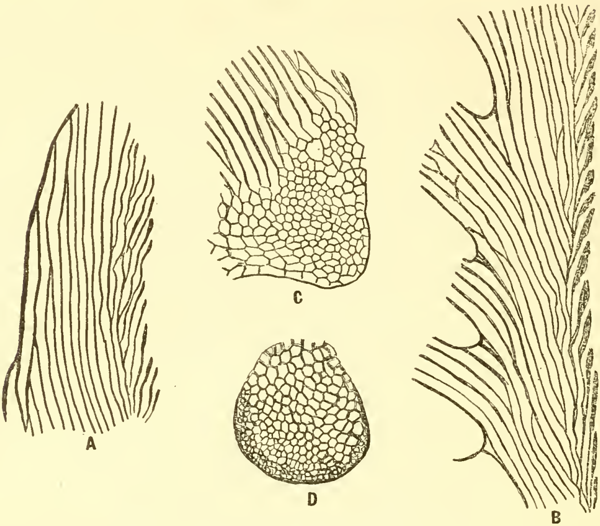

FIG. 11.—Osculipora repens Hagenow, 1851.

A. Longitudinal section, × 16, through the end of a branch.
B. Longitudinal section, × 16, through a well-developed branch showing the greatly thickened nematopores to the right and the tubes of several pinnules to the left.
C. Transverse section, × 16, through the middle of a fascicle.
D. Transverse section, × 16, cutting a branch just below a fascicle.
Cretaceous (Maastrichtian): Maastricht, Holland.

Occurrence.—Cretaceous (Maastrichtian): Maastricht, Holland; Royan, France.

Plesiotypes.—Canu collection and Cat. No. 68981, U.S.N.M.

OSCULIPORA ROYANA D'Orbigny, 1853.

Plate 23, figs. 10, 11.

1853. *Osculipora royana* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 679, pl. 800*bis*, figs. 1–4.
1909. *Osculipora royana* GREGORY, Catalogue Fossil Bryozoa in British Museum, Cretaceous, p. 66 (Bibliography).

Affinities.—This species is well described by D'Orbigny but the ovicell has never been figured. The specimens found by Canu in the same locality (Royan) have been compared with those in the Museum of Natural History of Paris; they are ovicelled. The ovicell is placed laterally on the zoarium. It is limited, smooth, very globular.

This species differs from *Osculipora truncata* Goldfuss, 1827, in which the branches are also cylindrical, in its transverse (and not cylindrical) fascicles which are closer together. It differs from *Osculipora repens* Hagenow, 1851, in its cylindrical branches, its fascicles much closer together, and its ovicells placed laterally. The branches are not always as slender as those studied by D'Orbigny, as we have some which are very vigorous.

Occurrence.—Cretaceous (Campanian): Montmoreau (Charente), France.

Cretaceous (Maastrichtian): Royan (Charente Inferieure), France.

Plesiotype.—Canu collection and Cat. No. 68982, U.S.N.M.

DIPLODESMOPORA, new genus.

Greek, *Diplos*, double; *desmos*, fascicle. Alluding to the double row of tubes in the fascicles.

The ovicell is limited, globular, smooth, margined, placed laterally. The tubes are funnel shaped, fasciculated, with peristomes in linear fascicles; they grow by dorsal gemmation. The zoarium has no basal lamella, but it has a thick dorsal covering formed of nematopores with thick walls.

Genotype.—*Diplodesmopora opposita*, new species. Coniacian, Maastrichtian.

Affinities.—Exteriorly this genus much resembles *Bitubigera* D'Orbigny, 1851, in which, however, the ovicell is not known. It differs from it in its widened tubes (club shaped and not cylindrical) and in the presence of nematopores instead of tergopores. The presence of nematopores gives a conical aspect to the zone of growth, a character which does not exist in *Idmonea.*

In its biserial fascicles and its nematopores *Diplodesmopora* resembles the genus *Osculipora* D'Orbigny, 1849, but differs from it in its widened and not cylindrical tubes.

Certain branches are exactly like those of *Idmonea* or *Idmidronea.* These zoarial forms are quite common and observable in different families. The ovicell is totally different from that of the genus *Idmonea* as it is now maintained. Moreover the dorsal nematopores are adventitious tubes absolutely contrary to the firmatopores of *Idmidronea.* They are buried in the epitheca, but they are open and visible in the zone of growth at the end of the branches.

The genus differs from *Truncatula* Hagenow, 1851, which is also provided with nematopores by its tubes with peristomes and grouped in fascicles and not in pinnules.

DIPLODESMOPORA OPPOSITA, new species.

Plate 27, figs. 19–25.

Description.—The zoarium is free, linear, with triangular section, with bifurcated branches. The fascicles are salient, monoserial or biserial, opposite, arranged on each side of the median crest. The tubes are visible; the peristomes are thin and quadrangular. The ovicell is quite large, elliptical, elongated, placed laterally in the vicinity of the fascicles, smooth and globular.

Measurements.—
- Diameter of peristomes .... 0.08 mm.
- Separation of fascicles .... .40 mm.
- Diameter of branches .... 1.33 mm.

Variations.—The fascicles are often monoserial and the branches have absolutely the aspect of *Idmonea*, but more often the fascicles are biserial and formed of a dozen tubes.

The ovicell is very regular, margined by a sort of collar; it does not grow from a tube of a fascicle, but from a more lateral tube and is placed between two fascicles.

A thin epitheca covers the nematopores; the dorsal then appears smooth. At the least weathering the nematopores appear in their usual occurrence from below upward.

In transverse section the tubes are smaller in the vicinity of the dorsal and correspond to the funnel-shaped tubes. The dorsal is very thick and perforated by pores corresponding to the nematopores. The section is more or less triangular, according to the place where it is made.

The longitudinal section is quite regular. The tubes are long, funnel shaped with dorsal gemmation. They are ramified in long, rectilinear dorsal nematopores with very thick walls.

Occurrence.—Cretaceous (Coniacian): Tours and Ste. Paterne (Indre-et-Loire), France.

Cotypes.—Canu collection and Cat. No. 68983, U.S.N.M.

DIPLODESMOPORA ALTERNATA, new species.

Plate 27, figs. 12–18.

Description.—The zoarium is idmoneiform, free with a subtriangular section. The linear bundles are salient, uniserial, formed of 3 or 4 tubes and disposed alternately on each side of the median crest The tubes are visible, little convex; the peristome is thin. The ovicell is very convex, slightly elongated, smooth, placed on the side of the zoarium. The noncellular face is smooth and the nematopores are closed by a very thin pellicle.

Measurements.—
- Diameter of fascicles .... 0.18 mm.
- Distance of fascicles .... .25–0.30 mm.
- Diameter of peristome .... .13 mm.
- Width of zoarium .... 1.00 mm.

Affinities.—Without the ovicell this species can be confounded with *Idmonea*, because there is no exterior mark of difference. The dorsal is smooth because the nematopores are closed by a thin calcareous pellicle, longitudinally striated. The zone of growth is conical and shows the orifices all around the zoarium. It reveals also exteriorly the presence of nematopores. This character does not exist in *Idmonea*.

The alternate arrangement of the fascicles distinguishes this species from *Diplodesmopora opposita*.

Occurrence.—Cretaceous (Maastrichtian) : Maastricht, Holland.

Cotypes.—Canu collection and Cat. No. 68984, U.S.N.M.

Genus HOMOEOSOLEN Lonsdale, 1850.

1850. *Homoeosolen* LONSDALE, in Dixon's Geology and Fossils of the Tertiary and Cretaceous formations of Sussex, p. 307.

The ovicell is frontal, elliptical, elongated, more or less globular. The tubes are long, widened (club-shaped) oriented with dorsal gemmation, with terminal walls a little thickened, without peristome, with oblique orifice, grouped in branches with pinnules. The peristomes are distributed on the trunk of the branches and on the pinnules. The dorsal is smooth; it is turned to the exterior of the bushy zoaria. No adventitious tubes.

Genotype.—*Homoeosolen ramulosus* Lonsdale, 1850.

Structure.—The very simple and monomorphic structure of this genus was discovered by Gregory. Unfortunately he has classified in it some species much more complicated.

Affinities.—This genus differs from *Truncatula* Hagenow, 1851, in the absence of dorsal nematopores. It differs from *Semicytis* D'Orbigny, 1854, in the absence of frontal mesopores.

HOMOEOSOLEN RAMULOSUS Lonsdale, 1850.

Plate 24, figs. 8–14.

1909. *Homoeosolen ramulosus* GREGORY, Catalogue Fossil Bryozoa in British Museum, Cretaceous, p. 76, figs. 26, 27, pl. 3, fig. 7; pl. 4, fig. 2. (Bibliography, Geologic Distribution.)

1900. *Truncatula aculeata* CANU, Contributions a la Geologie de Romorantin, Bulletin Société Géologique de France, ser. 3, vol. 28, p. 193.

Structure.—Gregory's longitudinal section made at the extremity of a branch does not sufficiently indicate the true nature of the tubes. Ours is more complete. The tubes are widened, long and their terminal walls are a little thickened. The dorsal wall is very thick so that the mode of gemmation does not appear clearly and the dorsal appearance is perhaps only the result of the orientation of the tubes turned in a single direction.

The tubular orifices have no very special form; they are directed obliquely toward the top. They are distributed at the same time, on the zoarial trunk and pinnules; the latter are very irregular never symmetrically arranged and are transformed into true branches in most cases.

Affinities.—This species differs from *Homoeosolen gamblei* Gregory, 1909, in the absence of pinnules symmetrically arranged and in its ovicell more globular and not occupying the entire width of the zoarium.

The base is discoidal; it is attached to algae or on other bryozoa. The zoarium is somewhat bushy. On our specimens the cellular face is on the interior and the smooth face is at the exterior of the zoarium, contrary to that shown on Gregory's figures. The disk is partially or entirely covered with pores.

The noncellular or inferior face is not a basal lamella formed by the dorsal of the newly budding tubes. It appears to be formed in the same manner as the Frondiporidae by the dorsal of interior tubes budding anteriorly. But this observation requires further examination.

Occurrence.—Cretaceous (Turonian): Riou (Indre-et-Loire), France.

Cretaceous (Santonian): Romorantin (Loir-et-Cher), France.

Cretaceous (Campanian) La Bonneville (Seine-et-Oise), France.

Plesiotypes.—Canu collection and Cat. No. 68985, U. S.N.M.

HOMOEOSOLEN GAMBLEI Gregory, 1909.

Plate 24, figs. 1–7.

1909. *Homoeosolen gamblei* GREGORY, Catalogue Fossil Bryozoa in British Museum, Cretaceous, p. 84, fig. 28. (Bibliography. Geological distribution).

1854. *Truncatula carinata* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 1058, pl. 797, figs. 11–15 (not figs. 5–10).

1897. *Truncatula aculeata* CANU, Bryozoaires du Turonian de St. Calais, Bulletin Société Géologique de France, ser. 3, vol. 25, p. 748.

1903. *Truncatula tetragona* CANU, Note sur la constance de la Craie de-Villedieu, Bulletin Société Géologique de France, ser. 4, vol. 3, p. 268.

Structure.—The ovicell is placed on the anterior face but always in an excentric manner; its large axis is never parallel to the zoarial axis. It is elliptical, convex, margined, smooth or wrinkled, and often surmounted by a peristome larger than the others.

The longitudinal section is identical with that of *Homoeosolen ramulosus.* There is only one kind of tube; they are widened and their upper walls are little thickened. They have no peristome and open obliquely. The entire cellular face and the pinnules are covered by the orifices of the polypidian tubes. There are no accessory or adventitious pores.

The meridian section figured by Gregory indicates the habitual lozenge-shaped areas of the dorsal gemmation.

Affinities.—This species differs from *Homoeosolen ramulosus* Lonsdale, 1850, in the presence of its symmetrically arranged pinnules.

It differs from the species of *Truncatula* with which Canu has confused it in the absence of nematopores and in the presence of the apertures over the entire zoarial surface and not at the extremity of the pinnules alone.

Occurrence.—Cretaceous (Turonian): Conneré, Dunneau, and St. Calais (Sarthe), France.

Cretaceous (Coniacian): Villedieu and Lisle (Loir-et-Cher) and Les Phellipeaux (Charente), France.

Plesiotypes.—Canu collection and Cat. No. 68986, U.S.N.M.

Genus TRUNCATULA Hagenow, 1851.

1851. *Truncatula* HAGENOW, Die Bryozoen des Maastrichter Kriedebildung, p. 34.

The ovicell is placed on the dorsal, laterally and between two pinnules. The tubes are cylindrical, oriented, with dorsal gemmation; the apertures are elongated, oblique, without peristomes, grouped at the extremity of the pinnules and turned from the side of the dorsal. The nematopores are numerous, long, with thick walls, they are often closed by a calcareous pellicle; their ensemble forms a thick wall on the zoarium.

Genotype.—*Truncatula filix* Hagenow, 1851.

Range.—Cenomanian-Maastrichtian.

Historical.—D'Orbigny, 1852, has noted that Hagenow's *Trunculata* in most instances corresponds exactly to his *Osculipora*, but, noting that *Truncatula filix* was not an *Osculipora*, he maintained Hagenow's genus of which this species ought to be the genotype; unfortunately it is rare and has not yet been the object of special studies.

Gregory, 1909, confusing the orifices of the nematopores with those of the tubes, classified the species of this genus in *Homoeosolen* Lonsdale, 1850. The considerable difference between the sections does not permit this conclusion. Evidently the exterior appearance is very deceiving, the orifices of the nematopores being hardly different from those of the tubes; but the well preserved specimens shows the nematopores closed by a calcareous pellicle, and the longitudinal sections reveal nematopores which do not exist in *Homoeosolen*.

Affinities.—This genus differs from *Homoeosolen* Lonsdale, 1850, in the presence of nematopores, in the occurrence of apertures only at the extremity of the pinnules, and in its ovicells placed on the dorsal. It differs from *Osculipora* D'Orbigny, 1849, in its tubes without peristome and in the presence of pinnules and not of fascicles.

The zoarium is more or less bushy; the dorsal is exterior, the frontal which is smooth is interior; the apertures are open from the exterior side, that is to say, from the side of the dorsal with nematopores. In this arrangement the zoarium is not a trap for diatoms and its architecture appears to be hydrostatic.

TRUNCATULA FILIX Hagenow, 1851.

Plate 25, figs. 6, 7.

1851. *Truncatula filix* HAGENOW, Die Bryozoen der Maastrichter Kreidebildung, p. 35, pl. 3, fig. 4.

1909. *Osculipora filix* GREGORY, Catalogue Fossil Bryozoa in British Museum, Cretaceous, vol. 2, p. 64, figs. 24, 25.

The zoarium of this species is quite simple, consisting of a stem rising from a sole-like base. A strong smooth midrib occurs on the celluliferous side. The ovicell has been figured by Gregory, whose figures we copy here.

Occurrence.—Cretaceous (Maastrichtrian): Maastricht, Holland.

TRUNCATULA PINNATA Roemer, 1840.

Plate 25, figs. 1, 2.

1840. *Idmonea pinnata* ROEMER, Die versteinerungen des norddeutschen Kreidegebirges, p. 20, pl. 5, fig. 22.

1846. *Idmonea pinnata* MICHELIN, Iconographie zoophytologie, p. 203, pl. 52, fig. 9.

1846. *Idmonea aculcata* MICHELIN, Iconographie zoophytologie, p. 203, pl. 53, fig. 10.

1854. *Truncatula aculeata* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 1054, pl. 796, fig. 1–5.

1871. *Truncatula pinnata* SIMONOWITCH, Beitrage zur Kenntniss der Bryozoen des Essener Grünsandes, Verhandlungen des Naturhistorischen vereins der preussischen Rhinlande und Westphalens, vol. 28 (ser. 3, vol. 8), p. 58, pl. 4, fig. 1.

1872. *Truncatula aculeata* REUSS, Die Bryozoen und Foraminiferen des unteren Planers, Paleontographica, vol. 20, pp. 98, 122, pl. 30, fig. 4.

1909. *Homoeosolen pinnatus* GREGORY, Catalogue of Fossil Bryozoa in British Museum, Cretaceous, p. 69. (Bibliography.)

Affinities.—The ovicells are often larger than those figured by Simonowitsch and D'Orbigny; even their place is irregular as is indicated in our figured specimens.

The species differs from *Truncatula subpinnata* D'Orbigny, 1854, in its nematopores never closed, more numerous, smaller, and in which the orifice is quite oblique on the zoarial axis, and in its zoarial dimensions at least twice as large. It differs from *Truncatula tetragona* Michelin, 1846, in the orifice of the nematopores, which is larger, not elongated like a whistle, with a proximal transverse lip.

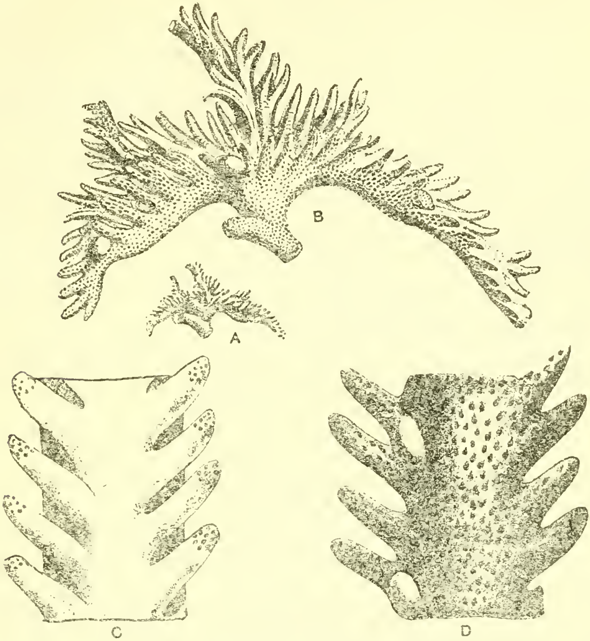

FIG. 12.—Truncatula pinnata Roemer, 1840.

A, B. Zoarium natural size and enlarged showing the base. The dorsal is exterior and covered with nematopores.

C. Frontal or inner face, enlarged.

D. Dorsal side, enlarged, showing ovicells and nematopores. (A, B, after D'Orbigny; C, D, after Simonowitsch.)

Cretaceous of France and Germany.

Occurrence.—Cretaceous (Cenomanian) Le Mans (Sarthe), France.

Geological distribution.—Cenomanian of France (D'Orbigny) England, Germany (Reuss); Turonian of Germany (Reuss).

Plesiotypes.—Canu collection and Cat. No. 68987, U.S.N.M.

TRUNCATULA SUBPINNATA D'Orbigny, 1854.

Plate 25, figs. 3–5.

1854. *Truncatula subpinnata* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 1055, pl. 796, figs. 6–9.

1889. *Truncatula subpinnata* PERGENS, Révision des Bryozoaires du Crétacé figurés par d'Orbigny, Mémoires de la Société Belge de Géologie de Paléontologie et d'Hydrologie, vol. 3, p. 385.

Structure.—We have found very beautiful specimens which have permitted us to study the structure. The nematopores are often closed by a calcareous pellicle, they are large, elongated, and parallel to the zoarial axis. The ovicell is globular, margined, and smooth.

In transverse section the tubes are much smaller toward the dorsal; they are then enlarged and with dorsal gemmation; the dorsal is thick and perforated with nematopores.

In longitudinal section the tubes are club shaped with dorsal gemmation. The nematopores are long, with thick walls; they form a thick zoarial wall by their consolidation.

The apertures are little visible on the frontal; they open chiefly on the dorsal and along the entire length of each pinnule. The zoarial base is a small flat disk twisted like a crank.

Affinities.—This species differs from *Truncatula pinnata* Roemer, 1840, in its smaller zoarial dimensions and in its dorsal ribs, in its nematopores larger and arranged parallel to the zoarial axis (and not obliquely) and in its more globular ovicell.

It differs from *Truncatula tetragona* Michelin, 1846, in its small zoarial dimensions, its less numerous nematopores arranged parallel to the zoarial axis.

Occurrence.—Cretaceous (Cenomanian): Le Mans (Sarthe), France. Cretaceous (Turonian); Duneau and Conneré (Sarthe), France.

Plesiotypes.—Canu collection and Cat. No. 68988, U.S.N.M.

TRUNCATULA TETRAGONA Michelin, 1846.

Plate 26, figs. 8–11.

1846. *Idmonea tetragona* MICHELIN, Iconographie zoophytologique, p. 219, pl. 53, fig. 19.

1854. *Truncatula tetragona* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 1056, pl. 796, figs. 10–14.

1889. *Truncatula tetragona* PERGENS, Révision des Bryozoaires du Crétacé figurés par d'Orbigny, Memoires de la Société Belge de Géologie de Paléontologie et Hydrologie, vol. 3, p. 385.

1897. *Truncatula tetragona* CANU (not Canu 1900 and 1903), Bryozoaires du Turonian de St. Calais, Bulletin Société Geologique de France, ser. 3, vol. 25, p. 748.

1909. *Homoeosolen tetragonus* GREGORY, Catalogue Fossil Bryozoa in British Museum, Cretaceous, p. 72 (not synonymy).

Structure.—In longitudinal section the tubes are cylindrical with dorsal gemmation occurring on a thick layer of nematopores. The latter are long, rectilinear with very thick walls. The section in this species is absolutely identical with that of *Truncatula subpinnata*

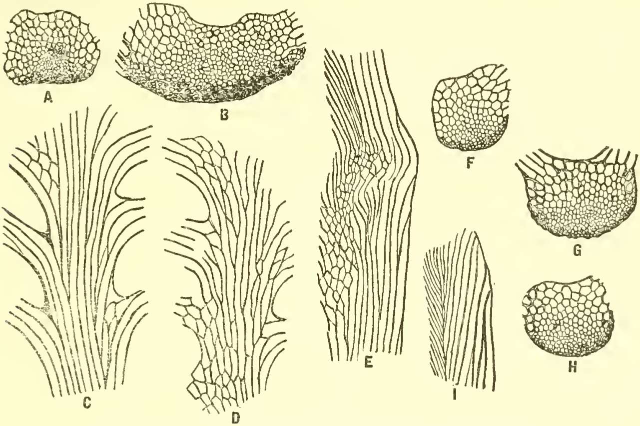

FIG. 13.—A–E. Truncatula tetragona Michelin, 1846.

A. Transverse section, × 12, cutting the narrowest part of a branch between two pinnules and showing the tetragonal form.

B. Transverse section, × 12, passing just below a pinnule.

C. A meridian section, × 12, cutting the axis of development and showing the central tube.

D. Meridian section, × 12, through the dorsal, cutting the young stages of the nematopores, the tubes of which are indicated by the lozenge-shaped areas.

E. Longitudinal section, ×12, through a branching specimen in which the lozenge-shaped areas indicate the point of bifurcation The dorsal with its nematopores is to the left.

Cretaceous (Turonian): Ruillé Poncé (Loir-et-Cher), France.

F–I. Truncatula subpinnata D'Orbigny, 1854.

F–H. Three transverse sections, × 12, at different heights in the branch and showing the thick dorsal zone penetrated by the nematopores.

I. Longitudinal section, × 12, illustrating the structure of the dorsal with its nematopores to the left, and the frontal to the right.

Cretaceous (Cenomanian): Le Mans (Sarthe), France.

D'Orbigny, 1854. In transverse section the dorsal is very thick and perforated by nematopores. The tubes are quite numerous, small; their diameter increases toward the frontal; the smallest pores are the nematopores. The meridian section shows the normal development of the tubes above the layer of nematopores in the axis of the zoarium. The tubes are cylindrical and proceed from a ramification opposite a preceding pinnule. At the center there is a longitudinal axial tube.

Affinities.—D'Orbigny's figure is quite exact and should cause no confusion, so it is without reason that Pergens and Gregory have identified this species with *T. subpinnata* D'Orbigny, 1854. It differs from it in its greater zoarial dimensions, in its smaller pinnules projecting little from the zoarial trunk and in its nematopores obliquely arranged (and not parallel) to the zoarial axis.

Its difference from *Truncatula pinnata* Roemer, 1840, which is also a large species, is more difficult to discover, and there are some very difficult cases to determine, but it differs from it in the aspect of the nematopores, which are arranged in rows oblique to the zoarial axis and which bear a proximal transverse lip, and in its smaller pinnules, less projecting on each side of the zoarial trunk.

Occurrence.—Cretaceous (Cenomanian): Le Mans (Sarthe) and Montlouet (Maine-et-Loire), France.

Cretaceous (Turonian): Fontaine d'Antoigné near Chatellerault (Vienne), Ruillé Poncé (Loir-et-Cher), Cément near Chinon (Indre-et-Loire), Les Janièrès and St. Calais (Sarthe), France.

Cretaceous (Coniacian): Chatham, England.

Plesiotypes.—Canu collection and Cat. No. 68989, U.S.N.M.

TRUNCATULA GRACILIS D'Orbigny, 1854.

1854. *Truncatula gracilis* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 1059, pl. 798, figs. 1–5.

1909. *Homocosolen striatus* GREGORY, Catalogue Fossil Bryozoa in British Museum, Cretaceous, p. 97. (Bibliography.)

Gregory, 1909, identified D'Orbigny's species with *Retepora striata* Hagenow, 1846. This is quite possible, but no direct comparison having been made, we think that the better figure should have provisional priority.

Occurrence.—Cretaceous (Coniacian): Lisle (Loir-et-Cher), France.

Cretaceous (Santonian): Romorantin (Loir-et-Cher), France.

Cretaceous (Maastrichtian): Manie Roux (Charente) and Royan (Charente Inférieure), France.

TRUNCATULA CARINATA Reuss, 1846.

1846. *Hornera carinata* REUSS, Die Versteinerungen der böhmischen Kreideformation, pt. 2, p. 63, pl. 14, fig.6.

1909. *Homocosolen carinatus* GREGORY, Catalogue Fossil Bryozoa in British Museum, Cretaceous, p. 73.

Structure.—Gregory, 1909, wrote on page 75 "Pocta (op. cit. p. 7, fig. 3) gives an excellent transverse section (×26) showing the intimate structure of the species. The stem is strengthened front and back by a layer of laminated tissue, which does not appear to have any cancelli." In Pocta's figure the nematopores (cancelli of Gregory) are, on the contrary, quite visible. This species is therefore a *Truncatula* and not a *Homoeosolen.*

Affinities.—This is a small species like *Truncatula subpinnata* D'Orbigny, 1854, with which it is perhaps identical. In the figures it differs only in the smaller ovicell and in smaller and more numerous nematopores.

Occurrence.—Cretaceous (Cenomanian): Bohemia, Saxony, and England.

TRUNCATULA DISCOIDEA, new species.

Plate 25, fig. 9–11.

Our figures represent a unique specimen which might possibly belong to some known arborescent species. Having no specimens showing such a relation, we think that it should be given a new name, although we are not yet convinced that it is more than a simple zoarial base.

In spite of external appearances this is not a *Supercytis*, for the ovicell is indeed on the dorsal between the branches, as in all the species of the genus *Truncatula*. *T. subpinnata* D'Orbigny, 1854, appears to have tendencies to group its pinnules in a similar position.

Occurrence.—Cretaceous (Santonian): Vendome (Loir-et-Cher), France.

Holotype.—Cat. No. 68990, U.S.N.M.

TRUNCATULA VENDOCINENSIS, new species.

Plate 26, figs. 12–16.

Description.—The zoarium is borne on an expanded circular base. The fronds are large, smooth, rectilinear, bifurcated; the transverse section is trapezoidal. The tubes are cylindrical, without peristome, grouped into pinnules, open at the extremity of the pinnules and on the posterior face. On the posterior face of the zoarium there are numerous nematopores, small, irregular, disposed in quincunx in the form of a V.

Structure.—The sections of this species are identical with those of *Truncatula tetragona* Michelin, 1846. The meridian section shows cylindrical tubes and an axial tube. The longitudinal section shows a thick layer of nematopores with very thick walls. Finally the transverse section is trapezoidal and shows the posterior zone of nematopores and the anterior zone of polypidian tubes.

Affinities.—This species differs from *Truncatula tetragona* Michelin, 1846, which it very much resembles in the great separation of the pinnules, in the great divergence of the pinnules, spreading out over the zoarial trunk, in the larger number of nematopores, and in the greater zoarial dimensions.

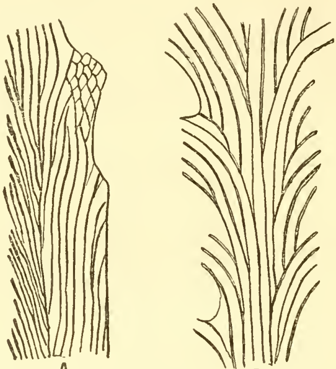

Fig. 14. Truncatula vendocinensis, new species.

A. Longitudinal section, × 16, showing the thick walled nematopores of the basal surface, to the left.

B. A meridian section, × 16, passing through the pinnules on each side.

Cretaceous (Santonian): Vendome (Loir-et-Cher), France.

Occurrence.—Cretaceous (Santonian): Vendome (Loir-et-Cher), France.

Cotype.—Canu collection and Cat. No. 68991, U.S.N.M.

Genus DISCOCYTIS D'Orbigny, 1854.

1854. *Discocytis* d'Orbigny, Paléontologie française, Terrain Crétacé, vol. 5, p. 1061.

The ovicell is ovoid, very large, placed exteriorly between two pinnules. The tubes are subcylindrical and long, without peristome, with elongated orifice, opening at the extremity of the pinnules and from the exterior side. The dorsal (exterior face) is surrounded by a thick layer of nematopores with thick walls. The cupuliform zoarium consists of a flat base with a narrow peduncle, and a broad cup shaped or funnel shaped head, which is composed of numerous radiating bundles (=pinnules) of zooecia.

Genotype.—*Discocytis* (*Pelagia*) *eudesi* Michelin, 1844.

Range.—Cenomanian-Campanian.

Affinities.—Discocytis is a discoidal *Truncatula*, but it differs in its much larger ovicells and in its subcylindrical tubes.

The genus *Bicavea* D'Orbigny, 1853, presents also a cupuliform or discoidal zoarium with zooecia grouped in radial bundles. Unfortunately the ovicell is unknown, and we are not able to find specimens to make the necessary sections.

DISCOCYTIS EUDESI Michelin, 1844.

Plate 28, figs. 10–15.

1844. *Pelagia eudesi* MICHELIN, 1844, Iconographie zoophytologique, p. 123, pl. 32, fig. 5.

1909. *Discocytis eudesi* GREGORY, Catalogue Fossil Bryozoa in British Museum, Cretaceous, p. 100 (Bibliography, geological distribution.)

Structure.—The characteristic of the species is the extraordinary size of the ovicells, which measure from 1.5 mm. to 2 mm. in length.

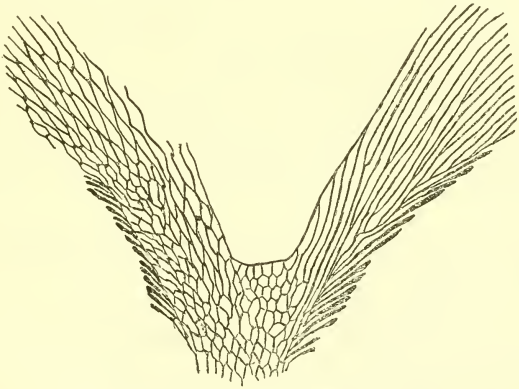

FIG. 15.—Discocytis eudesi Michelin, 1844.

Longitudinal (median) section through a zoarium, × 12, passing through the middle of a pinnule on the right and between two pinnules on the left. The thick walled nematopores of the basal surface are quite evident.
Cretaceous (Cenomanian): Le Mans (Sarthe), France.

We have counted as many as 10 on the same specimen. This very unusual fecundity accounts for the great number of specimens which have been found and which occur in all the museums of Europe. In spite of its fecundity, the species has not a great geographic extension, but remains restricted to the French Cenomanian.

The median section taken between two pinnules shows a series of elongated or spindle-like lozenge shaped areas; they result from the divergence of the tubes directed toward the adjacent pinnules. The median section made on a pinnule gives the longitudinal section; it is analogous to that of *Truncatula.* The tubes are subcylindrical, widened toward their extremity, and open on the two faces inferior and superior of the pinnule. The nematopores completely surround the base of the zoarium; their orifice is much smaller than that of the tubes.

Occurrence.—Cretaceous (Cenomanian; Le Mans (Sarthe), France.

Plesiotype.—Canu collection and Cat. No. 689921, U.S.N.M.

DISCOCYTIS? ECCENTRICA Ulrich and Bassler, 1907.

Plate 28, fig. 16.

1907. *Discocytis eccentrica* ULRICH and BASSLER, Bryozoa in Cretaceous Paleontology of New Jersey, p. 326, pl. 22, figs. 16–19.

We have been fortunate enough to discover the ovicell of this charming cupuliform and pedunculated species. It is a vesicle placed on the edge of the zoarium, of which it arrests the development and which ramifies between the fascicles. It is limited, smooth, little convex, and provided with special walls.

This species is therefore not at all a *Discocytis.* We maintain it provisionally in this genus, for the number of specimens collected does not permit us to make sections and to establish the nature of the tubes and adventitious pores. Perhaps it will be necessary to classify it in *Bicavea* D'Orbigny, 1854, a genus in which the ovicell is still unknown.

Occurrence.—Cretaceous (Vincentown marl): Vincentown. New Jersey.

Cotypes.—Cat. No. 52592, U.S.N.M.

Genus SUPERCYTIS D'Orbigny, 1854.

1854. *Supercytis* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 1060.

Colony fastened at the base, where part of a cylindrical rather short peduncle is widened rather abruptly above, giving rise to simple or bifurcated branches, diverging horizontally, but joined at their base. Each of these branches is short, depressed, covered below by a thin epitheca and above by oblique, pyriform cellules. In the middle of the colony, above, may often be noted one or two ovarian vesicles, smooth, oval, semiconvex, and having within a canal which communicates with the interior of the colony. (Translation after D'Orbigny, 1854.)

Genotype.—*Supercytis digitata* D'Orbigny, 1854. Coniacian.

Gregory, 1909, identified doubtfully the genotype with *Homoe-*

osolen ramulosus Lonsdale, 1850. The ovicell not being placed on the branches as in *Homoeosolen*, we believe that D'Orbigny's genus ought to be maintained. The discovery of new material alone will enable us to establish its reality.

SUPERCYTIS DIGITATA D'Orbigny, 1854.

Plate 27, figs. 1–4.

1854. *Supercytis digitata* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 1061, pl. 798, figs. 6–9.

The specific characters of this interesting form are brought out above in the generic description.

Occurrence.—Cretaceous (Coniacian): Fecamp, etc., France.

Genus UNICYTIS D'Orbigny, 1854.

1854. *Unicytis* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 1047.

The ovicell is placed on the lateral face between two pinnules. The tubes are cylindrical, long, oriented without peristome, with dorsal gemmation, and ramified in the pinnules. All the pinnules are placed on the median axis of the frontal; they are composed of alternate bundles. The zoarium is surrounded on three sides by a thick calcareous epitheca formed of nematopores with very thick walls.

Genotype.—*Unicytis falcata* D'Orbigny, 1854. Coniacian-Campanian.

Structure.—In its general structure this genus is very close to *Truncatula* Hagenow, 1851, which is also provided with dorsal nematopores. It differs from it in its cylindrical and nonexpanded tubes and in its pinnules formed of two alternate bundles.

The apertures of the tubes are at the extremity of the pinnules. The triangular zoarium is surrounded by a dense layer of nematopores with thick walls, with orifices transverse and much smaller than the apertures.

UNICYTIS FALCATA D'Orbigny, 1854.

Plate 27, figs. 5–11.

1854. *Unicytis falcata* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 1048, pl. 794, figs. 8–12. (Geographic distribution.)

Structure.—In transverse section the tubes are nearly of the same size; they are therefore cylindrical; they are somewhat smaller toward the dorsal; their gemmation is therefore dorsal. The zoarium is almost surrounded by a very thick epitheca, in which the perforations of the nematopores are visible with difficulty.

The longitudinal section is quite original. Each pinnule is formed of two bundles, one coming from the right and the other from the left of the zoarial axis. The tubes are cylindrical; they are separated by a very large interzooecial canal.

The interpretation of the sections causes us to suppose that the reunion of the pinnules on the median axis of the zoarium arises from the reunion of two lateral and symmetrical pinnules of *Truncatula*. In reality the form *Unicytis* precedes the form *Truncatula* for it exists at the extremity of branches of specimens of this latter genus. It is more correct to say that *Truncatula* is derived from *Unicytis* by the separation of the two bundles forming each pinnule of the latter genus. We may add that the different forms of the tubes in these two genera imply some anatomical differences necessitating their separation.

Occurrence.—Cretaceous (Santonian): Vendome (Loir-et-Cher), France.

Plesiotype.—Canu collection and Cat. No. 68993, U.S.N.M.

Genus SEMICYTIS D'Orbigny, 1854.

1854. *Semicytis* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 1048.

The ovicell is placed on the cellular face, in the vicinity of the pinnules. The tubes are subcylindrical, oriented, little expanded, without peristome, with dorsal gemmation axial and irregular. No basal lamella. The apertures are placed on the anterior face of the trunk and of the pinnules. The mesopores are more or less numerous between the apertures. The zoarial dorsal is formed of a very large lamellar epitheca perforated by rectilinear vacuoles.

Genotype.—*Semicytis disparilis* D'Orbigny, 1854. Turonian-Santonian.

Structure.—As in the other genera of the same family, the gemmation is not exactly dorsal; it does not occur on the basal lamella. There are rather successive ramifications on a variable plane in the vicinity of the zoarial axis; the ramified tubes are sometimes polypidian and are then oriented towards the anterior face, sometimes aborted and oriented towards the posterior where they perforate a very thick epitheca of lamellar tissue.

This genus differs from *Truncatula* Hagenow, 1851, in the presence of mesopores. Its characteristics have been well recognized by D'Orbigny. Gregory reunites it with *Homoeosolen* but it differs, however, in the presence of adventitious tubes, vacuoles, and mesopores. It differs from *Desmepora* Lonsdale, 1850, in the presence of a lamellar tissue, which is dorsal and not peripheral, in the absence or great reduction of the zone of nematopores, in the presence of mesopores quite visible on the specimens and in tangential sections, and in the occurrence of the apertures on the trunk and on the pinnules.

SEMICYTIS DISPARILIS D'Orbigny. 1854.

Plate 26, figs. 1–4.

1909. *Homoeosolen disparilis* GREGORY, Catalogue Fossil Bryozoa in British Museum, Cretaceous, p. 89, pl. 111, fig. 8 (Bibliography, Geological distribution).

Structure.—The apertures are distributed on the principal trunk of the zoarium and on the pinnules; between them are placed the meso-

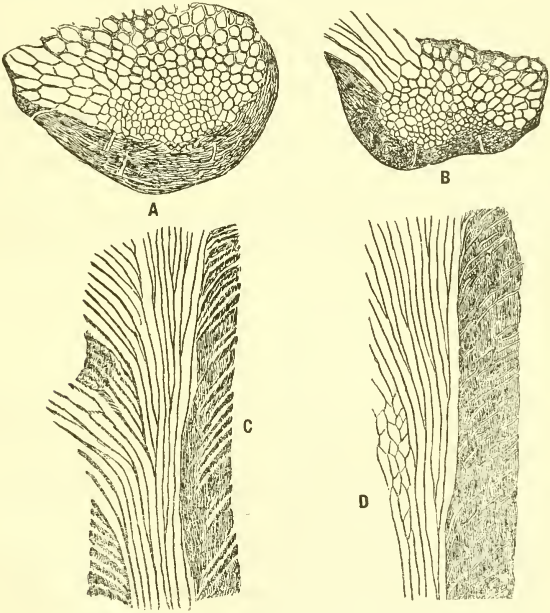

FIG. 16.—Semicytis disparilis D'Orbigny, 1854.

A. Transverse section, × 16, through a thick branch.

B. Transverse section, × 16, cutting a pinnule.

C. Longitudinal section, × 16, through an ordinary branch.

D. Portion of a longitudinal section, × 16, showing the thick dorsal perforated by the vacuoles and also possibly the central canal.

Cretaceous (Coniacian) : Tours and Villedieu, France.

pores irregularly arranged and generally smaller. The mesopores and the apertures have the same elongated form and are equally oblique.

The longitudinal sections are quite variable; the two which we publish are not exactly similar to those of Pergens; they differ from them in the number of mesopores, the thickness of the lamellar epitheca, and in the form of the vacuoles often transformed into nematopores. The mesopores are more or less long and numerous, but their walls are always quite thick. The dorsal nematopores of Pergen's figure are transformed in our sections into veritable rectilinear or curved vacuoles perforating the epitheca. The gemmation is not exactly dorsal as it sometimes occurs by bifurcation at all heights but in a neighboring plane of the zoarial axis. The orientation of the tubes is the cause of this appearance. It is in reality a peripheral gemmation, oriented and symmetrical.

The transverse section shows the tubes a little smaller in the vicinity of the dorsal. These tubes are nematopores which become vacuoles. The vacuoles are quite small, much scattered.

The meridian section shows the habitual losenge-shaped areas observed on the basal lamella of species with dorsal gemmation. We can not explain the presence of the pointed partition at the middle of many of the losenge-shaped areas.

Occurrence.—Cretaceous (Coniacian): Villedieu and Lisle (Loir-et-Cher), Tours (Indre-et-Loire), and Les Phelippeaux (Charente), France.

Plesiotypes.—Canu collection and Cat. No. 68994, U.S.N.M.

SEMICYTIS FENESTRATA D'Orbigny, 1854.

Plate 26, figs. 5–7.

1909. *Homoeosolen fenestrata* GREGORY, Catalogue Fossil Bryozoa in British Museum, Cretaceous, p. 93, pl. 2, figs. 9, 10; pl. 3, figs. 5, 6 (Bibliography, geological distribution).

Affinities.—D'Orbigny's figure representing the cellular face is not exact; we give a new photograph of a specimen coming from the same locality as D'Orbigny's type (Les Roches).

The difference from *Semicytis disparilis* is easy to see, namely, its much smaller zoarial dimensions and the very special form of the orifices of the vacuoles everywhere much more scattered and much less numerous.

Occurrence.—Cretaceous (Turonian): St. Calais and Connerré (Sarthe) and Luynes (Loir-et-Cher), France.

Cretaceous (Coniacian): Villedieu and Les Roches (Loir-et-Cher), France, and Chatham, England.

Plesiotypes.—Canu collection and Cat. No. 68995, U.S.N.M.

Genus DESMEPORA Lonsdale, 1850.

1850. *Desmepora* Lonsdale, Polyzoa, in Dixon's Geology and Fossils of the Tertiary and Cretaceous formations of Sussex, p. 281.

The ovicell is limited, little convex, surrounded by a deep, smooth groove, placed laterally between two pinnules. The tubes are long, cylindrical, oriented, with dorsal irregular gemmation, grouped in pinnules, without peristomes. The zoarium is surrounded by a thick, lamellar epitheca, perforated by vacuoles formed by the superior ramifications of the dorsal and frontal nematopores.

Genotype.—Desmepora semicylindrica Roemer, 1840.

Range.—Cenomanian-Danian.

The principal species of this genus are *Desmepora blackmorei* Gregory, 1909; *D. pinnigera* Gregory, 1909; *D. reussi* Gregory, 1909; and D. *rugosa* D'Orbigny, 1850.

This genus differs from *Osculipora* D'Orbigny, 1849, in its widened and noncylindrical tubes which are grouped in pinnules and not in fascicles.

The transverse section is very deceptive; it shows small pores toward the dorsal and large pores toward the frontal as in the Idmoneidae. This arrangement still does not indicate the presence of widened tubes for the longitudinal section indicates that they are cylindrical. In reality we can distinguish three zones—first, a thick peripheral zone formed of lamellar tissue; second, a posterior zone of small tubes or nematopores whose superior ramifications form the vacuoles; third, an anterior zone of large cylindrical tubes.

In accordance with this, the longitudinal section shows, first, an anterior zone of large cylindrical polypidian tubes, branched at all heights and diverging toward the pinnules; second, a posterior zone of nematopores, coming from the interior of the zoarium, directed in a contrary direction to the tubes and branching at their extremity into successive vacuoles; third, a peripheral zone of lamellar tissue, perforated by very irregular vacuoles. The vacuoles of the anterior part are also engendered by the nematopores coming from the interior of the zoarium and arranged between the tubes.

DESMEPORA SEMICYLINDRICA Roemer, 1840.

Plate 28, figs. 1–7.

1840. *Idmonea semicylindrica* Roemer, Die Versteinerungen des norddeutschen Kreidegebirges, p. 20, pl. 5, fig. 21.

1909. *Desmepora semicylindrica* Gregory, Catalogue Fossil Bryozoa in British Museum Cretaceous, p. 110, fig. 29.

Structure.—The lamellar epitheca is very thick especially on the dorsal, as indicated by the transverse section. The tubes are much smaller towards the center, or in the vicinity of the dorsal, which indicates their widened nature (club shaped).

The longitudinal sections are very difficult to make because of the great thickness of the lamellar epitheca. The tubes are cylindrical and are very long. There is no basal lamella, and although the gemmation appears dorsal, because of the orientation of the tubes, it is very irregular and occurs at all heights. A section reveals the

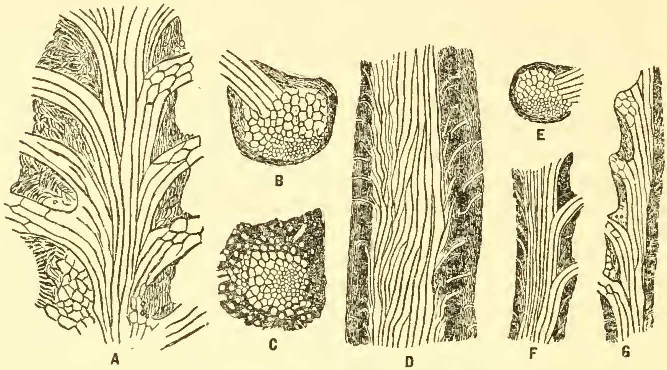

FIG. 17.—A–D. Desmepora semicylindrica Roemer, 1840.

A. Meridian section, × 12, in a specimen with outspread pinnules.

B. Transverse section, × 12, through a pinnule and showing the cylindrical tubes of the pinnule, the peripheral zone of lamellar tissue, the anterior zone of polypidian tubes and the posterior zone of nematopores.

C. Transverse section, × 12, not cutting a pinnule.

D. Longitudinal section, × 12, through a branch with a very thick epitheca.

Cretaceous (Danian): Moen, Denmark.

E–G. Desmepora rugosa D'Orbigny, 1854.

E. Transverse section, × 12, through a pinnule and showing the three zones of tubes as in Figure B.

F. Longitudinal section, × 12, illustrating the zone of nematopores to the left and that of polypidian tubes to the right. The vacuoles arise from the nematopores.

G. Longitudinal section, × 12, passing through the pinnules.

Cretaceous (Campanian): Bonneville, France.

presence of vacuoles, perfectly characterized by their curvature. A second bears only nematopores with very thick walls; finally, a third bears vacuoles below and nematopores above. These are variations in accordance with the general structure previously described.

The true arrangement of the tubes may only be known on the meridian sections of the specimens with pinnules exactly parallel to the frontal plane; we have not had the opportunity to discover such a specimen and to verify the figure given by Gregory. The latter appears to be rather a tangential section. The orifices of the tubes are oblique, irregular, grouped at the extremity of the pinnules. The exterior decoration of the zoarium is very curious. The adventitious pores are arranged in longitudinal rows and open transversally. In the sections this very irregular arrangement does not exist and the adventitious tubes, vacuoles or nematopores are here of a disconcerting irregularity.

The orientation of the tubes on a single face of the zoarium does not appear in itself a good generic character. It is remarkable, however, that in most cases all the species of the same genus have the tubes equally oriented.

Occurrence.—Cretaceous (Turonian): Fontaine d'Antoigné, near Chatellerault (Vienne), Connerré, St. Calais, and Dunneau (Sarthe), and Luynes (Indre-et-Loire), France. Danian of Denmark.

Cretaceous (Coniacian): Tours (Indre-et-Loire), France.

Plesiotypes.—Canu collection and Cat. No. 68996, U.S.N.M.

DESMEPORA RUGOSA D'Orbigny, 1850.

1850. *Osculipora rugosa* D'ORBIGNY, Prodrome de paléontologie stratigraphique, vol. 2, p. 268.

1909. *Semicytis rugosa* GREGORY, Catalogue Fossil Bryozoa in British Museum, Cretaceous, p. 119, pl. 3, figs. 3, 4 (Bibliography, geologic distribution).

Historical.—Gregory was the first to perceive that this species was not similar to the other *Semicytis* described by D'Orbigny; he recognized its exact structure in introducing it in the Desmeporidae. Unfortunately believing that the other *Semicytis* were *Homoeosolen*, he believed it necessary to preserve the generic name of D'Orbigny for this single species. However, he declared (p. 119) that the two genera *Semicytis* and *Desmepora* are synonymous. In reality *Semicytis rugosa* is indeed a *Desmepora*, and we have indicated previously the true nature of the *Semicytis* of D'Orbigny.

Structure.—In longitudinal section the tubes are long, little widened, subcylindrical, with irregular dorsal gemmation. The zoarial walls are thick and perforated by short vacuoles. The frontal nematopores are quite distinct.

The zoarium is small and much attenuated, so that the preparation of the section is very difficult. The base is a small flat disk.

Occurrence.—Cretaceous (Coniacian): Fécamp (Seine inferieure) and Tours (Indre-et-Loire), France, and Chatham, England.

Pleisiotypes.—Canu collection and Cat. No. 68997, U.S.N.M.

Subdivision RECTANGULATA Waters, 1887.

In this convenient and well-marked subdivision of the Cyclostomata the ovicell is developed between the peristomes perpendicularly to the axis of the terminal zooecia and not between the tubes and parallel with this axis as in the subdivision Parallelata. The Rectangulata include most of the so-called "heteroporoids" and "cerioporoids," although in the type species of both *Heteropora* and *Ceriopora* the ovicell has not yet been discovered, and the position remains doubtful.

Family LICHENOPORIDAE Smitt, 1866.

Figures and descriptions of this family and its genera are given in Bulletin 106, United States National Museum. The following species of *Lichenopora* is introduced on account of its peculiarities:

Genus LICHENOPORA Defrance, 1823.

LICHENOPORA BURDIGALENSIS Duvergier, 1921.

Plate 12, figs. 1–3.

1821. *Lichenopora burdigalensis* DUVERGIER, Note sur les bryozoaires du Néogène de l'Aquitaine, Actes Societé Linnéenne de Bordeaux, vol. 72, p. 41, pl. 4, figs. 11–13.

The type and only specimen is incomplete. The tubes appear narrow, arranged in radial, uniserial rows, but not in fascicles. The cancelli are large and polygonal and occupy almost all of the zoarium observed. The ovicell is large, flat, surrounded by numerous ramifications situated between the rows of tubes; its surface is very finely porous; the marginal thread is thick and salient. On the inferior face the tubes are arranged eccentrically in a manner to form a flabelliform ensemble as in *Berenicea.*

Among the recent species, *Lichenopora californica* Busk, 1875, and *L. holdsworthii* Busk, 1875, have an analogous ovicell. The discovery of this fossil species is therefore quite important, and the entire group will probably be separated generically when the oeciostome is better known. In the other species of *Lichenopora* the ovicell is a central expansion not marginated and not digitate.

Occurrence.—Miocene (Upper Burdigalian): Saucats (Pontpourquey) Gironde, France.

LOBOSOECIIDAE, new family.

The ovicell is a convex lobed vesicle formed after the consolidation of the subjacent tubes. The oeciostome is central, large, transverse, salient; the oeciopore is larger than the aperture.

This family differs from the Eleidae, in which the tubes are also provided with a zooecial area, in its central and not terminal oeciostone and in its ovicell, which is lobed and not regularly elliptical. It differs from the Diaperoeciidae in which the oeciostome is also central, in the presence of lateral lobes to the ovicell and the closing of the subjacent tubes. But a single genus is known, namely, *Lobosoecia.*

LOBOSOECIA, new genus.

Greek: *lobos*, lobe; in allusion to the form of the ovicell.

The ovicell is lobed. The tubes are without peristome, widened, oriented, long, with dorsal gemmation; the walls are very thick at the extremity; the zooecial area is hexagonal; the aperture is round.

Genotype.—Lobosoecia semiclausa Michelin, 1846. Cretaceous.

LOBOSOECIA SEMICLAUSA Michelin, 1846.

Plate 12, figs. 4–11.

1846. *Melicerítites semiclausa* MICHELIN, Iconographie zoophytologique, p. 211, pl. 53, fig. 3.

1899. *Meliceritites semiclausa* GREGORY, Catalogue fossil bryozoa in the British Museum, Cretaceous, p. 328, pl. 14, figs. 1, 2, 3 (not fig. 29) (not synonymy).

Structure.—The aperture is orbicular. This is the principal character of this species which has been well figured by Michelin and by Gregory, although the bibliography of the latter author is incorrect. D'Orbigny appears to be the initial author of the confusion.

The zooecial area is rhomboidal or hexagonal with a tuberosity at the angles. The transverse section shows the tubes increasing in size towards the periphery and an external, very thick zoarial wall. The longitudinal section exhibits the habitual tubes observed in species having a zooecial area. They are regularly widened, with dorsal gemmation, and the walls are very thick at their extremity.

The ovicell surmounts a number of zooecia, the apertures of which are thus closed. The lobes extend between the peripheral apertures. The oeciostome is thick, funnel shaped, transverse, with a sort of proximal lip. The oeciopore is twice as large as the apertures and its form is that of a crescent.

Occurrence.—Cretaceous (Cenomanian): Le Mans (Sarthe), France, and Warminster, England (Gregory).

Family ELEIDAE D'Orbigny, 1852.

Bibiography (morphological).—1852. D'ORBIGNY, Paléontologie française, Terrain Crétacé, p. 1585.—1899. GREGORY, Catalogue of the Cretaceous Bryozoa in the British Museum, vol. 1, p. 285.—1912. LEVINSEN, Studies on the Cyclostomata operculata, Memoires de l'Academie Royal des Sciences et des Lettres de Danemark, vol. 10, p. 19.

The ovicell is a large, pyriform, globular sack, with well-defined outlines. It is formed on the completely consolidated distal tubes.

The oeciostome is terminal. The tubes are closed by a perforated facette.

The genera of this family here discussed are *Meliceritites* Roemer, 1840, and *Cyclocites*, new genus. Numerous names applied to various forms of growth have been given, but the structure of the genotype of each must be restudied before they can be recognized.

Genus MELICERITITES Roemer, 1840.

1840. *Meliceritites* Roemer, Die Versteinerungen des norddeutschen Kreidegebirges, p. 18.

The tubes are expanded at their recurved extremity. Their gemmation is dorsal around one or more cylindrical axial tubes with regular peripheral gemmation. The orifice of the facettes is semicircular.

Genotype.—Meliceritites (*Ceriopora*) *gracilis* Goldfuss, 1827.

The genera created by D'Orbigny and now considered synonyms of *Meliceritites*, are based upon zoarial differences only, but nevertheless it is still necessary to verify all of them by properly made thin sections. Most of the species of this genus exhibit special zooecia termed eleocellaria whose forms are very useful in specific determinations.

Very frequently the tubes are arranged in transverse rows. The longitudinal sections then have a special aspect as the hollow tubes appear to alternate with solid ones; in reality the latter are formed by the walls of the tubes placed regularly between two others.

There are several sorts of tubes shown in the same section. At the center the tubes are capillary, cylindrical, and may not have borne polypides. They ramify more regularly than in *Heteropora* and related genera. Laterally the polypidian tubes are greatly expanded and considerably broader but much less in length; they result from the last ramifications of the small central tubes. This arrangement of the tubes is not restricted to the Eleidae as it may be observed in the Plagioeciidae (*Filicea*, *Laterocea*) and in the Ceriocavidae. The section through an eleocellarium is identical with that through the other tubes. The eleocellaria appear therefore to form merely external ornaments.

The calcareous lamella which closes the tubes is not a mobile operculum, as often thought, but it is identical with the lamella, which closes the tubes of a large number of cyclostomatous bryozoa when the polypide dies or becomes aborted.

The discovery of the ovicell of the Eleidae was made by Canu in 1897,[6] when he figured this structure on two occasions.[7] Levinson

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[6] Bryozoaires du Turonien des Janieres, Bulletin Société Geologique France, ser. 3, vol. 25, p. 150, pl. 5, fig. 10.

[7] Idem, pp. 750, 752, 753, pl. 22, figs. 1, 2, 3, 6.

attributed this discovery to Gregory, but the catalogue of the British Museum in which his results appeared was not published until 1899.

MELICERITITES GRACILIS Goldfuss, 1827.

Plate 13, figs. 1–4.

1827. *Ceriopora gracilis* GOLDFUSS, Petrefacta Germaniae, vol. 1, p. 35, pl. 10, fig. 11*a–c*.

1899. *Meliceritites gracilis* GREGORY, Catalogue of Cretaceous Bryozoa in the British Museum, vol. 1, p. 324, fig. 38 (not synonymy).

1912. *Meliceritites gracilis* LEVINSEN, Studies on the Cyclostomata operculata, Kgl. Danske Vidensk Selsk. Skrifter, ser. 7, vol. 10, p. 28, figs. *a*, *b*.

Not Michelin, 1845, Roemer, 1840, Reuss, 1872, Marsson, 1887, Pergens, 1890, Canu, 1897, Hagenow, 1851, etc.

Measurements.—	Apertura	ha=0.10 mm. la=0.18 mm.
	Peristome	hp=0.28–0.32 mm. lp=0.24–0.28 mm.
	Operculum	ho=0.18 mm. lo=0.18 mm.
	Ovicell	Lo=0.90 mm. lo=0.90 mm.
	Oeciostome	hoe=0.10 mm. loe=0.22 mm.
	Oeciopore	hp=0.08 mm. lp=0.16 mm.
	Facettes	hf=0.40–0.44 mm. lf=0.26–0.28 mm.

Structure.—The specimen figured by Goldfuss in 1827 was incomplete and worn and his poor illustration has occasioned many false determinations. With better specimens derived from the same locality (Essen, Germany), Gregory, in 1899, and Levinsen, in 1912, have described the various characters of this species and given better figures. We are able finally to complete their observations.

The tubes are arranged in transverse rows. The peristomes are thin, salient, elongated, triangular, adjacent at their base. The aperture is little transverse, semicircular, concave at its proximal margin; it is placed at the bottom of a peristomie and its form does not correspond to that of the peristome. The operculum is triangular and covers the aperture and the calcified portion of the distal peristome. The facettes are lozenge shaped, finely punctate, and half of their surface is occupied by the peristome; they are somewhat convex and separated by little salient threads.

In order to interpret the oral arrangement it is necessary to admit that the expanded and recurved part of the tubes is elliptical in section and that with the operculum inserted in a circle, the diameter of the latter ought to correspond to that of the tentacular sheath.

The ovicell belongs to a short type already noted in *Meliceritites transversa* new species and *Meliceritites semiclausa*, variety Gregory, 1899. It is triangular, very convex, as broad as long. The oeciostome is supported on the facette of the superior zooecium; it is elliptical and transverse (fig. 3).

The micrometric measurements of the facettes are rather changeable, especially in width (figs. 3, 4). The aperture itself can vary from 0.15 to 0.18 mm. The width of the facettes, 0.34 mm., given by Gregory is an extreme case and rather rare. The zoarial diameter is also variable, for the colonies appear to be very large; our specimens are 2 mm. in diameter, but the measurement of 2 to 5 mm. given by Gregory is quite possible.

Levinsen, 1912, has noted closed zooecia (kenozooecia), while Gregory, 1899, and Levinsen, 1912, have indicated the perforated facettes. We have not observed this particular case but they are quite natural.

Occurrence.—Cretaceous (Cenomanian): Essen, Germany. The species has been found with certainty in no other locality. It is regrettable that Gregory chose it as the genotype of Roemer's genus *Meliceritites*, 1840, because Roemer misidentified the species himself (see *Entalophora roemeri* Levinsen, 1912). The synonymy of the species contains only the references given above.

Plesiotype.—Cat. No. 68935, U.S.N.M.

MELICERITITES ANGULOSA D'Orbigny, 1852

Plate 12, figs. 17–22.

1912. *Meliceritites angulosa* Levinsen, Studies on the Cyclostomata Operculata, Memoires Academie Royale Sciences et Lettres de Danemark, ser. 7, vol. 10, p. 23, pl. 2, figs. 4–22 (bibliography).

This species, which is very common in France, has been figured under many names by D'Orbigny. Canu retained the name of *ornata* in 1899, but Levinsen preferred the one which was printed first by D'Orbigny (p. 610, Paleontologie française).

On plate 12 we figure a curious ovicelled specimen in which the oeciostome is transformed into an eleocellarium.

Occurrence.—Cretaceous (Coniacian): Fecamp (Seine inferieure), Villedieu (Loir-et-Cher), Tours, Saint Paterne (Indre-et-Loir), and Phelippeaux (Charente), France; Chatham, England.

Cretaceous (Santonian): Coulommiers near Vendome (Loir-et-Cher), Barbezieu, Bedocheau and Champagnac (Charente), France.

Cretaceous (Campanian): St. Medard, Brossac, and Piaud (Charente), France.

Plesiotype.—Cat. No. 68936, U.S.N.M.

MELICERITITES LAMELLOSA D'Orbigny, 1852.

Plate 14, fig. 13.

1852. *Elea lamellosa* D'ORBIGNY, Paléontologie française, Terrain Crétacés, vol. 5, p. 632, pl. 625, figs. 11–15.

1912. *Melicerititcs lamellosa* LEVINSEN, Studies on the Cyclostomata Operculata, Mémoires Académie Royale Sciences et Lettres de Danemark, ser. 7, vol. 10, p. 45, pl. 3, figs. 1–9 (bibliography).

This species is quite common in France where it is best known under the name given by D'Orbigny, *Elea lamellosa*, its zoaria consisting of expanded twisted fronds. We figure a splendid ovicell giving a good idea of the regularity of these beautiful fossils. The oeciopore is transverse and elliptical.

Occurrence.—Cretaceous (Coniacian): Fecamp (Seine inferieure), Phelippeaux (Charente), Tours, Saint Paterne (Indre-et-Loir), Villedieu and Lisle (Loir-et-Cher), France.

Cretaceous (Santonian): Coulommiers near Vendome and Romorantin (Loir-et-Cher), France.

Plesiotypes.—Cat. No. 68937, U.S.N.M.

MELICERITITES MAGNIFICA D'Orbigny, 1852.

Plate 12, figs. 12–16.

1852. *Multelea magnifica* D'ORBIGNY Paleóntologie française, Terrain Cretacé, vol. 5, p. 649.

1912. *Melicerititcs magnifica* LEVINSEN, Studies on the Cyclostomata Operculata, p. 20, pl. 1, figs. 3–10; pl. 7, figs. 13–19 (not synonymy).

Under this name D'Orbigny has confounded three species, as is well shown by his collection in the Museum of Natural History at Paris. Nevertheless the name can be maintained for the figured specimens which were obtained from the Coniacian of the Loire Valley. The second species is *Melicerititcs arbusculus* Leymerie, 1841, a species badly figured, which Waters named *Melicerititcs royana* in 1891.

The ovicell is irregular in its general form; to the two variations noted by Levinsen in 1912 we here add a third (fig. 14). Our sections confirm those of Hennig, of Gregory, 1899, and of Levinsen, 1912. We have still not been able to discover the origin of the successive lamellae which form the large zoaria.

Very common in the valley of the Loire, this species is rarer in the Charentes. It characterizes the lower Senonian.

Occurrence.—Cretaceous (Coniacian): Tours, (Indre-et-Loire), Phelippeaux (Charente), and Villedieu (Loir-et-Cher), France.

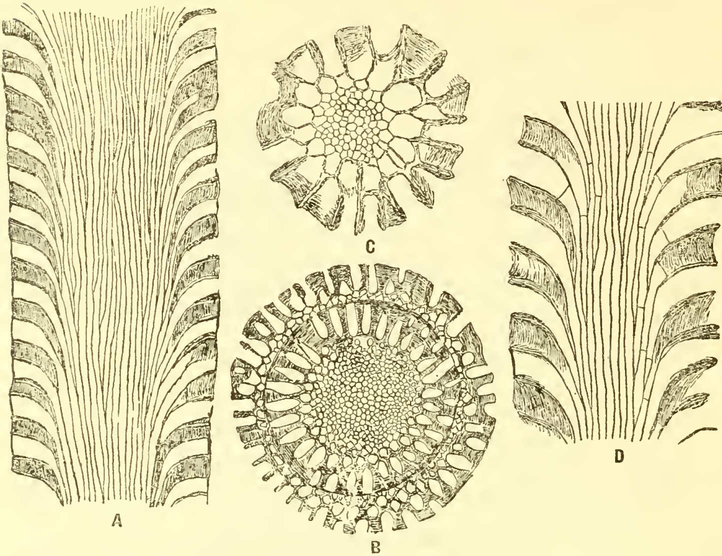


FIG. 18.—Genus Meliceritites Roemer, 1840.

A, B. *Meliceritites magnifica* D'Orbigny, 1852. A. Longitudinal section, × 16, illustrating the narrow central tubes and the expanded lateral ones with the facettes preserved in many cases. B. Transverse section, × 16, through a branch with a superimposed layer of zooecia.

Cretaceous (Coniacian): Villedieu (Loir-et-Cher), France.

C, D. *Meliceritites* (*Foricula*) *aspera* D'Orbigny, 1852. C. Transverse section, × 16. D. Longitudinal section, × 16, with a few diaphragms in the tubes.

Cretaceous (Coniacian): Villedieu (Loir-et-Cher), France.

Cretaceous (Santonian): Coulommier Canal, near Vendome (Loir-et-Cher), Bedocheau and Barbezien (Charente), France.

Plesiotypes.—Cat No. 68938, U.S.N.M.

MELICERITITES ASPERA D'Orbigny, 1852.

Plate 14, figs. 10–12.

1852. *Foricula aspera* D'ORBIGNY, Paléontologie francaise, Terrain Crétacé, p. 659, pl. 742, figs. 1–5.

1912. *Melicertites pyrenaica* LEVINSEN, Studies on the Cylostomata Operculata, Mémoires Académie Royale Sciences et Lettres de Danemark, p. 36, pl. 6, figs. 11–21; pl. 7, fig. 30.

The species described as *Meliceritites pyrenaica* by Levinsen is certainly the same as *M. aspera*. The material was furnished him by Canu and error in the labeling was probable.

The species of D'Orbigny's group *Foricula* are very easy to recognize exteriorly by the punctations arranged irregularly between the apertures. These small pores are little apparent in tangential sections and they are not visible in longitudinal sections. They are apparently produced simply by irregularities of calcification as Levinsen has already mentioned.

The group *Foricula* appears to be characterized by the presence of diaphragms in the tubes, visible in the longitudinal section but we do not believe that these diaphragms are of generic order.

Occurrence.—Cretaceous (Coniacian): Villedieu (Loir-et-Cher), Tours and Saint Paterne (Indre-et-Loire), and Phelippeaux (Charente), France.

Cretaceous (Campanian): Brossac, Piaud and Roux (Charente), France.

MELICERITITES (FORICULA) SPINOSA D'Orbigny, 1852.

1852. *Foricula spinosa* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 659, pl. 742, figs. 6–8.

This species is very common in the Charentes and we believed it worth while to give its geological distribution.

Occurrence.—Cretaceous (Campanian): Deviat, St. Bonner, St. Médard, Chez Béron, Saint Aulais, Courgeac, Echebrune-Meussac, and Montmoreau, France.

Maastrichtian (Dordonian): Chillac, Roux, Fouchalon, Manie-Roux, Bessac, Sainte-Leur, Chez-Beron, D'Archiac, and Manie-Mulon, France.

Genus SEMIMULTELEA D'Orbigny, 1852.

SEMIMULTELEA ESCHAROIDES Goldfuss, 1827.

Plate 13, figs. 5–7.

1827. *Cellepora escharoides* GOLDFUSS, Petrefacta Germaniae, vol. 1, p. 28, pl. 12, fig. 3*a–c*.

Measurements.—	Apertures	ha=0.12 mm.
		la=0.14 mm.
	Facettes	hf=0.50 mm.
		lf=0.22 mm.
	Eleocellaria	L=0.64 mm.
		l=0.28 mm.

Although this species is found frequently in the collections of the principal museums of Europe, it is always represented by very poorly preserved specimens. Most often these are large, free, multilamellar, more or less expanded masses, for which the name *Semimultelea* was proposed by D'Orbigny in his zoarial classification.

Our specimens show the same general characters, but they are globular or subcylindrical and some portions of the surface are a little better preserved, permitting us to observe the principal external characters.

The apertures are ogival and surrounded by a thin, little salient peristome. The facettes are smooth, convex, sometimes separated by a salient thread.

The eleocellaria are quite large, more or less broadly spatulate at their distal extremity. They are not rare, although Goldfuss does not mention them.

The zoarial lamellae seem to be formed of suborbicular colonies coalescing irregularly.

Occurrence.—Cretaceous (Cenomanian): Essen, Germany.

Plesiotypes.—Cat. No. 68939, U.S.N.M.

CYCLOCITES, new genus.

The tubes are expanded at their recurved extremity. Their gemmation is dorsal around a bundle of cylindrical tubes with regular peripheral gemmation. The orifice of the facette is circular.

Genotype.—*Cyclocites primogenitum*, new species. Bathonian.

This genus differs from *Meliceritites* Roemer, 1840 in the circular form of the aperture. There is no eleocellarium nor is there an oeciostome.

CYCLOCITES PRIMOGENITUM, new species.

Plate 15, figs. 9–12.

Description.—The zoarium is formed of anastomosing, ramifying, cylindrical branches very diverging in their relation to each other. The facettes are little distinct, flat, separated by a furrow of little depth. The aperture is orbicular, placed anteriorily on the facette. The peristome is thin and very little salient. The tubes of the central bundle are long, cylindrical, rectilinear, with regular peripheral gemmation. The lateral tubes are horn shaped, much expanded and recurved almost at right angles at their extremity. The ovicell is large, pyriform, convex; the oeciopore is orbicular.

Measurements.—	Diameter of branches	2.5 mm.
	Diameter of the facettes	.25–0.30 mm.
	Diameter of apertura	.13– .15 mm.

Variations.—The facettes which are very fragile, disappear very easily, and the tubes are then terminated by a large irregular orifice, the walls of which as seen in tangential section are vacuolar. In longitudinal section the tubular walls appear also vacuolar but very irregularly so. The tubular walls of the central bundle are plain.

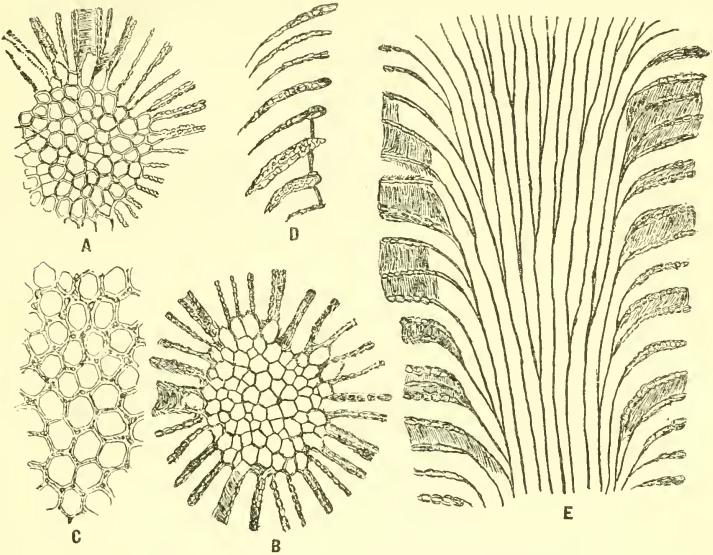


FIG. 19.—Cyclocites primogenitum, new species.

A. Portion of transverse section, × 16, showing structure of central tubes.
B. Transverse section, × 16.
C. Tangential section, × 16, illustrating the vesicular structure of the walls.
D. Portion of a longitudinal section, × 16, with the facettes still preserved.
E. Longitudinal section, × 16, exhibiting the central bundle of cylindrical tubes and the thickened lateral tubes with vesicular walls.
Jurassic (Bathonian): Ranville (Calvados), France.

Occurrence.—Jurassic (Bathonian): Ranville (Calvados), France.
Cotypes.—Canu collection and Cat. No. 68940, U.S.N.M.

CERIOCAVIDAE, new family.

The ovicell is a long, transverse, convex, regular, symmetrical vesicle with special walls. The oeciostome is large, median, tubular, salient.

The ovicell closes a certain number of tubes which are necessarily aborted; it is necessary, therefore, to classify this family in the section of the Rectangulata. This family differs from the Plagioeciidae, particularly in the position of the ovicell which is placed above the peristomes and not below them.

Ceriocava D'Orbigny, 1852; *Spiroclausa* D'Orbigny, 1852; *Haplooecia* Gregory, 1896; and the new genera *Grammecava* and *Ripisoecia* are referred to the family.

Genus CERIOCAVA D'Orbigny, 1852.

1852. *Ceriocava* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 1015.

The gemmation is peripheral. The tubes are long, cylindrical in their ascending portion, and rectilinear and much widened in their terminal recurved portion. There is no peristome. There are diaphragms in the cylindrical portion and the walls are vesicular in the outer widened portion of the tubes.

Genotype.—*Ceriocava* (*Millepora*) *corymbosa* Lamouroux, 1821.

Structure and affinities.—The form of the tubes in this genus is quite unique; it has not yet been observed in other genera and it has long been extinct. Gregory, 1896, maintained that this genus is of the same type as *Entalophora*. This is an error, as it differs in the gemmation, which is peripheral (and not dorsal), in the cylindrical tubes, in their greater length (and not regularly widened), and in the presence of diaphragms.

CERIOCAVA CORYMBOSA Lamouroux, 1821.

Plate 14, figs. 1–8.

1821. *Millepora corymbosa* LAMOUROUX, Exposition méthodique des genres de l'ordre des Polypiers, p. 87, pl. 83, figs. 8, 9.

1896. *Ceriocava corymbosa* GREGORY, Catalogue fossil bryozoa in the British Museum. Jurassic, p. 163, fig. 13 (Bibliography).

Structure.—Our studies have been made on the form *Ceriopora pustulosa* Michelin, 1846, which is rather common in France.

The ovicell is rather rare; it is not always completely developed, but it occurs in the form of elongate vesicles. It has its own special wall, which is never common with those of the zooecia; this is the rule in Rectangulata, but we are totally ignorant as to how this calcification occurs.

The transverse section embraces two parts. In the center the tubes are of the same diameter and correspond to the cylindrical tubes. The periphery corresponds to a longitudinal section in the recurved portion of the tubes; this portion is widened and the walls are vesicular and striated in the interior.

The longitudinal section shows the tubes divided in two portions. They are cylindrical in their greater length, ascending and rectilinear: the walls are thin and adjacent and there are diaphragms far apart; the gemmation is peripheral, since the tubes are bifurcated at all heights. The terminal portion is recurved almost at right angles to the zoarial axis; it enlarges much and very rapidly; the

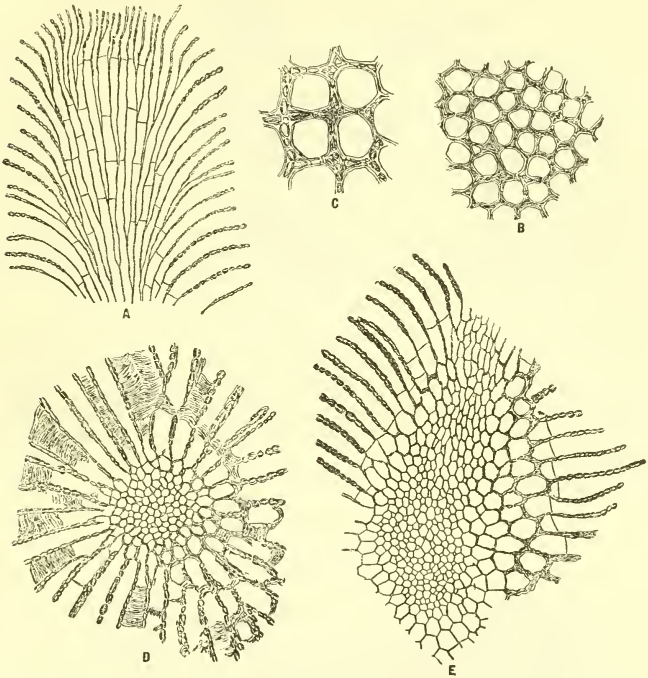


FIG. 20.—*Ceriocava corymbosa* Lamouroux, 1821.

A. Longitudinal section, × 12, illustrating the thin tubes with diaphragms in the central region and the thickened, vesicular walls of the outer portion.

B, C. Tangential section, × 12 and a portion, × 25, showing the structure.

D. Transverse section, × 12.

E. Longitudinal section, × 12, through a branch showing a perpendicular bifurcation.

Jurassic (Bathonian): St. Aubin (Calvados), France.

vesicles of the walls increase in size toward the periphery and leave between them small pores of communication.

In tangential section the apertures are irregularly polygonal; they are surrounded by a sort of annular canal formed by the section cutting the parietal vesicles.

Occurrence.—Jurassic (Bathonian): St. Aubin, Ranville, and Langrune (Calvados), France.

Plesiotypes.—Canu collection and Cat. No. 68941, U.S.N.M.

Genus SPIROCLAUSA D'Orbigny, 1852.

1852. *Spiroclausa* D'ORBIGNY, Paléontologie française, Terrain Crétacé, p. 883.

In the Paléontologie Francaise D'Orbigny has exactly limited all of his genera, but they are not entirely concordant with the descriptions in the Prodrome, because these later studies were more complete, the material more numerous, and the publication was more definite. We can not admit the changes made by Gregory in the classification, and we preserve the genus *Spiroclausa* as it is defined in the Paléontologie Francaise. Gregory, 1899, has classified the genus *Spiroclausa* in the same family as *Terebellaria*, but this is impossible, for the ovicells are quite different.

The genotype is extremely curious on account of its spiral zoarium in appearance, like that of a corkscrew. The ovicell is a smooth sack, little salient, elongated, and located between the salient spirals. It appears to us to have some analogy with that of the *Leiosoeciidae*, although we believe the genus better placed in the *Ceriocavidae* at present.

The tubes are cylindrical with hollow walls.

SPIROCLAUSA SPIRALIS Goldfuss, 1827.

Plate 14, fig. 9.

1827. *Ceriopora spiralis* GOLDFUSS, Petrefacta Germaniae, Bryozoa, vol. 1, p. 36, pl. 11, fig. 2.

1852. *Spiroclausa spiralis* D'ORBIGNY, Paléontologie francaise, Terrain Crétacé, vol. 5, p. 883, pl. 764, figs. 1–5.

1899. *Zonopora spiralis* GREGORY, Catalogue fossil bryozoa in British Museum. Cretaceous, vol. 1, p. 427 (Bibliography).

Structure.—The ovicell is a convex sack, smooth, located between two successive spires. The tubes of the salient spires are long in longitudinal section. Between them and forming the concave spirals the shorter dactylethrae are arranged; they grow by successive ramifications most of the time. Sometimes, however, they are transformed into mesopores—that is to say, into anterior and superior ramifications of a single tube.

It is probable that this unusual spiral mode of growth is the cause of the modification in form of the ovicell.

When worn the specimens offer slightly the aspect of *Zonopora*, but the spires always remain regular.

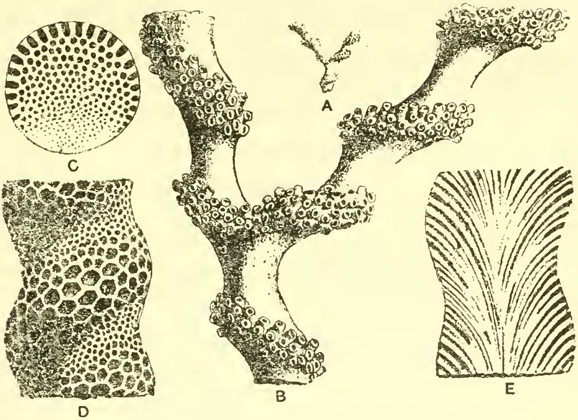


FIG. 21.—Spiroclausa spiralis Goldfuss, 1827.

A, B. Zoarium natural size and enlarged.
C. Transverse section enlarged.
D. Portion of a branch, enlarged.
E. Longitudinal section, enlarged. (A–E, after D'Orbigny.)
Cretaceous of France.

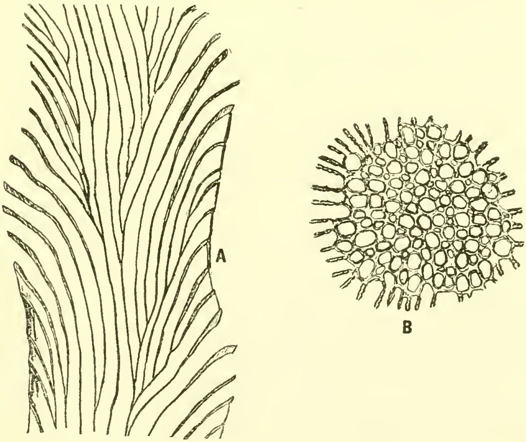


FIG. 22.—Spiroclausa spiralis Goldfuss, 1827.

A. Vertical section, × 16 .
B. Transverse section, × 16.
Cretaceous (Maastrichtian) : Royan (Charente inferieure), France.

Occurrence.—Cretaceous (Campanian): Longuesse (Seine-et-Oise), Montmoreau and Courgeac (Charente), France.

Cretaceous (Maastrichtian): Poulipiac (Le Gabriel), Mouchaud, Bessac, Barbezieux and Manie Roux (Charente) and of Royan (Charente inferieure), France and Maastricht, Holland.

RIPISOECIA, new genus.

(Greek. *Ripis*, fan, alluding to the form of the ovicell.)

The ovicell is a flabelliform vesicle, little convex, striated transversally. The tubes are cylindrical, long, with peristomes, recurved in their distal part; their walls are hollow in the axial portion and vesicular in the terminal portion. The mesopores are closed by a calcareous lamella.

Genotype.—*Ripisoecia* (*Millepora*) *conifera* Lamouroux, 1821. Bathonian.

Affinities.—The ovicell appears to much resemble that of *Terebellaria*. As the specimen which we figure is the only ovicelled one we have not dissected it to study the nature of the walls. The placing of this genus in the family Plagioeciidae is therefore possible, although the ovicell in its position shows a resemblance to the Ceriocavidae. Certain incompletely developed ovicells of the genus *Ceriocava* have an identical form; and we have found a small rectangular ovicell analogous to that which we figure for *Ceriocava corymbosa* Lamouroux, 1821.

RIPISOECIA CONIFERA Lamouroux, 1821.

Plate 15, figs. 1–8.

1821. *Millepora conifera* Lamouroux, Exposition méthodique des genres de l'ordre des Polypiers, p. 87, pl. 83, figs. 6, 7.

1896. *Heteropora conifera* Gregory, Catalogue fossil bryozoa in the British Museum, Jurassic, p. 202, figs. 19, 20 (Bibliography).

Structure.—Our studies and sections have been made on the two forms *Heteropora ramosa* Michelin, 1846, and *Heteropora reticulata* Haime, 1854. They do not confirm figure 19*a* of Gregory for we have not observed the diaphragms.

The transverse section is that of the zoarial form *Heteropora*. In the center the tubes are of the same size; they are therefore cylindrical. In the periphery the terminal, recurved portion of the tubes is shown through their length; their walls, like those of the mesopores, also are vesicular; their internal surface is striated transversally.

The longitudinal section shows tubes rigorously cylindrical with peripheral gemmation; they are recurved almost at right angles to the zoarial axis at their extremity and their walls are vesicular. The peristome is little salient. The mesopores are irregular; they are rather short and narrow.

In tangential section the mesopores appear to be of a smaller diameter than the tubes and their arrangement is quite variable. The annular canal formed by the parietal vesicles is quite thin.

The mesopores are closed by a very fragile calcareous lamella and specimens with it intact are very rare. The peristome is hardly salient; it is sometimes quite visible.

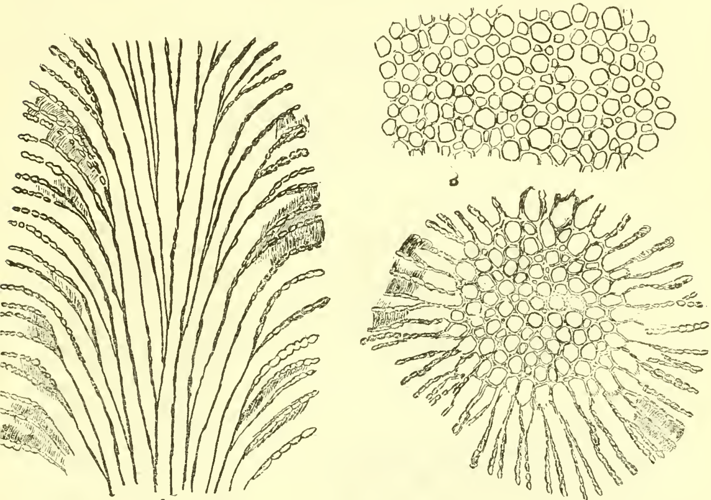


FIG. 23.—Ripisoecia conifera Lamouroux, 1821.

A. Longitudinal section, × 16, showing the vesicular walls of the recurved portion.
B. Tangential section, × 16.
C. Transverse section, × 16.
Jurassic (Bathonian): St. Aubin (Calvados), France.

Occurrence.—Jurassic (Bathonian): St. Aubin (Calvados), France.
Plesiotypes.—Canu collection and Cat. No. 68942, U.S.N.M.

GRAMMECAVA, new genus.

(Greek; *gramme*, line in allusion to the black median line of thin sections.)

The tubes are short, with triparietal gemmation, without peristome; their recurved extremity is much widened and has vesicular walls; they are often closed by a facette bearing an operculate aperture. Gemmation occurs on the basal lamella visible in the transverse sections and on the superior edge of the zoarium.

Genotype.—Grammecava (*Ceriopora*) *dumetosa* Michelin, 1846. Jurassic.

GRAMMECAVA DUMETOSA Defrance, 1824.

Plate 16, figs. 1–7.

1824. *Millepora dumetosa* Defrance, Dictionnaire des sciences naturelles, vol. 31, p. 84 (not Lamouroux).

1846. *Ceriopora dumetosa* Michelin, Iconographie Zoophytologique, p. 245, pl. 57, fig. 7.

1854. *Neuropora defrancei* Haime, Description des Bryozoaires fossiles de la formation Jurassique, Mémoires de la Société géologique de France, ser. 2, vol. 5, p. 215, pl. 10, fig. 7.

Historical.—Gregory was in error when in 1896 he classed this species with *Ceriocava corymbosa* Lamouroux, 1821, as the sections

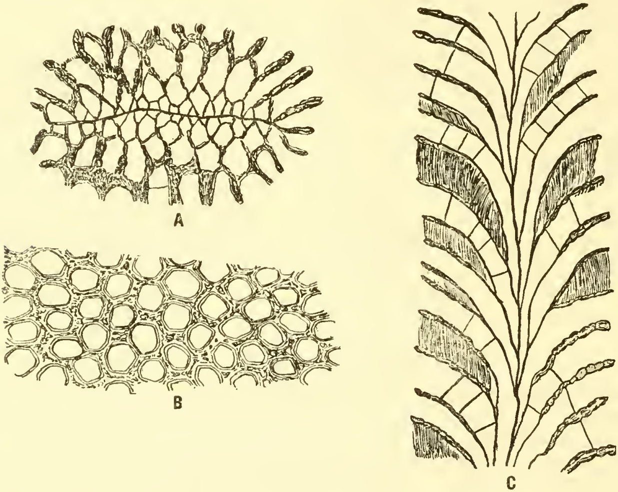


Fig. 24.—Grammecava dumetosa Defrance, 1824.

A. Transverse section, × 16. The median lamella is undulated.

B. Tangential section, × 16.

C. Longitudinal section, × 16, showing the basal (median) lamella, diaphragms in the tubes and the vesicular walls.

Jurassic (Bathonian): Luc (Calvados), France.

which we have prepared indicate a quite different structure. The nature of the tubes is indeed the same, but triparietal gemmation occurs on the basal lamella in the present species.

Structure.—Exteriorily many of the tubes are closed by a facette. These are perforated by a circular aperture with peristome but always closed by a pseudo-operculum. We have never seen a facetted tube with an open aperture. This phenomenon is inexplicable in the present state of the science. The other tubes have a large polygonal opening.

In transverse section the basal lamella appears as a straight or undulated line. The tubes are polygonal and arranged symmetrically on each side. In the periphery the expanded part of the tubes has hollow vesicular walls.

In longitudinal section the basal lamella is thick. The tubes are short with triparietal gemmation. The inferior part presents a variable number of diaphragms, sometimes close together. The expanded portion of the tube shows vesicular walls and diaphragms variable in position. The orifices being arranged in quincunx, the section is often tangential to the wall of the tube which appears black in all of its concourse.

We have not discovered the ovicell of this species, but all of its features appear to favor its reference to this family.

Occurrence.—Jurassic (Bathonian): Luc and Ranville (Calvados), France.

Plesiotypes.—Canu collection and Cat. No. 68943, U.S.N.M.

Genus HAPLOOECIA Gregory, 1896.

1896. *Haplooecia* Gregory, Catalogue of fossil Bryozoa in the British Museum, Jurassic, p. 157.

The characters of this genus are noted in the following description of the genotype.

Genotype.—*Haplooecia straminea* Phillips, 1829. Jurassic.

HAPLOOECIA STRAMINEA Phillips, 1829.

Plate 14, figs. 14, 15.

1896. *Haplooecia straminca* Gregory, Catalogue of the fossil Bryozoa in the British Museum, Jurassic p. 159, figs. 11, 12.

We have not discovered the ovicell of this species, and our present studies are based upon thin sections, which permit the reference of the genus to the Ceriocavidae. In longitudinal section the tubes are analogous to those of *Ceriocava.* They are long, cylindrical in their rectilinear part, and much expanded in their recurved portion. Gemmation is peripheral, and the zoarial axis appears to be occupied by a tube which branches at the bifurcations. The terminal walls are hollow, but not vesicular, as in *Ceriocava.* In transverse sections the tubes are polygonal, and those of the periphery alone have hollow walls.

Exteriorly the facettes are elliptical, little distinct, separated by a furrow of little depth. The aperture is terminal, orbicular or somewhat transverse, without peristome.

So far as we are able to judge now, the genus *Haplooecia* Gregory, 1896, differs from the preceding new genus *Ripisoecia* in the absence of mesopores and in its terminal aperture. It differs from *Ceriocava* D'Orbigny, 1852, in its terminal aperture, in the great constancy of the facettes, and in the absence of diaphragms in the tubes. It differs from the new *Grammecava* in the absence of the basal lamella and in the different mode of gemmation. All the known members of the family have therefore tubes provided with facettes, without peristome, of the group for which Marsson proposed the term Metoporina.

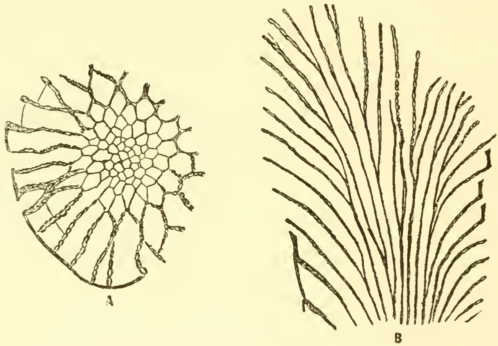


FIG. 25.—Haplooecia straminea Phillips, 1829.

A. Portion of a transverse section, × 12. The partitions in some of the tubes are accidental and are not diaphragms.

B. Longitudinal section, × 12, with some tubes showing the aperture and facette.

Jurassic (Bathonian): Ranville (Calvados), France.

Occurrence.—Jurassic (Bathonian): Ranville (Calvados), France.

Plesiotypes.—Canu collection and Cat. No. 68949, U.S.N.M.

Family LEIOSOECIIDAE Canu and Bassler, 1920.

1920. Leiosoeciidae CANU and BASSLER, North American Early Tertiary Bryozoa, Bull. 106, U. S. National Museum, p. 823.

This family is well characterized by its smooth orbicular ovicell placed above and obstructing a number of the tubes but not perforated by them.

In addition to *Leiosoecia* and *Parleiosoecia* Canu and Bassler 1920 we are now able to place the ancient genera *Ditaxia* Hagenow 1851 and *Chilopora* Haime, 1854 in this family.

Genus LEIOSOECIA Canu and Bassler, 1920.

1920. *Leiosoecia* Canu and Bassler, North American Early Tertiary Bryozoa, Bull. 106, U. S. National Museum, p. 823.

Zoarium consisting of cylindrical tubes and regular, parietal mesopores.

The genotype, although figured by us in 1920, was not described, so that we have added notes concerning it below.

Genotype.—Leiosoecia (*Multicrescis*) *parvicella* Gabb and Horn. Cretaceous of New Jersey.

LEIOSOECIA CONSTANTII D'Orbigny, 1850.

1841. *Heteropora dichotoma* Michelin, Iconographie zoophytologique, p. 4. pl. 1, fig. 11 (not Goldfuss, 1830).

1850. *Ceriopora constantii* d'Orbigny, Prodrome de paléontologie stratigraphique, vol. 7, p. 143.

1854. *Heteropora constantii* d'Orbigny, Paléontologie française, Terrain Crétace, vol. 5, p. 1071, pl. 799, fig. 6, 7.

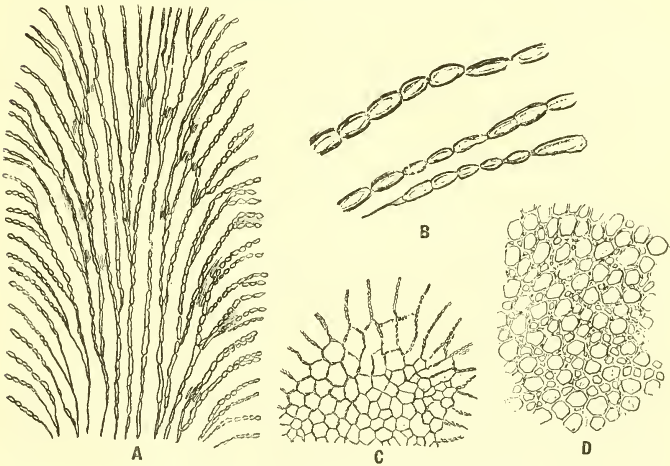


Fig. 26.—Leiosoecia constantii D'Orbigny, 1850.

A. Longitudinal section, × 16, showing the cylindrical tubes with vesicular walls.

B. Portion of the same section, × 65, exhibiting the vesicular structure in more detail.

C. Part of a transverse section, × 16.

D. Tangential section, × 16.

Lower Cretaceous (Aptian): Ervy, France.

We have discovered the ovicell of this species; it is not good enough to be figured, but it undoubtedly belongs to this genus because all the ovicells of the genus resemble each other.

The tubes are cylindrical, with vesicular walls; they ramify at all heights. The shorter are closed by a calcareous membrane and are thus transformed into dactylethrae little numerous and appearing between the tubes in the tangential sections.

The vesicular walls of the tubes are absolutely similar to those which Waters, 1904, has figured for *H. claviformis* of recent seas.

Occurrence.—Lower Cretaceous: Albian of Grandpré (Ardennes) (D'Orbigny); Aptian of Ervy, France (Canu collection).

Plesiotype.—Cat. No. 68960. U.S.N.M.

LEIOSOECIA PARVICELLA Gabb and Horn, 1860.

1860. *Multicrescis parvicella* GABB and HORN, Descriptions of new Cretaceous corals from New Jersey, Proceedings, Academy of Natural Sciences, Philadelphia, p. 367.

1860. *Multicrescis parvicella* GABB and HORN, Descriptions of new species of American Tertiary and Cretaceous fossils, Journal Academy of Natural Sciences, Philadelphia, ser. 2, vol. 4, p. 401, pl. 69, figs. 36–38.

1862. *Multicrescis parvicella* GABB and HORN, Monograph of fossil Polyzoa of Secondary and Tertiary formations of North America, Journal Academy of Natural Sciences Philadelphia, ser. 2, vol. 5, p. 178, pl. 21, fig. 70.

1907. *Heteropora parvicella* ULRICH and BASSLER, Cretaceous Paleontology of New Jersey, Geological Survey, New Jersey, Paleontology, vol. 4, p. 327, pl. 23, figs. 1, 2.

1920. *Leiosoecia parvicella* CANU and BASSLER, North American Early Tertiary Bryozoa, Bull. 106, U. S. National Museum, p. 824, fig. 273.

Although figured in our work of 1920, this species was not described, and we therefore take the present opportunity to give a few notes concerning it.

The tubes are cylindrical, with peripheral gemmation (by bifurcation), very irregular. The ovicell is globular, salient, orbicular, surrounding five or six aborted tubes; the walls are smooth.

This species is so irregular that we have not been able to obtain a good longitudinal section, so that we do not know exactly the nature of the adventitious pores; according to the fractured specimens and tangential section, they appear to be mesopores of equal length.

Occurrence.—Cretaceous (Vincentown): Vincentown, New Jersey.

Plesiotype.—Cat. No. 68950, U.S.N.M.

LEIOSOECIA OCCLUSA, new species.

Plate 22, figs. 16, 17.

Description.—The zoarium is free, claviform; it seems exteriorly to be formed by many superposed subcolonies. The walls of the tubes are thin; the apertures are large and polygonal. The ovicell is orbicular, deeply embedded, a little convex. An epitheca partially closes certain zones of apertures.

Measurements.—

Diaeter of apertures	0.22–0.26 mm.
Diameter of ovicell	.80 mm.
Length of zoarium	15.00 mm.

Affinities.—Another specimen in the Canu collection is claviform without an enlarged inferior part; its dimensions are identical and it bears groups of closed zooecia.

Our species appears to resemble the figure of *Radiopora inflata* Simonovitsch, 1871, but Gregory, in 1909, confirms the *Radiopora* character of this species, which, however, scarcely appears on the author's figure.

Occurrence.—Cretaceous (Cenomanian): Essen, Germany.

Holotype.—Cat. No. 68951, U.S.N.M.

Genus DITAXIA Hagenow, 1851.

1851. *Ditaxia* HAGENOW, Die Bryozoen der Maastrichter Kreidebildung, p. 49.

Leiosoeciidae in which the tubes are short, cylindrical, with triparietal gemmation on a thick median lamella. They are recurved at their extremities with irregularly thickened walls. The peristomes are slightly salient in young specimens but absent in the mature stages. The mesopores are little abundant, cylindrical or club-shaped, of variable length.

Genotype.—*Ditaxia anomalopora* Goldfuss, 1827.

Range.—Coniacian—Danian.

Historical.—Hagenow considered the great thickness of the median lamella as the essential character of his genus. Pergens in 1889 applied the name to all species provided with club-shaped tubes and with mesopores. Gregory classed the genus in his family Clausidae, characterized by the presence of dactylethrae (or aborted cellules). The accessory cellules being the superior ramifications of the normal tubes are mesopores and not dactylethrae. The diagnosis of Hagenow's genus must therefore be reestablished as above after a study of thin sections of the genotype. It differs from *Chilopora* Haime, 1854, in its much larger ovicell in the presence of a very thick median lamella and in the considerable thickening of the extremity of the tubes.

DITAXIA ANOMALOPORA Goldfuss, 1827.

Plate 17, figs. 9–13.

1827. *Ceriopora anomalopora* GOLDFUSS, Petrefacta, Germania, vol. 1, p. 33, pl. 10, figs. *c*, *d*, (not *a*, *b*).

1899. *Ditaxia anomalopora* GREGORY, Catalogue of the Cretaceous Bryozoa in the British Museum, vol. 1, p. 406; vol, 2, p. 309 (cites bibliography).

We are not certain that the species figured by D'Orbigny in 1852 is exactly that of Goldfuss, and there is a great confusion in his collection in this respect. The geologic distribution given by Gregory appears to be erroneous.

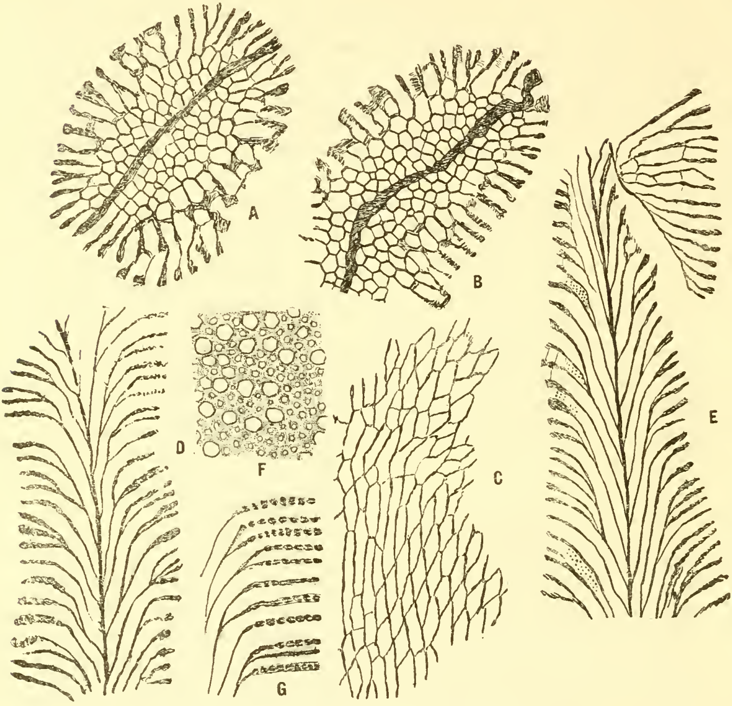


FIG. 27.—Ditaxia anomalopora Goldfuss, 1827.

A. Transverse section, × 16, with the median lamella almost rectilinear.

B. A similar section, × 16, with undulated median lamella.

C. A meridian section, × 16, cutting just above the median lamella.

D. Typical longitudinal section, × 16, showing the short tubes.

E. Another longitudinal section, × 16, showing a unilamellar expansion commencing to cover the frond.

F. Tangential section, × 16, illustrating zooecia and thick walled mesopores.

G. Portion of a longitudinal section of well developed frond, × 16, exhibiting the vesicular wall structure.

Cretaceous (Maastrichtian) : Maastricht, Holland.

Structure.—We have not yet had the good fortune to discover an ovicell of this species well enough preserved to be photographed, but its place in the family Leiosoeciidae appears to us not to be doubted.

In longitudinal section the tubes are short, cylindrical, recurved at their extremity. The gemmation is triparietal, the third wall being that of a very thick basal lamella. The specimens being bilamellar, this latter is often visible as a median lamella. The mesopores are very short, expanded; their walls and also those of the tubes in their recurved portions are moniliform.

In transverse sections the tubes are all equal and in consequence cylindrical. There are no smaller tubes adjacent to the median lamella, and the gemmation is therefore triparietal. The median lamella is very thick, undulated or sinuous, rarely rectilinear.

In meridian sections the tubes have the usual lozenge shape.

The exterior aspect is quite variable. One characteristic of this species is that unilamellar expansions often incrust the bilamellar frond. Well preserved young specimens have a slightly salient, oblique peristome, in this respect resembling *Chilopora* but the older specimens strongly calcified lack the peristome. Certain fronds exhibit large irregular spaces composed of mesopores alone. The diameter of the orifices is 0.08 to 0.10 mm., and that of the mesopores, 0.02–0.04 mm.

The young fronds grow distally and laterally. Their transverse section is traversed entirely by the median lamella. Other fronds growing solely at their distal extremity have the median lamella completely surrounded by tubes.

Occurrence.—Cretaceous (Maastrichtian): Maastricht, Holland.

Plesiotypes.—Cat. No. 68952, U.S.N.M.

DITAXIA PARVIPORA, new species.

Plate 17, figs. 1–8.

1900. *Ditaxia anomalopora* Canu, Note préliminarie sur les Bryozoaires de Tours, Comptes Rendus Association française Avancement Science, sess. 2, p. 409.

Description.—The zoarium is free, bilamellar, formed of much compressed, flabelliform, branching fronds. The tubes are short, cylindrical, without peristome, of small diameter, with triparietal gemmation, recurved at their extremity where the walls are thickened. The mesopores are small, quite short, expanded, and as numerous as the tubes. The ovicell is of medium size, smooth, convex, subround, its contours indefined; the oeciopore is very small and central.

Measurements.—
- Diameter of tubes .... 0.08 mm.
- Width of fronds .... 3.00 to 5.00 mm.

Structure.—At the surface it is difficult to distinguish the tubes from the mesopores and the distinction is possible only on very well preserved specimens, but in tangential sections the tubes appear with a larger diameter. The much expanded form of the mesopores is the cause of these differences. The zoarium was probably attached to algae by a slightly expanded base. The median lamella is salient at the extremity of the frond. On the wide fronds of a certain thickness the ovicell is partially covered over by the adjacent mesopores (fig. 7).

In transverse section, the tubes are all equal (hence cylindrical) even in the immediate vicinity of the median lamella (hence triparietal gemmation). The median lamella is rather thick . Our meridian

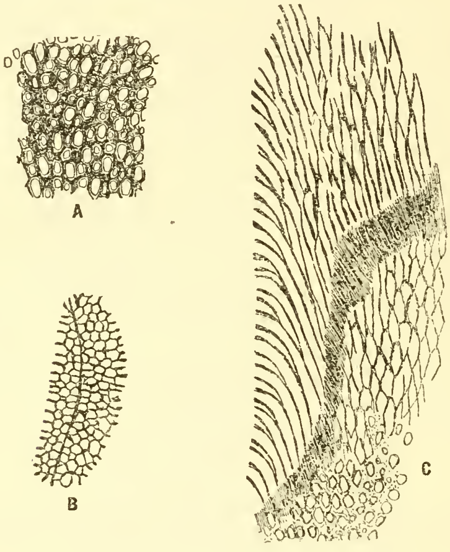


FIG. 28.—Ditaxia parvipora, new species.

A. Tangential section, × 16, showing few mesopores.

B. Transverse section, × 16.

C. Thin section cut obliquely through a zoarium, × 16, illustrating the structure in longitudinal section to the left, the basal lamella in the middle, the median section above and below this, and the tangential section at the bottom.

Cretaceous (Coniacian) : Tours (Indre-et-Loire), France.

section cuts the branch just before a bifurcation in such a way that a portion is transformed into a longitudinal section. The tubes appear clearly cylindrical, recurved at their extremity where the walls are thickened; gemmation is triparietal. The mesopores are very short and much expanded. On the meridian portion the tubes appear evidently lozenge-shaped. At the base of the section a portion appears in tangential section caused by the undulation of the branch due to ramification.

Occurrence.—Cretaceous (Coniacian): Tours and Saint Paterne (Indre-et-Loire), France.

Cotypes.—Canu collection and Cat. No. 68953, U.S.N.M.

Genus CHILOPORA Haime, 1854.

1854. *Chilopora* HAIME, Description des Bryozoaires fossiles de la formation jurassique, Mémoires de la Société Géologique de France, ser. 2, vol. 5, p. 213.

Leiosoeciidae, in which the ovicell is smooth, convex, very small, opening sometimes by a large oeciopore. The tubes are cylindrical, without peristome, terminated by a salient lip, with triparietal gemmation, much recurved at their extremity, separated by mesopores.

Genotype.—*Chilopora guernoni* Haime, 1854.

Range.—Bathonian, Santonian.

Historical.—Haime created this genus in 1854 for a species having the characters of *Heteropora*, but in which the peristomes are distinct from the intermediate openings and provided inferiorily with a salient lip. This character is not limited to this genus, for it has been found in other species. The thin sections prepared from specimens of the genotype have permitted us to define the characters of the genus more exactly.

CHILOPORA GUERNONI Haime, 1854.

Plate 16, figs. 8–13.

1854. *Chilopora guernoni* HAIME, Description des Bryozoaires fossiles de la formation jurassique, Memoires de la Société Geologique, France, ser. 2, vol. 5, p. 213, pl. 10, fig. 5.

1896. *Chilopora guernoni* GREGORY, Catalogue of the Jurassic Bryozoa in the British Museum, p. 693.

Structure.—The fragments which we have found of this species are very irregular and belonged to very fragile fronds. We still are unable to give an exact idea of the zoarial form. The ovicells are small, appearing arranged longitudinally, and terminated sometimes by a large orifice, which we are not yet certain is a true oeciopore.

On well-preserved specimens the tubes are provided with the lip and the mesopores are distinct and very small. On other specimens the difference is little apparent exteriorly, but it appears clearly in the tangential sections.

In the longitudinal sections the tubes are short, cylindrical, recurved at their extremity, with triparietal gemmation, thin at their origin. The median (basal) lamella is little thickened. The mesopores are short and expanded; their walls are hollow or moniliform. Diaphragms are sometimes present.

In transversal sections there are both large and small tubes adjacent to the median lamella, because the tubes are thin at their base, but the gemmation appears still as triparietal, because in dorsal gemmation there are only small tubes adjacent to the basal lamella.

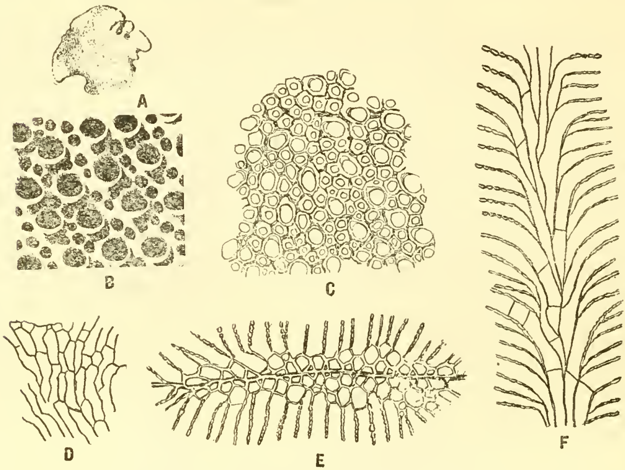


FIG. 29. Chilopora guernoni Haime, 1854.

A, B. The bilamellar zoarium natural size and the surface enlarged (after Haime).

C. Tangential section, × 16.

D. Portion of a meridian section, × 16.

E. Transverse section, × 16, showing the median lamella.

F. Longitudinal section, × 16.

Jurassic (Bathonian): Occaignes (Orne), France.

Occurrence.—Jurassic (Bathonian): Ranville, and Occaignes, France.

Plesiotype.—Canu collection and Cat. No. 68954, U.S.N.M.

CHILOPORA CRETACEA, new species.

Plate 17, figs. 14–16.

Description.—The zoarium is free, formed of compressed, bilamellar fronds, bifurcated, with peripheral growth. The tubes are cylindrical, short, with triparietal gemmation on a slightly thickened basal lamella; they are terminated exteriorly by a salient and triangular superior lip. The ovicell is globular or convex, smooth, quite small. The mesopores are very short and parietal.

Structure.—Without the ovicell, the occurrence of a *Chilopora* in the Cretaceous would have been unperceived; indeed this same species has been confused by Filliozat with *Ditaxia anomalopora* Goldfuss, 1827. The ovicell is globular and convex when it is placed on the zoarial margins; on the fronds it is scarcely convex and is overlapped by the cellular margins according to the rule in the Leiosoeciidae. This difference arises from the peripheral growth of the fronds. The ovicell, at first marginal on the young fronds, becomes more central and more embedded when the fronds grow in width and thickness.

The mesopores are small, but the difference between them and the tubes is visible only in the tangential sections.

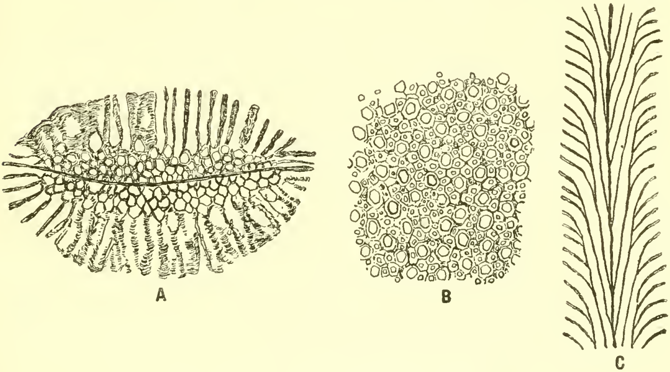


FIG. 30.—Chilopora cretacea, new species.

A–C. Transverse, tangential and longitudinal sections, × 16. Cretaceous (Santonian): Vendome (Loir-et-Cher), France.

In longitudinal sections the tubes are much more regular than in the Jurassic species; they are regular, cylindrical, very little narrowed at their base. The median lamella is thick. The mesopores are short and parietal. On the transverse section the median lamella entirely traverses the preparation, for the growth is peripheral. On the Jurassic species and in the genus *Ditaxia* it is central and never reaches the zoarial margins, for the growth occurs solely on the superior part of the frond.

Occurrence.—Cretaceous (Coniacian); Phellippeaux (Charente), France.

Cretaceous (Santonian): Vendome (Loir-et-Cher) and Bédocheau (Charente), France.

Cotypes.—Canu collection and Cat. No. 68955, U.S.N.M.

Family TRETOCYCLOECIIDAE Canu, 1919.

Rectangulata in which the ovicell is orbicular, flat, smooth, regular and limited, traversed by the tubes and sometimes by adjacent mesopores.

This family corresponds to the Diaperoeciidae in the Parallelata, but differs from it in addition to its axis arranged perpendicularly to the zooecial axis instead of parallel, in the flat orbicular and not globular form of the ovicell, and in the presence of mesopores.

The genera referred to this family at present are as follows:

Tretocycloecia Canu, 1919. Cretaceous–Recent.
Partretocycloecia Canu and Bassler, 1920. Eocene.
Telopora Canu and Bassler, 1920. Recent
Alveolaria Busk, 1859. Pliocene.
Psilosolen, new genus. Pleistocene, Recent.

The simplest genera are the most recent, and the decadence of the Cyclostomata is well shown by the family.

Genus TRETOCYCLOECIA Canu, 1919.

1919. *Tetrocycloecia* (in error for *Tretocycloecia*) CANU, Etudes sur les Ovicelles des Bryozoaires Cyclostomes (2), Bulletin Société Geologique de France, ser. 4, vol. 17, p. 346.

The tubes are cylindrical. The mesopores are irregularly directed; their walls are vesicular. The tubes which perforate the ovicell are accompanied by the adjacent mesopores.

Genotype.—Tretocycloecia (*Heteropora*) *dichotoma* Reuss, 1847 (not Hagenow, 1851).

Range.—Midwayan–Recent.

TRETOCYCLOECIA DICHOTOMA Reuss, 1847.

1847. *Heteropora dichotoma* REUSS, Die fossilen Polyparien des Wiener Tertiarbeckens, p. 35, pl. 5, fig. 20.
1877. *Heteropora dichotoma* MANZONI, I Briozoi fossili del Miocene d'Austria ed Ungheria, p. 35, pl. 12, fig. 46.
1859. *Heteropora pustulosa* BUSK, A Monograph on the Fossil Polyzoa of the Crag, p. 122, pl. 19, fig. 6; pl. 20, fig. 1.
1920. *Tretocycloecia dichotoma* CANU and BASSLER, North American Early Tertiary Bryozoa, Bull. 106, U. S. National Museum, p. 828, fig. 275.

The studies relative to this species have been made from the specimens collected in France. We are not entirely certain of our determination, for we have never been able to procure Austrian specimens for comparison.

The zoarium is quite variable; massive, reticulate, but more often arborescent and cylindrical.

The tubes are cylindrical, quite long, bifurcating chiefly in the median region at all heights. They are curved at right angles at their extremity. There are numerous diaphragms. The mesopores are rather numerous in the tangential sections and smaller than the tubes. In the longitudinal sections they appear of the same diameter as the tubes and are rarely oriented in the same direction; this results in a complex structure on the zoarial margins which is very difficult to interpret. This phenomenon is not rare, and we have already observed it in Reteporidae; this is the characteristic of divergent mesopores.

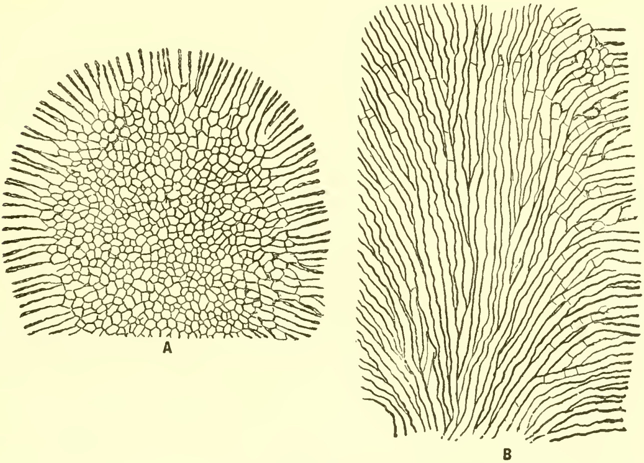


FIG. 31.—Tretocycloecia dichotoma Reuss, 1847.

A. Portion of a transverse section, × 12.
B. Longitudinal section, × 12.
Miocene (Helvetian): Doué-la-Fontaine (Maine-et-Loire), France.

The tubes and the mesopores are polygonal; their walls are not vesicular.

The ovicell is orbicular, little deep, placed on the mesopores. It is perforated by a certain number of tubes accompanied by a row of mesopores. The oeciopore is submedian and of a diameter smaller than that of the tubes.

The zoarium is often formed of many successive lamellae of zooecia. The enveloping lamella is capable of covering the ovicell itself, the fragile wall of which is thus preserved and may be rediscovered.

The peristomes are little salient. On the zoarial surface they are often grouped in radial rows around a hypothetic center.

In spite of its exterior appearance, this species is not *Ceriopora dichotoma* Goldfuss, 1827. Not only the ovicell is quite different, but also the sections are not identical for there is no internal basal lamella.

Occurrence.—Miocene (Helvetian): Doué-la-Fontaine (Maine-et-Loire), France.

Geological distribution.—Tortonian of Austria Hungary (Reuss). Plaisancian of England (Busk).

Plesiotype.—Canu collection and Cat. No. 68956, U.S.N.M.

TRETOCYCLOECIA (HETEROPORA) PELLICULATA Waters, 1879.

Plate 13, figs. 9, 10.

1910. *Heteropora pelliculata* ROBERTSON, Cyclostomatous Bryozoa of the West Coast of North America, University of California publications, vol. 6, p. 258, pl. 25, figs. 51–55 (bibliography).

1920. *Heteropora pelliculata* CANU and BASSLER, North American Early Tertiary Bryozoa, Bull. 106 U. S. National Museum, p. 681, figs. 222, J, K, L (sections).

In 1920 we published thin sections of this species, and we are now able to illustrate its ovicell, showing it to belong to the genus *Tretocycloecia*. At the extremity of the tubes the walls are vesicular; the vesicles are small and visible in tangential sections. The tubes are cylindrical with peripheral gemmation.

The ovicell is that of *Tretocycloecia*, but more irregular. We still have no knowledge of the anatomical details of this species, and it is hoped that living specimens will soon be dredged, so that we will be able to complete our studies of this remarkable genus in which the fossil representatives are very numerous.

Occurrence.—Recent: Japan, Australia, New Zealand, etc. Our specimens are from Neah Bay, Washington.

Plesiotypes.—Cat No. 7377, U.S.N.M.

TRETOCYCLOECIA SABAUDICA, new species.

Plate 18, figs. 5–9.

Description.—The zoarium is large, free, reticulate, with short, cylindrical branches growing in all directions. The tubes are cylindrical; the peristome is thin and little salient. The mesopores are numerous and often closed by a calcareous lamella. The ovicell is large, orbicular, little convex, surrounding a large number of tubes.

Occurrence.—Cretaceous (Greensand): Chamboy (?France). Type collected by Carl Rominger many years ago at a now unlocated locality marked Chamboy.

Holotype.—Cat. No. 68958, U.S.N.M.

Genus ALVEOLARIA Busk, 1859.

1859. *Alveolaria* BUSK, Monograph Fossil Polyzoa of the Crag, Publications Paleontographical Society, London, vol. 14, p. 128.

The tubes are cylindrical; mesopores are absent. The zoarium is an aggregation of cup-shaped bodies adjacent to each other by their basal lamella. The ovicell is irregular, not salient, placed at the center of each subcolony.

Genotype.—Alveolaria semiovata Busk, 1859. Plaisancian.

ALVEOLARIA SEMIOVATA Busk, 1859.

Plate 18, Figs, 1–4.

1859. *Alveolaria semiovata* BUSK, Monograph Fossil Polyzoa of the Crag, Publications Paleontological Society, London, vol. 14, p. 128.

Busk has very well described and figured the structure of this genus and species and we here can only add some additional notes

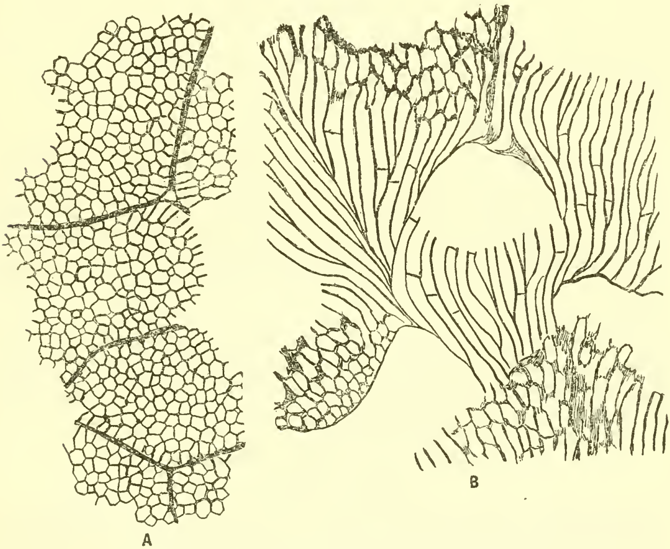


FIG. 32.—Alveolaria semiovata Busk, 1859.

A. Transverse section, × 16.
B. Longitudinal section, × 16, through several subcolonies.
Pliocene (Plaisancian): Sudbourne Church, Suffolk, England.

from the study of thin sections. Each subcolony is a sort of bowl covered exteriorly with a basal lamella (epitheca of D'Orbigny). The tubes are cylindrical and adjacent on the entire length of their concourse. They grow by dorsal gemmation in the vicinity of the basal lamella and by peripheral budding in the middle of each subcolony. Diaphragms are present.

The ovicell is of the exact type of the Tretocycloeciidae; the tubes which perforate it are often closed by a calcareous lamella. The zoaria of *Psilosolen* differ from *Alveolaria* only in a more elongated form of the branches and in the absence of dorsal budding. *Alveolaria* is an aggregation of non-digitate colonies like *Telepora* Canu and Bassler 1920. When we know the internal structure of this latter genus from thin sections it may perhaps be necessary to unite it with *Alveolaria.*

Occurrence.—Pliocene (Plaisancian): Sudbourne Church, etc., Suffolk, England.

Plesiotypes.—Cat. No. 60363 U.S.N.M.

PSILOSOLEN, new genus.

Psilos-unfurnished and *solen*, tube.

Tretocycloeciidae in which there are no adventitious tubes. The tubes are cylindrical, with peripheral gemmation.

Genotype.—*Psilosolen capitiferax*, new species.

Range.—Pleistocene, Recent.

The ovicell is a swelling perforated by the tubes as in the Diaperoeciidae, but it is not inserted in the tubes themselves. On the contrary, the ovicell is perpendicular to the tubes and surrounds only the peristomes, as in the family Tretocycloeciidae, where this new genus may be naturally classed. The ovicell is little convex and very different from the elongated and very salient sac of the Ascosoeciidae.

It is remarkable to note again that through the geological ages it is the simplest form of the family that has persisted. The Cretaceous and Tertiary genera of this family are more complicated and provided with adventitious tubes.

PSILOSOLEN CAPITIFERAX, new species.

Plate 13, fig. 8.

Description.—The zoarium is free, with the form of *Entalophora*, more or less compressed, dichotomous; the extremity of the branches is enlarged, flattened, and *bears the ovicell.* The tubes are visible, separated by a furrow, convex, wrinkled transversely, somewhat widened at the summit; the peristome is thin, salient, elliptical or suborbicular. The ovicell is a swelling covering the extremity of a branch; it is perforated by a dozen tubes, some of which are closed by a finely porous diaphragm.

Measurements.—	Diameter of peristome	0.16–0.18 mm.
	Distance between peristomes	.50–1.35 mm.
	Diameter of orifice	.12 mm.
	Separation of peristomes	Variable.
	Diameter of tube	.18– .20 mm.

Structure.—The internal structure of this species is described and illustrated in detail in our volume on the Later Tertiary and Quaternary Bryozoa of North America now in press. The ovicell, located at the end of the branch, is not very salient. It is hollowed out of the zoarium itself, as is easy to verify in the sections.

Affinities.—Our species is almost identical with *Entalophora capitata* Robertson, of whose variations we are ignorant. It differs from it in its ovicell, which completely covers the end of the branch, and in the smaller micrometric dimensions (if the enlargement indicated on Miss Robertson's figures is exact).

Occurrence.—Pleistocene: Santa Barbara (very common) and Dead Mans Island (rare), California.

Cotypes.—Cat. No. 68959, U.S.N.M.

Family ASCOSOECIIDAE Canu, 1919.

1919. Ascosoeciidae CANU, Etudes sur les Ovicelles des Bryozoaires Cyclostomes (2), Bulletin Société Geologique de France, ser. 4, vol. 17, p. 336.

The ovicell is a large, elliptical, elongate swelling, quite salient and perforated by the tubes; often a median oeciopore is present.

In addition to the genus *Ascosoecia*, *Parascosoecia*, and *Polyascosoecia* described under this family in our monograph of 1920, we are now able to refer the following genera to it: *Sulcocava* D'Orbigny, 1850; *Filicrisina* D'Orbigny, 1852; *Cavarinella* Marsson, 1884, and the new genera *Grammascosoecia* and *Grammanotosoecia*.

The Ascosoeciidae and Cytisidae are perhaps the two principal families of Cretaceous cyclostomatous bryozoa, as the seas of that time abounded in their species. The Cytisidae is entirely extinct, while the Ascosoeciidae existed, greatly diminished, during the Cenozoic and are rarely found in recent seas.

KEY FOR DETERMINATION OF GENERA OF ASCOSOECIIDAE.

1.	Gemmation triparietal	2.
	Gemmation biparietal	4.
2.	Median lamella	*Grammascosoecia.*
	No median lamella	3.
3.	Vacuoles on the dorsal; mesopores on the frontal	*Polyascosoecia.*
	No frontal mesopores. The walls of the tubes are very thick at their extremities	*Crisina.*
4.	Tubes cylindrical	5.
	Tubes conical	6.
5.	Mesopores only	*Ascosoecia.*
	Mesopores and vacuoles	*Reteporidea.*
6.	No mesopores, Sulci present	*Sulcocava.*
	Mesopores regular (parietal)	*Parascosoecia.*
7.	No mesopores { dorsal dactylethrae	*Filicrisina.*
	No mesopores { peripheral sulci	*Sulcocava.*

Genus PARASCOSOECIA Canu, 1919.

1920. *Parascosoecia* Canu and Bassler, North American Early Tertiary Bryozoa, Bull. 106, U. S. National Museum, p. 840. (Give description and illustration.)

PARASCOSOECIA CICATRIX Gregory, 1899.

1899. *Sparsicavea cicatrix* Gregory, Catalogue of Cretaceous Bryozoa, p. 391, fig. 52.

1897. *Peripora pseudospiralis, Heteropora clava, Heteropora obliqua,* Canu, Bryozoaires du Turonian de St. Calais, Bulletin Société geologique de France, ser. 3, vol. 25, pp. 746, 747.

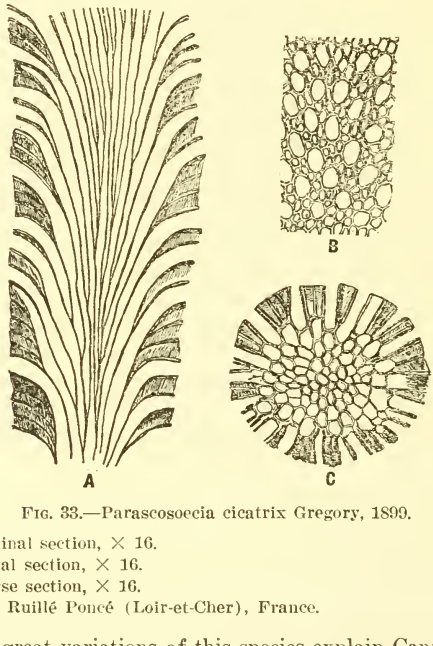


Fig. 33.—Parascosoecia cicatrix Gregory, 1899.

A. Longitudinal section, × 16.
B. Tangential section, × 16.
C. Transverse section, × 16.
Cretaceous: Ruillé Poncé (Loir-et-Cher), France.

The very great variations of this species explain Canu's errors in determination. The pellicule which closes the mesopores disappears often in fossilization, and the specimens have then most fantastic aspects.

In 150 specimens from Canu's collection but one ovicell has been found.

The authors (Gregory, Novak, etc.) have given to the mesopores of this zoarial form, *Sparsicavea*, a too great regularity and a general aspect which does not correspond to the reality observed in thin sections. A simple, longitudinal section causes two thick lateral walls to appear perforated by the mesopores. This is an optical illusion caused by the relative regularity of the mesopores and the great thickness of their walls. We have called these structures parietal mesopores.

Pergens, in 1889, observed the identity of the mesopores of *Sparsicavea* with those of *Heteropora* and classified all the species in the latter genus. He found it necessary since to separate them, because in *Sparsicavea* the tubes are club shaped.

In the form of the ovicell this species must be classified in the Ascosoeciidae.

Occurrence.—Cretaceous (Upper Turonian or Angoumian) : Ruillé-Poncé (Loir-et-Cher), Les Janieres and St. Calais (Sarthe), France (Canu collection).

Geological distribution.—Turonian and Coniacian of France (Gregory).

Plesiotypes.—Cat. No. 68978, U.S.N.M.

PARASCOSOECIA MARSSONI Gregory, 1899.

Plate 19, fig. 11.

1887. *Sparsicavca irregularis* Marsson, Die Bryozoen der weissen Schreibkreide der Insel Rügen, Palaeontologische Abhandlungen, vol. 4, p. 26, pl. 2, fig. 6 (not d'Orbigny).

1899. *Sparsieavea marssoni* Gregory, Catalogue of Cretaceous Bryozoa in British Museum, vol. 1, p. 397; 1909, vol. 2, p. 304 (Synonymy).

We have discovered a superb ovicelled specimen of this species which is figured on plate 19.

Occurrence.—Cretaceous (Danian) : Herfolge (Seeland), Denmark.

Geological distribution.—Cretaceous (Campanian) : Island of Rügen, Germany.

Plesiotype.—Cat. No. 68961, U.S.N.M.

PARASCOSOECIA FRANCQANA D'Orbigny, 1852.

Plate 19, fig. 12.

1852. *Sparsicavea francqana* d'Orbigny, Paleontologie française, Terrain Crétacé, Bryozoaires. p. 951, pl. 775, figs. 4–6.

The ovicell of this species measures 1.35 mm. by 0.66 mm. Gregory, 1899, was in error in uniting the species with *Sparsicavea carantina* D'Orbigny, 1852.

Occurrence.—Cretaceous (Danian) : Herfolge (Seeland), Denmark.

Geological distribution.—Cretaceous (Senonian) : Département du Nord, France.

Plesiotype.—Cat. No. 68962, U.S.N.M.

Genus CRISINA D'Orbigny, 1852.

1852. *Crisina* D'ORBIGNY, Paleontologie française, Terrain Crétacé, vol. 5, p. 912.

1887. *Crisidmonea* MARSSON, Bryozoen der weissen Schreibkreide der Insel Rügen, Paleontologische Abhandlungen, vol. 4, p. 30.

The ovicell is a globular sac, very salient, unsymmetrical, inclosing the opposite lines of each side of the median crest on almost all of the zoarial width. The inclosed peristomes are more salient and larger. The tubes are short, club shaped, with triparietal gemmation; their calcareous walls are very thick at their extremity. The dorsal is very thick, of lamellar structure, and perforated by scattered vacuoles.

Genotype.—*Crisina normaniana* D'Orbigny, 1852.

Range.—Cenomanian-Campanian.

This genus is very close to *Polyascosoecia* and differs in its ovicell covering all the zooecial width, in the absence of frontal mesopores, and in its short club-shaped tubes with dilated walls.

The structure of the genus *Crisidmonea* Marsson, 1887, is identical, but its ovicell is not known.

The known species are: *Crisina normaniana* D'Orbigny, 1850; *C. triangularis* D'Orbigny, 1851; *Crisina subgradata* D'Orbigny, 1850; *Crisidmonea macropora* Marsson, 1887; *Idmonea prima* Pocta, 1892; and *I. cretacea* Milne-Edwards, 1838.

The genus *Crisina* of D'Orbigny is also one which has been poorly interpreted by the authors who have succeeded him and which it is necessary to reestablish within the exact limits fixed by the French paleontologist. His definition is as follows: "Colonie fixe par sa base, d'où partent des rameaux libres, anguleux, divisés par des dichotomisations sur le même plan, représentant un ensemble dendroïde. Chaque branche est mince en dessus, de chaque côté, de lignées transversales de cellules, occupant chacune un des côtés, et alternant entre elles au milieu. Le dessous offre, par lignes longitudinales, des pores opposés plus ou moins larges, non saillants et souvent dans des fossettes longitudinales. L'accroissement a lieu seulement à l'extrémite des rameaux par des germes de cellules; quelquefois des vésicules ovariennes sur le côté des rameaux sous forme de boursouflures."

D'Orbigny did not wish to classify in this genus all the Idmoneas provided with pores of whatever nature on the reverse. The three species which he has described are provided with widely spaced pores (vacuoles) placed at the base of longitudinal fossettes (sulci). The sections which we have made of *Crisina triangularis* and *normaniana* confirm entirely this interpretation of his text.

D'Orbigny has classified in the same genus three species of Reuss not provided with sulci and only from an examinataion of the figures.

This unfortunate generalization has encouraged Pergens, Stoliczka, and others to give to the genus a much broader sense, and they have not taken into account the nature of the pores. But one must not forget that D'Orbigny made an attempt at a general classification and his generic definitions alone have an exact value.

In 1899 Gregory generalized further. He applied the term *Crisina* to that group which the zoologists have always called *Idmonea*, on the pretext that the pores have no morphological value. It is evident that the pores have not a great value of classification, but they have some value, for they are never replaced one

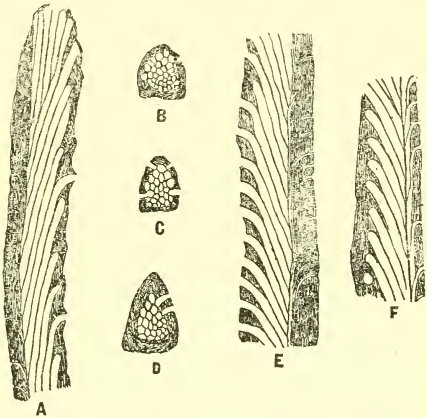


FIG. 34.—Genus Crisina D'Orbigny, 1852.

A–C. Longitudinal section, × 16, of Crisina normaniana D'Orbigny, 1852, (A) and transverse sections, × 16 (B, C).

Cretaceous (Coniacian): Fecamp (Seine inferieure), France.

D–F. Transverse section, × 16, of C. triangularis D'Orbigny, 1851 (D), and longitudinal sections, × 16, one (E) in the middle of a branch, the other (F) through the extremity of a branch and showing the origin of the vacuoles.

Cretaceous (Coniacian): Tours (Indre-et-Loire), France.

by the other, and in a given species their form and their presence are constant.

We have discovered the ovicell of *Crisina normaniana* D'Orbigny, 1852, and find it is of the type of *Ascosoecia*.

Summarizing the genus *Crisina* D'Orbigny, 1850, is perfectly limited by his definition, its ovicell, and the internal structure. Among the species cited by D'Orbigny, *Retepora lichenoides* is a member of our genus *Polyascosoecia*, and the species of Reuss are incompletely studied. Those which are described and figured in Paleontologie française are of the *Ascosoecia* type.

CRISINA NORMANIANA D'Orbigny, 1852.

Plate 20, figs. 9–14.

1852. *Crisina normaniana* D'ORBIGNY, Paleontologie française, Terrain Crétacé, vol. 5, p. 914, pl. 612, figs. 1–5.

D'Orbigny's figure is perfectly exact. The dorsal is usually ornamented with three sulci alone. The zoarium is much smaller than that of *Crisina triangularis.*

D'Orbigny's figured type came from Fecamp, which has yielded our figured specimens also. The ovicell has been discovered in the material coming from a geode. This remarkable locality, extraordinarily rich in bryozoa, is celebrated for its geodes of flint; on breaking these their interior shows multitudes of bryozoa and sponge spicules, admirably preserved.

This ovicell is globular and of the type of *Ascosoecia;* it incloses the transverse and opposite lines on the full zoarial width. The peristomes are longer, larger, and are not so adjacent, exhibiting therefore the same structure as in the genus *Polyascosoecia.* The only difference is in the position occupied by the ovicell.

The sections are identical with those of *Crisina triangularis* D'Orbigny, a larger and more easily sectioned species.

Occurrence.—Cretaceous (Coniacian): Fecamp (Seine inférieure), France.

Plesiotypes.—Canu collection and Cat. No. 68963, U.S.N.M.

CRISINA TRIANGULARIS D'Orbigny, 1851.

Plate 20, figs. 15–21.

1851. *Crisina triangularis* D'ORBIGNY, Paleontologie française, Terrain crétacé, vol. 5, Bryozoaires, p. 915, pl. 612, figs. 11–15; pl. 769, figs. 11–14.

1851. *Crisina ligeriensis* D'ORBIGNY, Paleontologie française, Terrain crétacé, vol. 5, p. 265, pl. 614, figs. 11–15.

1899. *Retecava cretacea* GREGORY, Catalogue of the Cretaceous Bryozoa in the British Museum, vol. 1, pl. 9, fig. 8 (not synonymy).

Gregory identified this species with *Idmonea cenomana* D'Orbigny, 1851. This is incorrect, as is also his synonomy. However, he gives a figure under the name *Retecava cretacea*, which does not correspond at all to the text and which, if it is correct, represents *Crisina triangularis.* The Canu collection contains a great number of D'Orbigny's species, collected at the same localities. Their study shows that Gregory's synonymy for *Crisina triangularis* and for *Retecava cretacea* is absolutely incorrect. The figures of D'Orbigny are very accurate for the present species, and there is little to be added to his description.

In vertical section the tubes are short with peristome, with triparietal gemmation, oriented, somewhat club shaped; the walls are much dilated at their extremity, forming a thick frontal. The dorsal is very thick, of lamellar structure, and perforated by the scattered vacuoles. These latter appear to come from either side of the basal lamella.

In transverse section the zoarial walls are very thick; the tubes are almost equal, the smallest being in the vicinity of the dorsal.

The sulci of the dorsal disappear in tangential sections. These latter show that the calcification operates by very fine and juxtaposed calcareous elements in each lamella. The structure of the zoecial walls on the frontal is identical.

Occurrence.—Cretaceous (Coniacian): Tours (Indre-et-Loire), St. Paterne et Villedieu (Loire-et-Cher), France.

Geologic distribution.—Coniacian, Santonian, Campanian, and Maastrichtian of France (D'Orbigny, Pergens).

Plesiotypes.—Canu collection and Cat. No. 68964, U.S.N.M.

GRAMMASCOSOECIA, new genus.

(Greek: *gramme*, line, in allusion to the black median line of transverse sections.)

The ovicell is a large suborbicular sack. The tubes are cylindrical, short, without peristome, with dorsal gemmation. The mesopores are regular, short, peripheral. The basal lamella is linear.

Genotype.—*Grammascosoecia* (*Ceriopora*) *dichotoma* Goldfuss, 1827. Maastrichtian.

This genus differs from *Ascosoecia*, in which the tubes are also cylindrical in the presence of short tubes and in the dorsal gemmation on a basal lamella.

It differs from *Reteporidea* D'Orbigny, 1850, in the presence of the short tubes, the dorsal and nonperipheral gemmation and the absence of lamellar structure at the zoarial periphery. It differs from the genus *Parascosoecia* in its cylindrical and nonconical tubes.

In this abundant family, Ascosoeciidae, each genus is clearly characterized either by its system of gemmation or by the form of its tubes, a form which we know corresponds to some special anatomical structure.

GRAMMASCOSOECIA DICHOTOMA Goldfuss, 1827.

1827. *Ceriopora dichotoma* GOLDFUSS, Petrefacta Germaniae, vol. 1, p. 34, pl. 10, fig. 9.

1851. *Heteropora dichotoma* HAGENOW, Die Bryozoen der Maastrichter Kreidebildung, p. 47, pl. 5, fig. 75.

1851. *Heteropora undulata* HAGENOW, Die Bryozoen der Maastrichter Kreidebildung, p. 47, pl. 5, fig. 16.

1851. *Heteropora tenera* HAGENOW, Die Bryozoen der Maastrichter Kriedebildung, p. 47, pl. 5, fig. 14.

?1894. *Heteropora dichotoma* HENNIG, Studier öfver Bryozoerna i Sveriges Kritsystem II, Cyclostomata, Lunds Universitets Arsskrift, vol. 30, no. 8, p. 22, fig. 12.

?1899. *Sparsicavea undulata* GREGORY, Catalogue of Cretaceous Bryozoa in British Museum, p. 289, figs. 50, 51 (Bibliography).

1899. *Sparsicavea dichotoma* GREGORY, Catalogue of Cretaceous Bryozoa in the British Museum, vol. 1, p. 393, vol. 2, p. 304.

1889. *Heteropora dichotoma* PERGENS, Revision des Bryozoaires du Crétacé figurés par d'Orbigny, Mémoires de la Société Belge de Géologie de Paleontologie et d'Hydrologie, vol. 3. p. 373.

1854. *Multicrescis laxata*, D'ORBIGNY, Paleontologie française, Terrain Crétacé, vol. 3, p. 1077, pl. 800, figs. 10, 11 (according to Pergens).

Structure.—The structure of this species has not been comprehended by the various authors who have studied it. The section figured by Hennig is incomplete and does not indicate the basal lamella.

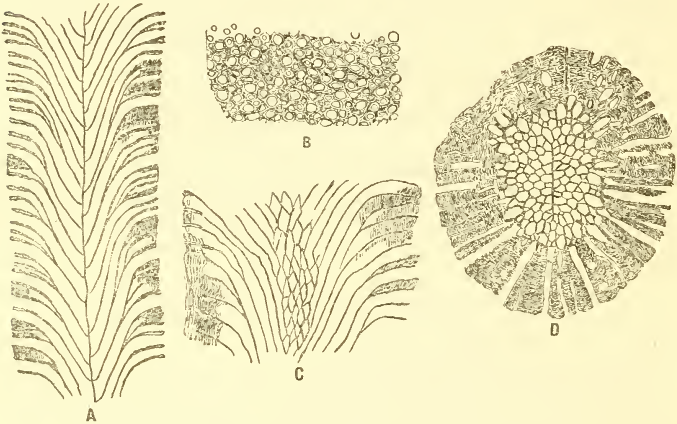


FIG. 35.—Grammascosoecia dichotoma Goldfuss, 1827.

A. Longitudinal section, × 16, showing the basal (median) lamella.
B. Tangential section, × 16.
C. Meridian section, × 16, taken just above the basal lamella.
D. Transverse section, × 16.
Cretaceous (Maastrichtian): Maastricht, Holland.

The transverse section shows in the middle a linear structure always undulated, which represents the remains of the basal lamella. The tubes are polygonal with adjacent walls, perceptibly equal; the inequalities arise from the section which is made perpendicularly to the zoarial axis and not to the tubes.

The longitudinal section should be made perpendicularly to the basal lamella, always visible on the transverse fractures. The tubes are cylindrical, short, supported on the basal lamella according to the method special to all short tubes; at their extremity they are recurved at right angles and their walls are thicker. The mesopores are regular; that is to say, somewhat parallel to the extremity of the tubes; between two peristomes there are generally two, a large and a small one, but the variations and exceptions are quite frequent. They are always formed by ramifications of the proximal tube.

In tangential section the tubes and the mesopores have thick walls. Above each orifice there are always at least two mesopores arranged somewhat transversally and not longitudinally; this arrangement explains the presence of a small and a large mesopore in the longitudinal sections.

The presence of the median basal lamella gives to the zoarium the aspect of a *Mesenteripora* provided with mesopores. The fronds are rarely cylindrical, but are almost always slightly compressed. The meridian section prepared in the immediate vicinity of the basal lamella shows the losenge-shaped areas wider and less geometrical than in the species with club-shaped tubes. They are longer when the section is further removed from the basal lamella.

Affinities.—The three species of Hagenow, *Heteropora tenera*, *dichotoma*, and *undulata*, really form only a single species. Not only are the sections absolutely identical, but all the intermediate stages between these three forms have been found. Gregory, 1909, under the name of *Sparsicavea undulata*, described a species with conical tubes, without basal lamella, which we can not believe is the same as Hagenow's species.

The exterior aspect of these fossils is quite deceiving. For example, *Tretocycloecia dichotoma* Reuss, 1847, has really an analogous aspect, but nevertheless it is not provided with a basal lamella and belongs to a different family. Likewise, the undulated aspect of the zoarium is a character without importance, as may be observed on a large number of species of different families. The section of Hennig, 1894, is incomplete and we are not entirely certain of its determination, since he has not figured the basal lamella. Likewise Pergens, 1889, did not mention it in *Multicrescis laxata* D'Orbigny, 1854.

Occurrence.—Cretaceous (Maastrichtian): Maastricht, Holland.

Plesiotypes.—Cat. No. 68965, U.S.N.M.

GRAMMASCOSOECIA POROSA, new species.

Plate 21, figs. 9, 10.

Description.—The zoarium is branched or reticulated; the fronds are divergent, irregular, and compressed (elliptical in transverse section). The tubes are cylindrical, short, without peristome, with dorsal gemmation on the basal lamella. The orifices are arranged in irregular quincunx and more or less grouped around the porous elliptical areas formed of a large number of mesopores. The mesopores are small, polygonal, variable in number about each tube. The basal lamella is undulated when it is long and rectilinear when it is very short.

Measurements.—
Diameter of branches .... 5.00 mm.
Diameter of orifices .... 0.10 mm.

Affinities.—We have not discovered the ovicell of this species, and are therefore not able to affirm its classification without doubt, but

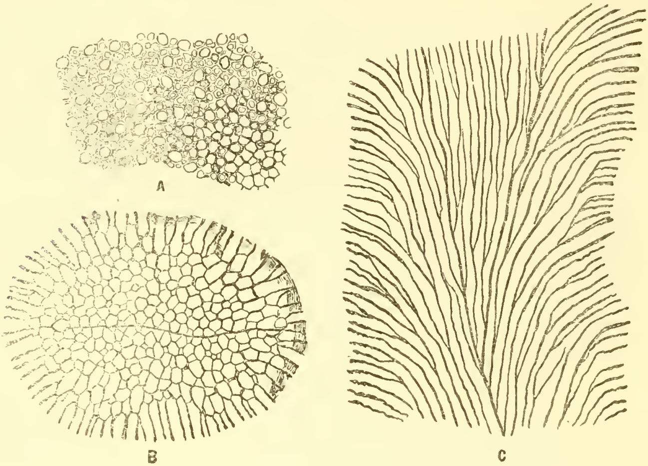


Fig. 36.—Grammascosoecia porosa, new species.

A. Tangential section, × 16.
B. Transverse section, × 16.
C. Longitudinal section, × 16. The basal lamella bifurcates.
Recent: South Africa.

its structure otherwise is absolutely analogous to that of *Grammascosoecia dichotoma* Goldfuss, 1827. Evidently this reason is not sufficient to classify the two species in the same genus, but it was interesting to discover this same structure in a recent species.

Occurrence.—South Africa. The specimens of this species were some time ago sent to Canu by Miss Jelly.

Cotypes.—Canu collection and Cat. No. 7378, U.S.N.M.

GRAMMASCOSOECIA PARVIPORA, new species.

Plate 21, fig. 7, 8.

Description.—The zoarium is free, cylindrical. The peristomes are small, arranged in regular quincunx, close to each other, thin, salient.

The tubes are cylindrical, recurved at their extremity and separated by the small mesopores irregularly arranged. The ovicell is very large, orbicular, very convex, perforated by a large number of tubes.

Measurements.—	Diameter of peristomes	0.10 mm.
	Distance of peristomes	.42 mm.
	Separation of peristomes	.42 mm.
	Diameter of zoarium	2.00 mm.

Affinities.—This species differs from *Grammascosoecia dichotoma* Goldfuss, 1827, in its smaller micrometric dimensions, in its more salient peristomes, and in a smaller number of mesopores between the peristomes.

In transverse section the basal lamella is very short. The zoarium is surrounded by a thick lamellar tissue, perforated by the mesopores. The intensity of calcification is so great that the mesopores have the aspect of vacuoles in longitudinal sections.

Occurrence.—Cretaceous (Maastrichtian): Maastricht, Holland.

Holotype.—Cat. No. 68967, U.S.N.M.

GRAMMANOTOSOECIA, new genus.

Greek, *gramme*, line, and *notos*, back or dorsal.

Ascosoeciidae with orbicular ovicell. The tubes are long, cylindrical, without peristome, with dorsal gemmation on a basal lamella. There are numerous mesopores between the tubes.

Genotype.—*Grammanotosoecia contorta*, new species. Santonian, Campanian.

In the presence of a median lamella in transverse sections of the free specimens and in the exterior aspect, this genus has much resemblance to *Ditaxia* Hagenow, 1851. It differs from it in the nature of its ovicell, which is like that in the Ascosoeciidae (and not the Liosoeciidae). and in the dorsal gemmation instead of triparietal. It differs from *Grammascosoecia* in its dorsal instead of triparietal gemmation.

GRAMMANOTOSOECIA CONTORTA, new species.

Plate 21, fig. 1–6.

Description.—The zoarium is free and formed of large, narrow, elongated, bilamellar fronds *twisted* around a central axis. The tubes are cylindrical, with dorsal gemmation on a median lamella, without peristome; their orifice is orbicular. The mesopores are numerous, small, polygonal. The ovicell is large and orbicular, perforated by the tubes but not by the mesopores.

Measurements.—	Diameter of orifice	0.10–0.12 mm.
	Diameter of ovicell	1.50 mm.
	Width of fronds	2.00–4.00 mm.

Structure.—The mesopores are distributed irregularly over the zoarial surface. The orifices are similarly distributed, and often their ensemble affects the aspect of *Zonopora.*

The fronds being twisted, it is very difficult to obtain good longitudinal sections. Moreover, our specimens are so highly calcified that we have not been able to make the sections thin enough for good photography. Nevertheless we have been able to verify that the tubes were cylindrical and that the gemmation was dorsal. The median lamella is thin and fragile.

In transverse section the tubes everywhere have the same diameter, showing that they are cylindrical. The small tubes adjacent to the median line being much smaller, reveal the dorsal gemmation. The median lamella is very thin and rectilinear.

Occurrence.—Cretaceous (Santonian): St. Bonnier and Deviat (Charente), France.

Cretaceous (Campanian): Gaineau, Brossac, Montmoreau, Maud, Saint Médard, Saint Aulais and Salles (Charente), France.

Cotypes.—Canu collection and Cat. No. 68968, U.S.N.M.

Genus POLYASCOSOECIA Canu and Bassler, 1920.

1920. *Polyascosoecia* CANU and BASSLER, North American Early Tertiary Bryozoa, Bull. 106 U. S. National Museum, p. 837.

The ovicell is globular, salient, spread between the fascicles whose length it augments, placed eccentrically on the frontal. The tubes are cylindrical, oriented, short, with triparietal gemmation; they ramify into numerous mesopores or vacuoles on the frontal. The dorsal of the zoarium is thick, with lamellar structure, and perforated by vacuoles bent toward the base.

Genotype.—*Polyascosoecia coronopus*, new species.

Range.—Jacksonian-Plaisancian.

This genus differs from *Pleuronea*, in which the ovicell is placed identically, not only in the different nature of the ovicell, but in its cylindrical tubes. It differs from the genus *Erkosonea*, equally provided with pores on the two faces of the zoarium, in its ovicell placed laterally, and in its short cylindrical tubes, with triparietal gemmation.

The known species belonging to this genus are as follows:

Polyascosoecia coronopus, new species. Helvetian.
Polyascosoecia jacksonica Canu and Bassler. Jacksonian.
Polyascosoecia imbricata Canu and Bassler. Jacksonian.
Polyascosoecia (*Hornera*) *sparsa* Reuss, 1864. Latdorfian.
Polyascosoecia (*Crisina*) *foraminosa* Reuss, 1865. Rupelian (Stampian).
Polyascosoecia (*Crisina*) *canaliculata* Reuss, 1865. Rupelian (Stampian).

Polyascosoecia (*Idmonea*) *foraminosa* Manzoni, 1877. Miocene.

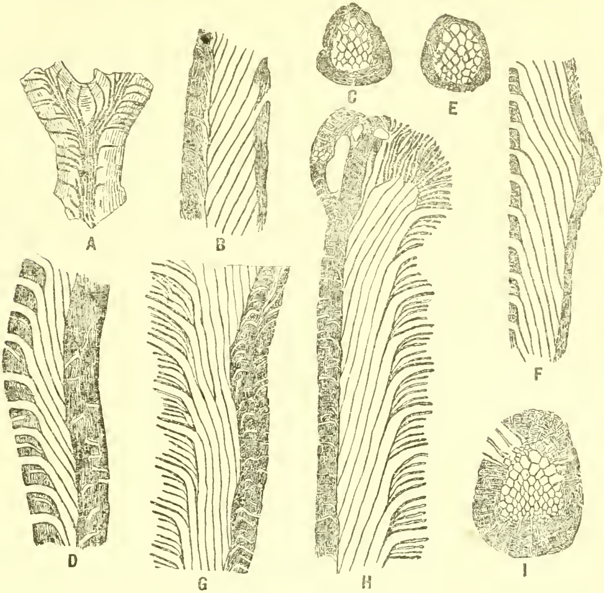


FIG. 37.—Genus Polyascosoecia Canu and Bassler, 1920.

A–D. *Polyascosoecia lichenoides* Goldfuss, 1827.

A. Longitudinal section, × 12, showing the zooecia perforating the thick lamellar structure (after Gregory).

B. Longitudinal section, × 16.

C. Transverse section, × 16.

D. Another longitudinal section, × 16.

Cretaceous (Maastrichtian): Maastricht, Holland.

E, F. *Polyascosoecia cancellata* Goldfuss, 1829.

Transverse and longitudinal sections, × 16.

Cretaceous (Maastrichtian): Maastricht, Holland.

G–I. *Polyascosoecia coronopus*, new species.

G. Longitudinal section, ×16, of a zoarium with a second dorsal layer.

H. Longitudinal section, × 16, showing the zooecia and mesopores to the right and the lamellar tissue pierced with vacuoles to the left.

I. Transverse section, × 16.

Miocene (Helvetian): Mus (Gard), France.

Polyascosoecia (*Idmonea*) *cancellata* Reuss, 1847 (not Goldfuss). Miocene.

Polyascosoecia (*Idmonea*) *punctata* Busk, 1859. Plaisancian.

Polyascosoecia (*Idmonea*) *lichenoides* Goldfuss, 1847. Maastrichtian.

Polyascosoecia (*Idmonea*) *cancellata* Goldfuss, 1827. Campanian (Danian).

The last two species, in which the frontal mesopores are replaced by vacuoles, will probably be referred to another genus when the ovicells are better known.

POLYASCOSOECIA CORONOPUS, new species.

Plate 20, fig. 1–8.

Description.—The zoarium is idmoneiform, borne on an expanded base attached to marine objects; the branches are ramified dichotomously like the horn of a deer. The linear fascicles are little salient, formed of 5–6 tubes; they are opposite with respect to the median axis of the zoarium and somewhat distant from the latter. The tubes are cylindrical and oriented (longitudinal section). There are mesopores on the anterior face and vacuoles on the posterior face. The ovicell is a large salient sack placed to the right or left of the median axis between three fascicles.

Measurements.—	Width of fascicles	0.10 mm.
	Separation of fascicles	.24 mm.
	Diameter of tubes (in section)	.12 mm.
	Diameter of basal trunk	1.50 mm.
	Diameter of branches	1.00 mm.

Structure.—The general aspect is that of an *Idmonea* entirely covered with pores on all sides of the zoarium; but the study of thin sections indicates that these pores have not the same structure nor the same function.

In transverse section all the tubes have not the same diameter, and we can only surmise that the tubes are club shaped. The longitudinal section indicates short cylindrical tubes. This discordance arises from the fact that this section has been made perpendicularly to the zoarial axis and not to the direction of the tubes. A transverse section with unequal tubes crossing from the center to the circumference can therefore reveal, in the Idmoneoid forms, likewise some long, club-shaped tubes as well as short, cylindrical tubes. The necessity of longitudinal sections is therefore absolute.

In longitudinal section the cylindrical tubes are oriented on the same side of the basal lamella; they grow on the dorsal, one from the other according to the ordinary rule of oriented zooecia. At their extremity they branch into three or four mesopores very regular in their length and their direction. The dorsal is very thick and formed by lamellar tissue similar to that in the Horneridae; it is perforated by vacuoles. These small tubes appear to grow one from the other on the other side of the basal lamella; they are bent at right angles and are terminated obliquely and directed toward the base. We are unable to say if they were completely independent of the adjacent tubes or if they were formed from the divergent branches. We believe more in their independence, for the cylindrical tubes multiply by successive bifurcation, which is not the case. Moreover, the dorsal may be formed by two lamellae of vacuoles. The presence of a polypide is therefore not necessary to the life of the accessory tubes.

The base of the zoarium is expanded. Unfortunately we have not been able to make a section and we are ignorant of its mode of formation.

The ovicell slightly resembles *Pleuronea;* but in the family Tubuliporidae the tubes surrounded by the ovicell never modify their length. On the contrary, in the family Ascosoeciidae the peristomes of the tubes surrounded by the ovicell are much elongated, so that they are either isolated (*Ascosoecia*) or, as here, they are fasciculated. These tubes are always open, but they may be closed by fossilization or by accident.

Affinities.—The Cretaceous species figured by Goldfuss have a reticulate zoarium, and we have no knowledge of its internal structure. In this connection we may observe that species having a similar aspect may have absolutely different relationships.

Retepora lichenoides Goldfuss, 1827, which Gregory classed as *Retecava*, is a Cretaceous species quite similar not only in its exterior aspect but also in the presence of dorsal vacuoles, but it differs from the present form in the presence of frontal mesopores (and not vacuoles).

Crisina foraminosa Reuss, 1851, and *Crisina canaliculata* Reuss, 1866, have the same exterior aspect, but we have no knowledge of its structure in these sections. Our species appears to differ in its more salient fascicles.

Occurrence.—Miocene (Burdigalian): La Combe near Mus (Gard), Sauveterre (Hérault), Les Angles (Gard), France.

Miocene (Helvetian): Loupian and Montagnac (Herault) and La Combe near Mus (Gard), France.

Cotypes.—Canu collection and Cat. No. 68969, U.S.N.M.

POLYASCOSOECIA LICHENOIDES Goldfuss, 1827.

1827. *Retepora lichenoides* GOLDFUSS, Petrefacta Germaniae. p. 29, pl. 9, fig. 13.

1851. *Idmonea lichenoides* HAGENOW, Die Bryozoen der Maastrichten Kreidebildung, p. 28, pl. 2, fig. 6.

1851. *Coelophyma granulatum* HAGENOW, Die Bryozoen der Maastrichten Kreidebildung, p. 106, pl. 2, fig. 17.

1899. *Retecava lichenoides* GREGORY, Catalogue of the Cretaceous Bryozoa in the British Museum, p. 194, fig. 16.

Sections of this species are difficult to make on account of the irregularity of its branches. We illustrate the best of our sections; and although they are not perfect, the real structure is shown.

The tubes are cylindrical, short, with triparietal gemmation, without peristome; their extremity is quite thick, forming a calcareous dilation perforated by a vacuole. The dorsal is very thick, of lamellar structure, and perforated by vacuoles.

The ovicell was long ago illustrated by Hagenow, but unfortunately has not been found again. We are therefore ignorant as to whether his figure is entirely exact. His drawing is too small and the tubes are not visible. Nevertheless, the place of the ovicell, its form, and the similarity of the sections cause us to place this species in *Polyascosoecia*.

The section given by Gregory is a meridian section; it confirms us in the nature of the adventitious pores, which are clearly vacuoles.

Geological distribution.—Cretaceous (Campanian): Rügen, Germany.

Cretaceous (Maastrichtian): Maastricht, Falkenberg, and Petit Lanage (Limbourg), Holland.

Plesiotypes.—Canu collection and Cat. No. 68970, U.S.N.M.

POLYASCOSOECIA CANCELLATA Goldfuss, 1829.

1829. *Retepora cancellata* Goldfuss, Petrefacta Germaniae, vol. 1, p. 103, pl. 36, fig. 17.

1851. *Idmonea cancellata* Hagenow, Bryozoen der Maastrichter Kreidebildung, p. 29, pl. 2. fig. 7.

1899. *Retecava concellata* Gregory, Catalogue of the fossil Bryozoa in the British Museum. Cretaceous, vol. 1, p. 202 (Bibliography).

1894. *Idmonea cancellata* Hennig, Studien öfver Bryozoerna I Sveriges Kritsystem, II, Lunds Universitets Arssdrift, vol. 30, no. 8, p. 10, pl. 1, figs. 4–6.

Structure.—Thin sections are very difficult to interpret in species with a thick lamellar structure. Nevertheless by combining all the different sections we can comprehend the real structure of the present species.

In longitudinal section the tubes are cylindrical with triparietal gemmation. A very thick lamellar tissue entirely surrounds the zoarium; it is perforated by the vacuoles. This structure is absolutely identical with that of *Polyascosoecia lichenoides* Goldfuss, 1829, and of *P. coronopus*, the genotype. Although we have not discovered its ovicell, we do not hesitate to class this species in the genus *Polyascosoecia*.

Geologic distribution.—Cretaceous (Campanian); Rügen, Germany (Hagenow, Marsson).

Cretaceous (Maastrichtian); Maastricht, Petit-Lanage, Fauquemont (Limbourg), Holland (Hagenow), Royan (Charente-inferieure), France (D'Orbigny).

Cretaceous (Danian); Faxe and D'Annetorp, Denmark (Hennig), *Plesiotypes.*—Canu collection and Cat. No. 68971, U.S.N.M.

Genus RETEPORIDEA D'Orbigny, 1852.

1852. *Reteporidea* D'ORBIGNY, Paléontologie Française, Terrain Crétacé, vol. 5.

The ovicell is a large inflation, quite convex, covering the entire width of the zoarium. The tubes are cylindrical, with peristome and with axial gemmation by bifurcation at all heights. There are divergent parietal mesopores on the anterior face and vacuoles buried in a lamellar tissue on the posterior face.

Genotype.—*Reteporidea royana* D'Orbigny, 1850. Cretaceous.

Historical.—Gregory in 1899 suppressed this genus of D'Orbigny because he identified it with *Semicellaria* and *Laterocavea* of the same author and because he had adopted the genus *Hemicellaria* D'Orbigny, 1847, which D'Orbigny had later declared to be erroneous. We could adopt the conclusions of Gregory only after the discovery of the ovicell of *Semicellaria* and *Laterocavea* and the preparation of the necessary sections.

Our studies having been based on typical specimens of *Reteporidea*, we are obliged to recognize D'Orbigny's genus in its original meaning.

Affinities.—This genus differs from *Ascosoecia* in the presence of vacuoles and in the great thickness of lamellar tissue over all the zoarium. It differs from *Parascosoecia* in its cylindrical and non-conical tubes.

RETEPORIDEA ROYANA D'Orbigny, 1854.

Plate 22, figs. 1–5.

1854. *Reteporidea royana* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, Bryozoaires, p. 937, pl. 608, figs. 1–5; pl. 772, figs. 17, 18.
1899. *Hemicellaria royana* GREGORY, Catalogue Fossil Bryozoa in British Museum, Cretaceous, p. 369 (Bibliography).

Measurements.—	Peristome	0.12 mm.
	Distance between peristomes	.36 mm.
	Separation of peristomes in quincunx	.36 mm.
	Diameter of branches	.80 mm.
	Dimension of the fenestrae	1.00 by 0.70–.80 mm.

Structure.—D'Orbigny's figures are absolutely exact. The tubes are arranged on the anterior face of the branches which is at the same time the exterior face of the zoarium. The latter assumes the form of a deep, conical cup whose interior was occupied by the noncellular face of the branches. The zoaria may attain the size of the hand. We have frequently found the ovicells broken.

In longitudinal section the tubes are cylindrical with peristome; they are oriented toward the exterior, but they branch at all heights, as in the zoarial form *Frondipora.* There is no basal lamella. The zoarial walls are very thick, and are formed of a much developed and very irregular lamellar tissue; the lamellae are separable.

The mesopores of the exterior face are divergent; they are not exactly parallel to the recurved extremity of the tubes; their section

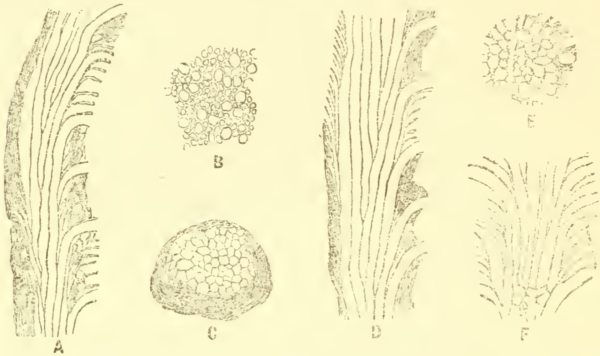


FIG. 38.—Genus Reteporidea D'Orbigny, 1852.

A–C. *Reteporidea royana* D'Orbigny, 1852.

A. Longitudinal section, × 16, illustrating the mesopores to the right and the vacuoles to the left.

B. Tangential section, × 16.

C. Transverse section, × 16.

Cretaceous (Maastrichtian): Royan, France.

D–F. *Reteporidea ramosa* D'Orbigny, 1854.

D. Longitudinal section, × 16, showing the vacuoles clearly.

E. Transverse section, × 16.

F. Meridian section, × 16, showing the structure of the mesopores.

Cretaceous (Maastrichtian): Royan, France.

is therefore complex and has not the regularity of *Sparsicavea.* Moreover, the zoarial lamellae complicate even more the general aspect.

On the dorsal the lamellar tissue is quite compact and it is difficult to see the nature of the dorsal pores which appear as vacuoles if the preparation is not thin enough.

In transverse section the zoarial walls appear also very thick and lamellar. The tubes are polygonal.

In the tangential section we observe some very small mesopores disseminated in small numbers between the tubes. This is not the exterior aspect, for the mesopores are quite expanded at their terminal extremity.

Affinities.—The peristomes are salient and thin. The mesopores are much expanded, irregularly arranged around the peristomes. On the dorsal the vacuoles are also much expanded in their terminal portion; they are arranged in rather regular quincunx. The transverse rows of peristomes are not fasciculated and the peristomes arranged in quincunx are not rare.

The fenestrae of the zoarium are always less wide than the branches; the species differs from *Reteporidea collardeti* in this character.

Occurrence.—Cretaceous (Maastrichtian): Royan and St. Legér (Charente inférieure), Ste. Colombe (Manche), (D'Orbigny), Talmont, and Bessac, France.

The specimens from Meudon, near Paris, noted by D'Orbigny as belonging to this species appear to us on the contrary to form a distinct species (*R. collardeti*).

Plesiotypes.—Canu collection and Cat. No. 68972, U.S.N.M.

RETEPORIDEA RAMOSA D'Orbigny, 1854.

1854. *Reteporidea ramosa* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, Bryozoaires, p. 938, pl. 608, figs. 6–10; pl. 773, figs. 1–3.

1889. *Hornera ramosa* PERGENS, Revision des Bryozoaires du Crétacé, figurés par d'Orbigny, Memoires de la Société Belge de Géologie, etc., vol. 3, p. 353.

1899. *Hemicellaria ramosa* GREGORY, Catalogue of Fossil Bryozoa in British Museum, Cretaceous, p. 371.

Measurements.—

Diameter of peristome	0.12–0.14 mm.
Distance between peristomes	.30 mm.
Separation of peristomes	.36 mm.
Diameter of branches	1.40 mm.

Structure.—The zoarium is not reticulated, but it offers the same peculiarities as that of *Reteporidea royana* D'Orbigny, 1850. It is large, conical; its base is discoidal and little expanded. The cellular face is exterior; the noncellular face is interior. The zoarium does not therefore constitute a trap for diatoms. The walls are very thick and are formed of lamellar tissue.

In longitudinal section the tubes are cylindrical, oriented toward the exterior, with gemmation by bifurcation at all heights (peripheral). There is no basal lamella.

The mesopores are divergent, not parallel to the recurved extremity of the tubes; buried in the lamellar tissue, they are little apparent. They are much widened in their terminal portion.

The vacuoles are capillary, numerous, adjacent, and perforate a very thick lamellar tissue. These are the ramifications of the dorsal tubes. However, the direct ramifications are visible at the exterior through an orifice which is a little larger, surrounded by a very short peristome; the secondary ramifications constitute the other visible orifices. This character is quite clear in our figure.

In transverse section the tubes are all equal, polygonal, and surrounded by a thick lamellar tissue.

Affinities.—The peristomes are often more or less grouped in transverse interrupted rows, but they never form fascicles. On certain portions of the zoarium they are even arranged in quincunx, and we have been able to measure their separation.

The specimens from Meudon mentioned by D'Orbigny appear to form a distinct species, *Reteporidea subramosa*, in which the peristomes are always arranged in quincunx and the branches are more divergent.

On the posterior face (interior) there are true sulci (characteristic of lamellar tissue), at the base of which are the openings of the vacuoles.

Occurrence.—Cretaceous (Maastrichtian): Royan and Bougniaux (Charente inferieure) and Ste. Colombe (Manche) (D'Orbigny); Courgeac, Poulipiac (LeGabriel) and Manie Roux (Dordogne), France.

Plesiotypes.—Canu collection and Cat. No. 68972, U.S.N.M.

RETEPORIDEA COLLARDETI, new species.

Plate 22, figs. 10–15.

Description.—The zoarium is reticulate, with wide meshes, in which the fenestrae are always wider than the branches. The branches are thin, orbicular. The tubes are arranged in transverse, irregular and interrupted rows; the peristome is thin and salient. The mesopores are numerous, hexagonal, funnel shaped. On the dorsal the vacuoles are small and arranged at the base of the very fine longitudinal sulci. The ovicell is enormous, globular salient, elliptical; it occupies the entire width of the branch; it is perforated by peristomes much separated and occasionally closed.

Measurements.—	Diameter of peristome	0.12 mm.
	Diameter of branches	.80 mm.
	Dimensions of fenestrae	2.00 by 0.90 mm.

Affinities.—D'Orbigny has confused this species with his *Reteporidea royana;* the two species are, in fact, quite similar in their aspect and in their micrometric measurements. The present species differs solely in its zoarial aspect with wide meshes, the fenestrae being always wider than the branches.

This species is dedicated to General Louis Collardet, military attaché to the French Embassy in Washington, District of Columbia, who was a brave soldier, an able diplomat, and a courteous gentleman, and whose charming nature made for him many friends in the United States.

Occurrence.—Cretaceous (Campanian): Meudon, near Paris, France.

Cotypes.—Canu collection and Cat. No. 68973, U.S.N.M.

RETEPORIDEA SUBRAMOSA, new species.

Plate 22, figs. 6–9.

Description.—The zoarium is free, branched; the branches are orbicular, dichotomous, and divergent. The tubes are arranged on the exterior face; the peristomes are little salient, thin, and arranged in regular quincunx. The mesopores are numerous, hexagonal, funnel shaped. On the dorsal the vacuoles are hexagonal, arranged in quincunx.

Measurements.—	Diameter of peristome	0.12 mm.
	Distance between peristomes	.50 mm.
	Separation of peristomes	.40 mm.
	Diameter of branches	1.50 mm.

Affinities.—This species is quite similar to *Reteporidea ramosa* D'Orbigny, 1850, but differs in its much more divergent branches, and in its tubes arranged always in quincunx and more scattered.

Occurrence.—Cretaceous (Campanian): Meudon, near Paris, France.

Cotypes.—Canu Collection and Cat. No. 68974, U.S.N.M.

Genus SULCOCAVA D'Orbigny, 1854.

1854. *Sulcocava* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 1021.

The ovicell is a globular sack surrounding many rows of peristomes. It is placed on the sharp edge of the zoarium and spread out over half of the broad face. The tubes are funnel shaped, with peristome long, with dorsal gemmation, ramified at all heights of the zoarial axis, recurved at their extremity. A very thick lamellar epitheca surrounds the zoarium and consolidates the peristomes. The orifice is narrow and smaller than the tube. The zoarium is covered by longitudinal sulci.

Genotype.—*Sulcocava cristata* D'Orbigny, 1851.

Range.—Coniacian-Maastrichtian.

Affinities.—This genus differs from *Parascosoecia* in the absence of mesopores. Gregory classed the genus in the Idmoneidae, but the peristomes are not grouped in true fascicles, as in the true *Idmonea*, and the ovicells are quite different.

SULCOCAVA CRISTATA D'Orbigny, 1854.

Plate 19, figs. 13–18.

1853–54. *Sulcocava cristata* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 1021, pl. 789, figs. 4–8.

1853–54. *Sulcocava sulcata* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 1020, pl. 789, figs. 1–3.

1853–54. *Sulcocava sulcata* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 1022, pl. 789, figs. 9–12.

1899. *Sulcocava cristata* GREGORY, Catalogue of the Cretaceous Bryozoa in the British Museum, vol. 1, p. 211 (Bibliography only, not figs. 21, 22).

1899. *Sulcocava sulcata* GREGORY, Catalogue of the Cretaceous Bryozoa in the British Museum, vol. 1, p. 215 (Bibliography).

Structure.—The peristomes are arranged in transverse and alternate rows on the zoarium, but they are never adjacent and do not form fascicles. The longitudinal furrows are quite regular, but they are easily attenuated by weathering or fossilization; the general aspect is quite variable.

The transverse section is generally lozenge-shaped. It is necessary to prepare the meridian section parallel to the longer axis and the longitudinal section to the shorter axis. The zoarium is surrounded by a sort of lamellar epitheca. The tubes are quite small at the center.

The longitudinal section is quite interesting and complicated. The tubes are funnel-shaped (=club-shaped); they are shorter than in *Entalophora*: their gemmation is dorsal and occurs in the immediate vicinity of the zoarial axis. The small interzooecial space is large enough to be easily visible in all the sections; it opens at the exterior by two small pores visible above and below each aperture. Finally very thick lamellar tissue surounds the zoarium and partially fills the interzooecial space; it consolidates the recurved portion of the tubes, but is independent of the latter. Sometimes it is perforated by a vacuole.

The lamellar tissue often narrows the aperture and also the peristome, which thus becomes totally or partially invisible in sections. The exterior lamella is less dense than the interior lamellae.

The meridian section shows the tubes with successive constrictions. This feature is due to the arrangement of the tubes in transverse rows and to the compression of the zoarium in a determined direction. There is no basal lamella, and this arrangement of the tubes does not form lozenge-shaped networks.

The ovicells are extremely rare; we have not been able to dissect a single one of them, so that the position of the genus in the family Ascosoeciidae is not exactly certain; the exterior appearance might be deceiving.

Historical.—It is quite true that *Sulcococava sulcata* D'Orbigny 1854, must be identical with *Sulcocava cristata*, as Pergens thought in 1889. Gregory's bibliography of 1909 is good, but his determination of specimens from Chatham is incorrect and his figures represent an absolutely distinct species, *Sulcocava depressa.*

Occurrence.—Cretaceous (Coniacian): Tours (Indre-et-Loire), Villedieu (Loir-et-Cher), Fécamp (Seine inferieure), France.

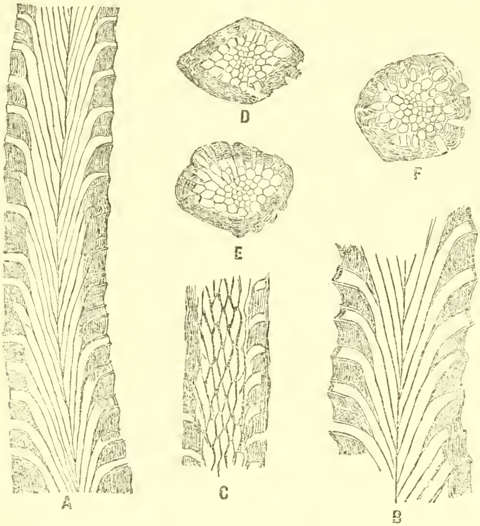


FIG. 39.—Sulcocava cristata D'Orbigny, 1854.

A, B. Longitudinal section, × 16, the second showing the hollow walls of the tubes.

C. Meridian section, × 16.

D–F. Three transverse sections, × 16, the first illustrating the normal shape of the zoarium.

Cretaceous (Coniacian): Tours, France.

Cretaceous (Santonian): Vendôme (Loir-et-Cher) and St. Paterne (Indre-et-Loire), France.

Plesiotypes.—Canu collection and Cat. No. 68975, U.S.N.M.

Genus CAVARINELLA Marsson, 1887.

1887. *Cavarinella* MARSSON, Die Bryozoen der Maastrichter Kreidebildung, p. 53.

CAVARINELLA RAMOSA Marsson, 1887.

Plate 19, fig. 10.

?1851. *Cavaria ramosa* HAGENOW, Die Bryozoen der Maastrichter Kreidebildung, p. 53, pl. 6, fig. 1.

1887. *Cavarinella ramosa* MARSSON, Die Bryozoen der weissen Schreibkreide der Insel Rügen, Paleontologische Abhundlungen, vol. 4, p. 19, pl. 1, fig. 6.

Our ovicelled specimen resembles Marsson's figure, but we are not certain that Hagenow's species is identical with it. The lack of specimens has not permitted us to make thin sections and to verify the exact nature of the genus *Cavarinella*, but it appears to differ from *Parascosoecia* only in its hollow zoarium, a character without great importance.

Cavaria Hagenow, 1871, as originally held, is only a zoarial form for this author classified here all the arborescent species with hollow zoaria. Marsson, 1887, chose for the type *Cavaria pustulosa* Hagenow, 1870, a species without mesopores. Gregory, 1899, undid the work of Marsson and chose for the type *Cavaria ramosa* Hagenow, 1851, which Marsson in 1887 had selected as the type of his genus *Cavarinella*. Examination of the figures and sections does not show the identity of the two species, so we have adopted provisionally Marsson's genus and on a former page have discussed the genus *Cavaria*.

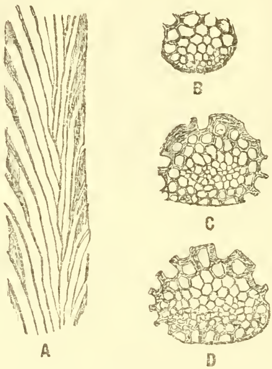


FIG. 40.—Filicrisina verticillata D'Orbigny, 1852.

A. Longitudinal section, × 16, illustrating the dactylethrae of the dorsal.
B–D. Three transverse sections, × 16.
Cretaceous (Campanian): Longuesse, France.

Occurrence.—Cretaceous (Danian): Herfolge (Seeland), Denmark.

Geologic distribution.—Cretaceous (Campanian): Island of Rügen, Germany; Cretaceous (Maastrichtian): Maastricht, Holland.

Plesiotype.—Cat. No. 68976, U.S.N.M.

Genus FILICRISINA D'Orbigny, 1852.

1852. *Filicrisina* D'ORBIGNY, Paléontologie française, Terrain Crétacé, vol. 5, p. 910.

1887. *Phormopora* MARSSON, Bryozoen der schreibkreide der Insel Rügen, Paleontologische Abhandlungen, vol. 4, p. 32.

Ascosoeciidae in which the ovicell is placed laterally. The tubes are conical, with peristome and with dorsal gemmation. They are placed on the anterior face and arranged in more or less transverse rows. Dactylethrae are developed on the posterior face; they are closed by a lozenge-shaped facette, perforated by a longitudinal slit.

Genotype.—*Filicrisina verticillata* D'Orbigny, 1852. Campanian.

The known species of this genus are *Filicrisina retiformis* D'Orbigny, 1852; *Hornera langethali* Marsson, 1887; *Phormopora irregularis* Marsson, 1887; and *Spiroclausa procera* Hamm.

Historical.—D'Orbigny classified this genus in the family Crisinidae, characterized by the presence of pores on the opposite face. Marsson, 1887, created the genus *Phormopora* for an analogous species, but a comparison of thin sections shows that its structure is similar to *Filicrisina.* Gregory in 1899 classified *Filiscrisina* in the Diastoporidae, close to *Filisparsa*, from which it differed in the rudimentary zooecia. He designated their orifices as small pores of epithecal tubes, which is not at all correct, because there are neither tubules nor vacuoles. He chose as type *Filicrisina retiformis*, but we have not studied this species in detail.

FILICRISINA VERTICILLATA D'Orbigny, 1852.

Plate 19, figs. 1–9.

1852. *Filicrisina verticillata* D'ORBIGNY, Paleontologie francaise, Terrain crétacé, vol. 5, p. 911, pl. 769, figs. 5–10.

1899. *Filicrisina verticillata* GREGORY, Catalogue of Bryozoa in British Museum, Cretaceous, vol. 1, p. 434, fig. 64 (bibliography).

The figured ovicells appears to us rudimentary, and better specimens are desirable. Under this aspect the ovicell is identical with the sack of the Ascosoeciidae.

The dorsal (reverse side of Gregory) is very curious. It is ornamented with lozenge-shaped areas bounded by salient threads, the superior angle of which is perforated by a longitudinal slit with salient peristome. A second calcareous layer covers this side, in which case the lozenge-shaped areas are smaller or poorly indicated and the small pores are rounded.

On the frontal (obverse side of Gregory) the peristomes are arranged in transverse, oblique rows or more rarely in quincunx.

The longitudinal section indicates the true nature of these exterior features. The tubes are conical, with dorsal gemmation and identical in structure with those of *Filisparsa*, *Entalophora*, *Idmonea*, etc., but they are aborted on the dorsal face and transformed into dactylethrae. The lozenge-shaped areas of the dorsal are therefore the facettes which close the dactylethrae, and there are therefore no epithecal tubules, as described by Gregory in 1899.

The transverse section is that of *Entalophora*, but eccentrically arranged, for it is impossible to distinguish the tubes of the dactylethrae. There is no basal lamella, and gemmation occurs around the zoarial axis. The latter, with the reduction of the dactylethrae is eccentric with relation to the geometrical center.

Occurrence.—Cretaceous (Campanian): Longuesse (Seine et Oise), France.

Plesiotypes.—Canu collection and Cat. No. 68977, U.S.N.M.

EXPLANATION OF PLATES.

Plate 1.

Fig. 1. *Oncousoecia* (*Filisparsa*) *bifurcata* Ulrich and Bassler, 1907---- page 6.
Fragment of branch, × 12, preserving an ovicell. The oeciostome is transverse and wide.
Cretaceous (Vincentown marl): Vincentown, New Jersey.

Figs. 2–5. *Oncousoecia accumulata*, new species---------------------- page 6.
2. Three zoaria, natural size.
3. A complete example, × 3, formed of discoid subcolonies piled upon each other.
4. A portion of the same, × 12, illustrating the position of the ovicell on the margin of each subcolony.
5. The extremity of a branch, × 12, illustrating the young portion of the subcolony.

Jurassic rocks of Germany.

Figs. 6–8. *Mecynoecia obesa*, new species-------------------------- page 12.
6. Two fragments, natural size.
7. An ovicelled branch, × 12.
8. Another example, × 12.

Recent: Philippine Islands, Sulade (*Albatross* Station D 5147).

Figs. 9–11. *Mecynoecia longipora*, MacGillivray, 1895--------------- page 13.
9. Zoarial fragments, natural size.
10. A branch, × 12, with the ovicell near the bifurcation and showing the prominent transverse oeciostome.
11. Another ovicelled fragment, × 12, with the ovicell at the bifurcation of the branches and showing wrinkling of the tubes.

Recent: Philippine Islands. Anima Sola (*Albatross* Station D 5217).

Figs. 12, 13. *Mecynoecia ramosissima* D'Orbigny, 1850-------------- page 14.
12. A bifurcated branch, × 6, with nonverticellate tubes and two ovicells developed.
13. A portion of an ovicelled branch, × 12, showing the transverse, elliptical oeciostome and the tubes arranged in verticells.

Cretaceous (Cenomanian): Le Mans (Sarthe), France.

Figs. 14, 15. *Mecynoecia stipata*, new species----------------------- page 15.
14. A nonovicelled branch, × 6, illustrating the close arrangement of the tubes.
15. A branch, × 12, showing a broken ovicell at the base and an abnormal one with a median furrow, higher up.

Cretaceous (Turonian): Ruillé Poncé (Loir-et-Cher), France.

Figs. 16, 17. *Mecynoecia* (*Spiropora*) *verticillata* Goldfuss, 1827------ page 13.
16. An unovicelled branch, × 12.
17. An ovicelled example, × 12, showing that the ovicell covers three verticells of tubes.

Cretaceous (Maastrichtian): Maastricht, Holland.

Fig. 18. *Notoplagioecia farringdonensis*, new species---------------- page 30.
Portion of a compressed branch, × 12, with a broken ovicell.
Lower Cretaceous (Aptian): Farringdon, England.

PLATE 2.

FIG. 1. *Mecynoecia micropora* D'Orbigny, 1853 .... page 16.
An ovicelled example, × 12.
Cretaceous (Coniacian): Tours (Indre-et-Loir), France.

FIGS. 2–10. *Mecynoecia annulosa* Michelin, 1847 .... page 16.
2. Several fragments, natural size.
3. A bifurcated fragment, × 12, with an elongated sacciform ovicell showing a transverse oeciostome.
4. Fragment, × 12, in which the ovicell is cordiform.
5. Another example, × 12, with a pyriform ovicell.
6. A branch, × 12, with the ovicell placed among verticellate tubes.
7. A branch, × 6, with the tubes arranged in quincunx at the base and in verticells at the top.
8. A verticellate specimen, × 6, with small orifices.
9. An example, × 6, with large orifices.
Jurassic (Bathonian): Occaignes (Orne), France.
10. An ovicelled specimen, × 12, in which the oeciostome is supported by an ordinary peristome.
Jurassic (Bathonian): Ranville (Calvados), France.

FIG. 11. *Microecia denisi*, new species .... page 21.
The ovicelled type specimen, × 12, exhibiting the minute oeciostome.
Cretaceous (Turonian): Ruillé Poncé (Loire-et-Cher), France.

FIGS 12, 13. *Trigonoecia michelini* Blainville, 1830 .... page 18.
12. A specimen, × 12, preserving two forms of ovicells.
13. Another example with two triangular ovicells, × 12.
Jurassic (Bathonian): Ranville (Calvados), France.

FIG. 14. *Mecynoecia variabilis* Hagenow, 1851 .... page 16.
An ovicelled specimen, × 12, with the upper end of the ovicell missing.
Cretaceous (Maastrichtian): Maastricht, Holland.

PLATE 3.

FIGS. 1–5. *Brachysoecia convexa*, new species .... page 22.
1. Cylindrical branching fragment, natural size.
2. Portion of same, × 12, showing the ovicell and the zone of growth.
3. View of the ovicell, × 25. The ovicell is short and the oeciostome is reflexed and adjacent to the peristome.
4. Ordinary zooecia, × 25, in which some of the apertures are closed by a diaphragm.
5. A tangential thin section, × 25.
Cretaceous (Cenomanian): Le Mans (Sarthe) France.

FIG. 6. *Bisidmonea tetragona* Lamouroux 1821 .... page 24.
6. A fragment, × 12, bearing the ovicell.
Jurassic (Bathonian): Ranville (Calvados), France.

FIGS. 7–10. *Bisidmonea? globuloecia*, new species .... page 25.
7, 8. Fragment, natural size, and × 12, of this minute species.
9. The ovicelled side, × 12.
10. Portion of branch, × 25.
Cretaceous (Cenomanian): Montlouet (Maine-et-Loire), France.

FIG. 11. *Plagioecia clypeiformis* D'Orbigny, 1853 .... page 28.
11. Entire zoarium, × 12, bearing two ovicells.
Cretaceous (Turonian): Fontaine d'Antoigne, near Chatellerault (Vienne), France.

FIG. 12. *Plagioecia varians* Ulrich, 1901______________________________ page 26.
An ovicelled zoarium, × 12, consisting of a single subcoloney.
Cretaceous (Vincentown marl): Vincentown, New Jersey.

FIGS. 13–15. *Plagioecia americana* Ulrich and Bassler, 1907____________ page 27.
13. An ovicelled example, × 12, in which the ovicell is short and shows the oeciostome clearly turned toward the base.
14. Another ovicelled example, × 12, exhibiting longer tubes near the zoarial margin.
15. A zoarium, × 12, preserving the ancestrular region where the tubes are shorter than usual.

Cretaceous (Vincentown marl): Vincentown, New Jersey.

PLATE 4.

FIGS. 1, 2. *Trigonoecia transversa*, new species______________________ page 19.
An ovicelled zoarium, × 6, and portion, × 12, showing two ovicells (one broken) and the small oeciostome.
Jurassic (Bathonian): Shipton Gorge, Dorset, England.

FIG. 3. *Cardioecia neocomiensis* D'Orbigny, 1852______________________ page 19.
Portion of a frond, × 12, with two ovicells. The cordiform shape of the ovicell and the small oeciostome are visible.
Lower Cretaceous (Valangian): Sainte Croix (Vaud), Switzerland.

FIG. 4. *Mecynoecia gracilis*, new species______________________________ page 12.
The type specimen, × 12, a free unilamellar zoarium with the characteristic ovicell.
Jurassic (Bathonian): Shipton Gorge, Dorset, England.

FIG. 5. *Trigonoecia verrucosa* Milne Edwards, 1838__________________ page 18.
Portion of the encrusting zoarium, × 12, bearing an ovicell.
Jurassic (Bathonian): Shipton Gorge, Dorset, England.

FIG. 6. *Nematifera reticulata* D'Orbigny, 1853______________________ page 20.
Portion of a branch, × 12, exhibiting the characteristic salient threads outlining the zooecia.
Lower Cretaceous (Valangian): Sainte Croix (Vaud), Switzerland.

FIG. 7. *Atractosoecia edwardsi* Canu, 1913___________________________ page 10.
Ovicelled portion of the incrusting zoarium, × 12, introduced for comparison with the following new species.
Jurassic (Bathonian): Ranville (Calvados), France.

FIG. 8. *Atractosoecia walfordiana*, new species______________________ page 10.
Portion of the incrusting type specimen, × 12, exhibiting three ovicells.
Jurassic (Bathonian): Shipton Gorge, Dorset, England.

PLATE 5.

FIGS. 1, 2. *Plagioecia compressa* Goldfuss, 1827______________________ page 28.
1. View of a variety with small apertures exhibiting an ovicell resulting from the fusion of two secondary ovicells, × 12.
2. The ovicell of the normal form of the species, × 12.

Cretaceous (Coniacian), Tours (Indre-et-Loire), France.

FIGS. 3, 4. *Notoplagioecia magnipora*, new species____________________ page 30.
Two ovicelled branches, × 12, each preserving the small oeciostome.
Cretaceous (Coniacian), Tours (Indre-et-Loire), France.

FIG. 5. *Notoplagioecia flexuosa* D'Orbigny, 1853_____________________ page 31.
An ovicelled zoarium, × 12.
Cretaceous (Coniacian) Tours (Indre-et-Loire), France.

FIGS. 6–8. *Cavaria pustulosa* Hagenow, 1851 .... page 32.
6. Fragment, natural size.
7. An ovicelled example, × 12, showing also the thin slightly salient peristome.
8. An ovicelled example, × 12, composed of several lamellae.
Cretaceous (Danian), Herfolge, and Faxe, Denmark.

FIGS. 9–12. *Plagioecia obliqua* D'Orbigny, 1850 .... page 29.
9. A fragment, × 12, with an oval ovicell which deforms the zoarial margin.
10. An example, × 12, with a fusiform ovicell.
11. A specimen, × 12, in which the ovicell is placed near the zoarial margin.
12. A specimen, × 12, with a long fusiform ovicell.
Cretaceous (Coniacian), Tours (Indre-et-Loire), France.

PLATE 6.

FIGS. 1, 2. *Cea rustica* D'Orbigny, 1852 .... page 37.
1. Zoarium enlarged, showing the funnel shape of the orifice.
2. Transverse section, × 12, illustrating the thick zoarial walls.
Cretaceous (Santonian): Vendome (Loir-et-Cher), France.

FIGS. 3–9. *Cea compressa* D'Orbigny, 1852 .... page 37.
3, 4. Lateral and end views of extremity of zoarium, enlarged, showing the zone of growth on the basal lamella.
5. Zooecial orifices exhibiting form when the oral tongue is completely developed and perforated (figs. 1, 3–5 after D'Orbigny, 1852).
6. Aspect, × 43, when the oral tongue is incompletely developed.
7. Zoarium, × 12, provided with an ovicell (figs. 6, 7. After Filliozat, 1917).
8. Longitudinal section showing the thickening of the walls at the extremity of the tubes.
9. Longitudinal section of a single wall, highly magnified (figs. 8, 9, after Pergens, 1883).
Cretaceous (Coniacian), Tours (Indre-et-Loire), France.

FIG. 10. *Cea lamellosa* D'Orbigny, 1852 .... page 37.
Zoarium with three ovicells, × 12.
Cretaceous (Coniacian), Villedieu (Loir-et-Cher), France

FIG. 11. *Cea tubulosa* D'Orbigny, 1852 .... page 37.
An ovicelled example. × 235. (After Filiozat, 1907).
Cretaceous, Bessé (Sarthe), France.

FIGS. 12–14. *Cea subcompressa* D'Orbigny, 1852 .... page 37.
12. Zoarial fragment, × 25, showing the orifice of the tubes.
13. An example, × 12, with a convex ovicell.
14. Another example, × 12, in which the ovicell is flat.
Cretaceous (Santonian): Vendome (Loir-et-Cher), France.

PLATE 7.

FIGS. 1–3. *Stathmepora johnstrupi* Pergens, 1886 .... page 40.
1. Zoarial fragments, natural size.
2. An example, × 12, preserving a broken ovicell.
3. A typical specimen, × 12, with well-developed complete ovicell.
Cretaceous (Danian), Faxe, Denmark.

FIGS. 4, 5. *Stathmepora gabbiana* Ulrich and Bassler________________ page 39.
Unovicelled and ovicelled branches of this species, × 12.
Cretaceous (Vincentown marl). Vincentown, New Jersey.

FIG. 6. *Laterocea simplex* D'Orbigny, 1852__________________________ page 38.
An ovicelled zoarium, × 12. The oeciopore is a quite minute opening.
Cretaceous (Coniacian): Villedieu (Loir-et-Cher), France.

FIGS. 7–10. *Cea* (*Filicea*) *regularis* D'Orbigny, 1852________________ page 37.
7. A zoarium, natural size.
8. Portion of a branch enlarged, showing the form of the orifices (figs. 7, 8. After D'Orbigny, 1852).
9. Tangential section, × 25, showing the structure of the thickened wall.
10. Branch showing some zooecia with the oral tongue completely developed (after Filliozat, 1907).

Cretaceous (Coniacian): Villedieu (Loir-et-Cher), France.

FIG. 11. *Diaperoecia polystoma* Roemer, 1839________________________ page 41.
Portion of an ovicelled example, × 12.
Cretaceous (Neocomian). Gross Wahlberg, Germany.

FIG. 12. *Diaperoecia papillosa* Reuss, 1846__________________________ page 42.
An entire zoarium, × 12, provided with two ovicells.
Cretaceous, Chatham, England.

PLATE 8.

FIGS. 1–6. *Diaperoecia turonica*, new species__________________________ page 42.
1. An example, × 12, with a large elongated ovicell.
2. Upper portion of a frond, × 25, showing elongated tubes. The growth occurs laterally and superiorly.
3. An ovicelled frond, × 12, in which the zooecia are arranged as in *Reticulipora* and as in *Mesenteripora*.
4. A lamella, × 12, in the *Reticulipora* form of growth, showing the basal lamella and the zone of growth.
5. A lamella, × 12, in the *Mesenteripora* form bearing an elliptical ovicell.
6. Mature portion, × 25, showing short tubes and complete peristomes.

Cretaceous (Turonian): Ruillé Poncé (Loir-et-Cher), France.

FIG. 7. *Diaperoecia transversata*, new species________________________ page 44.
The type specimen, × 12.
Cretaceous (Danian) Herfalge (Seeland), Denmark.

FIGS. 8–10. *Diaperoecia punctata*, new species______________________ page 44.
8, 9. The narrow ramose zoarium, × 12, with an ovicell developed.
9. Opposite side of the same specimen, × 12.
10. The same specimen, × 25, showing the punctations more clearly.

Cretaceous (Danian); Herfolge (Seeland), Denmark.

FIG. 11. *Idmonea magna* Canu and Bassler, 1920____________________ page 50.
An ovicelled example, ×12, of this very abundant species which seldom shows an ovicell.
Eocene (Jacksonian): Jackson, Mississippi.

FIGS. 12. *Diaperoecia saillons*, new species__________________________ page 43.
The incrusting zoarium, × 12.
Cretaceous (Vincentown marl): Vincentown, New Jersey.

PLATE 9.

FIGS. 1–5. *Diaperoecia compressa*, new species_______________________ page 45.
1. Fragments of the bifoliate zoarium, natural size.
2–4. Three fragments, × 12, bearing the ovicell which is never wider than a branch.

5. Surface, × 25, exhibiting the prominent threads separating the zooecia.
Cretaceous (Danian), Herfolge (Seeland), Denmark.

FIGS. 6–10. *Diaperoecia americana* Gabb and Horn, 1862 —— page 46.
6. Fragment of the solid ramose zoarium, natural size.
7. End of a branch, × 12, with a thick zone of growth.
8. A typical unovicelled branch, × 12.
9. An ovicelled branch, × 12, bearing tubes wider apart than usual.
10. An abnormal branch, × 12, in which the tubes of the lower portions are growing in the opposite direction.
Cretaceous (Vincentown marl): Vincentown, New Jersey.

FIGS. 11–18. *Stigmatoechos punctatus*, Marsson, 1887 —— page 48.
11, 12. Celluliferous and dorsal sides of a branch, enlarged.
13, 14. Longitudinal and cross sections, enlarged (figs. 11–14, after Marsson).
15, 16. Lateral and celluliferous sides of an ovicelled example, × 12.
17. Non celluliferous side of the same zoarium, × 12, showing the smooth dorsal.
18. Celluliferous side, × 25.
Cretaceous (Danian): Faxe, Denmark.

FIG. 19. *Diaperoecia distans* Hagenow 1851 —— page 45.
An ovicelled example, × 12.
Cretaceous (Danian): Herfolge (Seeland), Denmark.

FIG. 20. *Diplosolen lineatum* Gabb and Horn, 1862 —— page 47.
The hollow ramose zoarium, × 12, with an ovicell.
Cretaceous (Vincentown marl): Vincentown. New Jersey.

FIGS. 21–22. *Diplosolen entalophoroides* new species —— page 47.
21. The solid ramose zoarium, × 12, showing the ovicell wider than the branch.
22. A portion of the same specimen, × 25, illustrating the occurrence of the small zooeciules and the separating threads between the zooecia.
Cretaceous (Danian): Faxe, Denmark.

PLATE 10.

FIGS. 1–5. *Pleuronca fenestrata* Busk, 1859 —— page 50.
1. Edge view of a branch, × 12; the ovicell is placed laterally and borders on the dorsal.
2. Frontal, × 12, showing the lateral ovicell bordering on the median axis.
3. A fragment, × 12, with a median subsymmetrical ovicell.
4. Celluliferous side, × 25.
5. Dorsal side, × 25; the tergopores open at the bases of deep sulci.
Eocene (Jacksonian): Jackson, Mississippi.

FIG. 6. *Plagioecia divagans* Canu and Bassler, 1920 —— page 27.
An ovicelled zoarium, × 12.
Eocene (Jacksonian): Jackson, Mississippi.

FIGS. 7–19. *Terebellaria ramosissima* Lamouroux, 1821 —— page 34.
7. An unbranched specimen, natural size.
8. Young example, natural size.
9, 10. Very young zoarium, natural size and enlarged.
11. Portion of specimen (fig. 8) enlarged (figs. 7–11, after Haime, 1854).
12, 13. Lateral and end views of a branch, enlarged.
14. Surface enlarged, showing zones of apertures separated by zones of dactylethrae.
15. Longitudinal section, enlarged (figs. 12–15, after D'Orbigny, 1853).
16. Longitudinal thin section, × 10, through end of branch (after Gregory 1896).

17. End of a branch, enlarged (after D'Orbigny, 1853).
18. Transverse thin section across branch, × 10 (after Gregory, 1896).
19. Photograph of surface, × 12, showing ovicells; branch inverted to illustrate form of ovicell.

Jurassic, of France and England.

PLATE 11.

FIGS. 1–5. *Platonca scalaria*, new species........................... page 49.

1. Fragments of the branching zoarium, natural size.
2. An ovicelled branch, × 12, with the fascicles alternately arranged and showing the oeciostome adjacent to a tube.
3. A branch, × 12, with the ovicell at the bifurcation.
4. An ovicelled example, × 12, with the fascicles opposite each other; the ovicell lacks the oeciostome.
5. A small, basal, ovicelled branch, × 12; the oeciostome is isolated.

Recent: Philippine Islands, Sirun, Tawi Tawi group.

FIGS. 6, 7. *Platonea hirsuta*, new species........................... page 49.

The type specimen natural size and × 12.

Recent: Philippine Islands, Sirun, Tawi Tawi group.

FIGS. 8–10. *Tennysonia stellata* Busk, 1867........................... page 51.

8, 9. Portions of two zoaria, natural size.

10. Enlargement of a frond showing the zooecia separated by numerous mesopores.

Recent: Cape of Good Hope.

FIGS. 11–14. *Lobosoecia semiclausa* Michelin, 1846........................... page 52.

11. Fragment, natural size.
12. Portion of an ovicelled zoarium, × 12.
13. Posterior (inferior) side of the same specimen, × 12.
14. Transverse section, × 12.

Recent: Port Elizabeth, South Africa.

PLATE 12.

FIGS. 1–3. *Lichenopora burdigalensis* Duvergier, 1921........................... page 80.

1. Inferior side of type specimen, × 12.
2. Superior side of the same specimen, × 12, showing the digitate ovicell.
3. A portion, × 25, illustrating the tubes and cancelli.

Miocene (Upper Burdigalian): Saucats (Gironde), France.

FIGS. 4–11. *Lobosoecia semiclausa* Michelin, 1846........................... page 81.

4. Fragments, natural size.
5. Ovicelled fragment, × 12, exhibiting the oeciostome turned toward the base.
6. Portion of the same, × 25.
7. Another ovicelled fragment, × 12, in which the ovicell is composed of lobes and covers all the subjacent tubes. The oeciostome is turned toward the top.

8, 9. An ovicelled branch, × 12 and × 25, in which all the subjacent tubes are not closed.

10. Unovicelled portion of branch, × 25, showing the structure of the zooecial areas (facettes).
11. Diagrammatic view of the facettes, enlarged (after Gregory, 1899).

Cretaceous (Cenomanian): LeMans (Sarthe), France.

FIGS. 12–16. *Meliceritites magnifica* D'Orbigny, 1852............... page 85.

12, 13. Two ovicells, × 12, showing variation in form.

14. An example, × 12, with well developed pyriform ovicell.

15. Open (broken) ovicell, × 20, showing underlying zooecia completely developed.

16. Similar ovicell, × 20, with underlying zooecia lacking the frontal calcified wall.

Cretaceous (Coniacian), Villedieu (Loire-et-Cher), France.

FIGS. 17–22. *Meliceritites angulosa* D'Orbigny, 1852.................. page 84.

17. An eleocellarium with a regenerated zooecium, × 20.

18. Ovicelled branch, × 12, showing one complete and one broken ovicell and several large eleocellaria.

19. An ovicelled branch, × 12, in which the oeciostome is transformed into an eleocellarium.

20. Distal end of open ovicell, × 66.

21. Distal part of open ovicell, × 34, viewed from the proximal end.

22. Transverse section of an ovicelled branch, × 14, of *M. magnifica* (figs. 12, 13, 15–17, 20–22, after Levinsen).

Cretaceous (Coniacian) Chatham, England (fig. 17), Villedieu and Tours, France.

PLATE 13.

FIGS. 1–4. *Meliceritites gracilis* Goldfuss, 1827....................... page 83.

1, 2. Well preserved, ovicelled branch, × 12 and natural size.

3. Ovicelled portion of the same specimen, × 12.

4. Surface, × 25, exhibiting the semilunar orifice and triangular peristomes.

Cretaceous (Cenomanian): Essen, Germany.

FIGS. 5–7. *Semimultelea escharoides* Goldfuss....................... page 87.

5. Zoarium natural size, consisting of an elongated multilamellar mass.

6. View of apertures enlarged, given by Goldfuss.

7. Photograph of best preserved surface noted, × 12, showing the orifices and eleocellaria.

Cretaceous (Cenomanian): Essen, Germany.

FIG. 8. *Psilosolen capitiferax*, new species......................... page 112.

End view of branch, × 12, showing ovicell.

Pleistocene: Santa Barbara, California.

FIGS. 9, 10. *Tretocycloecia pelliculata* Waters, 1879................ page 110.

9. Tangential thin section, × 25, illustrating vesicular structure of walls.

10. Fragment of branch, × 12, showing usual aspect of zooecia and mesopores in upper fourth and the large ovicell below.

Pacific Ocean: Neah Bay, Washington.

FIGS. 11–13. *Entolophora (?Nematifera) roemeri* Levinsen............ page 20.

11, 12. Fragment natural size and × 12, showing the semielliptical orifices.

13. Surface of same, × 25, exhibiting a sort of eleocellarium.

Cretaceous (Cenomanian): Essen, Germany.

PLATE 14.

FIGS. 1–8. *Ceriocava corymbosa* Lamouroux, 1821.................. page 90.

1, 2. The branching zoarium, natural size and the surface, enlarged (after Michelin, 1847).

3, 4. Basal part of zoarium, natural size and an enlarged view of the tubes (after Haime, 1854).

5, 6. Surface of branch, × 12; the broken ovicells show the special walls.

7. Longitudinal thin section, enlarged (after Gregory, 1899).
8. Branch, × 12, showing two short but complete ovicells.
Jurassic (Bathonian): Ranville (Calvados), France.

FIG. 9. *Spiroclausa spiralis* D'Orbigny, 1854________________________ page 92.
An ovicelled example, × 12, the ovicell being the smooth convex sack between the two spires.
Cretaceous (Maastrichtian): Maastricht, Holland.

FIGS. 10–12. *Meliceritites* (*Foricula*) *aspera* D'Orbigny, 1852_________ page 86.
Three views of the surface, × 20, illustrating the porelike interspaces.
Cretaceous (Coniacian): Villedieu (Loir-et-Cher), France.

FIG. 13. *Meliceritites lamellosum* D'Orbigny, 1852__________________ page 85.
Frond, × 12, exhibiting the ovicell and oeciostome.
Cretaceous (Coniacian): Villedieu (Loir-et-Cher), France.

FIGS. 14, 15. *Haplooecia straminea* Phillips, 1829____________________ page 97.
14. Diagrammatic drawing of the type specimen, enlarged (after Gregory).
15. Photograph of another example, × 25.
Jurassic (Bathonian): Ranville (Calvados), France.

PLATE 15.

FIGS. 1–8. *Ripiscoecia conifera* Lamouroux, 1821____________________ page 94.
1. Small zoaria natural size, of the dwarfed form called *conifera*.
2, 3. Large branching zoaria natural size of the form *ramosa*.
4. Surface of a branch, × 12, illustrating the flabelliform, transversely wrinkled ovicell.
5. A frequent aspect of the zoarial surface, × 2, with some of the mesopores closed by a fragile epitheca.
6. Surface, × 25, in which the mesopores are open.
7. Portion of a branch, × 12, with salient peristome and both open and closed mesopores.
8. An example, × 12, in which the mesopores lack the calcareous lamella.
Jurassic (Bathonian): St. Aubin and Luc (Calvados), France.

FIGS. 9–12. *Cyclocites primogenitum*, new species____________________ page 88.
9. The narrow ramose zoarium, natural size.
10. Surface × 25, illustrating the hexagonal facettes and the orbicular aperture often closed by a calcareous lamella.
11. Fragment of surface, × 25, in which the facettes have been destroyed.
12. An ovicelled branch, × 12, showing a portion with the facettes preserved. The two ovicells placed side by side are little convex and their oeciostome is orbicular.
Jurassic (Bathonian): Ranville (Calvados), France.

PLATE 16.

FIGS. 1–7. *Grammecava dumetosa* Defrance, 1824___________________ page 96.
1. The compressed branching zoarium, natural size.
2. Surface of branch, enlarged (figs. 1, 2, after Michelin, 1846).
3. End of a branch, × 12, without facettes.
4. Portion of same, × 25.
5, 6. An example, × 12, and portion, × 25, exhibiting the facettes and closed apertures.
7. End of a branch, × 12, showing the median lamella.
Jurassic (Bathonian): Ranville (Calvados), France.

FIGS. 8–13. *Chilopora guernoni* Haime, 1854 ---------- page 105.
8. Zoarial fragments, natural size.
9. An ovicelled frond, × 12.
10. Fragment, × 12, preserving tubes with the lip-like projection only in the lower half.
11. Frond, × 12, exhibiting the small ovicell.
12. View, × 25, of tube with the characteristic terminal lip.
13. Another portion of the surface, × 12, in which the lip is wanting.

Jurassic (Bathonian): Occaignes (Orne), France.

PLATE 17.

FIGS. 1–8. *Ditaxia parvipora*, new species ---------- page 103.
1. Zoarial fragments, natural size.
2. A fragment, × 6, with a narrow zoarial base.
3. Another fragment, × 6, showing the median lamella at the extremity of the branch.
4. Zoarial surface, × 25, illustrating the form of the zooecia and mesopores.
5. Another surface, × 25, in which the distinction between the two kinds of tubes is not so apparent.
6. An example, × 12, illustrating the normal form of the ovicell with the oeciostome at the center.
7. Another example, × 12, with the ovicell partially covered by the adjacent mesopores.
8. A specimen, × 12, with small tubes.

Cretaceous (Coniacian): St. Paterne and Tours (Indre-et-Loire), France.

FIGS. 9–13. *Ditaxia anomalopora* Goldfuss, 1827 ---------- page 101.
9. Fragments of the bilamellar zoarium, natural size.
10. Section of a branch, enlarged, showing the median lamella.
11. Edge of a branch enlarged showing the crest representing the median lamella.
12. Zoarial surface, enlarged (figs. 9–12, after Hagenow, 1851).
13. Portion of the surface of young example × 12, showing slightly salient peristomes.

Cretaceous (Maastrichtian): Maastricht, Holland.

FIGS. 14–16. *Chilopora cretacea*, new species ---------- page 106.
14. Portion of the zoarial surface × 25. The tubes have a salient lip.
15. An ovicelled example, × 12. The ovicell is globular and placed on the edge.
16. Another ovicelled example, × 12. The ovicell is broken showing its interior.

Cretaceous (Santonian): Vendomé (Loire-et-Cher), France.

PLATE 18.

FIGS. 1–4. *Alveolaria semiovata* Busk, 1859 ---------- page 111.
1. Top view of the zoarium, natural size.
2. Lateral view of zoarium, natural size, broken to show the structure.
3. Two of the subcolonies, × 12, each with an ovicell.
4. Edge view of zoarium, × 6, illustrating its formation by cupshaped subcolonies.

Pliocene (Plaisancian): Sudbourne Church, Suffolk, England.

FIGS. 5–9. *Tretocycloecia sabaudica*, new species ---------- page 110.
5. The ramose zoarium, natural size.

6. Surface of the same, × 25, showing a portion with open mesopores.
7. An ovicell, × 12, with the external wall broken away.
8. Zoarial surface, × 25, exhibiting mesopores closed by a calcareous lamella.
9. Another surface, × 12, with a zone of open mesopores and a zone of closed ones.

Cretaceous (Greensand): Chamboy (?France).

PLATE 19.

FIGS. 1–9. *Filicrisina verticillata* D'Orbigny, 1852——— page 137.

1. Zoarial fragments, natural size.
2. Dorsal side of branch, × 25. At the top the facettes inclosing the dactylethrae are lozenge shape and perforated by a longitudinal slit. At the bottom the second calcareous layer bears round orifices.
3. Dorsal surface, × 25. Here the orifice of the lozenge-shaped facettes is little elongated and is not surrounded by a salient peristome.
4. Dorsal surface, × 25, with a second calcareous layer in which case the orifice perforating the facette has a round salient peristome.
5. Frontal surface, × 25, with tubes having salient peristomes.
6. Frontal side, × 12, with peristomes little salient.
7. Another frontal, × 12, in which the quincunx arrangement of the peristomes is apparent.

8, 9. Two ovicelled fragments, × 12, showing lateral position of ovicells.

Cretaceous (Campanian): Longuesse (Seine-et-Oise), France.

FIG. 10. *Cavarinella ramosa* Marsson, 1887——— page 135.

An ovicelled specimen, × 12, showing position of the genus *Cavarinella* in the Ascosoeciidae.

Cretaceous (Danian): Herfolge (Seeland), Denmark.

FIG. 11. *Parascosoecia marssoni* Gregory, 1899——— page 115.

Fragment with ovicell, × 12.

Cretaceous (Danian): Herfolge (Seeland) Denmark.

FIG. 12. *Parascosoecia francqana* D'Orbigny, 1852——— page 115.

Specimen, × 12, exhibiting ovicell of the Ascosoeciidae.

Cretaceous (Danian): Herfolge (Seeland), Denmark.

FIGS. 13–18. *Sulcocava cristata* D'Orbigny, 1854——— page 134.

13. Edge of zoarial fragment, × 12, showing ovicell.
14. Broad side of branch, × 12, traversed by longitudinal sulci.
15. Portion, × 25, showing small vacuoles at base of the sulci.
16. Broad side of ovicelled branch, × 12, showing ovicell on edge.
17. Edge of a broad branch, × 12.
18. Edge view of the extremity of a branch, × 12.

Cretaceous (Coniacian): Tours (Indre-et-Loir), France.

PLATE 20.

FIGS. 1–8. *Polyascosoecia coronopus*, new species——— page 126.

1. Zoarial fragments, natural size.
2. Zoarium with expanded base, × 6.
3. Lateral view of an ovicelled branch, × 12.
4. Anterior side of branch with broken ovicell, × 12, showing that it is a vesicle arranged above the tubes.
5. Another ovicelled example, × 12. The tubes of the fascicles surrounded by the ovicell have a slightly larger diameter.

6. Frontal face of a zoarium showing tubes and mesopores, × 25.
7. Posterior or dorsal side, × 25, exhibiting vacuoles.
8. Zoarial fragment, × 6, with a subsymmetrical ovicell surrounding four fascicles.

Miocene (Helvetian): Mus (Gard), France.

FIGS. 9–14. *Crisina normaniana* D'Orbigny, 1852 .... page 118.

9. Zoarium, natural size.
10–12. Lateral, dorsal and frontal views of a fragment showing aspect of zooecial tubes on the frontal face and of the vacuoles on the dorsal side, (figs. 9–12, after D'Orbigny, 1852).
13, 14. Lateral and frontal view of an ovicelled branch, × 12.

Cretaceous (Coniacian): Fecamp (Seine inferiore), France.

FIGS. 15–21. *Crisina triangularis* D'Orbigny, 1851 .... page 118.

15–17. Frontal, dorsal, and lateral views of a branch, magnified.
18. Dorsal side, magnified, showing the vacuoles (figs. 15–18, after D'Orbigny, 1852).
19, 20. Transverse and longitudinal sections, magnified (after Marsson).
21. Tangential section of the dorsal, × 25, showing the orifice of the vacuoles.

Cretaceous (Coniacian): Tours (Indre-et-Loire), etc., France.

PLATE 21.

FIGS. 1–6. *Grammanotosoecia contorta*, new species .... page 123.

1. Zoarial fragments, natural size.
2. Surface of an example, × 12, showing two ovicells.

Cretaceous (Campanian): Brossac (Charente), France.

3. A fragment, × 12, in which the orifices are arranged in groups.
4. The same specimens, × 25.

Cretaceous (Santonian): Saint Bonnier (Charente), France.

5. An example × 12, in which the orifices are large and arranged as in *Zonopora*.
6. Portion of the same specimen × 25.

Cretaceous (Santonian): Saint Medard (Charente), France.

FIGS. 7, 8. *Grammascosoecia parvipora*, new species .... page 122.

7. The cylindrical zoarium, natural size.
8. The same, × 12, illustrating the ovicell.

Cretaceous (Maastrichtian): Maastricht, Holland.

FIGS. 9, 10. *Grammascosoecia porosa*, new species .... page 121.

9. Zoarial surface × 12, showing the arrangement of the zooecial orifices around elliptical porous areas formed of mesopores.
10. View of the same surface, × 25.

Recent: South Africa.

PLATE 22.

FIGS. 1–5. *Reteporidea royana* D'Orbigny, 1854 .... page 129.

1. Zoarium natural size.
2. Anterior (celluliferous) side of branch, enlarged, showing the tubes and mesopores.
3. Posterior (dorsal) side enlarged, exhibiting the vacuoles.
4. A further enlargement of the anterior side.
5. Edge view of branch, enlarged, showing tubes to the left and vacuoles to the right (figs. 1–5 after D'Orbigny, 1850).

Cretaceous (Maastrichtian): Royan, etc., France.

FIGS. 6–9. *Reteporidea subramosa*, new species ____________________ page 133.
6. Fragments of the free, branched zoarium, natural size.
7. Celluliferous side, × 12, showing the zooecial tubes and the numerous intervening mesopores.
8. Dorsal side, × 12, with vacuoles.
9. Portion of fig. 7, × 25.
Cretaceous (Campanian) : Meudon, near Paris, France.

FIGS. 10–15. *Reteporidea collardeti*, new species ____________________ page 132.
10. Small fragments of the reticulate zoarium, natural size.
11. Celluliferous face, × 12, with the peristomes in oblique rows.
12. Another fragment, × 12, with peristomes in transverse rows.
13. An ovicelled branch, × 12, showing ovicell perforated by the tubes.
14. Celluliferous (anterior) face, × 25.
15. Posterior side of zoarium, × 12, illustrating vacuoles.
Cretaceous (Campanian) : Meudon near Paris, France.

FIGS. 16, 17. *Leiosoccia occlusa*, new species ______________________ page 100.
The free claviform zoarium, natural size and × 12. An ovicell (broken) is present near the top.
Cretaceous (Cenomanian) : Essen, Germany.

PLATE 23.

FIGS. 1–6. *Osculipora truncata* Goldfuss, 1827 ______________________ page 57.
1. Two fragments, natural size.
2. Celluliferous side, × 5, showing pinnules.
3. Lateral view of same, × 15.
4. An ovicell bearing branch, natural size and × 5, described by Hagenow as *Coelophyma laevis*.
5. Dorsal of branch, × 15, exhibiting the nematopores. (Figs. 1–5, after Hagenow, 1851.)
6. A fragment bearing the ovicell at the bifurcation of the branch.
Cretaceous (Maastrichtian) : Maastricht, Holland.

FIG. 7. *Osculipora repens* Hagenow, 1851 ____________________________ page 57.
Bifurcated fragment showing the ovicell on the anterior side.
Cretaceous (Maastrichtian) : Royan, France.

FIGS. 8, 9. *Osculipora houzeaui* Pergens, 1894 ______________________ page 57.
Frontal and dorsal views of a zoarium, × 13, the latter showing the ovicell (after Pergens, 1894).
Cretaceous (Maastrichtian) : Faquemont, Holland.

FIGS. 10, 11. *Osculipora royana* D'Orbigny, 1850 ____________________ page 58.
10. A fragment, × 12, showing the smooth, globular, lateral ovicell.
11. Anterior face of a fragment with two lateral ovicells, × 12.
Cretaceous (Maastrichtian) : Royan (Charente inferieure), France.

FIGS. 12–16. *Plethoporella ramulosa* D'Orbigny, 1853 ________________ page 56.
12. An incomplete zoarium, natural size.
13. Surface enlarged somewhat.
14. A longitudinal section, enlarged (figs. 12–14, after D'Orbigny, 1853).
15. Surface, × 12, preserving an ovicell.
16. A broken ovicell, × 12, showing the interior.
Cretaceous (Maastrichtian) : Royan, France.

FIG. 17. *Plethopora malmi* Hennig, 1894.
A longitudinal section, × 9, showing the zooecia (*z*) and the strengthening pores (*f*) (after Hennig, 1894).
Cretaceous of Sweden.

PLATE 24.

FIGS. 1–7. *Homoeosolen gamblei* Gregory, 1909---------------------- page 62.

1. Anterior face, × 12, showing a quite convex ovicell (broken) with its oeciostome.
2. Anterior side of a branch, × 12, with the ovicell deeply embedded.
3. Inferior or dorsal side of the branch, × 12.
4. Branch with a broken ovicell showing the internal wall, × 12.
5. A well-developed branch, × 25, with a median ovicell.
6. Longitudinal thin section, × 12, showing the form of the tubes.
7. A meridian section, × 10 (after Gregory 1909).

Cretaceous (Turonian): Ste. Calais (Sarthe), France.

FIGS. 8–14. *Homoeosolen ramulosus* Lonsdale, 1850----------------- page 61.

8, 9. Two branches, × 12, showing the ovicell on the anterior face.

10. A longitudinal section, × 12, illustrating the expanded tubes.

Cretaceous (Coniacian): Chatham, England.

11, 12. Obverse and reverse sides of a young zoarium, × 10.

Cretaceous: Charing, Kent, England.

13. Part of a branch with an entire pinnule and an ovicell developed, × 10.

14. Longitudinal section through the end of a branch, × 9, showing the simple tubulate form of the zooecia (figs. 11–14, after Gregory, 1909).

Cretaceous (Coniacian): Chatham, England.

PLATE 25.

FIGS. 1, 2. *Truncatula pinnata* Roemer, 1840------------------------ page 64.

Two portions of the same zoarium, × 12, showing the ovicell which here occupies abnormal places instead of its usual lateral position, on account of the irregular character of the zoarium.

Cretaceous (Cenomanian): Le Mans (Sarthe), France.

FIGS. 3–5. *Truncatula subpinnata* D'Orbigny, 1854------------------ page 66.

3. Side view of branch, × 12, showing the lateral position of the ovicell. The broken ovicell above shows the structure of the internal wall.
4. An ovicelled branch, × 12, in which the nematopores are closed by a calcareous epitheca. The apertures of the tubes are visible at the extremities of the pinnules.
5. Dorsal side of an ovicelled branch, × 12, showing the open nematopores.

Cretaceous (Cenomanian): Le Mans (Sarthe), France.

FIGS. 6, 7. *Truncatula filix* Hagenow, 1851------------------------- page 64.

Two views, × 10, exhibiting the lateral position of the ovicells (after Gregory, 1909).

Cretaceous (Maastrichtian): Maastricht, Holland.

FIG. 8. *Truncatula plebeia* Novak, 1877.

Dorsal side, enlarged.

Cretaceous of Bohemia.

FIGS. 9–11. *Truncatula discoidea*, new species---------------------- page 69.

9. The discoid zoarium, × 6, viewed from below and showing the marginal ovicell.
10. Portion of the inferior face, × 12, showing the position of the ovicells between the pinnules.
11. Superior face of the same zoarium, × 12.

Cretaceous (Santonian): Vendome (Loir-et-Cher), France.

PLATE 26.

FIGS. 1–4. *Semicytis disparilis* D'Orbigny, 1854 ---------------------- page 75.
1. Zoarium, natural size (after Gregory, 1909).
Cretaceous: Gravesend, England.
2. A branch natural size.
3. Celluliferous side, enlarged showing the openings of the apertures.
4. Noncelluliferous side illustrating the nematopores (figs. 2–4, after D'Orbigny, 1854).
Cretaceous of France.

FIGS. 5–7. *Semicytis fenestrata* D'Orbigny, 1852 ---------------------- page 76.
5. Obverse face of base of zoarium with an ovicell × 15 (after Gregory, 1909).
Cretaceous (Coniacian): Chatham, England.
6. Posterior face, × 12, showing the orifices of the nematopores.
7. Anterior face illustrating the openings of the tubes.
Cretaceous (Coniacian): Les Roches (Loir-et-Cher), France.

FIGS. 8–11. *Truncatula tetragona* Michelin, 1846 ---------------------- page 66.
8. A specimen, × 6, with closely spaced pinnules.
9. An example, × 6, exhibiting widely spaced pinnules.
10. Lateral view of a branch, × 12.
11. Posterior face, × 12, showing the orifices of the nematopores.
Cretaceous (Turonian): Ruillé Poncé (Loir-et-Cher), France.

FIGS. 12–16. *Truncatula vendocinensis*, new species ------------------ page 69.
12. Zoarial fragments, natural size.
13. A zoarial base, × 6.
14. Anterior face, × 6.
15. Dorsal, × 12, showing the orifices of the nematopores.
16. Another dorsal, × 12, in which the nematopores are irregularly arranged.
Cretaceous (Santonian): Vendome (Loir-et-Cher), France.

PLATE 27.

FIGS. 1–4. *Supercytis digitata* D'Orbigny, 1854 ---------------------- page 73.
1, 2. Profile of a colony, natural size and enlarged.
3. The same specimen viewed from above and showing two ovicells.
4. View of same from below.
Cretaceous (Coniacian): Fecamp, etc., France.

FIGS. 5–11. *Unicytis falcata* D'Orbigny, 1854 ------------------------ page 73.
5, 6. Lateral views of specimen natural size and enlarged.
7. Posterior side, enlarged, showing the nematopores.
8. Anterior side with the zooecial apertures.
9. A cross section of a branch (figs. 1–9 after D'Orbigny).
10. A longitudinal section, × 12, showing the zone of nematopores to the right and the zooecia opening in the pinnules to the left.
11. Transverse section × 12, illustrating the thick zone of nematopores which almost surrounds the branch.
Cretaceous (Santonian): Vendome, France.

FIGS. 12–18. *Diplodesmopora alternata*, new species ------------------ page 60.
12–14. Anterior, lateral and posterior sides of an ovicelled specimen, × 12.
15. Dorsal of an ovicelled specimen showing the conical zone of growth and the nematopores.
16–18. Three views of the same specimen illustrating the lateral ovicell.
Cretaceous (Maastrichtian): Maastricht, Holland.

FIGS. 19–25. *Diplodesmopora opposita*, new species ---------- page 60.

19. Lateral view of an example with a broken ovicell × 12. The fascicles are biserial and the nematopores are closed by an epitheca.
20. A worn example, × 12, with the dorsal nematopores visible.
21. Another example with a complete ovicell, × 12. The fascicles are uniserial and the nematopores are closed.
22. Transverse section, × 12, between the fascicles.
23. An incomplete transverse section, × 12, showing the zone of nematopores.
24. Transverse section, × 12, through the middle of the fascicles. The dorsal is very thick and is perforated by the nematopores.
25. Longitudinal section, × 12. The tubes are long, expanded with dorsal gemmation. They branch into dorsal nematopores which are long, rectilinear, with much thickened walls.

Cretaceous (Coniacian): Tours (Indre-et-Loire), France.

PLATE 28.

FIGS. 1–7. *Desmepora semicylindrica* Roemer, 1840 ---------- page 77.

1. Lateral view of branch, × 12, showing the ovicell.
   Cretaceous (Turonian): Fontaine d'Antoigne, near Chatellerault, France.
2, 3. Anterior view of a branch enlarged and cross section of the same (after Marsson.)
   Cretaceous: Island of Rügen.
4. Zoarium, natural size.
5, 6. Posterior face enlarged.
7. Anterior face enlarged (figs. 4–7, after Lonsdale).
   Cretaceous of England.

FIGS. 8, 9. *Desmepora reussi* Gregory, 1909 ---------- page 77.

Fragment, natural size, and enlarged.

Cretaceous (Cenomanian): Plauen, Saxony.

FIGS. 10–15. *Discocytis eudesi* Michelin, 1844 ---------- page 71.

10, 11. Zoarium natural size and enlarged.
12. Section through the zoarium, enlarged.
13. Anterior side of the zoarium enlarged (figs. 10–13, after D'Orbigny, 1852).
14. Posterior side of zoarium showing arrangement of numerous ovicells.
15. Part of another ovicell bearing zoarium, × 12.
   Cretaceous (Cenomanian): LeMans (Sarthe), France.

FIG. 16. *Discocytis eccentrica* Ulrich and Bassler, 1907 ---------- page 72.

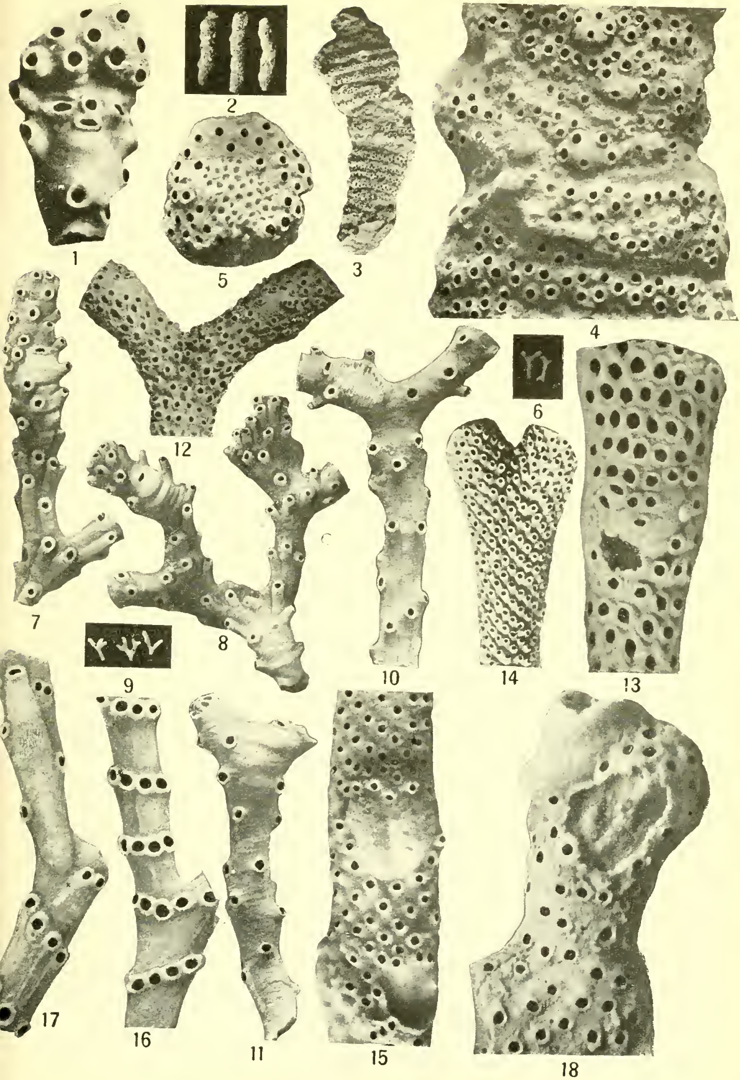
Portion of an ovicelled zoarium, × 12. The ovicell is a vesicle with special walls, situated on the edge of the zoarium and branched between the fascicles.

Cretaceous (Vincentown marl): Vincentown, New Jersey.

FIGS. 17. *Discocytis essenensis* Simonowitsch, 1871.

A median section through the zoarium enlarged (after Simonowitsch, 1871).

Cretaceous (Cenomanian): Essen, Germany.



FOSSIL AND RECENT CYCLOSTOMATOUS BRYOZOA.

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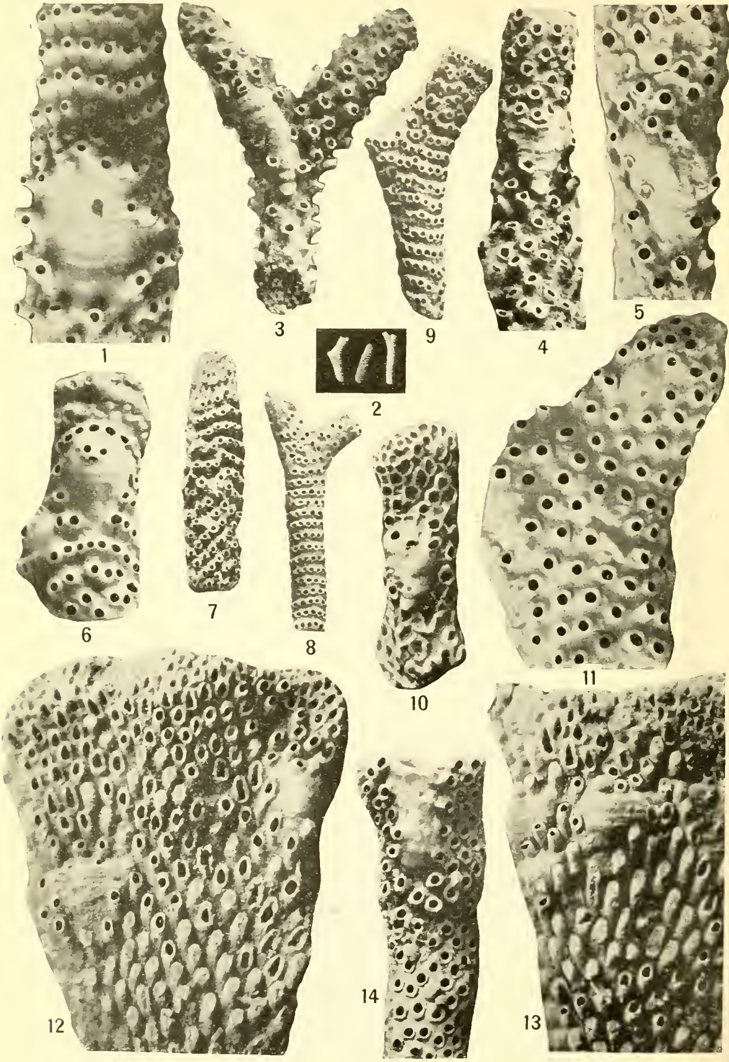

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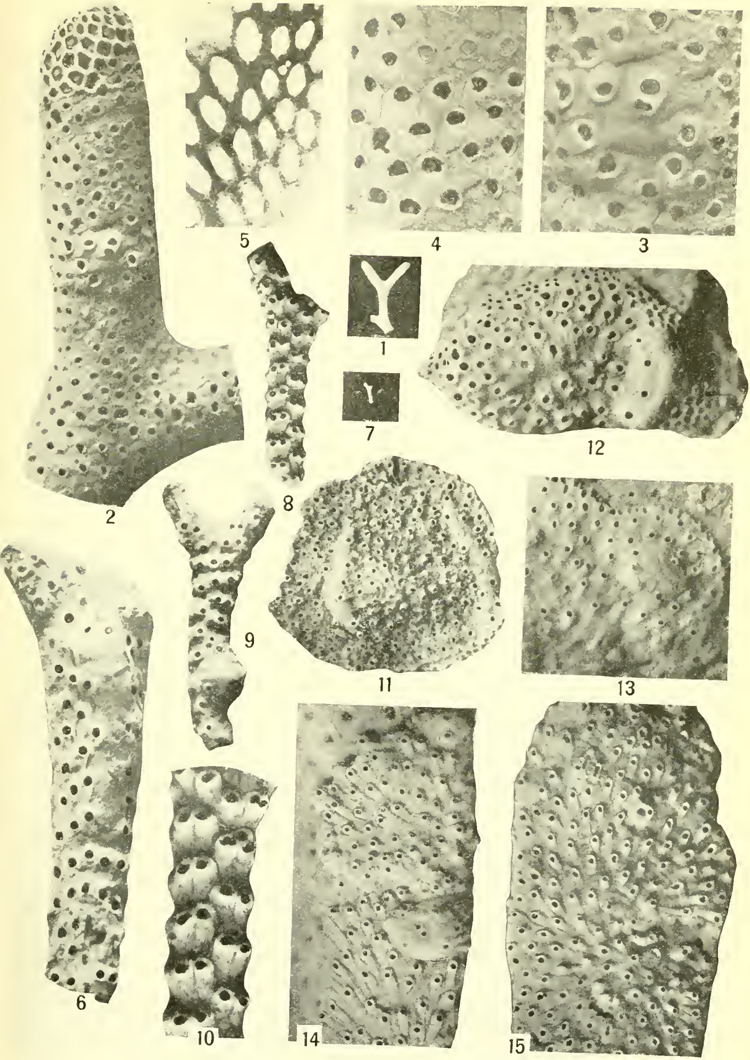

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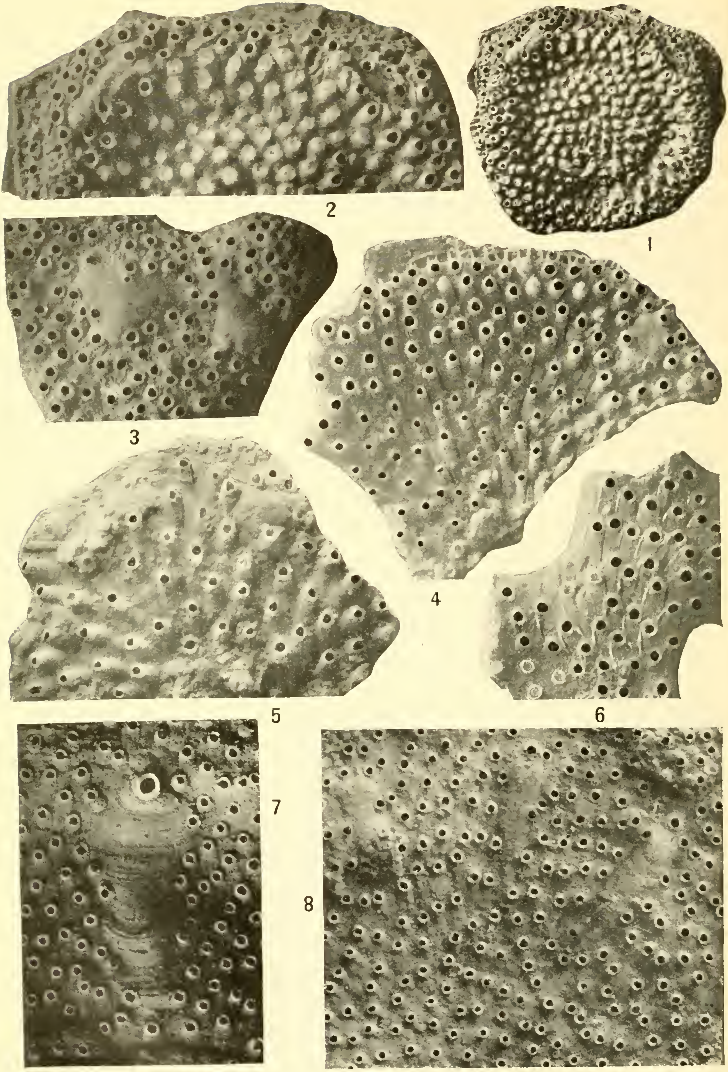

FOSSIL AND RECENT CYCLOSTOMATOUS BRYOZOA.

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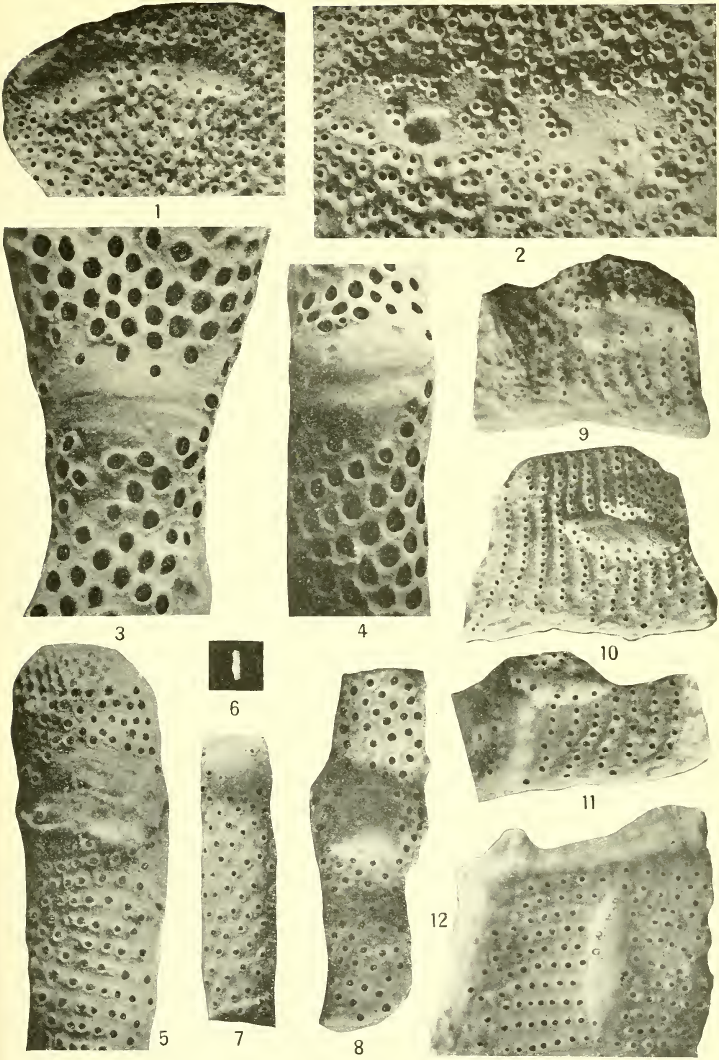

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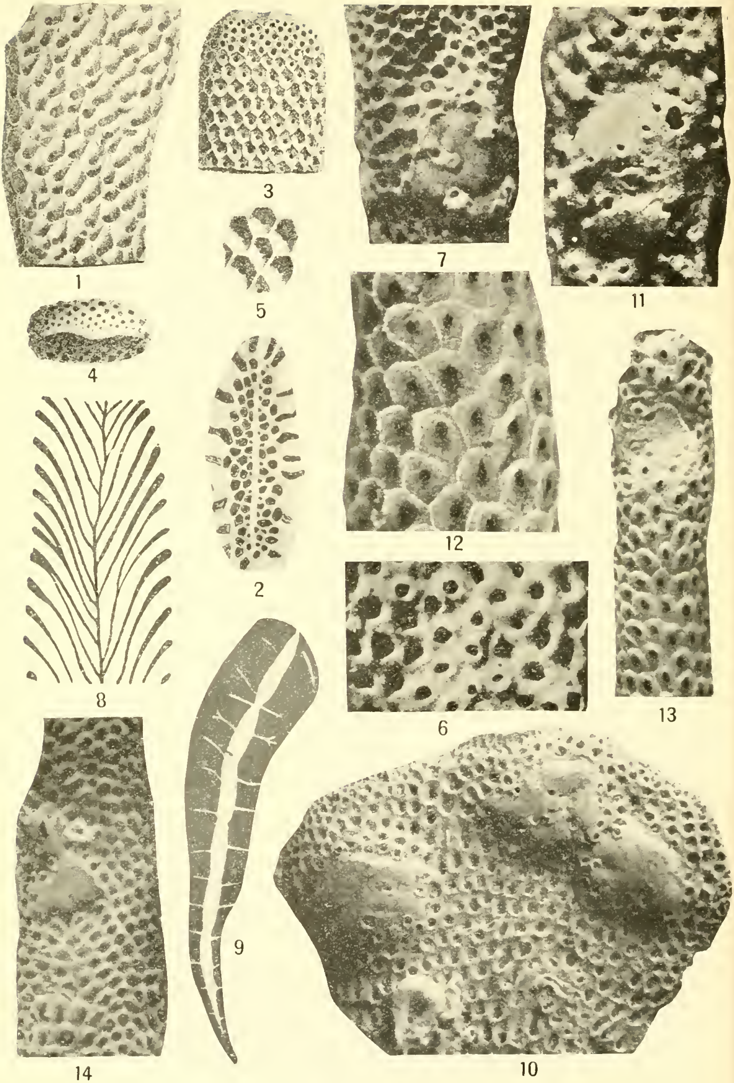

Fossil and Recent Cyclostomatous Bryozoa

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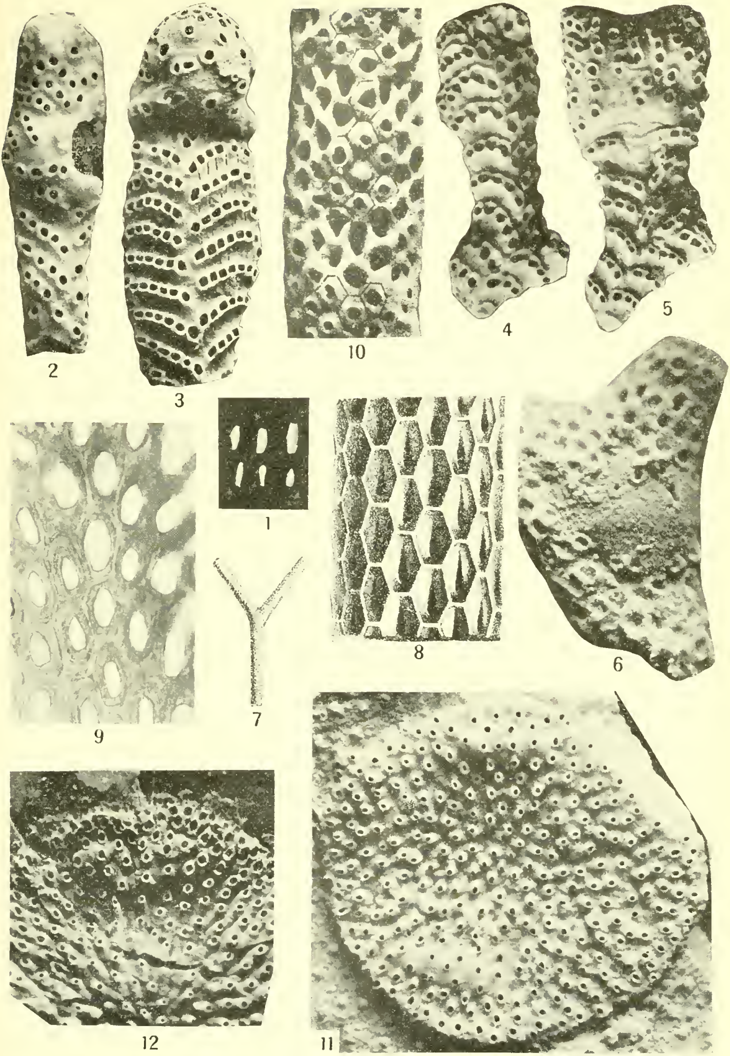

FOSSIL AND RECENT CYCLOSTOMATOUS BRYOZOA.

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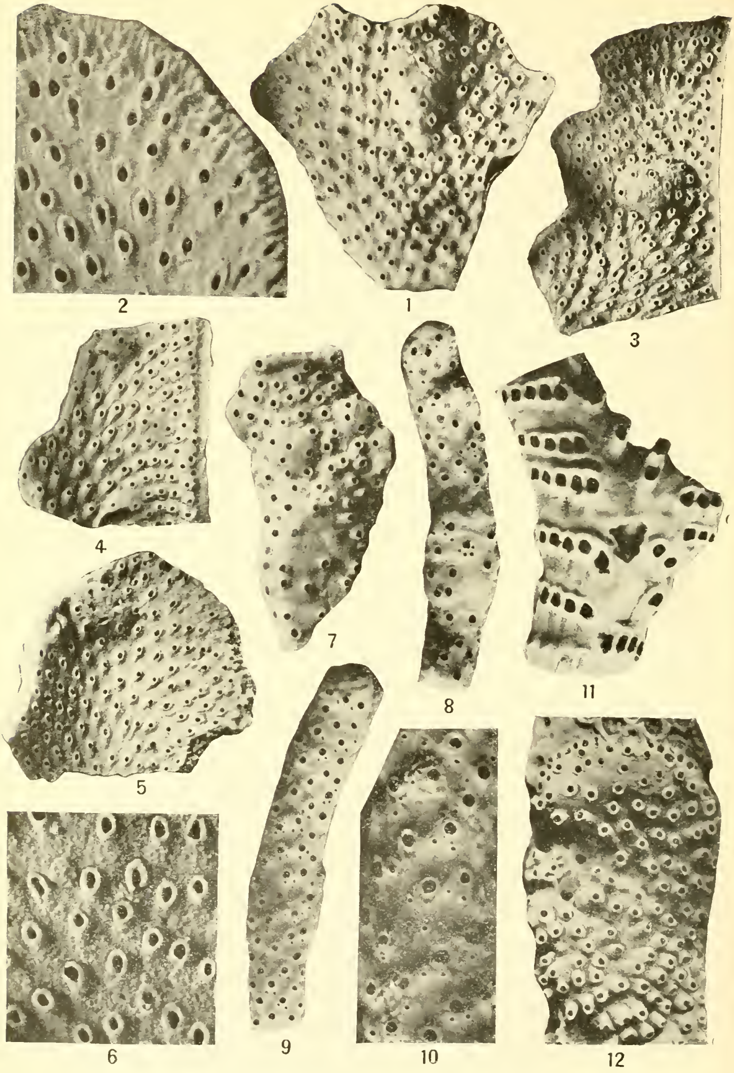

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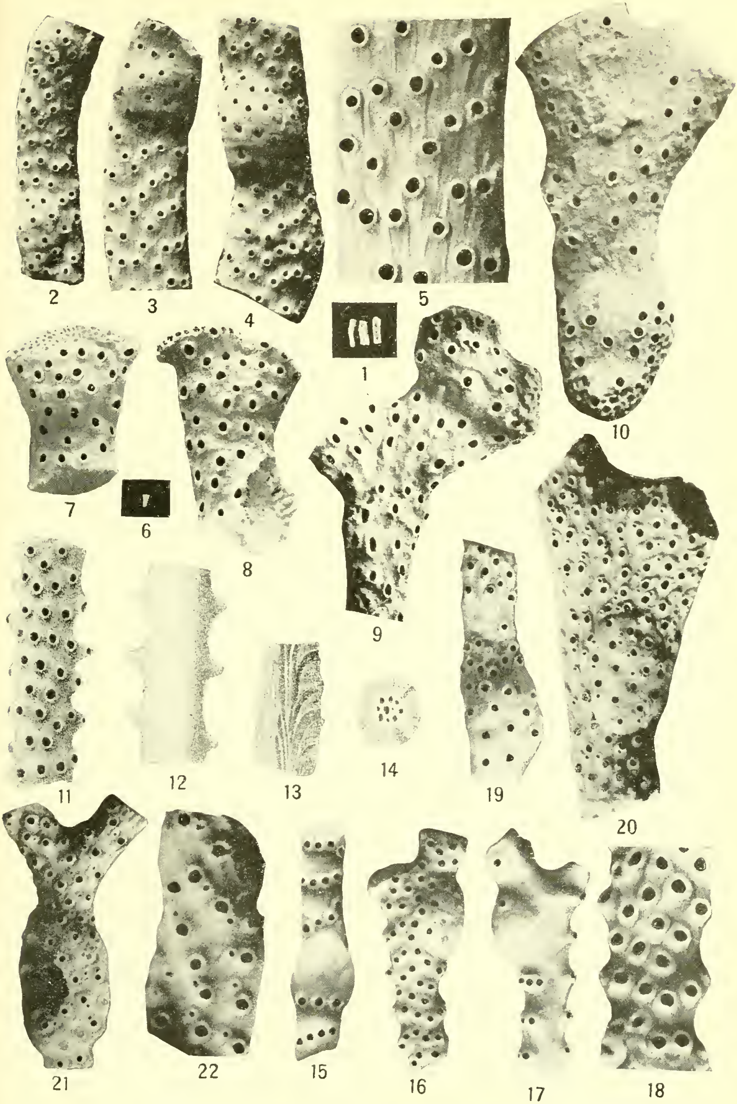

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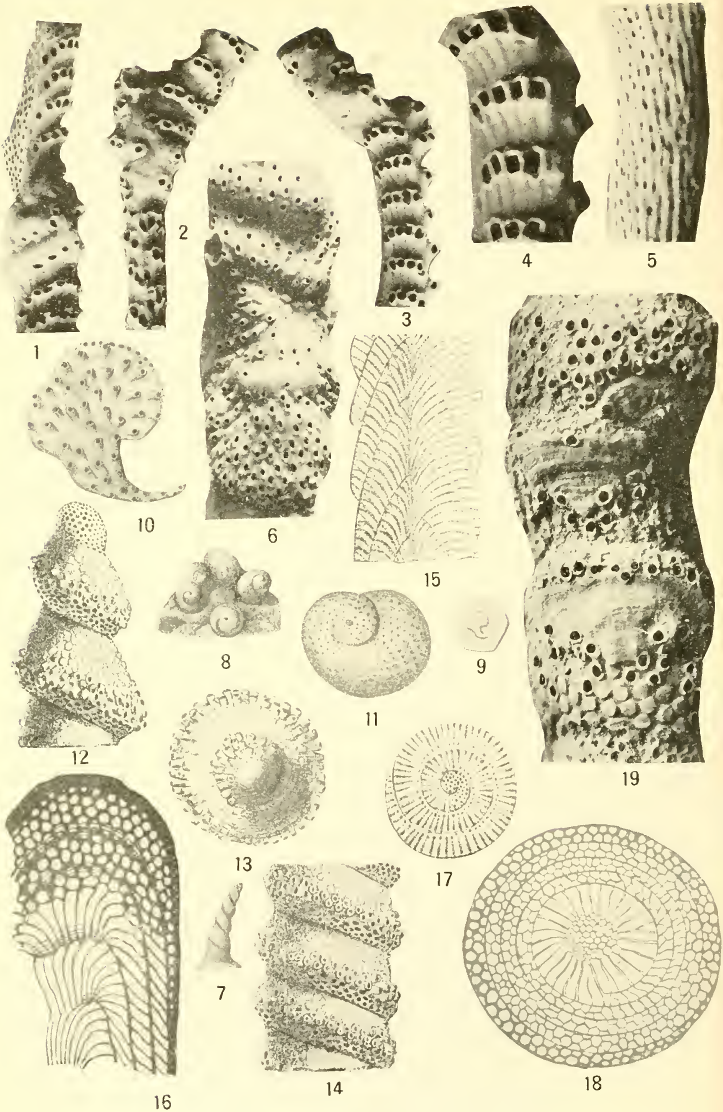

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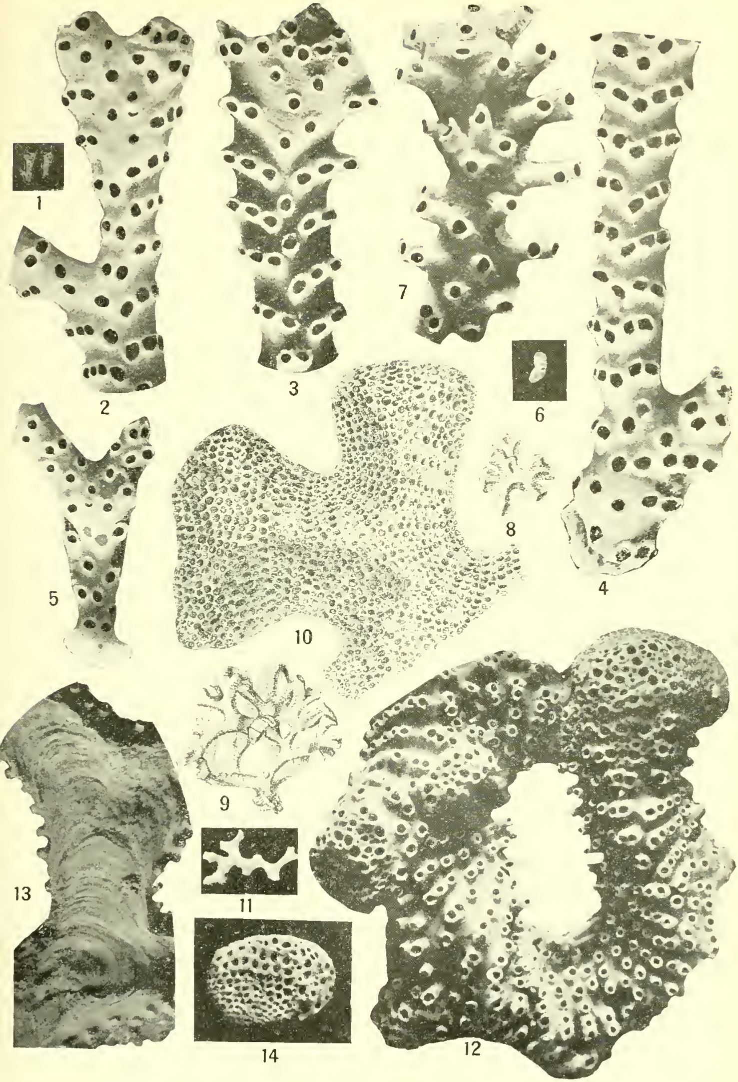

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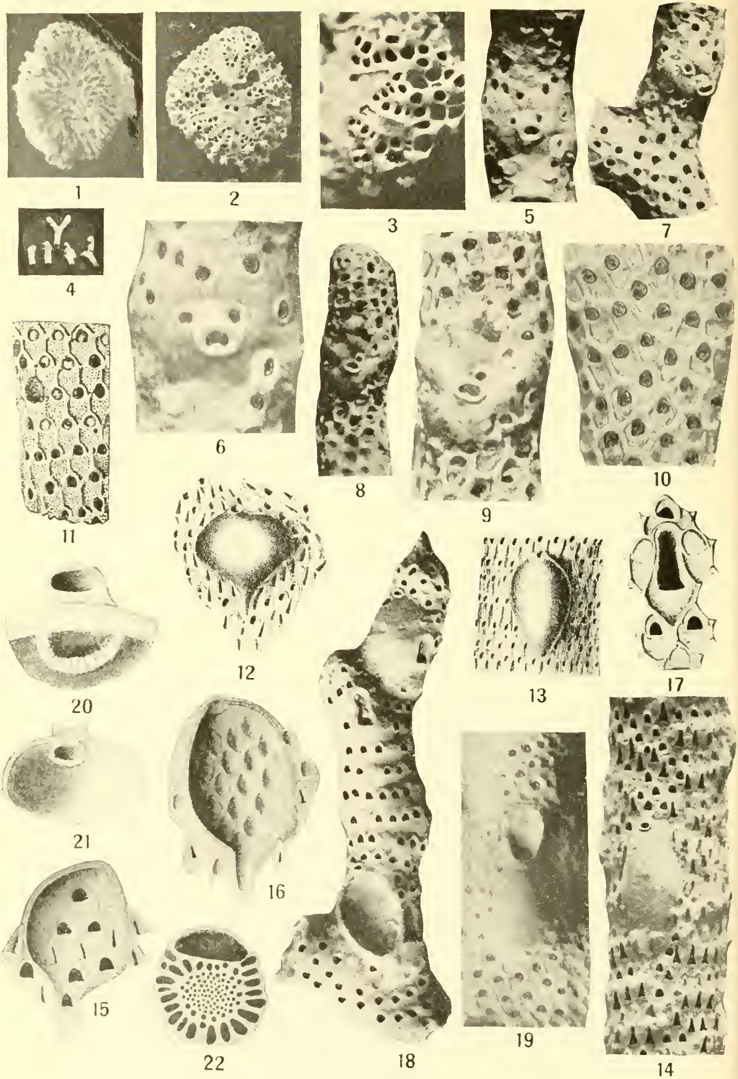

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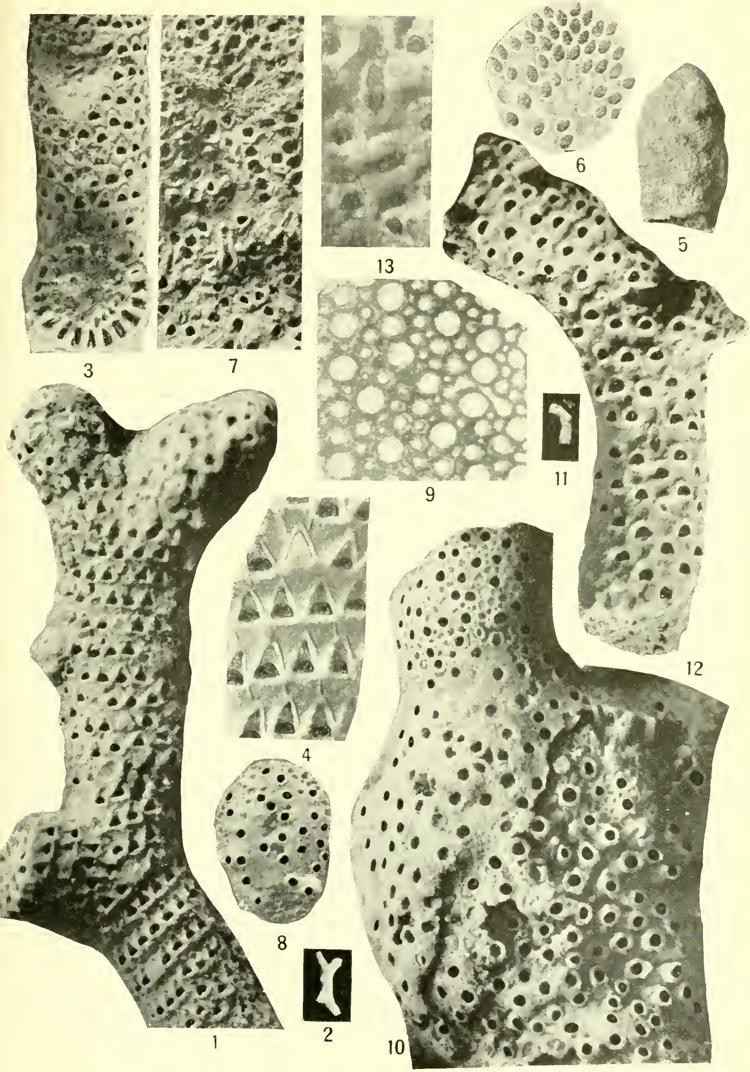

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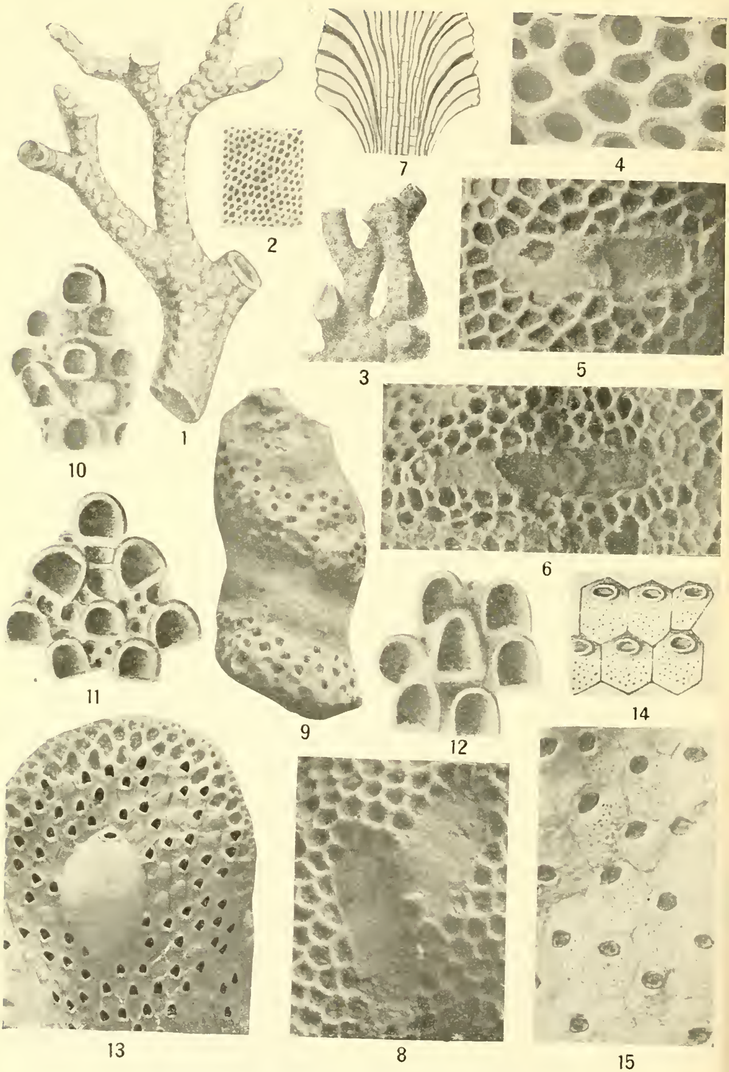

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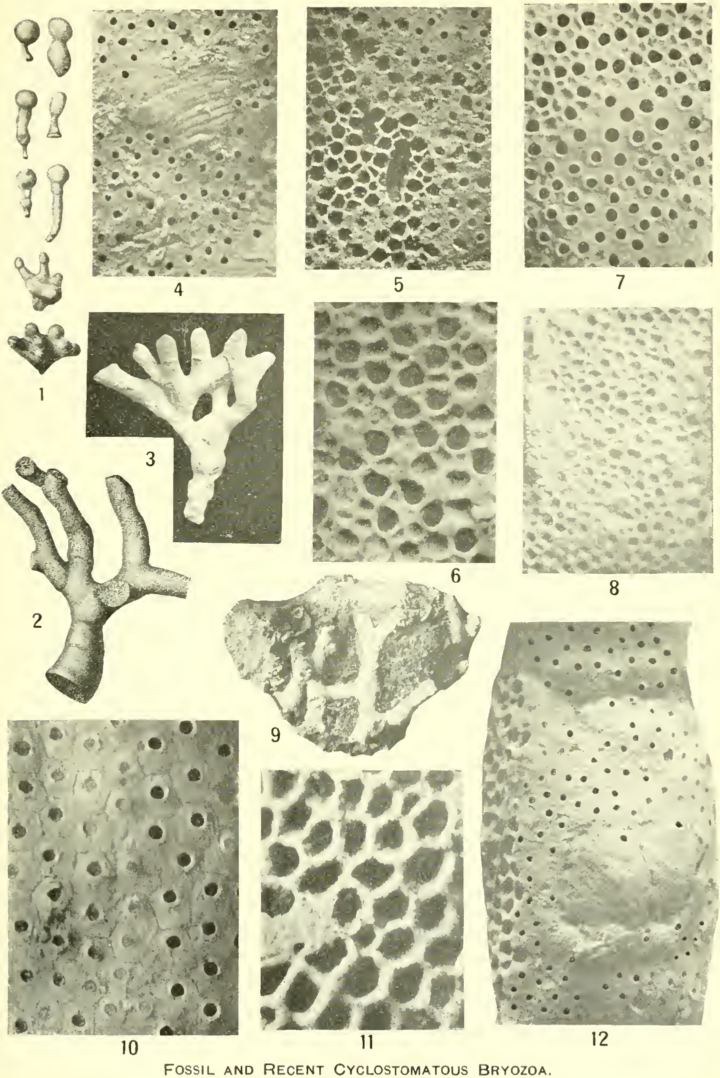

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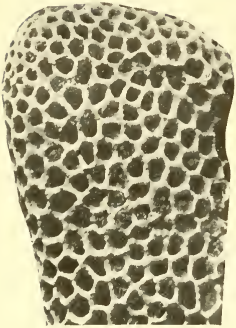

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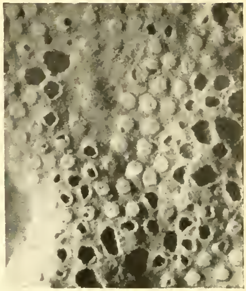

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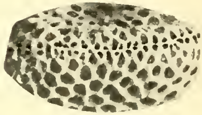

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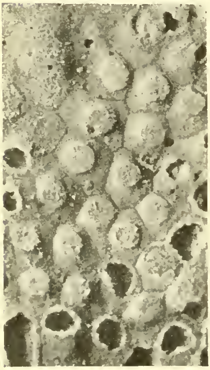

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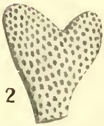

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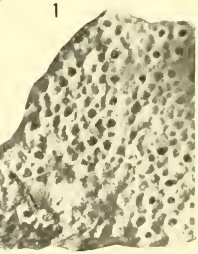

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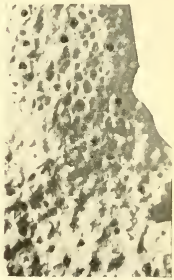

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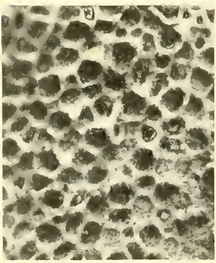

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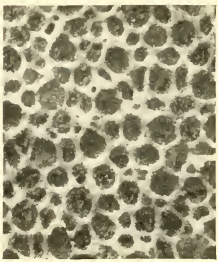

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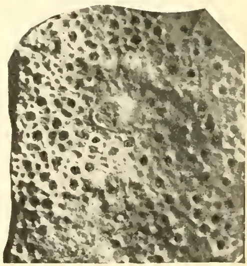

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FOSSIL AND RECENT CYCLOSTOMATOUS BRYOZOA.

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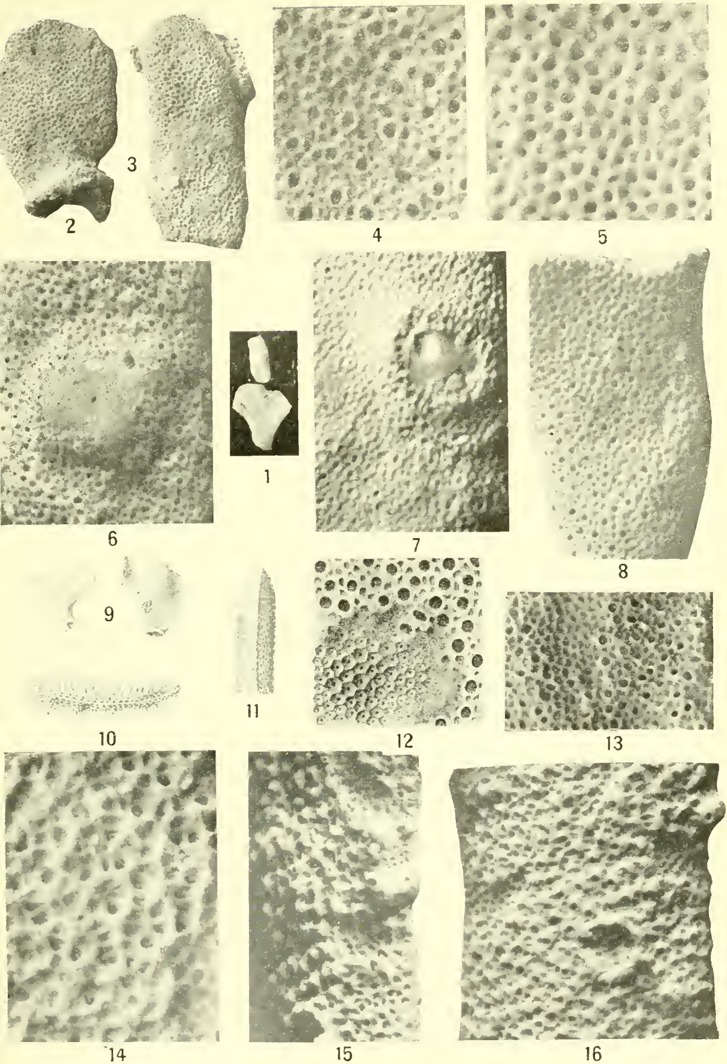

FOSSIL AND RECENT CYCLOSTOMATOUS BRYOZOA.

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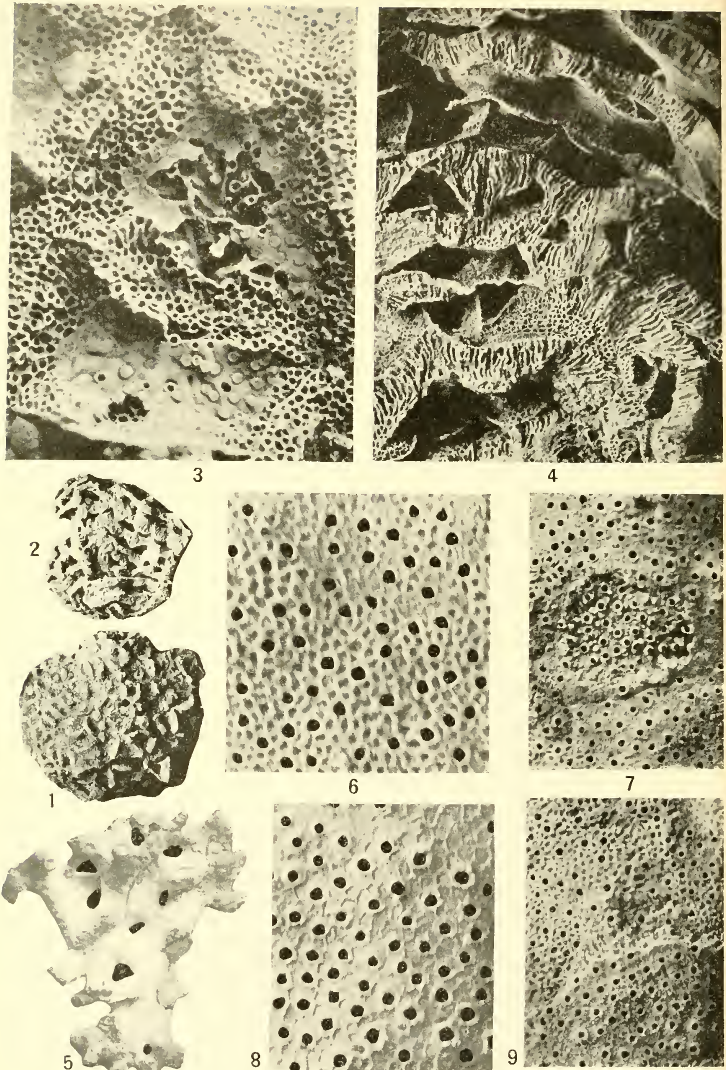

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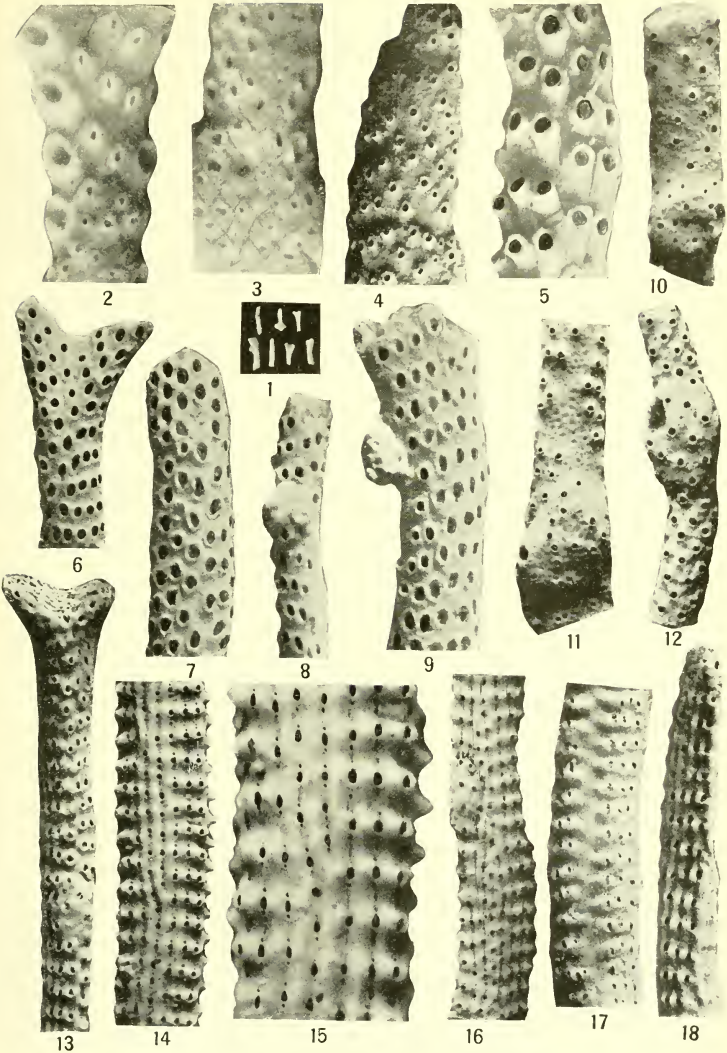

FOSSIL AND RECENT CYCLOSTOMATOUS BRYOZOA.

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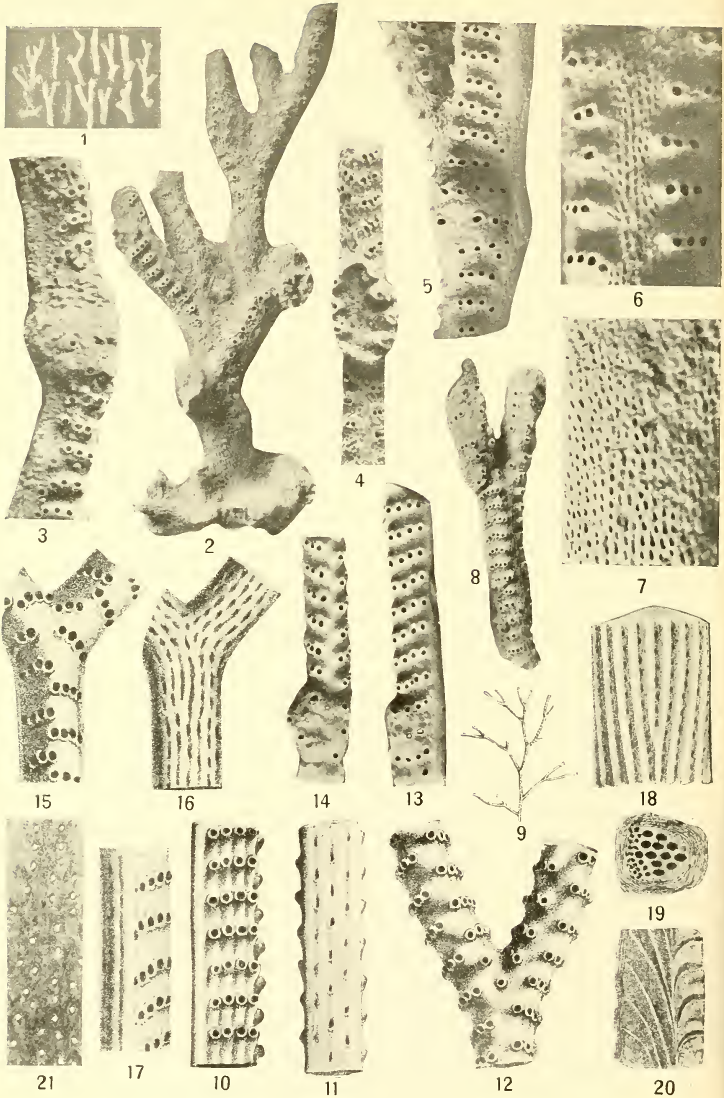
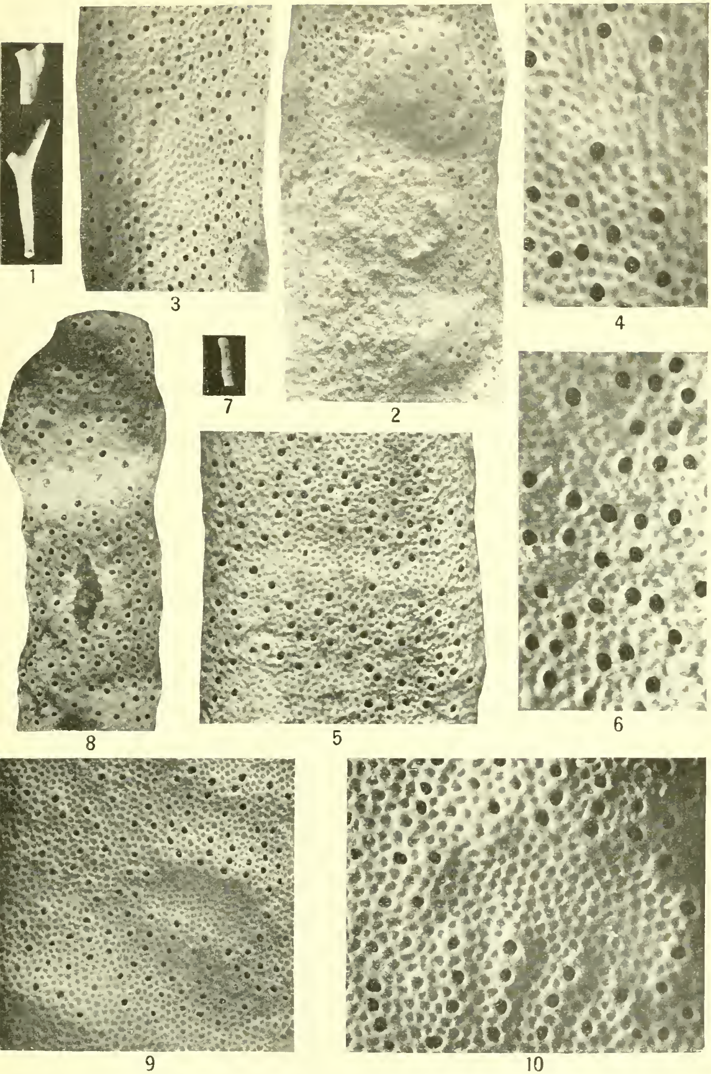


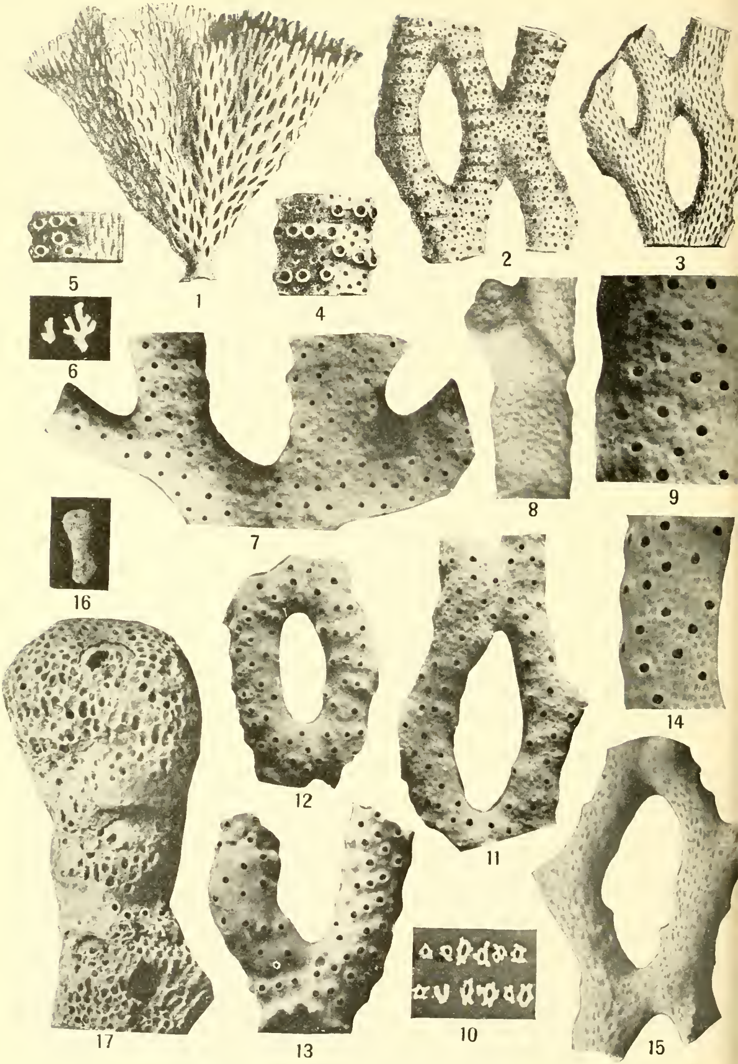
FOSSIL AND RECENT CYCLOSTOMATOUS BRYOZOA.

FOR EXPLANATION OF PLATE SEE PAGES 149-150.



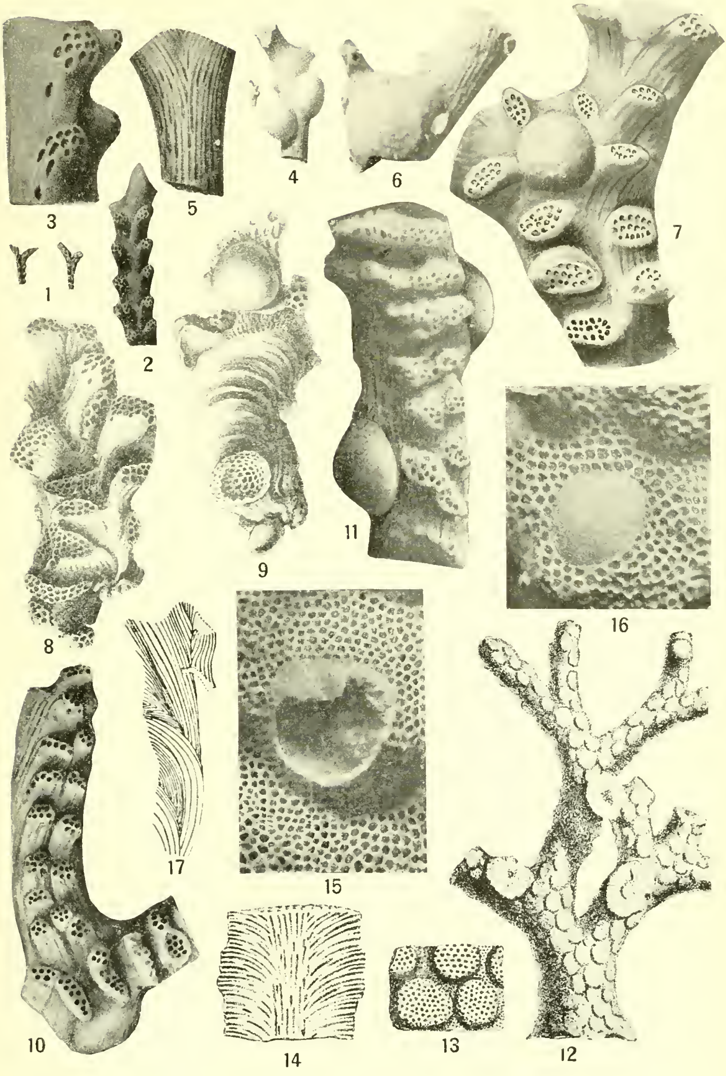
FOSSIL AND RECENT CYCLOSTOMATOUS BRYOZOA.

FOR EXPLANATION OF PLATE SEE PAGE 150.



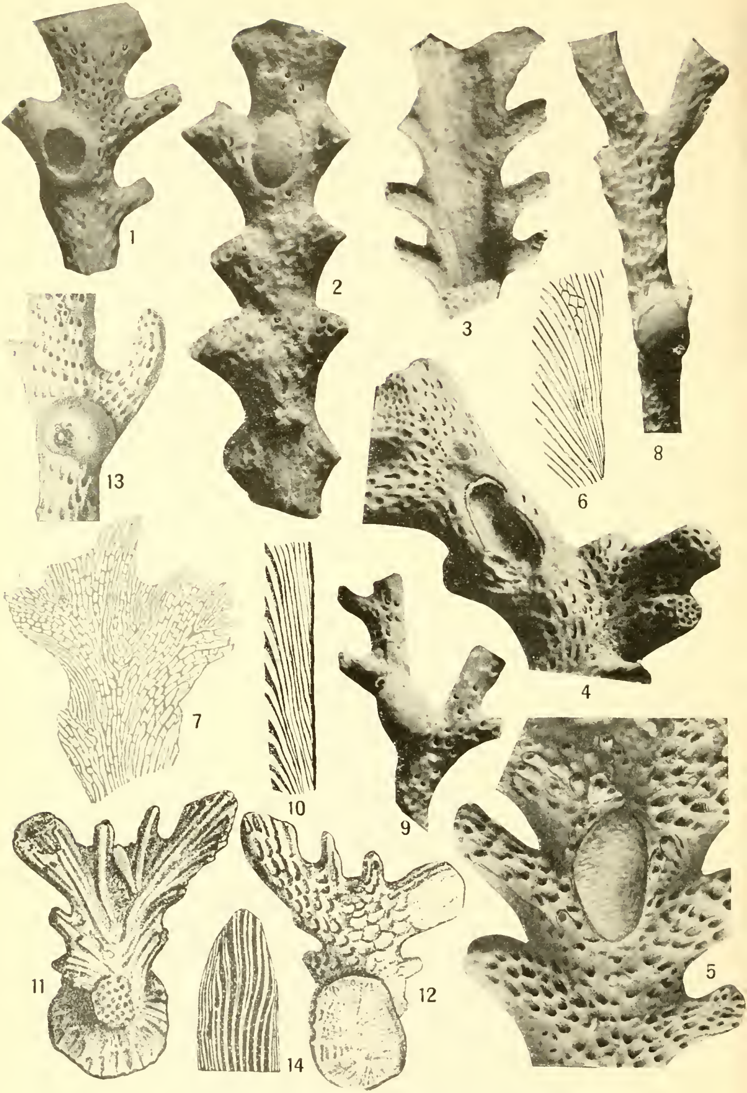
FOSSIL AND RECENT CYCLOSTOMATOUS BRYOZOA.

FOR EXPLANATION OF PLATE SEE PAGES 150-151



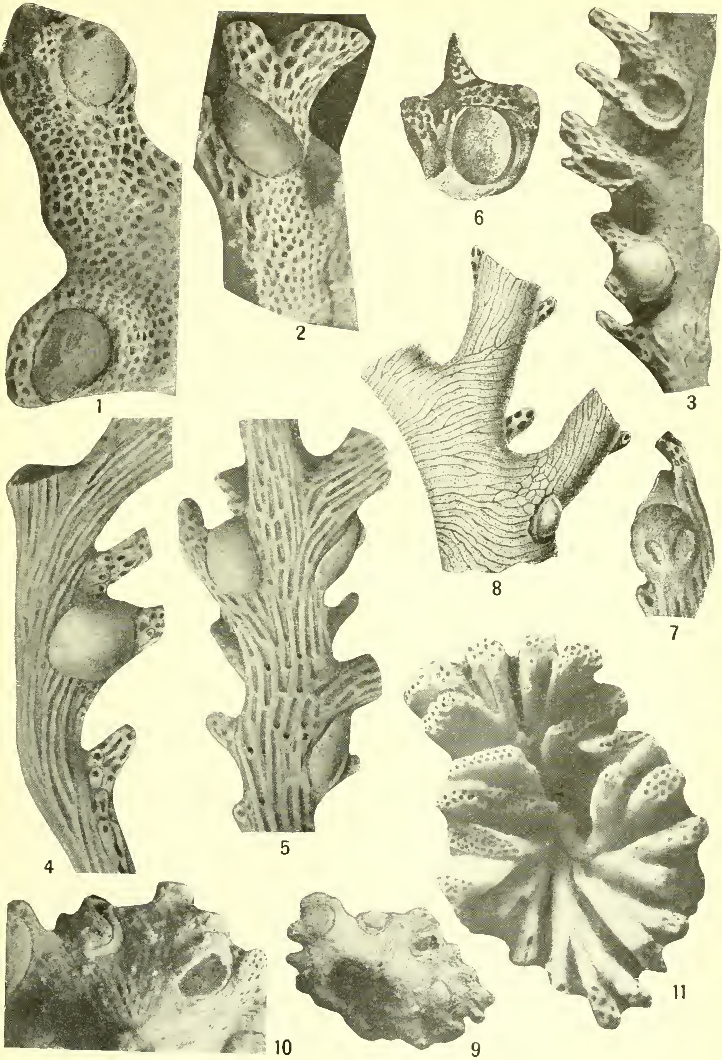
FOSSIL AND RECENT CYCLOSTOMATOUS BRYOZOA.

FOR EXPLANATION OF PLATE SEE PAGE 151



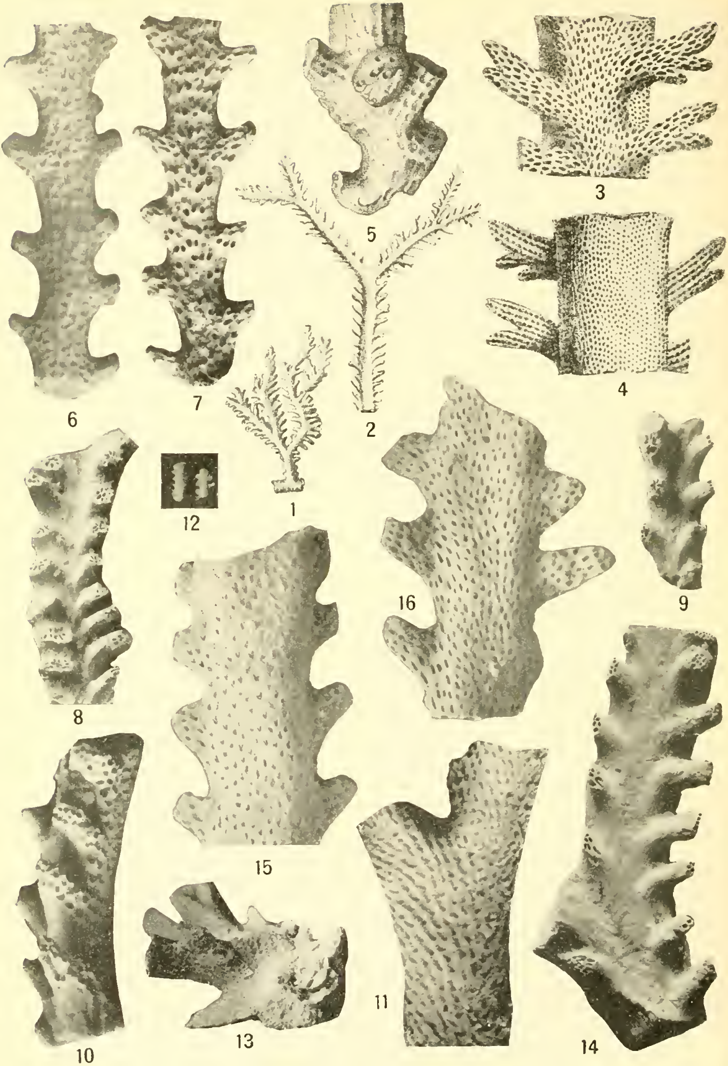
FOSSIL AND RECENT CYCLOSTOMATOUS BRYOZOA.

FOR EXPLANATION OF PLATE SEE PAGE 152.



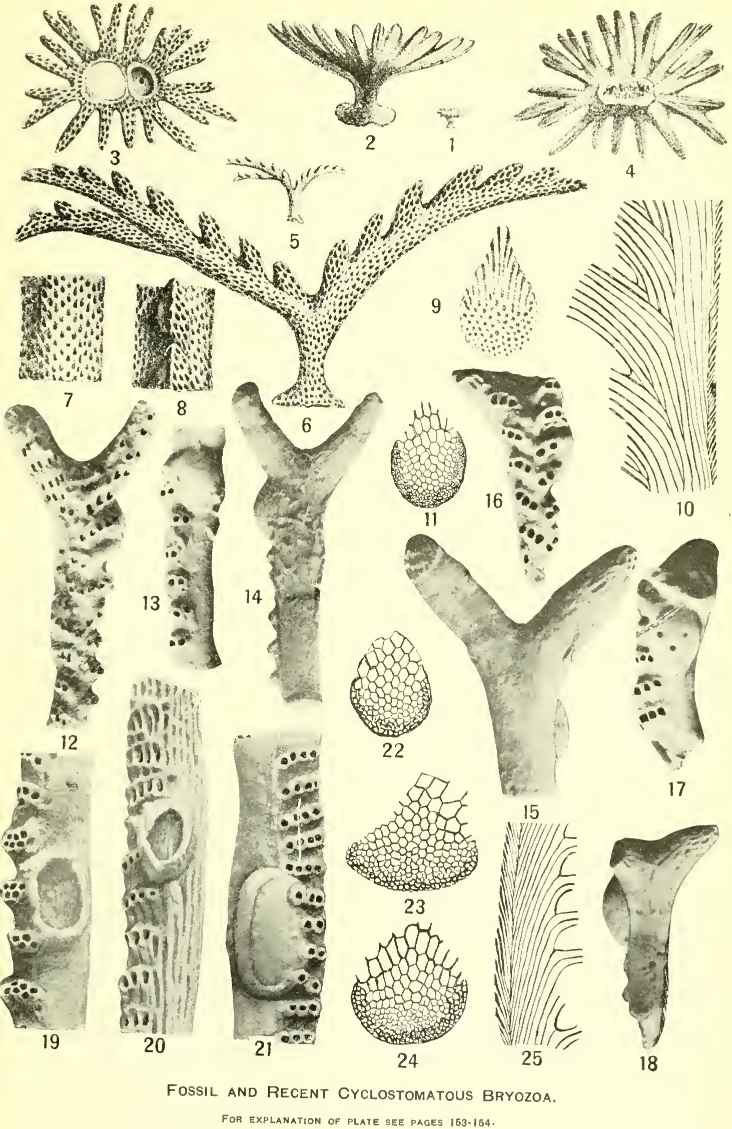
Fossil and Recent Cyclostomatous Bryozoa.

For explanation of plate see page 152.



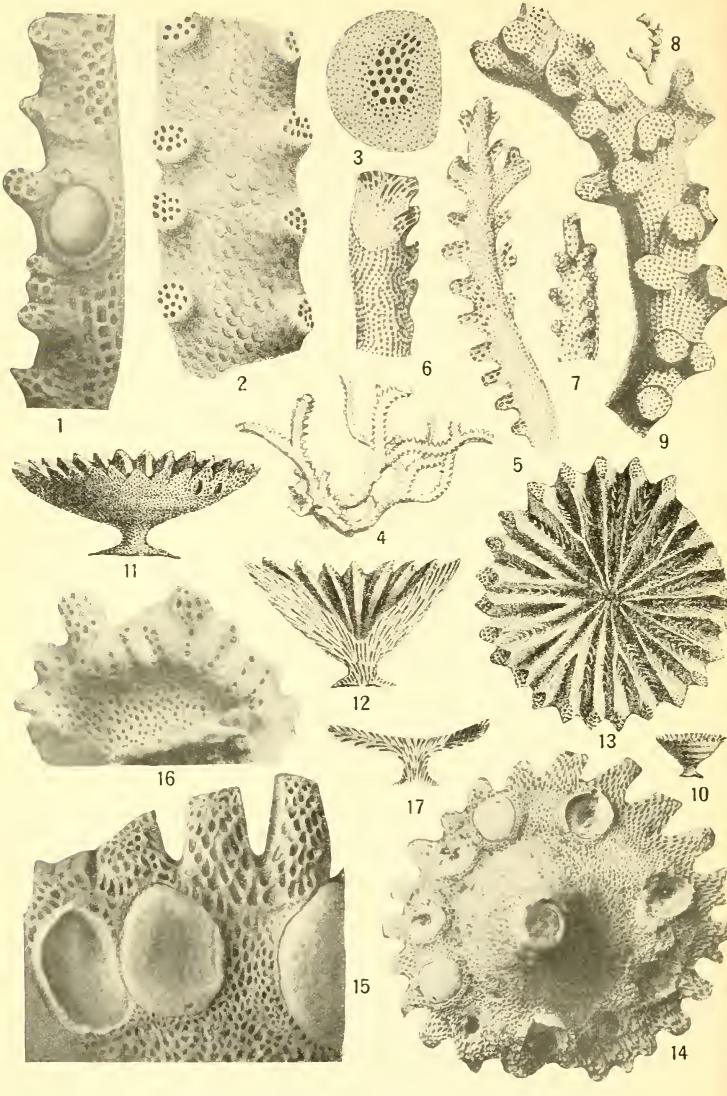
FOSSIL AND RECENT CYCLOSTOMATOUS BRYOZOA.

FOR EXPLANATION OF PLATE SEE PAGE 153.



FOSSIL AND RECENT CYCLOSTOMATOUS BRYOZOA.

FOR EXPLANATION OF PLATE SEE PAGES 153-154.



FOSSIL AND RECENT CYCLOSTOMATOUS BRYOZOA.

FOR EXPLANATION OF PLATE SEE PAGE 154.

INDEX OF SCIENTIFIC NAMES.

[Synonyms are in italics.]