

(222).—FIG. 106,7. **W. spatulata* (PROUT), Warsaw, Ill.; 7a, surface, $\times 25$; 7b, long. sec., $\times 25$ (222).

Family PALESCHARIDAE Miller, 1889

Thin parasitic expansions upon other fossils, especially cephalopod shells. Zoecial tubes thin, very short, without diaphragms or other structures; apertures direct, angular oblong, with groups of larger ones at regular intervals (114). *Ord.-Dev.*

Paleschara HALL, 1874 [*P. incrustans*]. May belong among cheilostomes. *Ord.-Dev.*—FIG. 106,5. **P. incrustans*, Dev.(Held.), N.Y.; 5a, incrusting zoarium, $\times 1$; 5b, surface, $\times 10$ (163).

Order CHEILOSTOMATA Busk, 1852

[=Cheilostenostomata SILEN, 1942 (*partim*)]

Zoaria mostly calcareous but in some families corneous or membranous, generally delicate and highly variable in form; most common are incrusting or free lamellate expansions, slender branching stems, and reticulate fronds. Zoecia almost exclusively short, rounded or angular chambers, arranged serially and in general side by side; orifice distal, smaller in diameter than the zoecium, closed by a hinged operculum, surrounded in many genera by a rim (peristome) that may be extended as a tube (peristomie) with aperture distinct from the operculum-covered orifice, thus resembling cryptostomes. Eggs matured in several sorts of ovicells. Specialized zooids (avicularia, vibracula) common. ?*M.Jur., Cret.-Rec.*

MORPHOLOGICAL FEATURES

The Cheilostomata, the dominant group among Cenozoic and Recent Bryozoa, are characterized by closure of the aperture with an **operculum**, hinged chitinous lip (*cheilos*), when the polypide is retracted. The order includes many beautiful sorts of zoarial growth, for the zoecial **frontal wall**, when calcified, commonly exhibits varied patterns of great delicacy. Formerly, differences in these patterns were relied on alone for the discrimination of genera and species and as a result, an unnatural classification prevailed. The calcification of the frontal wall is only one of the bryozoan

functions and a natural classification should be based upon all important features.

The Cheilostomata also exhibit the highest type of development in the Bryozoa and for that reason the description of the various animal functions has been reserved for this place. Study of living bryozoans shows that in order of importance these are (1) those concerned with reproduction, including passage of the eggs and escape of the larvae, which calls to attention relations between the zoecial operculum and ovicell; (2) the hydrostatic system, which controls extrusion and retraction of the polypide; and (3) calcification and chitinization, or the nature of skeletal parts. The least important of these formerly was considered alone almost invariably. The characters mentioned are not difficult to determine in Recent forms, but in fossil species, where only the calcareous skeleton remains, often it seems impossible to discover all of them. Fortunately, the form of the zoecial aperture indicates the hydrostatic function and the occurrence of **cardelles** (projections on the orifice edge for hinging of the operculum) reveals the presence and nature of movements of the operculum. The function of reproduction is illustrated by the character and location of the ovicell.

Reproduction.—A classification of the Bryozoa that finally may be judged acceptable is impossible at present, because probably each family should be characterized essentially by the larval form of its constituents; unfortunately, this is known at present for comparatively few families. The fertilized eggs of cheilostomatous Bryozoa are transformed into embryos as in the Cyclostomata and these develop into larvae within special cavities of incubation, which, when visible, are called **ovicells**. The larva called *Cyphonautes*, belonging to the widely distributed *Membranipora pilosa*, is a curious pelagic form with a pair of shell-like covers protecting its sides. Some cheilostome species reveal no ovicells; nothing on the exterior shows their mode of reproduction. Some are oviparous and expel their eggs by an intertentacular organ, but most have some visible ovicell, which is a globular swelling surmounting the zoecial orifice and not a direct modification of the zoe-

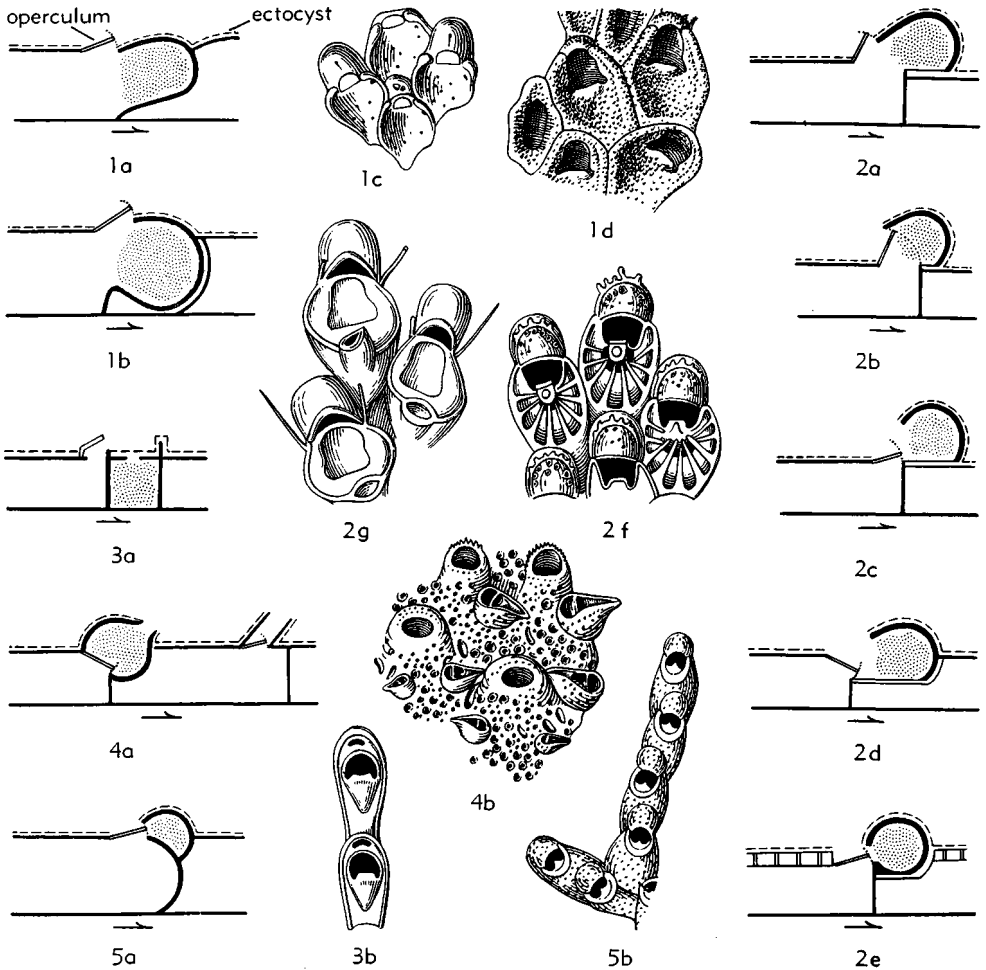


FIG. 107. Types of ovicells in cheilostome bryozoans. (In sections zooecial and ovicell walls are defined by relatively thick black lines, and interior of ovicell is marked by stipple pattern; operculum shown in partly open position; ectocyst shown by thin broken line; arrows indicate direction of growth, with proximal at left and distal at right) (137).

1a-d, Endozooecial ovicells, distinguished by location within the zooecium. **1a**, Longitudinal section showing ovicell very widely open toward zooecium and **(1b)** with partial separation by a fold of the zooecial wall; when the operculum shuts, both zooecium and ovicell are fully enclosed. **1c**, Endozooecial ovicells (at left and right) of *Micropora coriacea* ESPER, $\times 25$, with small semicircular opercula shut, closing off the interior spaces of zooecia and ovicells. **1d**, Fragment of *Smittipora levinseni* (CANU-B.), $\times 40$, opercula lost; small endozooecial ovicells may be discerned at distal extremities of the 2 upper zooecia.

2a-g, Hyperstomial ovicells, characterized by placement of the ovicell as overlap on distally adjoining zooecium. **2a**, Section of type in which closure of the operculum serves to shut both zooecium and ovicell, as in endozooecial ovicells. **2b**, Type in which the operculum may leave ovicell open when zooecium is closed. **2c**, Type in which ovicell cannot be closed. **2d**, Type with obliquely placed operculum and ovicell impinging strongly on distal zooecium. **2e**, Type in which ovicell opens into tubular area (peristomie) above operculum. **2f**, *Umbonula verrucosa* ESPER, $\times 36$, with hyperstomial ovicells; **2g**, *Ramphonotus mina* BUSK, $\times 50$, showing 3 zooecia with hyperstomial ovicells.

3a,b, Endotoichal ovicells, distinguished by complete separation of the ovicell from zooecium on proximal side, to which it is related, aperture of the zooecium and opening of the ovicell being in approxi-

cium, as in Cyclostomata. Furthermore, cheilostome ovicells, unlike those of cyclostomes, each of which contains many embryos, hold only a single egg or embryo. An ovicell of particular form and position should characterize all genera of a family, and of course all species of a genus should do likewise. In addition to the ovicell's position, the relationship of operculum to ovicell is quite important. Its various methods of operation are illustrated in the accompanying diagram (Fig. 107), which shows the more important types of structure. A section passing lengthwise through the zoecia is necessary to determine the nature of the ovicell, as well as the general structure. This section requires much care, since the specimen must be mounted on edge longitudinally so that abrasion follows a definite row of cells. Actual dissection of specimens with a fine needle under the microscope often is necessary to determine the kind of ovicell present.

Hydrostatic function.—The discovery of the zoecial hydrostatic function by JULLIEN in 1888 explained many manifestations of the bryozoan which long had remained a mystery. This concerns extrusion and retraction of the polypide and its tentacles and is so important that the suborders (Anasca and Ascophora) of the Cheilostomata are based upon it. In the Anasca, the so-called compensation sac (**compensatrix**) is wanting, and extrusion of the polypide from the zoecium is caused by depression of the chitinous frontal wall through action of parietal muscles. This feature, as well as the general anatomy of the anaskan cheilostome polypide, is illustrated in Figure 108. In the Ascophora, the polypide can emerge from the zoecium only if an equal volume of water is introduced to compensate for displacement caused by the extrusion. For this purpose, the compensatrix is located beneath the calcified frontal wall of the zoec-

cium and connected with the aperture (Fig. 109). At the moment of polypide extrusion, muscles attached to the compensatrix contract to enlarge the sac, and the operculum in opening for exit of the polypide, frees the water inlet leading to the sac. A drop of water enters the compensatrix, equalizing space occupied by the polypide. This entrance of water into the sac, the hydrostatic function, is exercised in many ways as indicated by the nature of the frontal wall of the zoecium and operculum. The shape of the operculum is a very diagnostic character and should be given special attention.

Operculum.—The small chitinous operculum, which fits over the zoecial orifice, serves to close at the same time both the opening for exit of the polypide and that leading to the compensation sac, because its anterior (distal) part (**anter**) covers the passage for the polypide and the posterior (proximal) part (**poster**) simultaneously covers the inlet to the compensatrix (Fig. 110). Thus, the shape of these portions of the operculum indicates the nature of the tubes they cover and so illustrates the importance of evidence furnished by the operculum. In one large group of the Ascophora, the orifice of the compensation sac is very small, and the operculum has a corresponding small narrow tongue; in another group, this orifice is quite large, and the corresponding portion of the operculum is large; again a special tube (**spiramen**) may introduce water into the compensatrix (Fig. 110). Finally, the compensation sac may not end in the aperture at all, but may open exteriorly by a special pore (**ascopore**).

The form of the operculum is mostly identical with that of the zoecial orifice, but the latter is not always visible exteriorly in fossil forms, being hidden by excessive calcification of the frontal wall or by avicularia (Fig. 111). The only safe means of determining the true form of the orifice is

(Fig. 107 continued)

- mately the same plane. *3a*, Longitudinal section. *3b*, *Cellaria sinuosa* HASSALL, $\times 50$, showing separate apertures of zoecia and the distally adjoined endotoichal ovicells.
- 4a,b*, Peristomial ovicells, in which the ovicell comprises an enlarged section of the peristomie. *4a*, Longitudinal section, showing operculum at base of peristomie, between zoecium and ovicell. *4b*, *Tubiporella magnirostris* MACGILL., showing 2 peristomial ovicells (lower ones).
- 5a,b*, Recumbent ovicells, in which the ovicell rests on the distal wall of the zoecium. *5a*, Longitudinal section. *5b*, *Phylactellipora hincksi* BASSLER, which has recumbent ovicells.

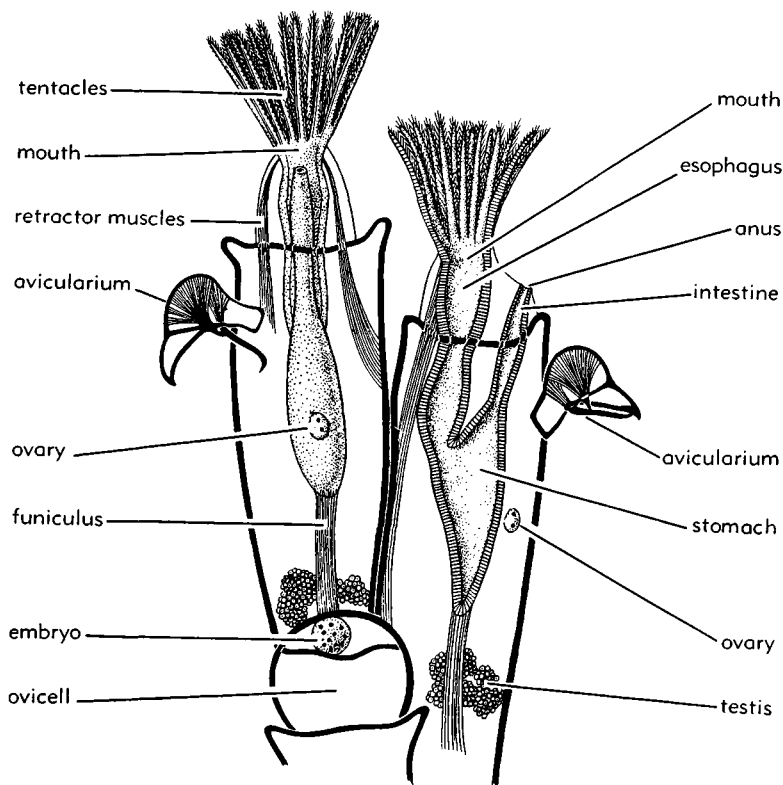


FIG. 108. Anatomy of anascan cheilostome zooids. Two individuals belonging to the common corneous cheilostome, *Bugula avicularia* LINNÉ, Rec., Atl., highly magnified, are illustrated to show various parts (after Parker & Haswell).

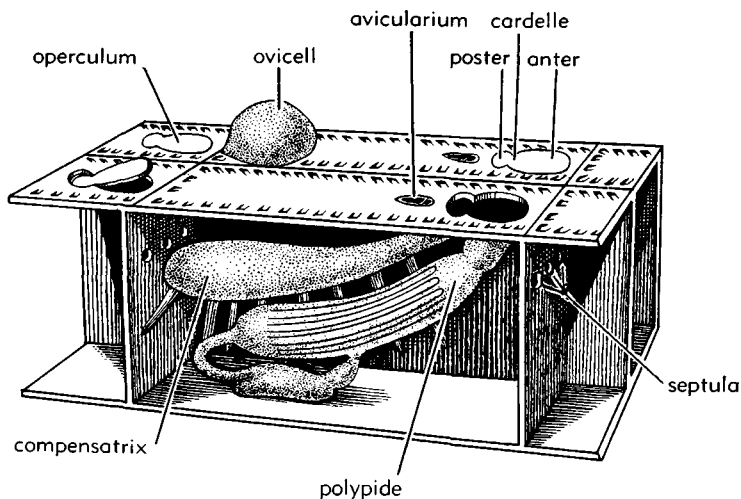


FIG. 109. Diagrammatic sketch of an ascophoran cheilostome showing nature of the frontal wall, operculum, retracted polypide, compensatrix, and an ovicell; communication pores (septula) occur in the walls between zoecia.

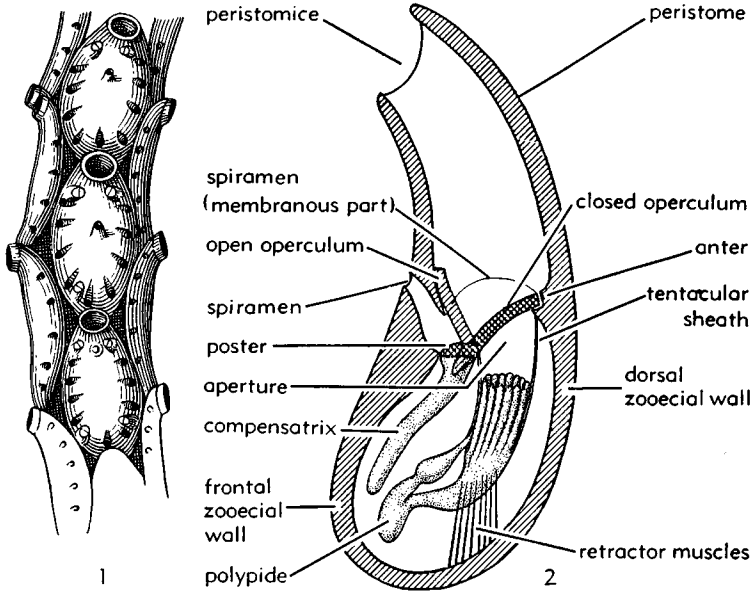


FIG. 110. Characters of ascophoran cheilostomes; *Tessaradoma gracile* Sars, Rec., Atl.; 1, Frontal side of zoarial branch, $\times 60$. 2, Longitudinal section, $\times 200$ (after Hincks & Jullien).

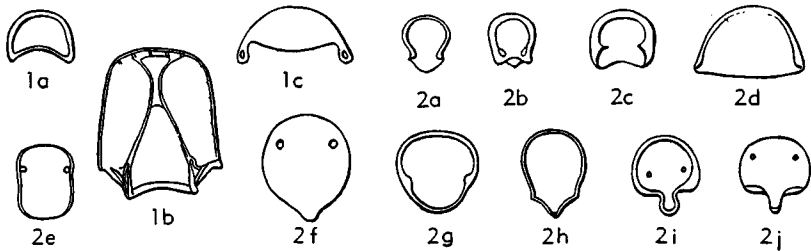


FIG. 111. Opercula of cheilostomes. 1a-c, Types belonging to anascan genera which lack a compensation sac; 1a, *Thalamoporella*; 1b, *Steginoporella*; 1c, *Aspidostoma*. 1d-m, Types belonging to ascophoran genera, showing contrast between proximal part (poster) covering entrance to the compensation sac, and distal part (anter) serving for closure of the passageway of the polypide; 2a, *Trypostega*; 2b, *Triphylozoon*; 2c, *Smittina*; 2d, *Holoporella*; 2e, *Stichoporina*; 2f, *Bipora*; 2g, *Escharoides*; 2h, *Schismopora*; 2i, *Rhynchozoon*; 2j, *Schizoporella*.

by examination of the interior of the zooecium by abrading of its basal surface. This preparation is easily made by mounting the fragment to be studied in hard Canada balsam on a glass slip, celluliferous side down, and then rubbing away the superfluous material until the inner side of the calcified frontal wall is revealed, whereupon the true nature of this wall, unchanged by any external influence, may be seen.

The preparation of the operculum, which remains only on Recent forms, is another

important but simple operation. In order to prepare slides for viewing under the microscope, a few zooecia with the operculum in place may be scraped off and crushed on the slide in a drop of water and after drying, Canada balsam and cover glass added. Some opercula will be broken, but enough perfect specimens will remain to make the saving of time well worth while.

Formation of zoarial skeleton.—The living tissue of the bryozoan, which by its differentiation gives rise to the various or-

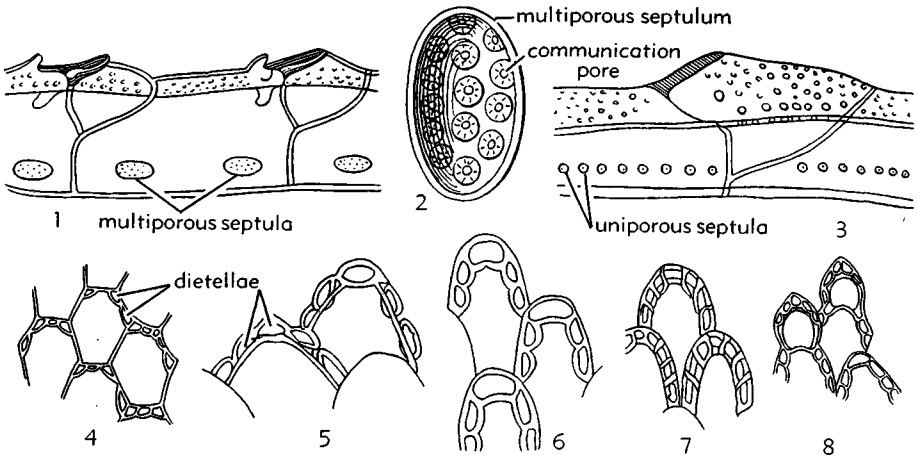


FIG. 112. Wall pores (septula) and pore chambers (dietellae) in distal part of cheilostome zooecia serving as passageways for mesenchymatous fibers that connect adjacent zooids (137). Side wall of *Cheilopora sincera* SMITT showing multiporous septula (rosette plates). 2, Greatly enlarged multiporous septulum. 3, Side view of *Hippodina fegeensis* (BUSK), showing uniporous septula. 4-8, Dietellae seen from basal side of zooecia (much enlarged); (4) *Escharoides prestans* (HINCKS), (5) *Ellisina levata* (HINCKS), (6) *Callopora lineata* (LINNÉ), (7) *Cauloramphus spinifer* (JOHNSTON), (8) *Trypostega venusta* (NORMAN).

gans, is a delicate epithelial membrane (**endocyst**) lining the interior of skeletal parts. The first derived product of the endocyst is the **ectocyst**, a thin outer covering membrane which has no secreting power. Next, the endocyst secretes the **mesenchyme**, which in turn originates organs of the polypide. The calcareous or chitinous secretion forming the zooecial skeleton occurs between the ectocyst and endocyst. The walls may consist simply of a smooth thin calcareous deposit (**olocyst**) or above this a second very porous layer (**tremocyst**) may be secreted, intimately joined with the olocyst or in some readily detachable. A third layer (**pleurocyst**), consisting of a granular deposit with lateral punctations, may also occur. The pores of these several layers are traversed by mesenchymatous fibers which likewise pass from zooecium to zooecium through the lateral walls by small pores called **septula**. These may be uniporous or multiporous but before reaching a septulum the mesenchymatous fibers traverse small lateral chambers (**dietellae**) in the proximal part of the zooecium (Fig. 112).

The discrimination of characteristics of these various zooecial skeletal features is important in determination of genera and species and so it is necessary in study that

the following preparations be made. First, thin sections of the wall, particularly the frontal, are needed to show characters of the three layers, olocyst, tremocyst, and pleurocyst. Second, the frontal wall must be abraded to show the occurrence of such structures as dietellae. This is effected by mounting the specimen, frontal side up, in Canada balsam on a slide and after heating to harden the balsam, rubbing it gently on a soft hone.

Avicularia and vibracula.—These are appendicular zooids, highly modified, comprising much reduced individuals that serve special functions. The so-called "bird's head" organ, or **avicularium**, attached to the zooecia of many Cheilostomata consists of a small cell containing a rudimentary polypide; its mobile chitinous mandible keeps up a snapping motion. This peculiarity has led to the belief that the function of avicularia is one of defense, but more probably they have something to do with alimentation or oxygenation of the colony. The **mandibles** are symmetrical objects corresponding to the opercula of normal zooecia, and like them, varying in shape with the species (Figs. 113,114). Preparation of them for study under the microscope is the same as for opercula; generally, both will be found

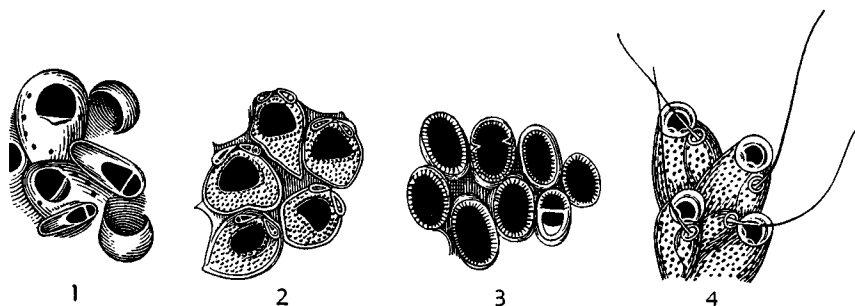


FIG. 113. Types of cheilostome avicularia and vibracula. 1, *Holoporella descostilsii* (AUDOUIN), $\times 25$, with large elongate avicularia showing bar for articulation of mandible. 2, *Antropora granulifera* (HINCKS), $\times 30$, with small avicularia in pairs at distal edge of zooecia. 3, *Crassimarginatella crassimarginata* (HINCKS), $\times 30$, with avicularia very like normal zooecia but distinguished by crossbar for articulation of mandible. 4, *Mastigophorella hyndmanni* (JOHNSTON), $\times 30$, zooecia and associated long vibracula (137).

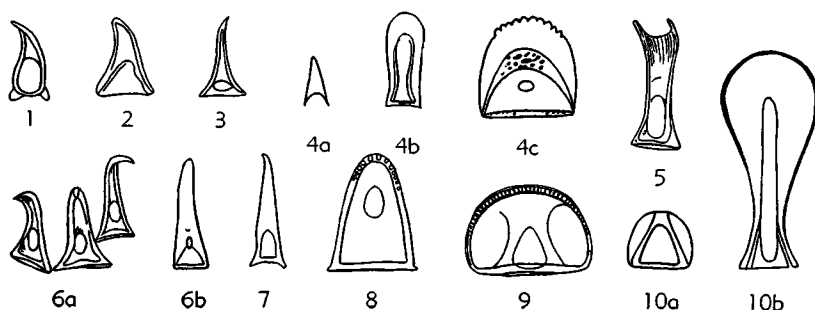


FIG. 114. Types of avicularium mandibles (much enlarged). 1, *Adeonellopsis*; 2, *Escharoides*; 3, *Schizoporella*; 4a-c, *Smitina*; 5, *Triphylozoon*; 6a,b, *Retepora*; 7, *Adeona*; 8, *Holoporella*; 9, *Umbonula*; 10a,b, *Thalamoporella* (137).

on the same slide. The proximal edge of the mandible works against a calcareous bar or a pair of teeth. In fossil forms and many dead specimens of Recent species, the mandible has been lost, but its position is indicated by porelike spaces on the avicularia. The vibracula are modified zooids similar to avicularia but differing in possession of a long bristle-like seta in place of the mandible. The porelike excavations marking the location of vibracula in fossils do not show the variation of structure observed in avicularia.

CLASSIFICATION

There are more factors that enter into determination of a cheilostomatous bryozoan than in those of any other order. The absence or presence of a compensation sac must be learned in order to place the species

in its proper suborder (*Anasca*, *Ascophora*). Then, relationships between operculum and ovicell and between operculum and compensatrix; position of ovicell; form of aperture; nature of frontal wall, which may be chitinous or calcareous and smooth (olocyst), punctate (tremocyst), or radially ribbed (pleurocyst); occurrence of dietellae and septula; presence and nature of avicularia and vibracula; and other structural features are to be observed. Proper description and illustration of a cheilostome species is a considerable task which cannot be accomplished simply by publishing a diagrammatic figure of zoecial surface characters.

Formerly, classification of the Cheilostomata was based on purely zoarial features, but in the latter half of the 19th century zoecial characters were studied more close-

ly, especially by BUSK (17,18), SMITT, HINCKS (4), JULLIEN (19), and CALVET (20). Various works on the structure of the Cheilostomata have been issued by HARMER (21,3b,3c), and WATERS (22,23). In 1909 LEVINSSEN (24) published a memoir which is indispensable to the modern student.

The fossil Cheilostomata form the subject of numerous researches, among which the work on French Cretaceous faunas by D'ORBIGNY (25) and various monographs on Tertiary faunas by CANU & BASSLER (26,27, 28,29,30,31,32) should be mentioned. The last-named works contain many text figures illustrating family and generic structure, besides detailed references to the literature.

The earliest known cheilostomes are reported from Middle Jurassic rocks of Normandy, but they are not common in strata older than Cretaceous. They are the dominant group at the present day, and are represented by a very large number of genera and species.

Suborder ANASCA Levinsen, 1909

Zooecial hydrostatic system (compensation sac) for extrusion of polypide from zoecium not present, but a zoarial hydrostatic system (hypostege) occurs between the cryptocyst and ectocyst. This extrusion occurs through depression by parietal muscles of the membranous or chitinous zooecial frontal wall surrounded by an elevated margin. In several families, the outer membranous layer (ectocyst) is covered by an arched porous frontal shield (pericyst), so that the absence of its opening, termed ascopore, suggests the name Anasca. ?*M.Jur.*, *Cret.-Rec.*

Division INOVICELLATA Jullien, 1888

Zoaria of delicate creeping stolons with spindle-shaped swellings from which erect uniserial zoecia with an operculum at the distal end arise at intervals. Avicularia, vibracula and permanent ovicells lacking. *Eoc.-Rec.*

Family AETEIDAE Smitt, 1867

Characters of division (106). *Eoc.-Rec.*

Actea LAMX., 1812 [**Sertularia anguina* LINNÉ, 1758] [= *Anguinaria* LAMARCK, 1816; *Filicella* SEARLES WOOD, 1844; *Salpingia* COPPIN, 1848; *Aeteopsis* BOECK, 1862; *Cercaripora* FISCHER, 1866]. Erect uniserial zoecia form tubular snake-like projections. Creeping stolons generally are only parts found as fossils. *Eoc.-Rec.*—FIG. 115, 5. *Actea* sp., Plio., Italy; creeping stolons, $\times 25$ (183).—FIG. 115,6. **A. anguina* (LINNÉ), *Rec.*, Atl.; $\times 25$ (137).

Division SCRUPARIINA Silén, 1941

Primitive cheilostomes characterized by erect, generally uniserial growth, tubular form, and frontal budding of zoecia, with restriction of opesium to part of front; no avicularium or spines. Hyperstomial ovicell in some species. *Cret.-Rec.*

Family SCRUPARIIDAE Busk, 1852

Creeping base, erect branches (70). *Cret.-Rec.*

Scruparia OKEN, 1815 [**Sertularia chelata* LINNÉ, 1758] [= *Unicellaria* BLAINV., 1830; *Scuparia* GRAY, 1848]. Budding at distal end in front, just proximal to opesium; ovicell on dwarfed zoecium. *Rec.*—FIG. 115,1. **S. chelata* (LINNÉ), E.Atl.; $\times 25$ (164).

Brettia DYSTER, 1858 [**B. pellucida*]. Uniserial, elongate, narrow zoecia, budding in pairs on dorsal side at distal end. *Rec.*—FIG. 115,4. **B. pellucida*, *Rec.*, Wales; $\times 10$ (137).

Bugulella VERRILL, 1879 [**B. fragilis*]. Allied to *Brettia*. *Rec.*, N.Atl.

Eucratea LAMX., 1812 [**Sertularia loricata* LINNÉ, 1758] [= *Loricaria* LAMX., 1821 (*non* LINNÉ, 1758) (obj.); *Notamia* FLEMING, 1828 (*non* RAF., 1819) (obj.); *Gemicellaria* BLAINV., 1830 (obj.); *Loricula* TEMPLETON, 1836 (*non* CURTIS, 1833) (obj.); *Gemmellaria* VAN BENEDEN, 1845 (obj.)]. Biserial zoecia back to back, branches arising from sides near distal end. No ovicell. *Cret.-Rec.*—FIG. 115,2. *E. labiata* NOVAK, *Cret.* (Cenom.), Czech.; 2a, $\times 1$; 2b, $\times 10$ (234).—FIG. 115,3. **E. loricata* (LINNÉ), N.Atl.; 3a, zoarium, $\times 1$; 3b,c, side, front, $\times 25$ (3a, 211; 3b,c, 137).

Family LABIOSTOMELLIDAE Silén, 1942

[=Protocheilostomata SILEN, 1942]

Zoaria erect, composed of smooth zooids formed by frontal budding, lacking ovicells, spines, and other appendages; closed by 2 lips, with proximal one representing first

stage of an operculum. Zooids develop from ovoid ancestrula. *Rec.*

Labiostomella SILÉN, 1942 [**Brettia gisléni* SILÉN, 1941]. *Rec.*, W.Pac.—FIG. 115,7. **L. gisléni* (SILÉN), Japan; zoarium (schematic) with exaggerated ancestrula, $\times 20$ (216).

Division MALACOSTEGA Levinsen, 1902

Zoecia retaining original frontal membrane with operculum incompletely undifferentiated. *Cret.-Rec.*

Family MEMBRANIPORIDAE Busk, 1854
 [=Biflustridae SMITT, 1872; Synaptacellidae MAPLE., 1911; Acanthodesiidae VIG., 1949; Cupuladriidae LAGAJIJ, 1952]

Zoaria generally incrusting, without ovicells, spines, or dietellae (pore chambers); avicularia commonly absent. Dorsal outlines of zoecia mostly rectangular; frontal wall chitinous, with gymnocyst little de-

veloped but cryptocyst ranging from a thin border to half of the opesial space (FIG. 116) (24,31). *Cret.-Rec.*

Membranipora BLAINV., 1830 [**Flustra membranacea* LINNÉ, 1767; SD NORMAN, 1903] [= *Nit-scheina*, *Nichtina* CANU, 1900]. Incrusting or erect, bifoliate. Gymnocyst practically wanting; tubercles or knobs produced by folding of rim at distal corners; aperture (opesium) occupying nearly the entire front; no interopesial cavities, cryptocyst barely visible to well developed; intertentacular organ (tower cell) possibly used in expelling larvae; more than 600 described species. *Mio.-Rec.*—FIG. 117,1. *M. tuberculata* Bosc, *Rec. Atl.*; $\times 25$ (137).—FIG. 117,2. **M. membranacea* LINNÉ, *Rec.*, *Atl.*; 2a, surface, $\times 25$; 2b, tower cells, $\times 10$ (137).

Acanthodesia CANU-B., 1920 [**Flustra savartii* AUDOUIN, 1826]. Like *Membranipora* but with proximal serrate denticle. *Eoc.-Rec.*—FIG. 118,4. **A. savartii* (AUDOUIN). *Rec.*, *Medit.*; $\times 25$ (230).

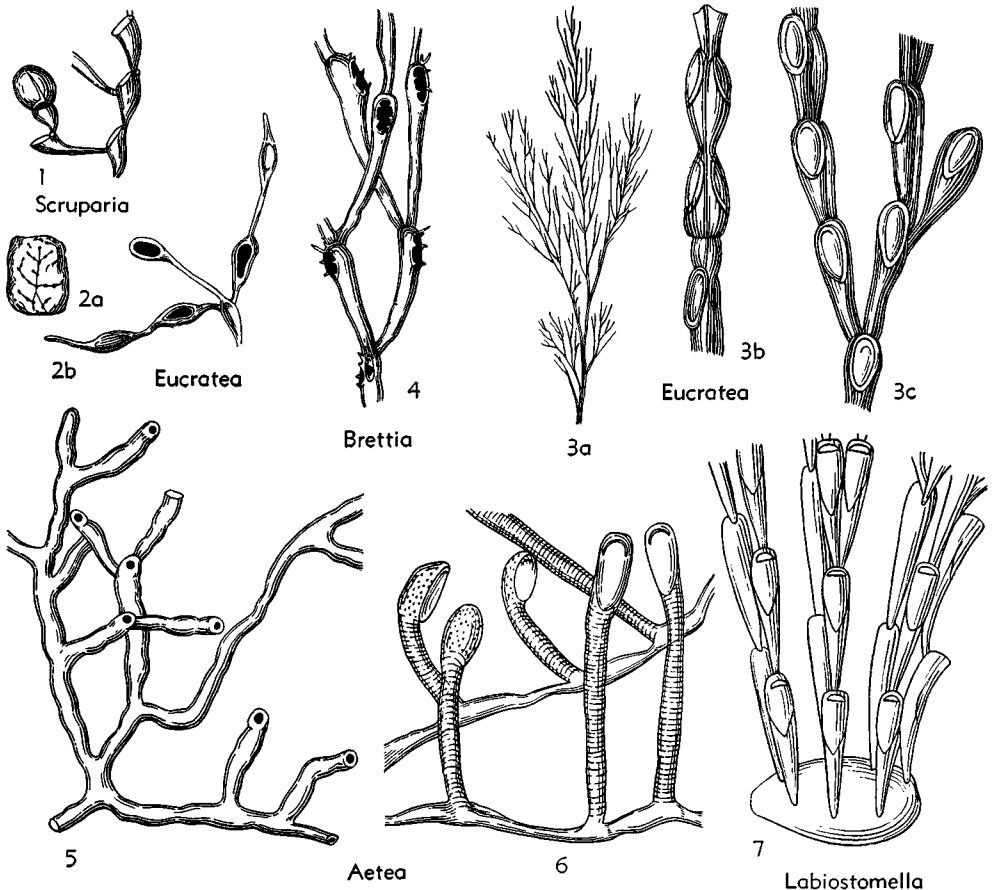


FIG. 115. Aeteidae, Scrupariidae, Labiostomellidae (p. G154, G155).

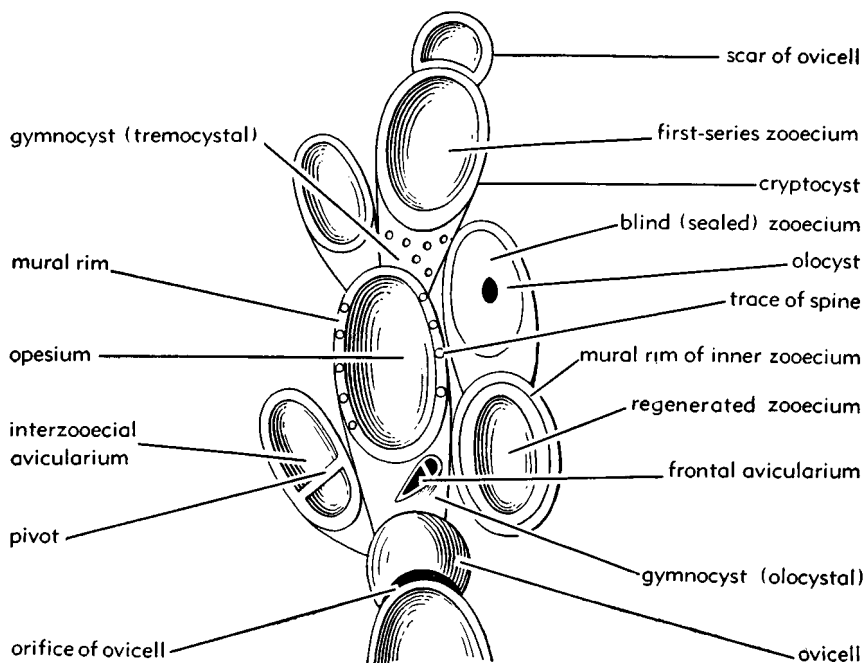


FIG. 116. Morphological features of Membraniporidae.

- Adenifera** CANU-B., 1917 [**Biflustra armata* HASWELL, 1880]. Distal glandular elevation and thin elongate avicularium on mural rim. *Eoc.-Rec.*—FIG. 117,4. **A. armata* (HASWELL), *Rec.*, SW.Pac.; 4a, $\times 25$; 4b, avicularium, $\times 50$ (166).
- Biflustra** D'ORB., 1852 [**B. ramosa*] [=?*Membranipora*]. Bifoliate. *Rec.*, SW.Pac.
- Cellarinidra** CANU-B., 1927 [**Cellarina clavata* D'ORB., 1851] [=*Cellarina* D'ORB., 1851 (non VAN BENEDEN, 1848)]. Articulated, narrow, cylindrical segments with apertures and interopesimal avicularia on all sides. *Cret.*—FIG. 117,5. **C. clavata* (D'ORB.), *Cenom.*, Fr.; 5a,b, segment, transv. sec., $\times 25$ (202).
- Conopeum** GRAY, 1848 [**Flustra lacroixii* AUDOUIN, 1826] [=*Foratella* CANU, 1900 (obj.); *Normanelina* COSSMAN, 1920; *Normaniella* DUVERGIER, 1921]. Simple membranipore with triangular interopesimal hollows on small gymnocyst at proximal corners. *Cret.-Rec.*—FIG. 118,5. **C. lacroixii* (AUDOUIN), *Rec.*, *Medit.*; $\times 25$ (137).
- Craspedopora** CANU-B., 1929 [**C. typica*]. Like *Conopeum* but has excessive deposit of tissue on septula piercing front wall. *Eoc.*—FIG. 118,7. **C. typica*, *Eoc.* (Brux.), Belg.; $\times 25$ (137).
- Cupuladria** CANU-B., 1919 [**Membranipora canariensis* BUSK, 1859]. Small, free orbicular zoaria with long, distal auriform vibraculum at distal extremity of each zoecium. Inner side shows polygonal compartments. *Mio.-Rec.*—FIG. 118,2. **C. canariensis* (BUSK), *Atl.*; 2a,b, front, back, $\times 25$ (137).
- Desmacystis** OSBURN, 1950 [**Membranipora sandalia* ROBERTSON, 1900]. Like *Membranipora* but gymnocyst occupies proximal half of zoecium; small, median avicularium. *Rec.*—FIG. 118,1. **D. sandalia* (ROBERTSON), *E.Atl.*; $\times 30$ (204).
- Exostesia** BROWN, 1948 [**E. didomatatia*]. *Rec.*, SW.Pac.
- Gregarinidra** BARROSA, 1949 [**Membranipora gregaria* HELLER, 1867]. *Rec.*, *E.Atl.*
- Heliodoma** CALVET, 1907 [**H. implicata*]. Like *Cupuladria* but zoecia in a concentric series separated by a row of long vibracula. *Rec.*—FIG. 117,8. **H. implicata*, *Atl.*; $\times 25$ (135).
- Otionella** CANU-B., 1917 [**O. perforata*]. Discoidal; concave inner side showing zoecial bases and convex outer side bearing apertures and auriculated interzoecial vibracula. *Cret.-Eoc.*—FIG. 118,3. **O. perforata*, *Eoc.* (Claib.), Ala., $\times 25$ (137).
- Pseudostege** BRYDENE, 1918 [**P. cantiana*]. [=*Pseudostega* BRYDENE, 1918]. Secondary zoecial layer above the primary one. *Cret.*, Eng.
- Quadriceclaria** D'ORB., 1851 (non SARRS, 1863) [**Q. elegans*]. Erect, articulated, quadrangular segments with large membraniporoid zoecia on 2 opposite faces and small ones on others. *Cret.*—FIG. 117,7. **Q. elegans*, *Senon.*, Fr.; $\times 10$ (202).

Synptacella MAPLE., 1911 [**S. asymmetrica*]. Zoecia ovoid, with gymnocyst in a single, free articulated rigid series. *Tert.*—FIG. 117,3. **S. asymmetrica*, Austral.; $\times 25$ (184).

Trochopora D'ORB., 1849 [**Lunulites conica* DEFRANCE, 1853] [= *Heteractis* GABB-H., 1862]. Cone-shaped, with hexagonal zoecia and symmetrical vibracula in radiating lines on upper surface and rows of pores on underside. *Eoc.-Mio.* —FIG. 118,6. **T. conica* (DEFRANCE), Mio. (Helv.), Fr.; $\times 25$ (137).

Vinularia DEFRANCE, 1829 [**V. fragilis*] [= *Heterocella* CANU, 1907 (obj.)] Articulated, narrow, quadriserial with large opesia on diverging zoecia and small ones on converging. *Vinularia* loosely used as general name for rodlike forms. *Eoc.-Rec.*—FIG. 117,6. **V. fragilis*, Lut., Fr.; 6a,b, converging and diverging sides, $\times 25$ (136).

Family ELECTRIDAE Lagaaij, 1952

[=emend. Electrinidae D'ORB., 1851]
[=Tendridae VIC., 1949]

Like Membraniporidae but well-developed gymnocyst occupies proximal part

of chitinous front; narrow cryptocyst in a few. No avicularia, ovicells or dietellae. Spines or tubercles occur on opesial border. Cyphonautes larva and intertentacular organ present (24,26). *Cret.-Rec.*

Electra LAMX., 1816 [**Flustra verticillata* ELLIS-S., 1786] [= *Annulipora* GRAY, 1848; *Electrina* D'ORB., 1851 (non BAIRD, 1850); *Reptelectrina* D'ORB., 1852]. Incrusting or erect; frontal a smooth gymnocyst, oval with spine-bearing opesium on distal side and flagellum at proximal extremity. *Eoc.-Rec.*—FIG. 119,1. **E. verticillata* (ELLIS-S.), Rec., N.Atl.; $\times 25$ (167).—FIG. 119,2. *E. pilosa* (LINNÉ), Rec., N.Atl.; $\times 25$ (167).

Aspidelectra LEV., 1909 [**Lepralia melolontha* BUSK, 1852]. *Cribrilina*-like frontal with hollow spines and slits. *Rec.*—FIG. 119,3. **A. melolontha* (BUSK), E.Atl.; $\times 37.5$ (134).

Herpetopora LANG, 1914 [**H. anglica*]. Incrusting; uniserial zoecia bilaterally branching, with long, narrow caudal portion. *Cret.-Olig.*—FIG. 119,8. **H. anglica*, Cret. (Senon.), Eng.; $\times 25$ (175).

Heteroecium HINCKS, 1892 [**Membranipora am-*

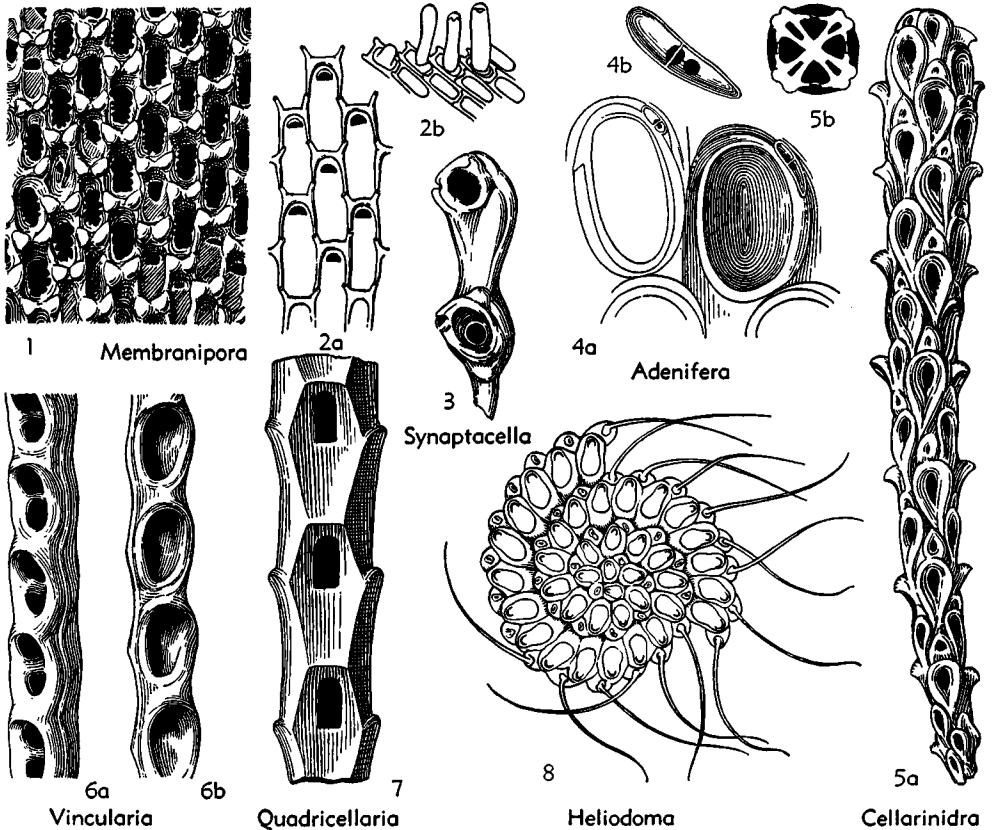


FIG. 117. Membraniporidae (p. G155-G157).

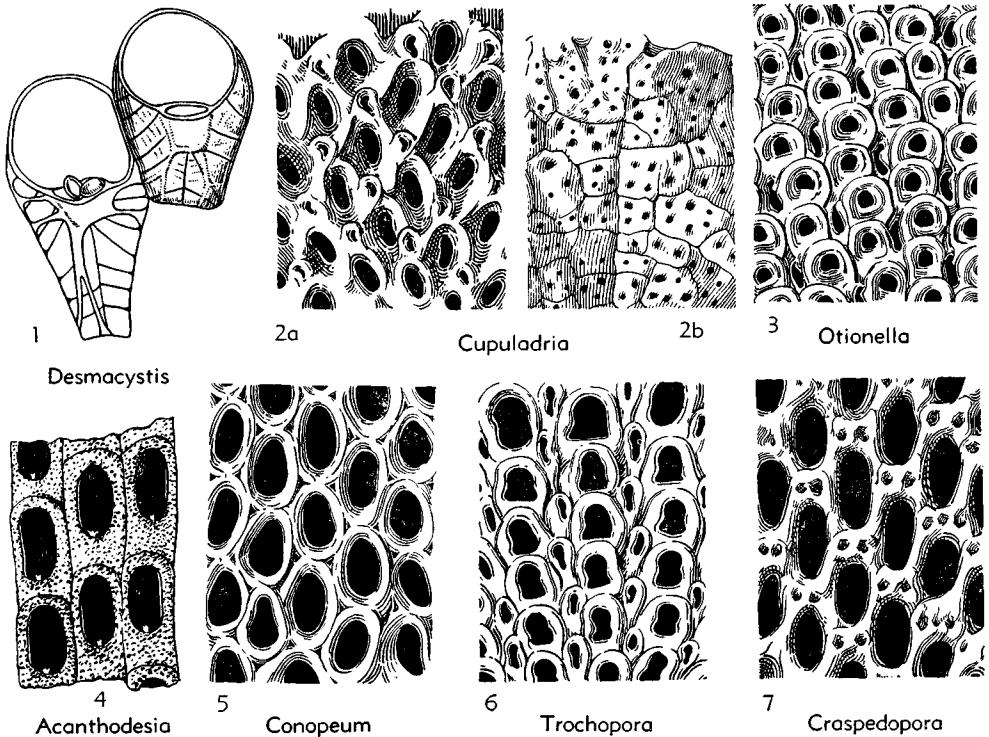


FIG. 118. Membraniporidae (p. G155-G157).

plectens HINCKS, 1881]. Like *Tendra* with acanthostegous ovicell but opercular valve and a flagellum are at proximal end of aperture. *Rec.*—FIG. 119,4. **H. amplexens* (HINCKS), Austral.; $\times 37.5$ (177).

Mystriopora LANG, 1915 [**M. möckleri*]. Incrusting, pleuroserial zoecia with entire oval opesia, short caudal portion, and zoeciules (?avicularia). *Cret.-Tert.*—FIG. 119,9. **M. möckleri*, Cenom., Eng.; $\times 25$ (175).

Pyripora D'ORB., 1849 [**Criserpia pyriformis* MICH., 1847] [= *Pyriflustrina*, *Pyriflustrella* D'ORB., 1853; *Charixa*, *Distelopora*, *Rhammatopora* LANG, 1915]. Uniserial or pauciserial pyriform zoecia with unilateral branching. *Cret.-Rec.*—FIG. 119,5. **P. pyriformis* (MICH.), Mio., Fr.; $\times 25$ (136).—FIG. 119,6. *P. catenularia* (JAMESON), *Rec.*, Atl.; $\times 25$ (167).

Taphrostoma CANU, 1908 [**T. spinosum*]. Aperture divided by a transverse semicircular trench for insertion of operculum. *Eoc.*—FIG. 119,10. **T. spinosum*, Barton., Fr.; surface, $\times 25$ (136).

Tendra NORDMAN, 1839 [**T. zostericola*]. Like *Membranipora* but with acanthostegous ovicells occupying space between frontal membrane (ectocyst) and an overlying double row of united hollow-arched spines. Opercular valve at distal

end of ovicell. *Rec.*—FIG. 119,7. **T. zostericola*, Blk.S.; 7a,b, $\times 37.5$ (137).

Tretosina CANU-B., 1927 [**T. arcifera*]. Bifoliate; with cryptocyst, a proximal serrate denticle and narrow, transverse slit in distal part of zoecium. *Tert.*—FIG. 119,11. **T. arcifera*, Mio., Austral.; $\times 25$ (137).

Family FLUSTRIDAE Smitt, 1867

Zoaria erect, corneous, flexible, foliaceous, composed of subrectangular contiguous multiserial membraniporoid zoecia with endozoecial ovicell and simple interzoecial avicularia (31). *Rec.*

Flustra LINNÉ, 1761 [**Eschara foliacea* LINNÉ, 1758] [= *Flustrina* VAN BENEDEN, 1849 (non D'ORB., 1852)]. Founded to replace *Eschara*. Zoarium typically bilamellar, bearing zoecia with salient mural rim and multiporous septula in lateral walls.—FIG. 120,1. **F. foliacea* (LINNÉ), N.Atl.; 1a, $\times 1$; 1b, $\times 25$; 1c, $\times 10$ (137).

Carbasea GRAY, 1848 [**Flustra carbasea* ELLIS-S., 1786]. Unilaminar, frondose zoarium. Avicularia and ovicells absent. (?Subgenus of *Flustra*). *Rec.*, Atl.

Chartella GRAY, 1848 [**Flustra papyracea* ELLIS-S., 1786]. Ovicells well developed. (?Subgenus of *Flustra*). *Rec.*—FIG. 120,2. **C. papyracea* (ELLIS-S.), *Atl.*; 2a, $\times 1$; 2b, $\times 25$ (137).

Retiflustra LEV., 1909 [**Retepora cornea* BUSK, 1852]. An open network; avicularia as large as zoecia. *Rec.*, SW.Pac.

Sarsiflustra JULLIEN, 1903 [**Flustra abyssicola* SARS, 1872]. Avicularia lyriform, as large as zoecia. *Rec.*, NW.Atl.

Spiralaria BUSK, 1861 [**S. florea*] [= *Spiralis* LEV., 1909]. Narrow spirally wound ribbon-shaped lamina. *Rec.*, SW.Pac.

Terminoflustra SILÉN, 1942 [**Flustra barleei* BUSK,

1860]. Square avicularian chambers at bifurcation of zoecial rows. *Rec.*, Atl.

Family HINCKSINIDAE Canu & Bassler, 1927

[= *Pseudolepraliidae* SILEN, 1942; *Antroporidae* VIG., 1949]

Similar to *Membraniporidae* but with endozoecial ovicells. Avicularia, vibracula, dietellae and spines may occur (24). *Cret.-Rec.*

Hincksina NORMAN, 1903 [**Membranipora flustroides* HINCKS, 1880]. Incrusting. Membranous area

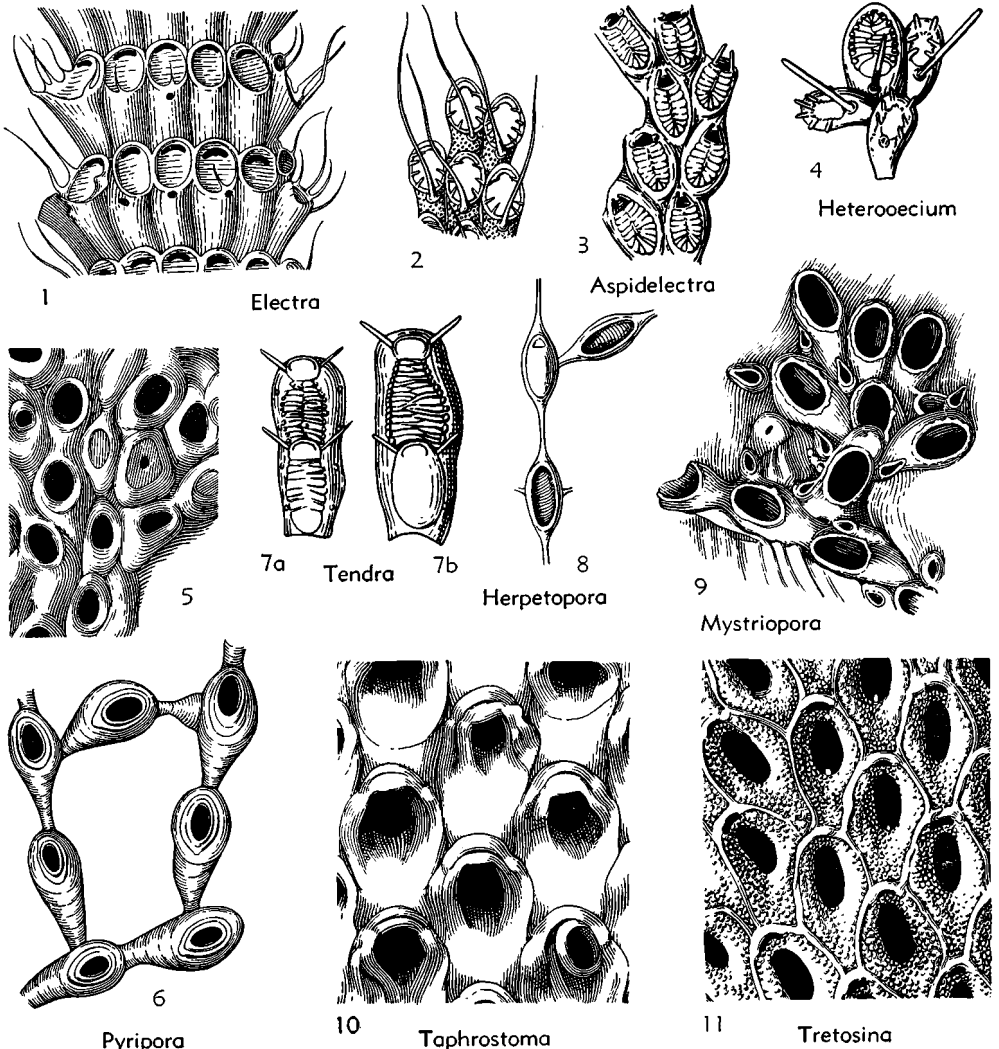


FIG. 119. Electridae (p. G157, G158).

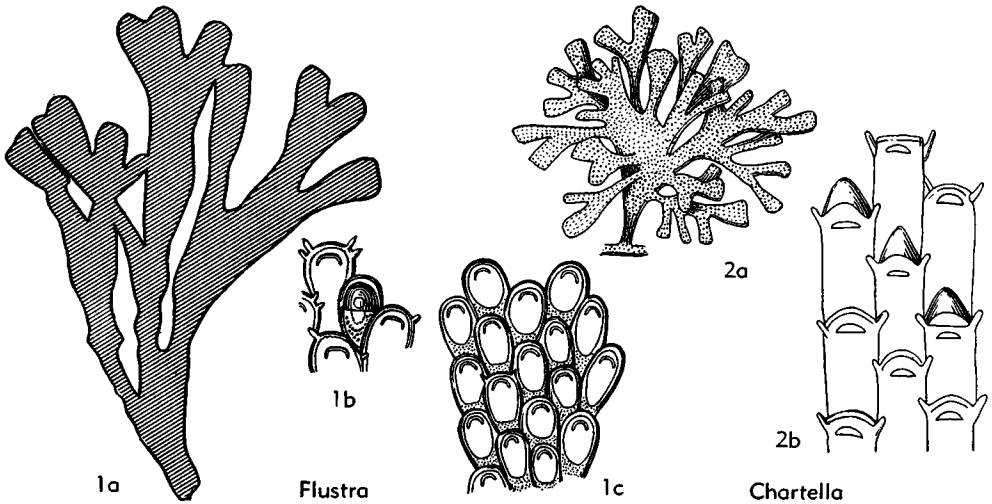


FIG. 120. Flustridae (p. G158, G159).

entire, mural rim with numerous spines, ovicell small; avicularia interzoecial. *Eoc.-Rec.*—FIG. 121,1. *H. megavicularia* CANU-B., *Eoc.*(Claib.), N.C.; $\times 25$ (137).—FIG. 121,2. **H. flustroides* (HINCKS), *Rec.*, NE.Atl., $\times 100$ (167).

Antropora NORMAN, 1903 (*non* LANG, 1916) [**Membranipora granulifera* HINCKS, 1880] [= *Dacryonella*, *Membrendoecium* CANU-B., 1917; *Canua* DAVIS, 1934]. Opesium surrounded by heavy cryptocyst; pair of avicularia at distal end of aperture. *Oligo.-Rec.*—FIG. 121,3. *A. pyriformis* (CANU-B.), *Oligo.*(Vicksb.), Ala.; $\times 25$ (137).—FIG. 121,4. **A. granulifera* (HINCKS), E.Atl.; $\times 25$ (167).—FIG. 121,5. *A. papillata* (BUSK) (type of *Membrendoecium*), *Rec.*, SW. Pac.; $\times 50$ (134).

Aplousina CANU-B., 1927 [**A. gigantea*]. Simple incrusting zoecia with small but prominent ovicells; no spines. *Cret.-Rec.*—FIG. 121,7. **A. gigantea*, *Rec.*, GulfMex.; $\times 25$ (137).

Biselenaria GREGORY, 1893 [*pro Diplotaxis* REUSS, 1867 (*non* KIRBY, 1837)] [**Diplotaxis placentula* REUSS, 1867]. Like *Vibracellina* but zoorium orbicular with porous base. *Eoc.-Oligo.*—FIG. 122,7. **B. placentula* (REUSS), *Oligo.*, Ger.; 1a,b, front, back, $\times 25$ (137).

Cauloramphus NORMAN, 1903 [**Flustra spinifera* JOHNSTON, 1832]. Frontal area membranous with thick lateral walls bearing stout spines and some tall stalked pedunculate avicularia. Ovicells inconspicuous. *Rec.*—FIG. 121,8. **C. spiniferum* (JOHNSTON), N.Atl.; $\times 25$ (167).

Cranosina CANU-B., 1933 [**Membranipora coronata* HINCKS, 1881]. Zoecia distinct, with thick granulated mural rim and transverse setiform avicularia. *Cret.-Rec.*—FIG. 122,6. **C. coronata* (HINCKS), *Rec.*, SW.Pac.; $\times 37.5$ (167).

Cribrendoecium CANU-B., 1917 [**C. tenuicostulatum*]. Zoecia with costulate surface and large interzoecial avicularia. *Eoc.*—FIG. 122,1. **C. tenuicostulatum*, Claib., N.C.; $\times 20$ (137).

Ellisina NORMAN, 1903 [**Membranipora levata* HINCKS, 1882 (*non* NORMAN, 1903)] [= *Ellisindra* CANU-B., 1933]. A small transverse dependent interzoecial avicularium above each zoecium. *Cret.-Rec.*—FIG. 122,4. **E. levata* (HINCKS), *Rec.*, E.Pac.; $\times 25$ (167).

Ogivalina CANU-B., 1917 [**O. eximipora*]. Large *Onychoella*-like zoecia with well-developed ovicell and cryptocyst. *Eoc.*—FIG. 122,5. **O. eximipora*, Claib., N.Car.; $\times 25$ (137).

Pseudolepralia SILÉN, 1942 [**P. ellisinae*]. Gymnocyct to operculum, small endozoecial ovicell, avicularia near aperture. *Rec.*—FIG. 121,6. **P. ellisinae*, N.W.Pac.; $\times 30$ (216).

Setosellina CALVET, 1906 [**S. roulei*]. Like *Vibracellina* but threadlike vibraculum at distal end of each zoecium. *Eoc.-Rec.*—FIG. 122,2. **S. roulei*, *Rec.*, E.Atl.; $\times 25$ (137).

Vibracellina CANU-B., 1917 [**V. capillaria*]. Incrusting. Zoecia elongate, with opesium entire and interzoecial vibracula. *Eoc.-Rec.*—FIG. 122,3. **V. capillaria*, *Eoc.*(Claib.), Tex.; $\times 25$ (137).

Family CALLOPORIDAE Norman, 1903

[= *Alderinidae* CANU-B., 1927; *Tegellidae*, *Allantoporidae* Vig., 1949]

Incrusting, with zoecia generally bearing small gymnocyct, cryptocyst confined to descending part; hyperstomial ovicell (24, 31). *Cret.-Rec.*

Callopora GRAY, 1848 (*non* HALL, 1851) [**Flustra lineata* LINNÉ, 1758] [= *Dermatopora* HAG., 1851;

Filiflustrella, *Reptoflustrina* D'ORB., 1853]. Zooeccia with large opesial area, narrow cryptocyst, spines on marginal walls and sessile avicularia with acute mandibles. *Cret.-Rec.*—FIG. 123,2. **C. lineata* (LINNÉ), *Rec.*, N.Atl.; $\times 37.5$ (134).

Acanthoporella DAVIS, 1934 [**Cauloramphus triangularis* CANU-B., 1923]. Spines and small avicularia on mural rim. *Pleisto.-Rec.*—FIG. 123,8. **A. triangularis* (CANU-B.), *Pleisto.*, Calif.; $\times 25$ (137).

Acanthoporida DAVIS, 1934 [**Membranipora angusta* ULR., 1901]. Terminal spines and distal round avicularium without pivot; dietellae and septules prominent. *Tert.*—FIG. 123,5. **A. angusta* (ULR.), *Eoc.*(Wilcox.), Md.; $\times 25$ (222).

Akatopora DAVIS, 1934 [**A. clausentina*]. Like *Callopora* but with lacunae in interzooeccial tissue and lacking avicularia. *Eoc.*—FIG. 124,1. **A. clausentina*, Lut., Eng.; $\times 25$ (146).

Alderina NORMAN, 1903 [**Membranipora imbellis* HINCKS, 1860]. Membranous front with crenulated

walls; no lateral spines or avicularia; dietellae present; ovicell with rib or depressed area. *Cret.-Rec.*—FIG. 123,1. **A. imbellis* (HINCKS), *Rec.*, Atl.; $\times 25$ (167).

Allantopora LANG, 1914 [**Hippothoa irregularis* GABB-H., 1860]. Zooeccia uniserial to multiserial, with circle of spines around aperture. *Cret.-Rec.*—FIG. 123,7. **A. irregularis* (GABB-H.), *Eoc.* (Wilcox.), N.J.; $\times 25$ (137).

Ammatophora NORMAN, 1903 [**Membranipora nodulosa* HINCKS, 1880]. Cryptocyst forms $\frac{2}{3}$ of area; no avicularia. *Cret.-Rec.*—FIG. 124,6. **A. nodulosa* (HINCKS), *Rec.*, E.Atl.; $\times 25$ (167).

Amphiblestrum GRAY, 1848 [**A. membranaceum* (= *Membranipora flemingii* BUSK, 1854)]. Like *Callopora* but spines rare, partially calcified; cryptocyst and gymnocyst present. *Cret.-Rec.*

A. (Amphiblestrum). *Cret.-Rec.*—FIG. 123,3. **A. membranaceum*, *Rec.*, N.Atl.; $\times 37.5$ (134).

A. (Bathypora) MACGILL., 1885 [**B. porcellana*]. *Rec.*, SW.Pac.

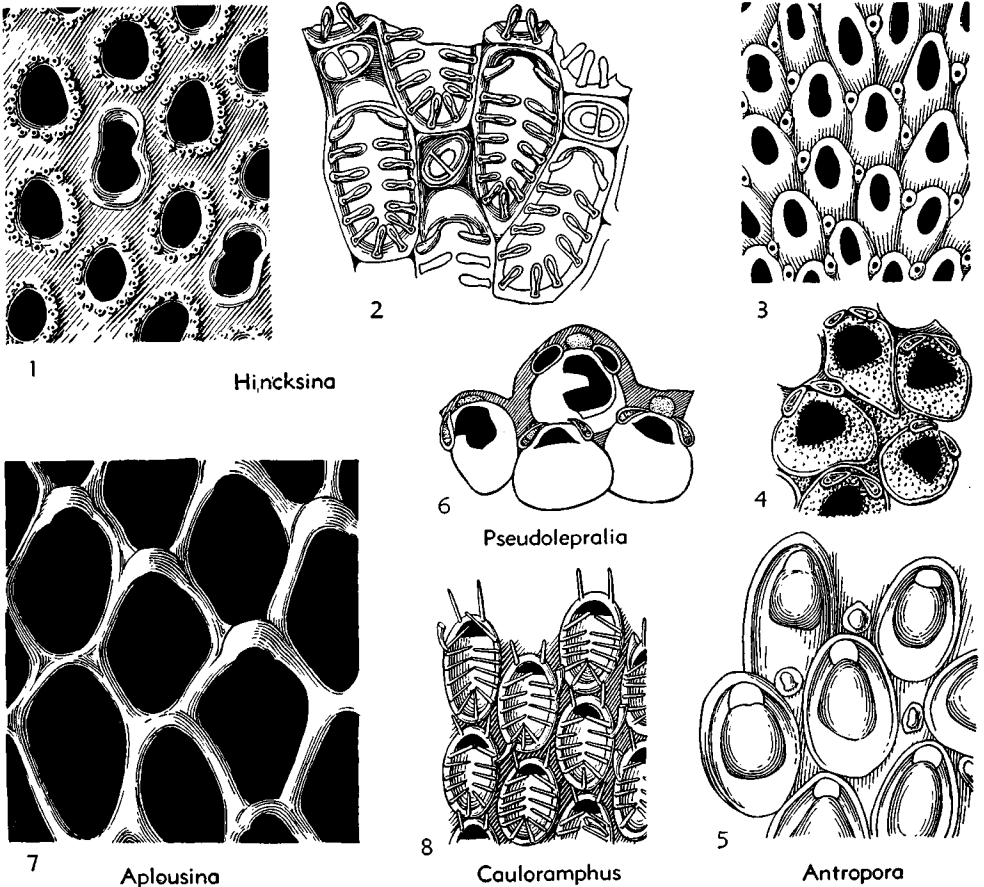
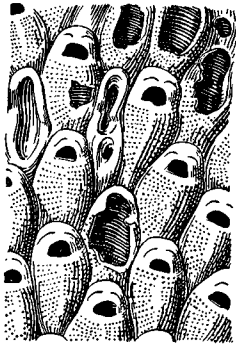


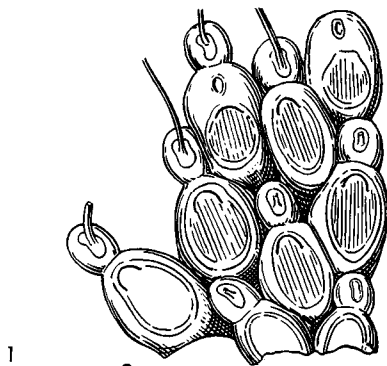
FIG. 121. Hincksinidae (p. G159, G160).

Bactrellaria MARSSON, 1887 [**B. rugica*]. Like *Stamenocella* but zooecia open on one side of a triserial branch. *Cret.*—FIG. 123,4. **B. rugica*, Camp., Ger.; 4a,b, $\times 25$ (186).

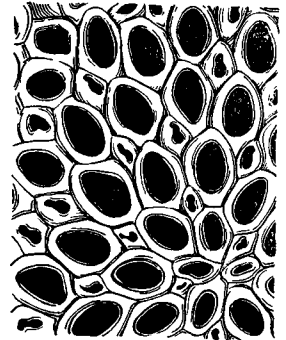
Bidenkapia OSBURN, 1950 [**Membranipora spitsbergenensis* BIDENKAP, 1897]. Gymnocyost almost covered by a large transverse avicularium. *Rec.*, Spitz.



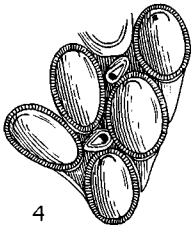
Cribrendoecium



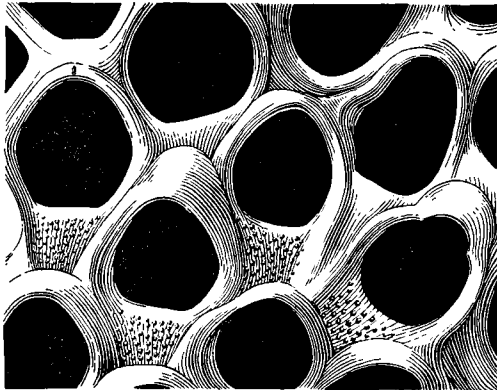
Setosellina



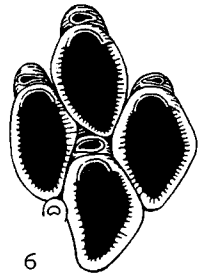
Vibracellina



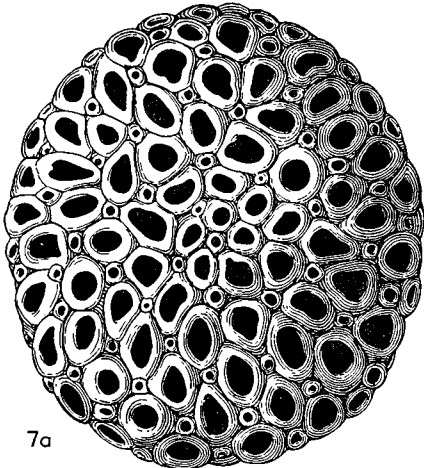
Ellisina



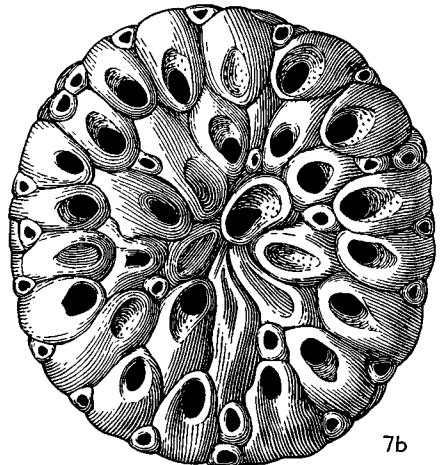
Ogivalina



Cranosina



7a



7b

Biselenaria

FIG. 122. Hincksinidae (p. G160).

Copidozoum HARMER, 1926 [**Membranipora plana* HINCKES, 1880]. Normal interzoecial avicularium with mandible broad at base and narrowed into a long, linear point. *Rec.*—FIG. 123,6. **C. planum* (HINCKES), SW.Pac.; $\times 25$ (167).

Crassimarginatella CANU, 1900 [**Membranipora crassimarginata* HINCKES, 1880] [= *Oochilina* NORMAN, 1903 (obj.); *Grammella* CANU, 1917 (obj.)]. Heavy lateral walls; elliptical opesium with no spines. Large interzoecial avicularium with solid theta-shaped pivot. *Cret.-Rec.*—FIG. 124,10. **C. crassimarginata* (HINCKES), *Rec.*, E.Atl.; $\times 25$ (137).

Doryporella NORMAN, 1903 [**Lepralia spathulifera* SMITT, 1867]. Gymnocyst occupying most of frontal, small oval avicularium. *Rec.*, N.Atl.

Flustrellaria D'ORB., 1853 [**F. fragilis*] [= *Ornatella* CANU, 1900]. Mural rim with hollow spines;

no avicularia. *Cret.*—FIG. 124,12. **F. fragilis*, *Cenom.*, Fr.; $\times 25$ (202).

Foveolaria BUSK, 1884 [**F. elliptica*; SD CANU, 1900]. Erect bifoliate narrow branches. Zooecia embedded in pit of thickened ectocyst. *Rec.*—FIG. 124,9. **F. elliptica*, SW.Pac.; $\times 25$ (134).

Fruitionella CANU-B., 1925 [**F. parvipora*]. Like *Foveolaria* but frontal comprises an olocyst with scattered pores. *Cret.*—FIG. 124,13. **F. parvipora*, Ripley, Tenn.; $\times 25$ (137).

Hapsidopora LANG, 1917 [**H. arcuata*]. Uniserial branching. Pyriform zooecia with small avicularia placed distally and laterally. *Cret.*—FIG. 124,3. **H. arcuata*, *Cenom.*, Eng.; $\times 25$ (175).

Larnacicus NORMAN, 1903 [**Membranipora cornigera* BUSK, 1860]. Distal end of zooecia divided into chambers; gymnocyst and interzoecial avicularia

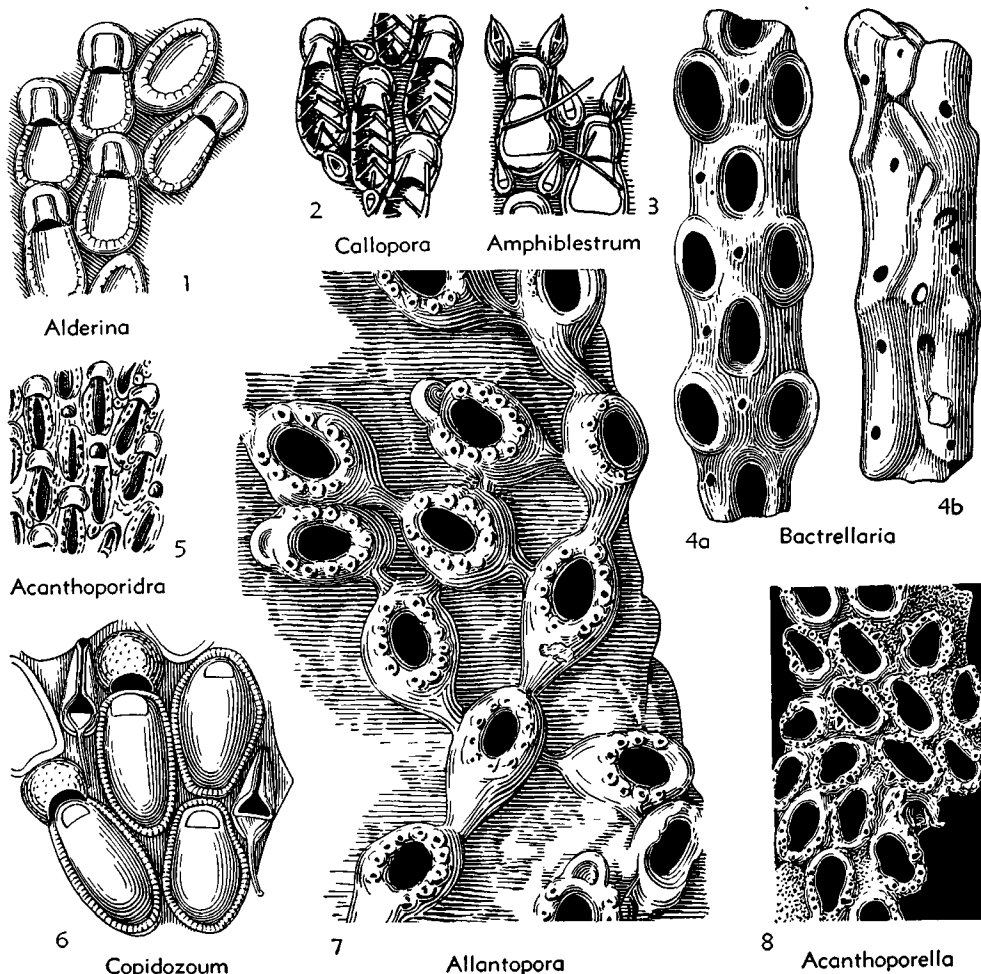


FIG. 123. Calloporidae (p. G161-G163).

with pivot present. *Rec.*—FIG. 124,4. **L. cornigera* (BUSK), N.Atl.; $\times 37.5$ (200).

Marginaria ROEMER, 1841 [**M. elliptica*]. *Cret.*, Ger.

Marssonopora LANG, 1914 [**Cellepora dispersa* HAG., 1839]. Uniserial pyriform zoecia narrowed proximally to a thin tube, separated by filiform zoocules. *Cret.*—FIG. 124,2. **M. dispersa* (HAG.), Camp., Ger.; $\times 25$ (175).

Membraniporida CANU-B., 1917 [**M. porrecta*].

Free, bifoliate or incrusting. Like *Alderina* but ovicell deeply imbedded and diatellae wanting. *Cret.-Rec.*—FIG. 124,7. **M. porrecta*, E.o.c. (Claib.), N.C.; $\times 25$ (137).—FIG. 124,8. *M. trigemma* CANU-B., Eoc.(Claib.), N.Car.; $\times 25$ (137).

Mollia LAMX., 1816 [**Eschara patellaria* MOLL., 1803]. Like *Retevirgula* in tubular zoecial connections but lacking avicularia and spines. *Cret.-Rec.*—FIG. 124,5. **M. patellaria* (MOLL), Rec., Atl.; $\times 25$ (137).

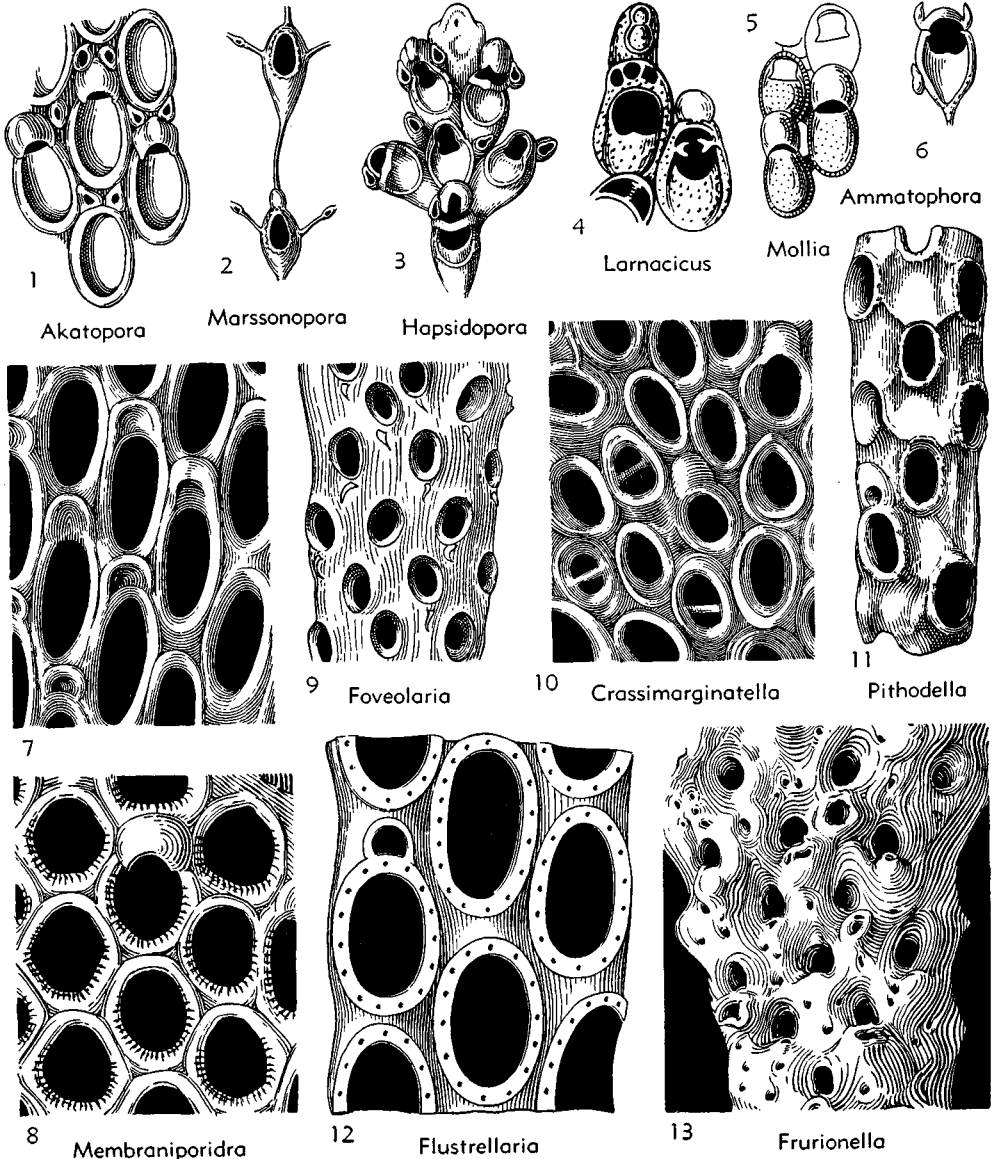


FIG. 124. Calloporidae (p. G161-G166).

Parellisina OSBURN, 1940 [**Membranipora curvirostris* HINCKS, 1862]. Avicularia vicarious (interzoecial), associated with vestigial zoecia (kenozoecia). *Rec.*—FIG. 125,7. **P. curvirostris* (HINCKS), *Rec.*, Atl.; $\times 25$ (204).

Periporosella CANU-B., 1917 [**P. tantilla*]. Bifoliate lamellae; zoecia elongate rectangular, each surrounded by 12 to 16 dietellae. *Cret.-Eoc.*—FIG. 125,1. **P. tantilla*, *Eoc.* (Claib.), N.Car.; 1a,b, ovi-cells, dietellae, $\times 25$ (137).

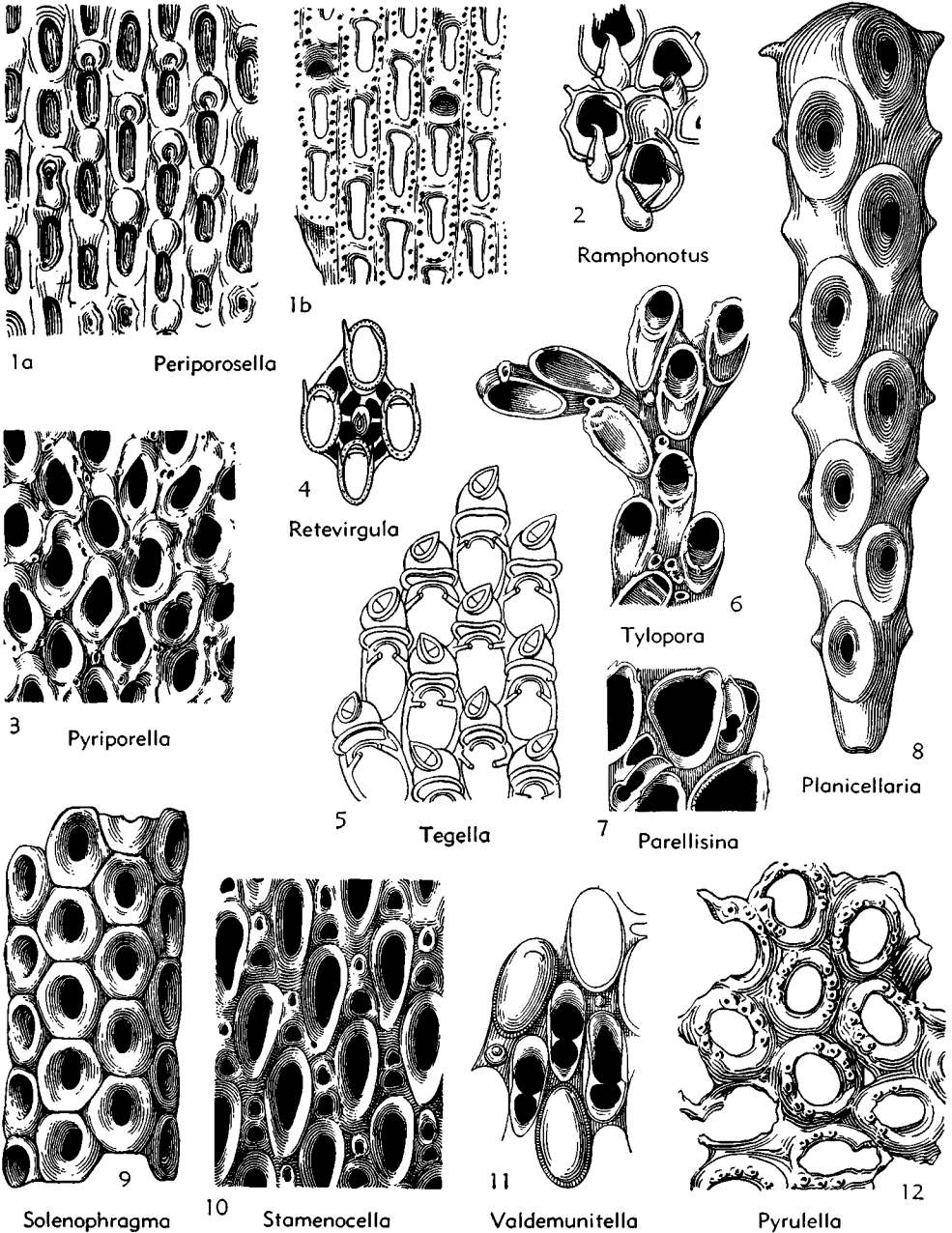


FIG. 125. Calloporidae (p. G165, G166).

Pithodella MARSSON, 1887 [**P. cincta*]. Narrow rods probably related to *Stamenocella*. *Cret.*—FIG. 124,11. **P. cincta*, Camp., Ger.; $\times 25$ (186).

Planicellaria D'ORB., 1851 [**P. oculata*]. Articulated segments with thick-walled apertures. *Cret.*—FIG. 125,8. **P. oculata*, Senon., Fr.; $\times 25$ (202).

Pyriporella CANU, 1911 [**P. ameghinoi*]. Pyriform zooecia with gymnocyst and small interzooecial avicularia. *Cret.*—FIG. 125,3. **P. ameghinoi*, Rocanean, Arg.; $\times 25$ (136).

Pyrullea HARMER, 1926 [**Membranipora pyrula* HINCKS, 1881]. Ovicell closed by opercular valve; opesium oval, surrounded by spines. *Cret.-Rec.*—FIG. 125,12. **P. pyrula* (HINCKS), Rec., SW. Pac.; $\times 25$ (137).

Ramphonotus NORMAN, 1894 [**R. minax* BUSK, 1860] [= *Rhynchotella* CANU, 1900]. Large avicularium on pedicle near opesial proximal border. *Cret.-Rec.*—FIG. 125,2. **R. minax* BUSK, Rec., N. Atl.; $\times 25$ (167).

Retevirgula BROWN, 1945 [**Membranipora acuta* HINCKS, 1885]. Like *Callopora* but zooecia dissociated, united by tubular connecting processes. *Rec.*—FIG. 125,4. **R. acuta* (HINCKS), SW. Pac.; $\times 15$ (133).

Solenophragma MARSSON, 1887 [**S. baculinum*]. Longitudinal canals in center of zoarium. *Cret.*—FIG. 125,9. **S. baculinum*, Camp., Ger.; $\times 25$ (186).

Stamenocella CANU-B., 1917 [**S. mediaviculifera*]. Erect slender, thin, bilamellar branches with long, flat gymnocyst supporting small avicularium and fragile ovicell. *Cret.-Mio.*—FIG. 125,10. **S. mediaviculifera*, Eoc. (JACKSON.), Ga.; $\times 25$ (137).

Tegella LEV., 1909 [**Flustra unicornis* FLEMING, 1828]. Like *Callopora* but pore chambers absent. *Cret.-Rec.*—FIG. 125,5. **T. unicornis* (FLEMING), Rec., N. Atl.; $\times 25$ (177).

Tylopora LANG, 1917 [**T. lorea*]. Like *Hapsidopora* but caudal portion much reduced and apertures dimorphic. *Cret.*—FIG. 125,6. **T. lorea*, Turon., Eng.; $\times 25$ (175).

Valdemunitella CANU, 1900 [**Membranipora valdemunita* HINCKS, 1885]. Like *Crassimarginatella* but with spatula-like avicularia. *Rec.*—FIG. 125, 11. **V. valdemunita* (HINCKS), SW. Pac.; $\times 25$ (136).

Family CHAPERIIDAE Jullien, 1888

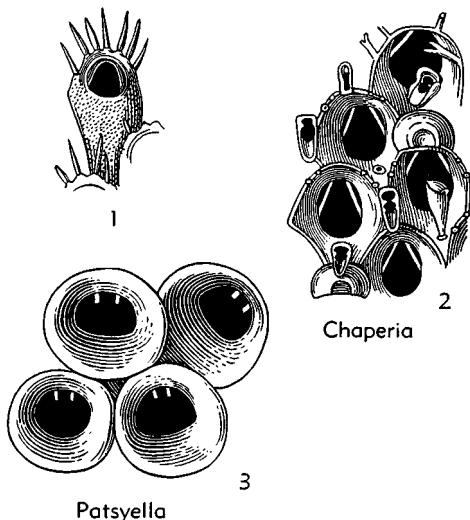
[=Chaperiellidae STRAND, 1928; Chaperiidae BASSLER, 1935]

Incrusting or bilamellar. Aperture large, provided interiorly with a pair of calcareous plates, horizontal projections from the walls opposite and beneath the operculum ("occludor laminae" of HARMER) which afford attachment for opercular muscles. Zoecial front without pores. *Oligo.-Rec.*

Chaperia JULLIEN, 1881 [**C. australis* (?= *Flustra acanthina* LAMX., 1825)] [= *Chapperia* WILLEY,

1900 (obj.); *Chaperiella* STRAND, 1928 (obj.); *Chaperiopsis* UTTLEY, 1949]. Internal calcareous plates converge toward distal wall; avicularium trumpet-shaped. Hyperstomial ovicell prominent among conspicuous spines along the distal rim. *Oligo.-Rec.*—FIG. 126,1. **C. acanthina* (LAMX.), Rec., S. Atl.; $\times 25$ (169).—FIG. 126,2. *C. bilaminata* (WATERS), Rec., S. Afr.; $\times 25$ (230).

Patsyella BROWN, 1948 [**Monoporella capensis dentata* WATERS, 1887]. Like *Chaperia* but ovicell ? endozooecial and opesia of ovicelled zooecia much larger than others. *Oligo.-Rec.*—FIG. 126,3. **P. dentata* (WATERS), Plio., N. Z.; $\times 25$ (133).



Patsyella

FIG. 126. Chaperiidae (p. G166).

Family HIANTOPORIDAE MacGillivray, 1895

Zoecial front a pericyst, as in *Arachnopsiidae*, but developed from an enlarged spine or spines forming incomplete cover with large, irregular pores (31). *Cret.-Rec.*

Hiantopora MACGILL., 1887 [**Lepralia ferox* MACGILL., 1868] [= *Membrostega* JULLIEN, 1903 (obj.)]. Pericyst of large pores caused by branching of spines above ectocyst. *Cret.-Rec.*—FIG. 127,2. **H. ferox* (MACGILL.), Rec., SW. Pac.; $\times 25$ (137).

Tremogasterina CANU, 1911 [**T. problematica*]. Pericyst complete, perforated by 1 or 2 large pores; large interopesial avicularia. *Cret.-Rec.*—FIG. 127,3. *T. celleporoides* (BUSK), Rec., SW. Pac.; $\times 25$ (137).

Tremopora ORTMANN, 1890 [**T. dendracantha*]. Like *Hiantopora* but ectocyst more visible because mural rim bears only 1 or 2 branched oral spines. *Mio.-Rec.*—FIG. 127,1. **T. dendracantha*, Rec., NW. Pac.; $\times 25$ (203).

Family ARACHNOPUSIIDAE Jullien,
1888

Incrusting. Zoecial front a pericyst, arched calcified shield above membranous ectocyst, perforated by large pores. Shield not formed by radial costae but by irregular projections from margins (31). *Eoc.-Rec.*

Archnopusia JULLIEN, 1886 [**Lepralia monoceros* BUSK, 1854]. Pericyst formed by coalescence of branched spines. Elliptical avicularium near aperture. *Oligo.-Rec.*—FIG. 127,4. **A. monoceros* (BUSK), *Rec.*, Straits Magellan; $\times 25$ (134).

Anexechona OSBURN, 1950 [**A. ancorata*]. Salient peristome absent but with large vicarious avicularia. *Rec.*—FIG. 127,6. **A. ancorata*, Gulf Calif.; $\times 50$ (204).

Exechonella CANU-B., 1927 [**Hiantopora magna* MACGILL., 1895]. Like *Archnopusia* but larger orbicular frontal pores and zoecial peristomes more developed. *Eoc.-Rec.*—FIG. 127,5. **E. magna* (MACGILL.), *Rec.*, SW.Pac.; $\times 25$ (181).

Hippexechonella VIG., 1949 [**Cyclicopora grandis* DUVERGIER, 1920]. Like *Exechonella* but aperture has 2 cardelles. *Mio.*—FIG. 127,7. **H. grandis* (DUVERGIER), Aquit., Fr.; $\times 25$ (148).

Division COILOSTEGA Levinsen, 1902
[=Coelostega HARMER, 1926]

Horizontal lamina of cryptocyst so much developed that commonly it extends forward around aperture; lateral (parietal) muscles operating frontal membrane above the cryptocyst pass downward to dorsal wall distally to the lamina by way of notches (opesiular indentations) at the sides or through special foramina on either side (opesiules). Distal end of polypide more or less enclosed in a calcified polypide tube, when opesiules are well developed. Interzoecial avicularia or vibracula generally present. Ovicells hyperstomial or endozoecial. ?*M.Jur.*, *Cret.-Rec.*

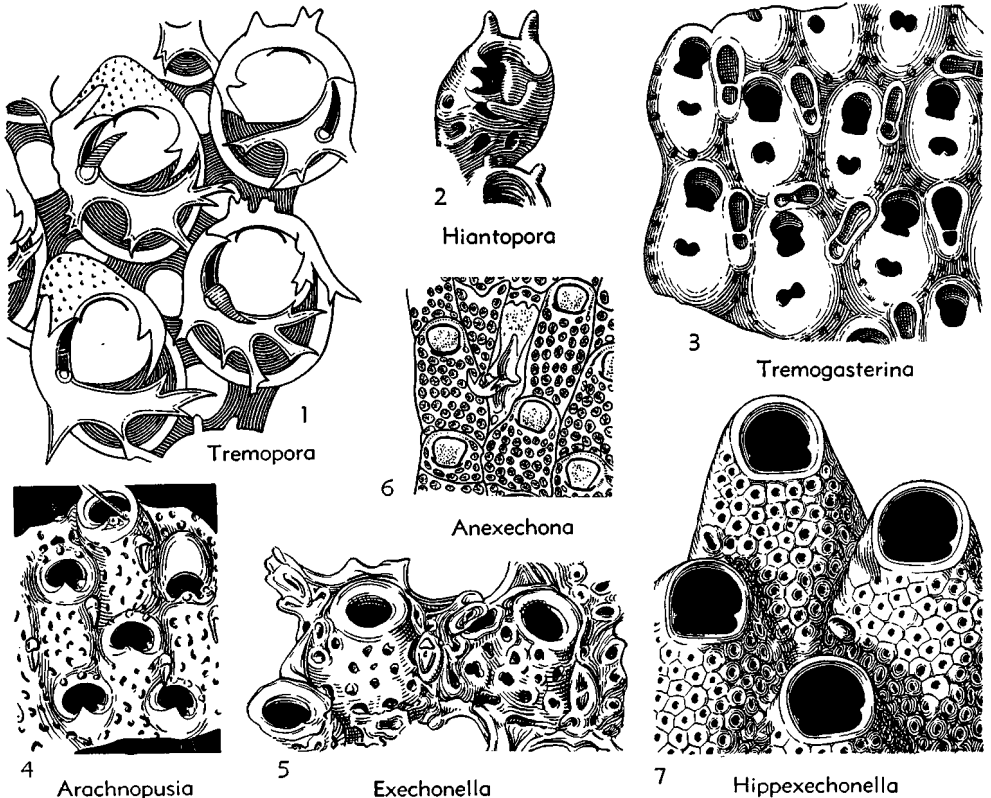


FIG. 127. Hiantoporidae, Archnopusiidae (p. G166, G167).

Family ONYCHOCELLIDAE Jullien, 1881

Ovicell endozoecial. No gymnocyst; cryptocyst calcified, depressed, traversed by parietal muscles through lateral opesicular indentations. Onychocellaria and avicularia with mandibles winged at base present (24). *?M. Jur., Cret.-Rec.*

Onychoella JULLIEN, 1882 [**O. marioni*] [= *?Reptocelleporaria* D'ORB., 1852; *Periteichisma* KOSCHIN-

SKY, 1885]. Hexagonal zooecia with subtrifoliate opesium and flat cryptocyst surrounded by salient rim. Onychocellaria asymmetrical, with wing on one side. *?M. Jur., Cret.-Rec.*—FIG. 128, 1. *O. angulosa* REUSS, Eoc. (Claib.), N. Car.; $\times 25$ (137). **Collura** JULLIEN, 1881 [**Eschara athulia* D'ORB., 1851]. Apertures with thick collar-like rim. *Cret.*—FIG. 128, 4. **C. athulia* (D'ORB.), Mastr., Fr.; $\times 25$ (202).

Distefanella CIPOLLA, 1922 [**D. altavillae*]. *Plio.*, Italy.

Floridina JULLIEN, 1881 [**Mollia antiqua* SMITT,

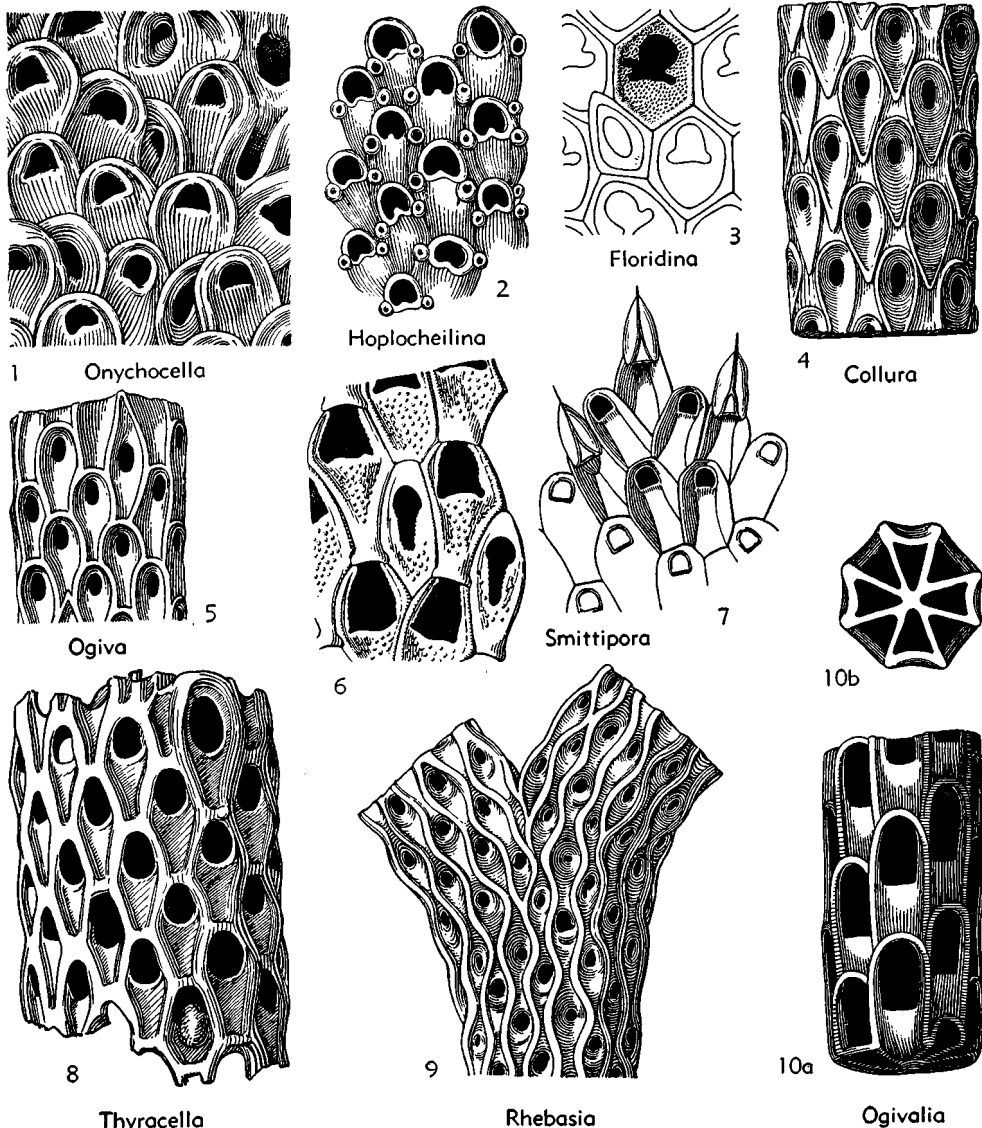


FIG. 128. Onychozellidae (p. G168, G169).

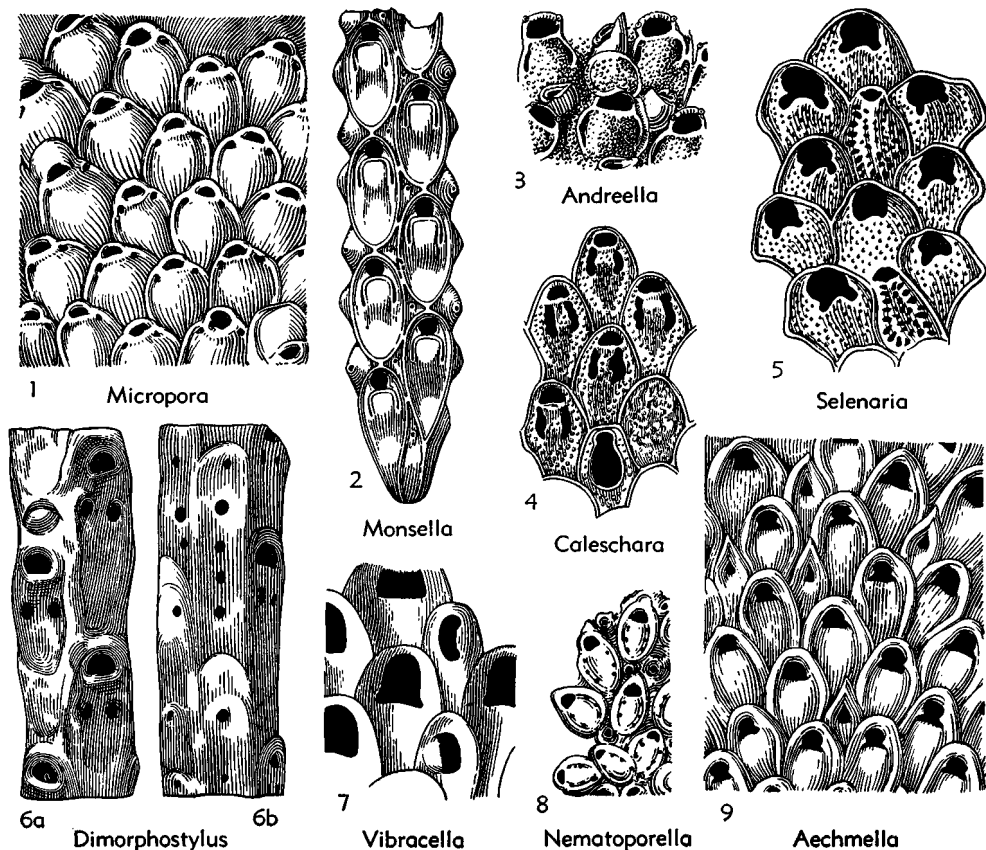


FIG. 129. Microporidae (p. G170, G171).

1872]. Aperture trifoliate, with large symmetrical opesiular indentations and straight avicularia with bimembranous mandible (onychocellaria). *Cret.-Rec.*—FIG. 128,3. **F. antiqua* (SMITT), *Rec.*, Gulf Mex.; $\times 25$ (137).

Hoplocheilina CANU, 1911 [**Eschara osculifera* REUSS, 1872]. Opesiules round shallow indentations; 2 large oval avicularia. *Cret.*—FIG. 128,2. **H. osculifera* (REUSS), *Cenom.*, Ger.; $\times 25$ (137).

Ogiva JULLIEN, 1881 [**Eschara actea* D'ORB., 1851]. Opesium elliptical, opesiules indistinct, avicularia elongate. *Cret.*—FIG. 128,5. **O. actea* (D'ORB.), *Coni.*, Fr.; $\times 10$ (202).

Ogivalia JULLIEN, 1881 [**Vincularia elegans* D'ORB., 1839]. Slender cylindrical branches. *Cret.-Rec.*—FIG. 128,10. **O. elegans* (D'ORB.), *Rec.*, S.Atl.; 10a,b, front, transv. sec., $\times 25$ (137).

Rhebasia JULLIEN, 1881 [**Eschara dorilas* D'ORB., 1851]. Branches with oval apertures at distal end of zoecia, margins confluent laterally. *Cret.*—FIG. 128,9. **R. dorilas* (D'ORB.), *Coni.*, Fr.; $\times 25$ (202).

Semieschara D'ORB., 1852 [**S. flabellata*]. Probably worn unilamellate *Onychocella*. *Cret.*, Fr.

Smittipora JULLIEN, 1881 [**Vincularia abyssicola* SMITT, 1874] [= *Diplopholeos*, *Rectonychochella*, *Velumella* CANU-B., 1917]. Like *Onychocella* but onychocellaria have straight mandible with 2 membranes. *Cret.-Rec.*—FIG. 128,6. *S. (Velumella) levinseni* CANU-B., *Rec.*, Atl.; $\times 25$ (137).—FIG. 128,7. **S. abyssicola* (SMITT), *Rec.*, Gulf Mex.; $\times 25$ (137).

Thyracella VOIGT, 1930 [**Eschara vigelius* PERGENS, 1893]. Long, straight onychocellaria larger than zoecia; large elliptical opesium. *Cret.*—FIG. 128,8. **T. vigelius* (PERGENS), *Maastr.*, *Holl.*; $\times 25$ (131).

Family MICROPORIDAE Hincks, 1880
[= Selenariidae HARMER, 1926]

Like Onychocellidae but onychocellaria replaced by avicularia and opesiular indentations changed to true perforations (opesi-

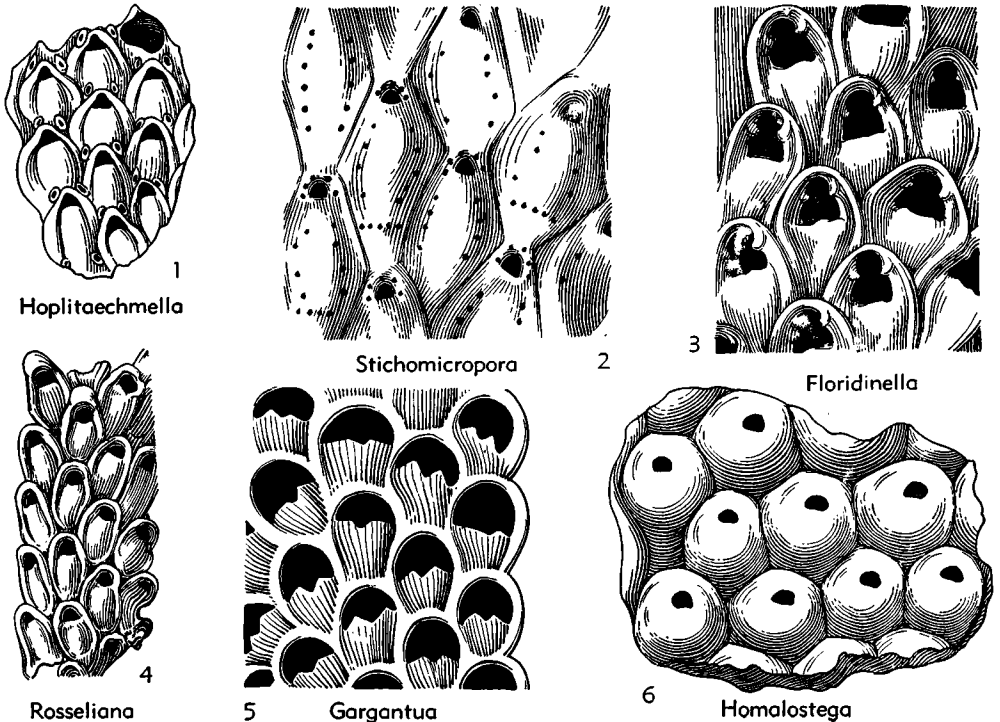


FIG. 130. Microporidae (p. G170, G171).

ules, micropores). No calcified polypide tube. Opesium semicircular (24). *Cret.-Rec.*

Micropora GRAY, 1848 (*non* EICHW., 1885) [**M. coriacea* (= *Flustra coriacea* ESPER, 1791) [= ? *Reptescharinella* D'ORB., 1853; *Peneclausa* JULLIEN, 1888 (obj.)]. Incrusting. Cryptocyst covers entire front except aperture and 2 small opesioles; small median avicularium at distal edge of aperture. *Cret.-Rec.*—FIG. 129,1. **M. coriacea* (ESPER), *Rec.*, N.Ad.; $\times 25$ (137).

Aechmella CANU-B., 1917 [**A. filimargo*]. Like *Floridina* but with avicularia. *Cret.-Mio.*—FIG. 129,9. **A. filimargo*, *Eoc.(Jackson.)*, Ala.; $\times 25$ (137).

Andreella JULLIEN, 1888 [**Micropora uncifera* BUSK, 1884]. Cryptocyst complete, perforated laterally by cross-shaped opesioles. *Rec.*—FIG. 129,3. **A. uncifera* (BUSK), Cape Horn; $\times 25$ (134).

Caleschara MACGILL., 1880 [**Eschara denticulata* MACGILL., 1868]. Large salient ovicell, long linear opesioles. No avicularia. *Eoc.-Rec.*—FIG. 129,4. **C. denticulata* (MACGILL.), *Rec.*, SW.Pac.; $\times 25$ (181).

Dimorphostylus VOIGT, 1928 [**D. tetrastichus*]. Articulated, rod-shaped segments with zoecia on front only; 2 opesioles. *Cret.*—FIG. 129,6. **D.*

tetrastichus, Dan. (drift), Ger.; 6a,b, front, back, $\times 50$ (227).

Floridinella CANU-B., 1917 [**F. vicksburgica*]. Like *Floridina* but without onychocellaria and avicularia; large broad opesial indentations. *Cret.-Rec.*—FIG. 130,3. **F. vicksburgica*, Oligo.(Vicksb.), Ala.; $\times 25$ (137).

Gargantua JULLIEN, 1888 [**Cellepora bidens* BUSK (*non* HAG., 1851)]. Minute avicularia; opesioles incomplete. *Cret.-Rec.*—FIG. 130,5. **G. bidens* (BUSK), *Cret.(Maastr.)*, Holl.; $\times 25$ (137).

Homalostega MARSSON, 1887 [**Cellepora convexa* HAG., 1839]. *Cret.*—FIG. 130,6. **H. convexa* (HAG.), Camp., Ger.; $\times 25$ (186).

Hoplitaechmella VOIGT, 1949 [**Cellepora vespertilio* HAG., 1839]. Avicularia include 2 sets, large vicarious and minute paired. *Cret.*—FIG. 130,1. **H. vespertilio* (HAG.), Camp., Ger.; $\times 15$ (227).

Monsella CANU, 1900 [**Planicellaria eocena* MEUNIER & PERGENS, 1886]. Articulated zoaria with long polypidian lamella and linear slits for opesioles. *Paleoc.*—FIG. 129,2. **M. eocena* (MEUNIER & PERGENS), Montian, Belg.; $\times 25$ (136). [*Monsellinae* VIG., 1949].

Nematoporella CANU-B., 1927 [*pro Nematopora* DUVERGIER, 1921 (*non* ULR., 1888)] [**Nematopora ovata* DUVERGIER, 1921]. Incrusting. Several pairs

of opesiules and avicularia replaced by vibracula. *Mio.*—FIG. 129,8. **N. ovata* (DUVERGIER), Burdig., Fr.; $\times 25$ (148).

Rosseliana JULLIEN, 1888 [**Flustra rosselii* AUDOUIN, 1826]. Frontal a cryptocyst with semicircular opesium, opesiules poorly outlined, no avicularia. *Oligo.-Rec.*—FIG. 130,4. **R. rosselii* (AUDOUIN), *Rec.*, *Medit.*; $\times 25$ (137).

Selenaria BUSK, 1854 [**S. maculata*]. Like *Vibracella* but avicularia with convex perforated frontal. *Eoc.-Rec.*—FIG. 129,5. **S. maculata*, *Rec.*, SW. Pac.; $\times 25$ (134).

Selenariopsis MAPLE., 1913 [**S. gabrieli*]. Dome-shaped. Zoecia quadrate in radial series. *Tert.*, Austral.

Steraechmella LAGAAIJ, 1952 [**S. buski* (= *Membranipora bidens* BUSK, 1889, pl. 2, fig. 4a)]. Like *Aechmella* but without avicularia. *Plio.*, Eng.

Stichomicropora VOIGT, 1949 [**S. sicksi* VOIGT, 1920]. Like *Micropora* but with transverse row of spicules across frontal to protect ovicells. *Cret.*—FIG. 130,2. **S. sicksi* VOIGT, *Camp.*, Ger.; $\times 20$ (227).

Vibracella WATERS, 1891 [**Cellepora trapezoidea* REUSS, 1847]. Free orbicular zoaria, lateral opesiular indentations, auriform avicularia; well-developed cryptocyst. *Cret.-Plio.*—FIG. 129,7. **V. trapezoidea* (REUSS), *Eoc.*, Italy; $\times 25$ (210).

Family LUNULITIDAE Lagaij, 1952

[=emend. Lunularidae LEV., 1909]

Zoaria free, thin, cupuliform to short, conical disks. Zoecia with more or less developed cryptocyst. Avicularia auriculate, with long, setose mandibles at proximal edge of each zoecium. Opesiular indentations inconstant. Ovicells endozoecial or absent (24). *Cret.-Rec.*

Lunulites LAMARCK, 1816 [*non Lunulite* LAMARCK, 1812 (invalid vernacular name)] [**L. radiatus*] [= *Pavolunulites*, *Reptolunites* D'ORB., 1852; *Oligotresium* GABB-H., 1862; *Lunularia* BUSK, 1884; *Dimiclausa* GREGORIO, 1890]. Zoecia in radial rows, with radicular and hydrostatic zoecia present. Ovicell endozoecial. *Cret.-Eoc.*—FIG. 131, 2. *L. vicksburgensis* (CONRAD), *Oligo.*(Vicksb.), Miss.; 2a,b, back, front, $\times 25$ (137).—FIG. 131, 3. *L. distans* (LONSD.), *Eoc.*(Claib.), N.Car.; with ovicell, $\times 25$ (137).—FIG. 131,4. *L. angulosa* (D'ORB.), *Cret.*(Senon.), Fr.; $\times 10$ (137).

Volvivflustrellaria BRYDONE, 1936 [**Membranipora taurnensis* BRYDONE, 1936]. Zoecia as in *Lunulites* but zoarium spindle-shaped. *Cret.*, Eng.

Family CALPENSIDAE Canu & Bassler, 1923

Zoaria incrusting, linear to cupuliform,

or articulated club-shaped. Zoecia with well-developed cryptocyst bearing one or more opesiules (26). *Cret.-Rec.*

Calpensia JULLIEN, 1888 [**Membranipora impressa* MOLL, 1803 (= *Cellepora nobilis* ESPER, 1796; *Membranipora calpensia* BUSK, 1854)]. Incrusting masses formed layer upon layer. Opesium semilunar; cryptocyst complete with 2 opesiules. No avicularia. *Plio.-Rec.*—FIG. 131,1. **C. nobilis* (ESPER), *Rec.*, E.Atl.; $\times 25$ (137).

Corynostylus CANU-B., 1919 [**C. labiatus*]. Articulated, club-shaped segments. Zoecia with gymnocyst. *Mio.*—FIG. 131,8. **C. labiatus*, W. Indies; $\times 25$ (137).

Discoporella D'ORB., 1852 (*non* BUSK, 1859) [**Lunulites umbellata* DEFRANCE, 1823] [= *Discocoflostrella* D'ORB., 1853]. Zoarium wide cup-shaped. Zoecia porous with 2 rounded opesiules and large vibracula on outer surfaces. *Mio.-Rec.*—FIG. 131,9. **D. umbellata* (DEFRANCE), *Mio.*, Fr.; $\times 25$ (137).

Hemiseptella LEV., 1909 [**Vincularia labiata* BUSK, 1884]. Incrusting. Opesium disymmetric, bordered on one side by spines; a single avicularium. *Mio.-Rec.*—FIG. 131,7. **H. labiata* (BUSK), *Rec.*, SW.Atl.; $\times 25$ (230).

Microporina LEV., 1909 [**Salicornaria borealis* BUSK, 1855]. Erect, jointed segments. Zoecial front a cryptocyst with many pores and 2 small opesiules. No ovicells but a few small avicularia. *Cret.-Rec.*—FIG. 131,5. *M. elongata* (HINCKS), *Rec.*, SE.Atl.; $\times 25$ (167).—FIG. 131,6. **M. borealis* (BUSK), *Rec.*, NW.Atl.; $\times 50$ (137).

Poricellaria D'ORB., 1852 [**P. alata*] [= *Diplodidymia* REUSS, 1869]. Zoarium erect. Zoecia in 4 rows with cryptocyst perforated laterally by a single long opesiule and 2 small pores before aperture. *Eoc.-Rec.*—FIG. 131,11. **P. alata*, *Eoc.* (Lut.), Fr.; $\times 37.5$ (137).

Verminaria JULLIEN, 1888 [**Membranipora oblonga* BUSK, 1859]. Incrusting. Opesium subterminal, many opesiules on each side. *Plio.*—FIG. 131,10. **V. oblonga* (BUSK), *Crag*, Eng.; $\times 25$ (134).

Family STEGINOPORELLIDAE Bassler, nov.

[=emend. Steganoporellidae HINCKS, 1884] [= *Labioporellidae* HARMER, 1926]

Zoecia generally dimorphic, comprising ordinary A-zoecia and enlarged B-zoecia (avicularia) with structurally different operculum (mandible); the zoecia are also dithalamic, divided by a descending lamina of cryptocyst into 2 chambers, the proximal one holding the polypide and the distal one containing parietal and opesiular muscles. No true avicularia, no ovicell (24). *Eoc.-Rec.*

Steginoporella SMITT, 1873 [*S. elegans*; SD JULIEN, 1888 (= *Membranipora magnilabris* BUSK, 1854) [= *Steginoporella* HINCKS, 1884]. Incrusting to erect bifoliate. Calcified part of frontal area a depressed cryptocyst. Zooecia of 2 sorts; small A-zooecia and large B-zooecia, with enlarged

operculum. *Eoc.-Rec.*—FIG. 132.1. **S. magnilabris* (BUSK), *Rec.*, GulfMex.; 1a,b, X25 (1a, 137; 1b, 164).

Gaudryanella CANU, 1907 [**G. variabilis*]. Like *Steginoporella* but zooecia bear 2 nonsymmetrical indentations, lack the B-zooecia, and their crypto-

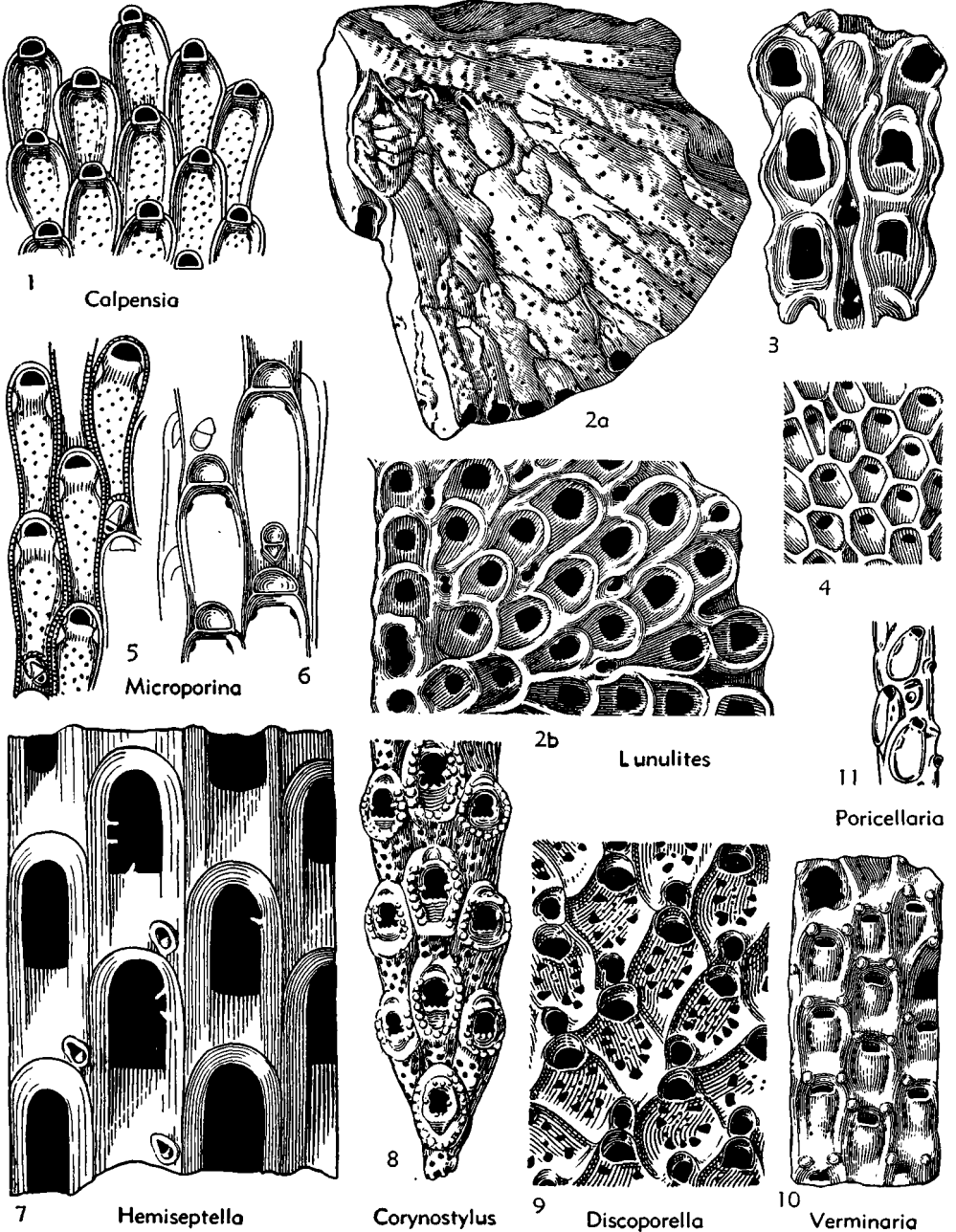


FIG. 131. Lunulitidae, Calpensidae (p. G171).

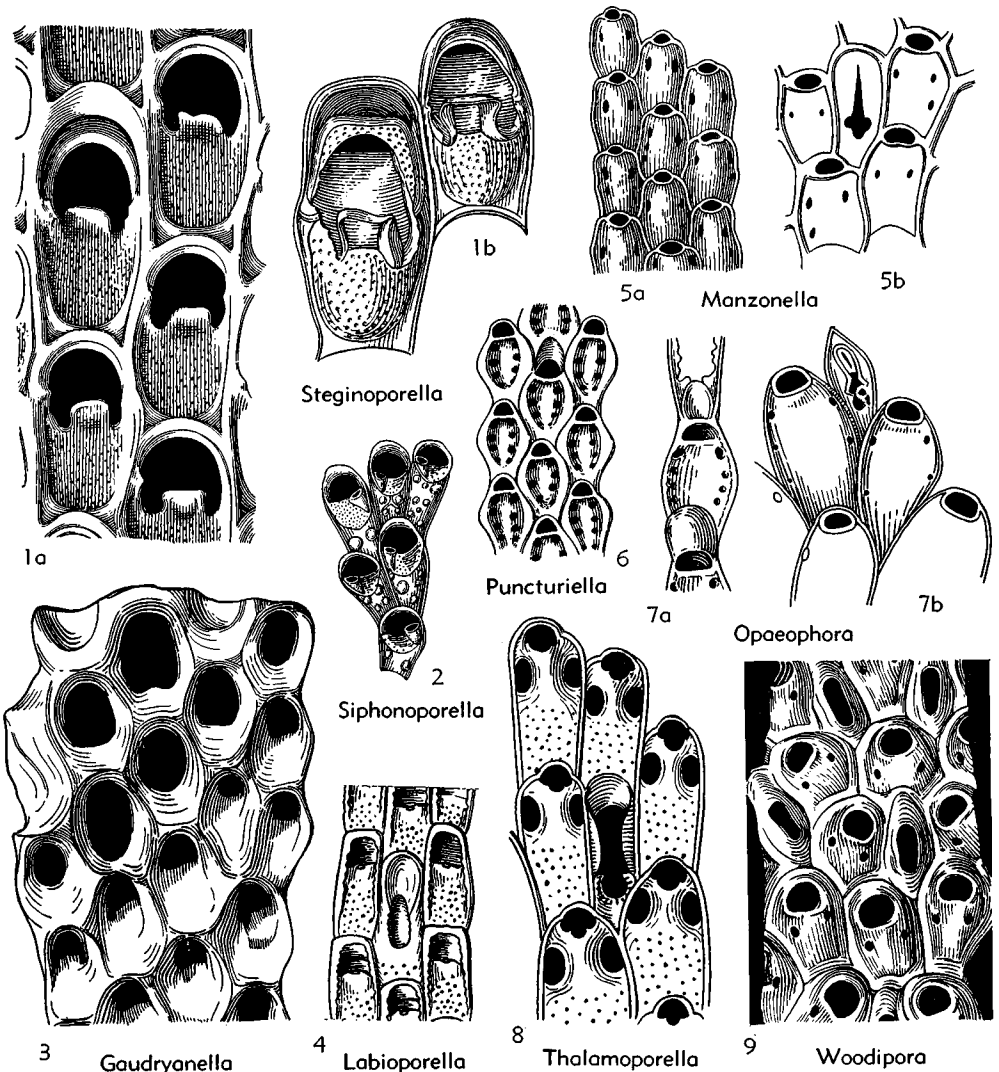


FIG. 132. Steginoporellidae, Thalamoporellidae (p. G172-G174).

cyst is small. *Eoc.*—FIG. 132,3. **G. variabilis*, Lut., Fr.; $\times 25$ (136).

Labioporella HARMER, 1926 [pro *Labiopora* LEV., 1909 (non Mojsisovics, 1878)] [**Labiopora crenulata* LEV., 1909]. Opesium small, not surrounded by porous cryptocyst; large vicarious avicularia. *Mio.-Rec.*—FIG. 132,4. **L. crenulata* (LEV.), Rec., SW.Pac.; $\times 25$ (177).

Siphonoporella HINCKS, 1880 [**S. nodosa*]. Like *Steginoporella* except that cryptocyst does not surround opesium, and polypidial tube is lateral, trumpet-shaped, and continued forward prominently; opesium large. *Tert.-Rec.*—FIG. 132,2. **S. nodosa*, Rec., SW.Pac.; $\times 25$ (137).

Family THALAMOPORELLIDAE
Levinsen, 1902

Incrusting, lamellar, or narrow erect branches. Zoecia with polypidial tube, large prominent hyperstomial ovicells, opesules separated from aperture, and large spatulate or 3-pointed avicularia replacing zoecia. Calcareous, compass-shaped spicules free in zoecial cavity (26). *Cret.-Rec.*

Thalamoporella HINCKS, 1887 [**Flustra rozieri* AUDOUIN, 1826]. Two large opesules pierce the

porous cryptocyst and a large interzoecial avicularium forms base of each new series of zoecia. *Oligo-Rec.*—FIG. 132.8. **T. rozieri* (AUDOUIN), *Rec., Medit.*; $\times 25$ (230).

Manzonella JULLIEN, 1888 [**Membranipora exilis* MANZONI, 1869]. Opesiules well formed, may be multiple; inverted dagger-shaped avicularia. *Plio.* —FIG. 132.5. **M. exilis* (MANZONI), Italy; *5a,b*, $\times 25$ (*5a*, 183; *5b*, 196).

Opaeophora BROWN, 1948 [*pro Foraminella* LEV., 1909 (*non* SOWERBY, 1835)] [**Haploporella lepida* HINCKS, 1881]. Much like *Manzonella* but a longitudinal series of small opesiules lines zoecial sides. *Rec.*—FIG. 132.7. **O. lepida* (HINCKS), SW.Pac.; *7a,b*, $\times 25$ (167).

Puncturiella LEV., 1925 [**P. gudumensis*]. Zoecia short, with a row of 6 to 8 opesiules along each lateral wall. *Cret.*—FIG. 132.6. **P. gudumensis*, Dan., Denm.; $\times 25$ (177).

Thairopora MACGILL., 1882 [*pro Diplopora* MACGILL., 1881 (*non* GÜMBEL, 1866)] [**Membranipora dispar* MACGILL., 1869] [= *Diploporella* MACGILL., 1885; *Pergensina* JULLIEN, 1888]. Like *Thalamoporella* but no ovicell known. *Rec.*, SW. Pac.

Woodipora JULLIEN, 1888 [**Membranipora holo-stoma* BUSK, 1859]. Cryptocyst entirely developed; 2 opesiules, rounded opesum, and short oval avicularia. *Cret.-Plio.*—FIG. 132.9. **W. holo-stoma* (BUSK), *Plio.* (Crag), Eng.; $\times 25$ (134).

Family ASPIDOSTOMATIDAE Jullien, 1888

[=Macroporidae UTTLEY, 1949]

Incrusting, bifoliate or narrow cylindrical branches. Zoecia with raised margins, short polypidial tubes with marginal flanges and 2 opesiules as narrow incisions in aperture. Hyperstomial ovicells normal in aspect (26). *Cret.-Rec.*

Aspidostoma HINCKS, 1881 [**A. crassum* (= *Eschara gigantea* BUSK, 1854)]. Zoecia mostly concave near orifice which is semilunar, deeply buried, limited at top by salient horseshoe-shaped lamella. Ovicell immersed in distal zoecium. *Cret.-Rec.* —FIG. 133.1. **A. giganteum* (BUSK), *Rec.*, SW. Atl., Antart.; *1a*, $\times 25$ (167); *1b*, $\times 25$ (134).

Crateropora LEV., 1909 [**C. falcata*]. Zoecia in distinct longitudinal rows; very short polypidial lamella, opesiules, and reticulocellaria (avicularia or onychocellaria with cryptocyst perforated by pores). *Cret.-Rec.*—FIG. 134.1. **C. falcata*, *Rec.*, SW.Pac., $\times 25$ (177).

Euritina CANU, 1900 [**Eschara eurita* D'ORB., 1851]. Narrow branches. Cryptocyst well developed, with 2 longitudinal grooves forming 3 facettes; opesiules minute. *Cret.-Eoc.*—FIG. 133.2. **E. eurita* (D'ORB.), *Cret.* (Turon.), Fr.; $\times 25$ (137).

Macropora MACGILL., 1895 [**M. centralis*; SD

CANU-B., 1917 (?= *Lepralia grandis* HUTTON, 1873)] [= *Macroporella*, *Macroporina* UTTLEY, 1949]. Differs from *Monoporella* in absence of opesiules and peristomial spines. *Cret.-Rec.*—FIG. 133.4. **M. centralis*, Tert., Austral.; $\times 25$ (181).—FIG. 133.5. *M. crassitina* WATERS, Mio., Austral.; $\times 25$ (230).

Megapora HINCKS, 1877 [**Lepralia ringens* BUSK, 1856]. Strongly developed partly depressed gymnocyst, apertures with vestibular arch and spines. *Rec.*—FIG. 133.3. **M. ringens* (BUSK), NE.Atl.; $\times 37.5$ (167).

Monoporella HINCKS, 1881 [**Haploporella nodulifera* HINCKS, 1881] [= *Chrossotoechia* CANU-L., 1925; *Haploporella* HINCKS, 1881]. Incrusting. Apertures with 2 small lateral indentations and porous cryptocyst perforated by 2 small opesiules; small polypidial lamella. *Cret.-Rec.*—FIG. 133.6. **M. nodulifera* (HINCKS), *Rec.*, SW.Pac.; $\times 25$ (167).

Odotionella CANU-B., 1917 [**Membranipora hians* HINCKS, 1885 (= *M. cyclops* BUSK, 1854)]. Disymmetrical opesiular indentations. Avicularia placed on gymnocyst. *Plio.-Rec.*—FIG. 133.7. *O. occultata* WATERS, Tert., N.Z.; $\times 25$ (230).—FIG. 133.8. **O. cyclops* (BUSK), *Rec.*, SW.Pac.; $\times 50$ (167).

Rhagasostoma KOSCHINSKY, 1885 [**R. hexagonum*]. Large interzoecial avicularia. *Eoc.-Mio.*—FIG. 133.9. **R. hexagonum*, *Eoc.* (Lut.), Ger.; $\times 25$ (172).

Family SETOSELLIDAE Levinsen, 1909

Incrusting, unilamellar or bifoliate. Zoecia with opesiulated cryptocyst. Endotooecial ovicell at zoecial distal extremity (31). *Cret.-Rec.*

Setosella HINCKS, 1877 [**Membranipora vulnerata* BUSK, 1860]. Vibracula present and 2 long opesiules placed low. *Rec.*—FIG. 134.4. **S. vulnerata* (BUSK), NE.Atl.; $\times 25$ (134).

Lagarozoum HARMER, 1926 [**L. profundum*] [= *Entomaria* CANU-L., 1927]. Ovicell with 2 lateral fissures and opened by frontal pore; short elevated convex polypidial lamella, spines and reticulocellaria. *Eoc.-Rec.*—FIG. 134.2. *L. spiniferum* (CANU), Mio. (Helv.), Fr.; $\times 25$ (136).

Setosinella CANU-B., 1933 [**S. prolifica*]. Like *Setosella* but ovicell not closed by operculum, vibracula replaced by setiferous avicularia. *Tert.*—FIG. 134.5. **S. prolifica*, *Eoc.*, N.J.; $\times 25$ (137).

Family COTHURNICELLIDAE Bassler, 1935

[=emend. Chlidioididae Busk, 1884]

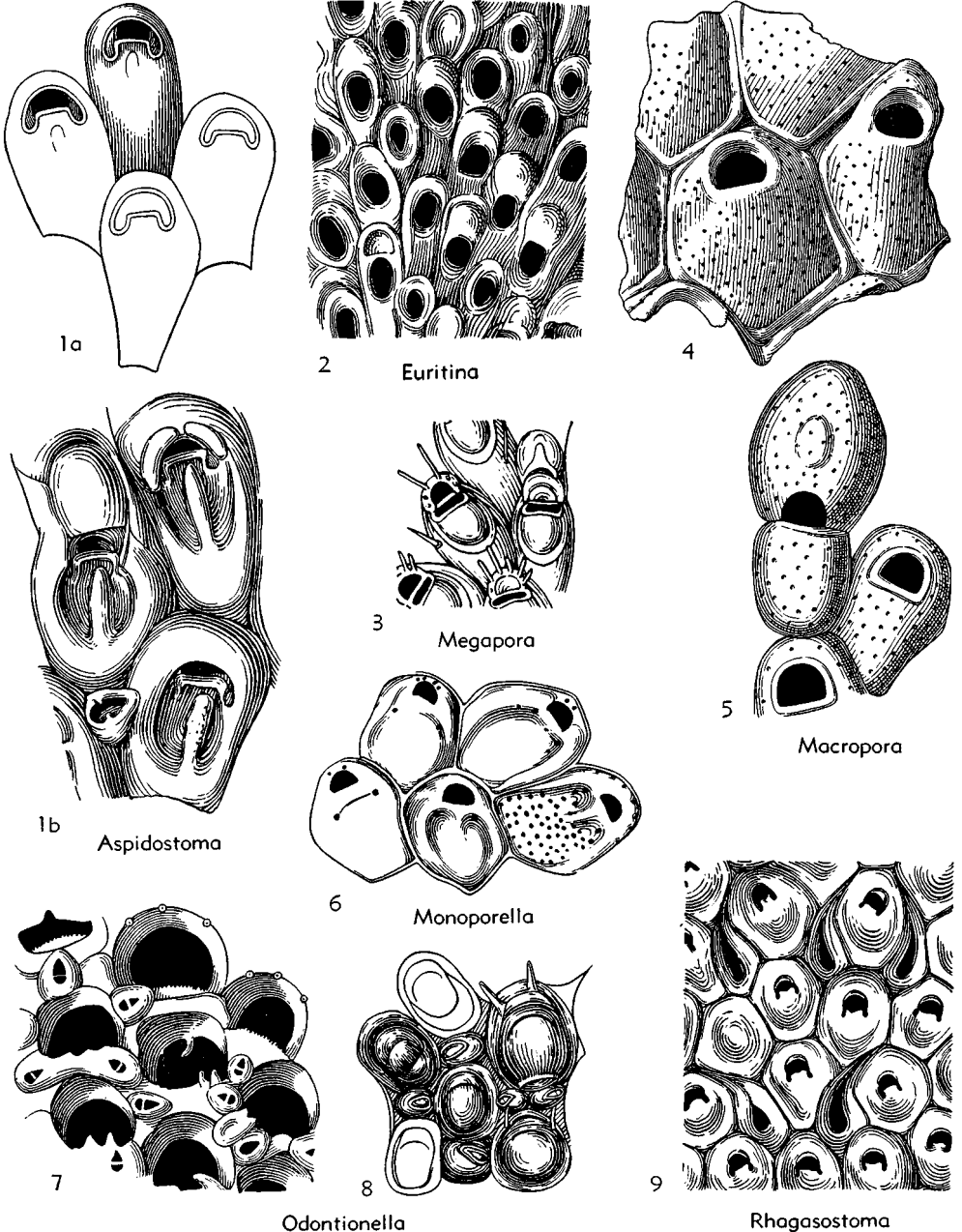
Zoarium jointed, arising from a stolonate network. Zoecia in unilinear rows, with deeply depressed cryptocyst pierced by a

transverse slit. No ovicells or avicularia. (31). *Rec.*

Cothurnicella W. THOMPSON, 1858 [*pro Chlidonia* LAMX., 1824 (*non HÜBNER*, 1816)] [**C. daedala* (= *Cellaria pyriformis* BERTOLINI, 1810)]

[= *Chlidonibrya* STRAND, 1928]. Apertures without semielliptical opesia. *Rec.*—FIG. 134.8. **C. pyriformis* (BERTOLINI), SW.Pac.; ×10 (137).

Crepis JULLIEN, 1882 [**C. longipes*]. Apertures with semielliptical opesia and a large cryptocyst. *Rec.*



Odontionella

Rhagasostoma

FIG. 133. Aspidostomatidae (p. G174).

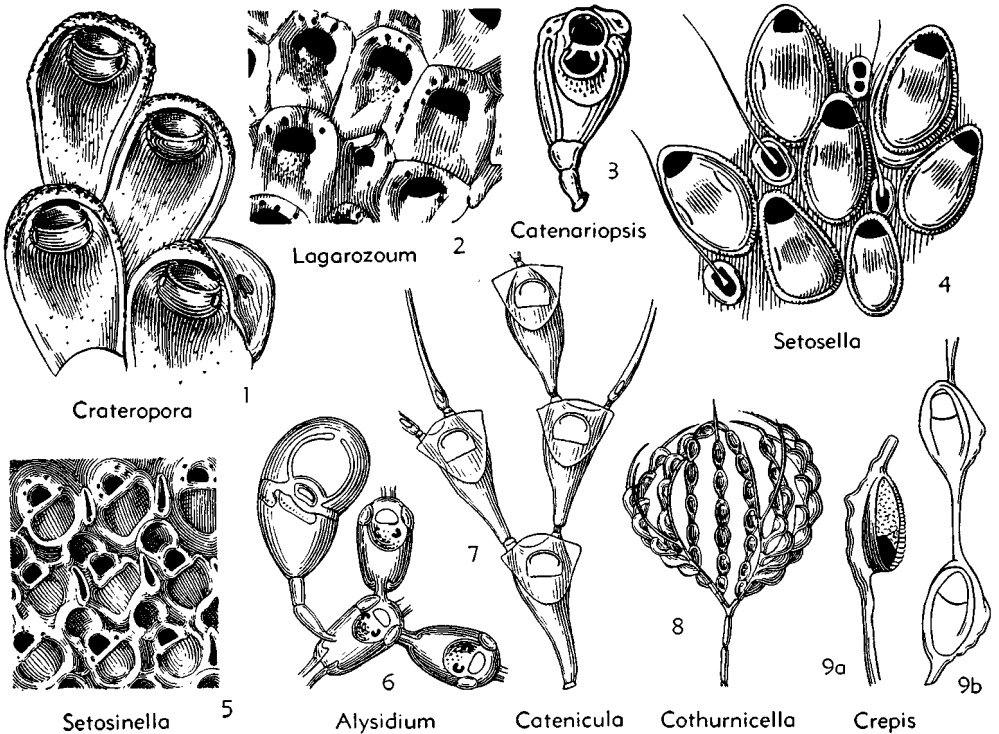


FIG. 134. Aspidostomatidae, Setosellidae, Cothurnicellidae, Alysidiidae (p. G174-G176).

—FIG. 134.9. **C. longipes*, E.Atl.; 9a,b, $\times 25$ (137).

Family ALYSIDIIDAE Levinsen, 1909

Zoarium jointed, with zoecia and gonozoecia springing from stolonate network. Zoecia with simple opercular valve and 2 opesiules, depressed cryptocyst in distal half. Ovicell typically bivalved, no avicularia (31). *Tert.-Rec.*

Alysidium BUSK, 1852 [**A. parasiticum*]. Cryptocyst calcified, ovicell bivalved, gonozoecia borne by stemlike kenozoecia. *Rec.*—FIG. 134.6. **A. parasiticum*, SE.Atl.; $\times 50$ (134).

Catenariopsis MAPLE., 1899 [**C. morningtonensis*] [?= *Alysidium*]. Zoecia incrusting, pyriform ventricose, unilinear; cryptocyst partly calcified. *Tert.*—FIG. 134.3. **C. morningtonensis*, Austral.; $\times 50$ (184).

Catenicula O'DONOGHUE, 1924 [**C. corbulifera*]. Ovicell of gonoeicum multivalve. *Rec.*—FIG. 134.7. **C. corbulifera*, SE.Atl.; $\times 50$ (201).

Division PSEUDOSTEGA Levinsen, 1909

Zoaria erect, cylindrical or bilamellate.

Zooecia in longitudinal series, frontal area formed by an imperforate depressed cryptocyst. Hydrostatic system external, confined to the hypostege (cavity between ectocyst and cryptocyst of each zooecium). Avicularia vicarious, replacing zooecia in the series; spines and pores wanting. Ovicell typically endotoichal with independent opening (special pore) buried at the base of the distal (succeeding) zooecium. *Cret.-Rec.*

Family CELLARIIDAE Hincks, 1880

[=Euginomidae, Meliceritidae VIC., 1939]

Zoaria typically erect, branched, with chitinous joints and long, rounded internodes. A pair of teeth on the proximal margin of aperture and 2 small lateral indentations deprived of denticles; operculum bilaminar with straight or concave proximal margin and pair of supporting denticles (26). *Cret.-Rec.*

Cellaria ELLIS-S., 1786 [**Eschara fistulosa* LINNÉ, 1758; SD HARMER, 1923] [= *Salicornaria* SCHWEIGER, 1819; *Farcimia* FLEMING, 1828 (*non*

POURTALÈS, 1870; *Salicornia* BLAINV., 1830; *Melicerita* JULLIEN, 1888 (non M.EDW., 1836)]. Zoarium with narrow cylindrical articulated segments. *Eoc.-Rec.*—FIG. 135,1. **C. fistulosa* (LINNÉ), *Rec.*, N.Atl.; 1a, $\times 1$; 1b, $\times 37.5$; 1c, $\times 25$ (1a.c, 167; 1b, 137).

Atelestozoum HARMER, 1926 [**A. obliquum*]. Bifoliate. Zoecia with elevated vertical walls marking off angular areas on surface. *Rec.*—FIG. 135, 2. **A. obliquum*, E.Indies; $\times 25$ (164).

Cryptostomaria CANU-B., 1927 [**C. crassatina*]. Ovicell without apparent orifice forms semicircular convexity at base of zoecia. *Rec.*—FIG. 135,6. **C. crassatina*, SW.Pac.; $\times 25$ (137).

Dimorphocellaria VOIGT, 1930 [**Cellaria goldfussi* REUSS, 1847]. Articulated segments with dimorphic zoecia, normal ones with semicircular apertures. *Cret.*—FIG. 135,7. **D. goldfussi* (REUSS), Maastr., Holl.; $\times 25$ (131).

Escharicellaria VOIGT, 1924 [**E. polymorpha*]. Bi-

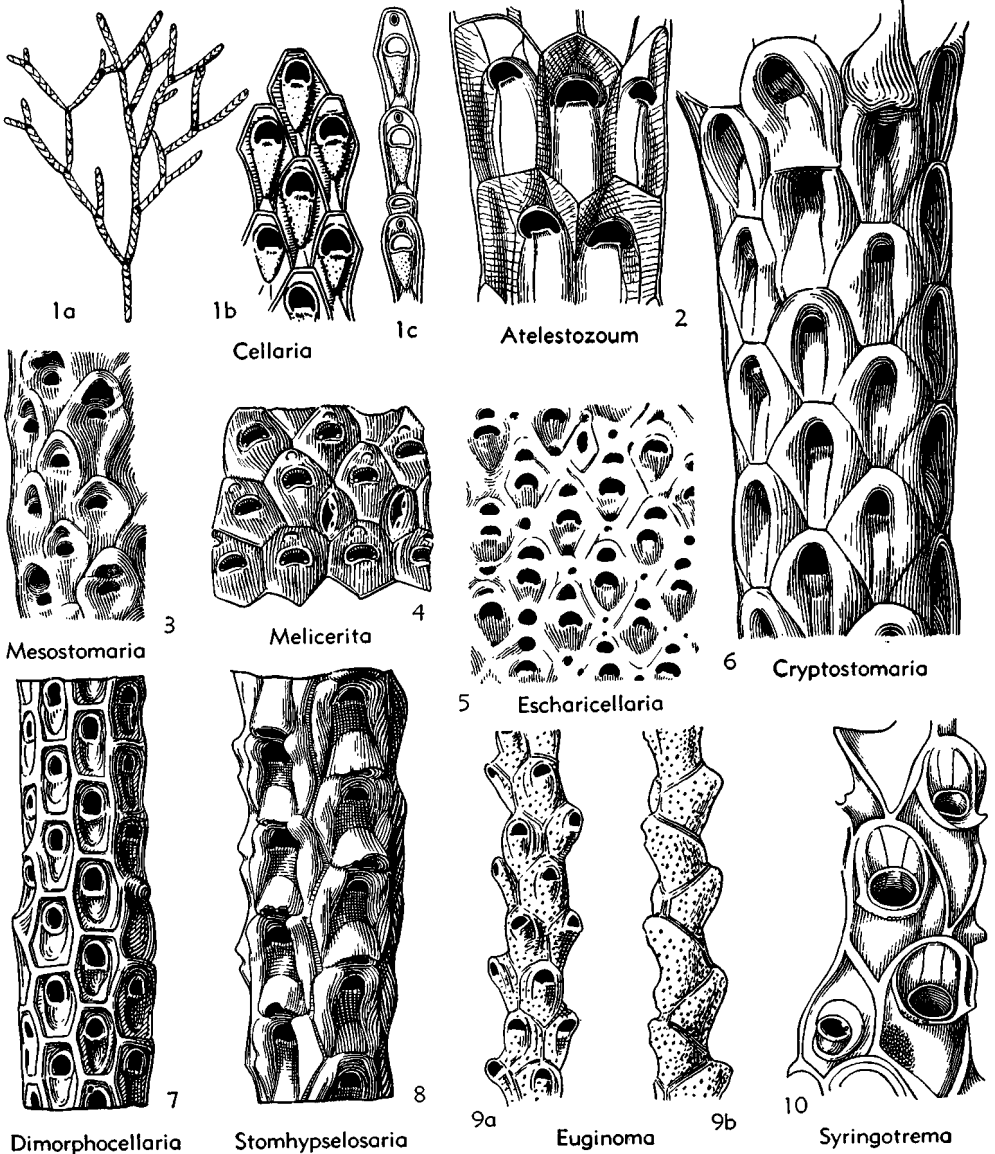


FIG. 135. Cellariidae (p. G176-G178).

lamellar, dichotomous, unarticulated branches. Zoecia with smooth flat cryptocyst, semicircular opesium; interzoecial avicularia. *Cret.*—FIG. 135,5. **E. polymorpha*, Senon., Ger.; $\times 25$ (227).

Euginoma JULLIEN, 1882 [**E. vermiformis*] [= *Enginoma* JULLIEN, 1882 (error)]. Bilinear zoarium, zoecia opening on one side only. *Rec.*—FIG. 135,9. **E. vermiformis*, E.Atl.; 9a,b, $\times 25$ (169).

Hemistylus VOIGT, 1928 [**H. virgula*]. Narrow articulated rods with zoecial apertures on one side only. *Cret.*, Ger.

Mawsonia LIVINGSTONE, 1928 [**Cellaria membranacea* THORNELEY, 1924]. Cylindrical branches of fused internodes with oval zoecial apertures and falciform interzoecial avicularia. *Rec.*, Antart.

Melicerita M.EDW., 1836 (non JULLIEN, 1888) [**M. charlesworthii* MORRIS, 1843] [= *Meliceritina* EHR., 1839; *Ulidium* SEARLES WOOD, 1844 (obj.)]. Zoarium bilaminar, not articulated. *Cret.-Plio.*—FIG. 135,4. **M. charlesworthii* MORRIS, Plio., Eng.; $\times 25$ (134).

Mesostomaria CANU-B., 1927 [**M. strictoramae*]. Slender free fronds. Aperture central with special peristome and no denticles. Ovicell convex, with large orifice. *Mio.-Rec.*—FIG. 135,3. **M. strictoramae*, *Rec.*, SW.Pac.; $\times 25$ (137).

Pseudocellaria LIVINGSTONE, 1928 [**Aspidostoma obliquum* THORNELEY, 1924]. Zoarium bilaminar, no avicularia, operculum crescentic. *Rec.*, Antart.

Stomhypsosaria CANU-B., 1927 [**S. condylata*]. Like *Cryptostomaria* but aperture terminal and ovicell a salient convexity at base of distal zoecium. *Eoc.-Rec.*—FIG. 135,8. **S. condylata*, *Rec.*, SW.Pac.; $\times 25$ (137).

Syringotrema HARMER, 1926 [**S. auriculatum*]. Free cylindrical unjointed zoaria attached by chitinous rootlets. Zoecia in pentagonal areas outlined by raised walls, with orifices removed from distal ends. *Rec.*—FIG. 135,10. **S. auriculatum*, E. Indies; $\times 25$ (164).

Family MEMBRANICELLARIIDAE

Levinsen, 1909

Erect, narrow to broad bifoliate branches. Opesium median or anterior, not terminal, completely surrounded by cryptocyst. Avicularia or interzoecial onychocellaria present. Ovicells hyperstomial, emerging through variously shaped openings, not located on distal zoecium (31). *Cret.-Rec.*

Membranicellaria LEV., 1909 [**Melicerita dubia* BUSK, 1885]. Avicularia with wide mandibles. *Rec.*—FIG. 136,1. **M. dubia* (BUSK), SE.Atl.; $\times 25$ (134).

Dictuonia JULLIEN, 1881 [**Eschara aceste* D'ORB., 1851]. Apertures lozenge-shaped; straight onychocellaria. *Cret.*—FIG. 136,3. **D. aceste* (D'ORB.), Maastr., Fr.; $\times 10$ (202).

Erinella CANU-B., 1927 [pro *Erina* CANU, 1908 (non SWAINSON, 1833)] [**Erina patagonica* CANU, 1908]. Like *Membro ucellaria* but has onychocellaria. *Mio.*—FIG. 36,7. **E. patagonica* (CANU), Arg.; $\times 25$ (136).

Omoiosia CANU-B., 1927 [**Vincularia maorica* STOLICZKA, 1865]. Narrow branches with hexagonal dimorphic zoecia bearing anterior or median opesia. Straight onychocellaria. *Tert.-Rec.*—FIG. 136,2. **O. maorica* (STOLICZKA), Tert., N.Z.; $\times 25$ (137).

Family COSCINOPEURIDAE Canu, 1913

Erect, bifoliate, narrow branches. Zoecia with semilunar, marginated, anterior apertures; hyperstomial ovicells embedded in distal zoecia; onychocellaria straight (24). *Cret.-Eoc.*

Coscinopeura MARSSON, 1887 [**Eschara elegans* HAG., 1840]. Zoarial margins bordered by large vibracula with porous front. *Cret.*—FIG. 136,5. *C. digitata* (MORTON), Eoc. (Wilcox.), N.J.; 5a,b, zoecia with vibracula, and with ovicells, $\times 25$ (137).—FIG. 136,6. **C. elegans* (HAG.), Camp., Ger.; $\times 25$ (160).

Escharifora D'ORB., 1852 [**E. argus*]. Orbicular avicularia; zoecial front occupied by pores. *Cret.*—FIG. 136,4. **E. argus*, Santon., Fr.; $\times 25$ (202).

Division CELLULARINA Smitt, 1867

Zoaria erect, ramose, flexible or jointed, attached by radicles; formed of unilaminar, narrow, commonly biserial branches, probably derived from incrusting membraniporoid ancestors which have become free except at the base of attachment. Zoecia not heavily calcified, all generally facing the same way. Heterozoecia mostly sessile or pedunculate avicularia or highly differentiated vibracula. Spines, modified in some into frontal scutes, protect opesia. Ovicell mainly hyperstomial. *Eoc.-Rec.*

Family FARCIMINARIIDAE Busk, 1884

Slender, erect, prismatic segments forming dichotomously branched tufts. Zoecia membraniporoid, without cryptocyst, generally in pairs back to back, facing in opposite directions. Sessile avicularia only, commonly paired on the gymnocyst. Zoecia in 4 to 6 series in longitudinal rows around a central axis; ovicell endozoecial. Regarded

as transitional between membraniporoids and scrupocellariids (24). *Eoc.-Rec.*

Farciminaria BUSK, 1852 [**F. aculeata*]. Zoarium chitinous, not jointed, fixed in the sand by many radicles. Lateral margins and frontal membrane of zooecia with spinelike processes. Ovicell with many kenozooecia. *Rec.*—FIG. 137,4. **F. aculeata*, SW.Pac.; $\times 25$ (134).

Columnella LEV., 1914 [*pro Columnaria* LEV., 1909 (non GOLDF., 1826)] [**Columnaria borealis* LEV., 1909] [= *Levisenella* HARMER, 1926 (non PRATT, 1902)]. Erect quadrangular branches. Zooecia in 4 series, without spines. Ovicell prominent. Single median avicularium attached to distal wall of zooecium. *Rec.*—FIG. 137,3. **C. borealis* (LEV.), N.Atl.; $\times 25$ (177).

Didymozoum HARMER, 1923 [*pro Didymia* BUSK, 1852 (non LEPELETIER & SERVILLE, 1825)] [**Didymia simplex* BUSK, 1852]. Biserial, branching with ovicell between 2 zooecia at bifurcations. *Rec.*—FIG. 137,1. **D. simplex* (BUSK), SW.Pac.; $\times 25$ (134).

Farciminellopsis SILÉN, 1952 [**F. gracilis*]. *Rec.*, NW.Pac.

Farciminelum HARMER, 1926 [**Farciminaria hexagona* BUSK, 1884]. Bilaminar flattened branches. Zooecia elongate, bearing many short spines on front and kenozooecia without orifice or operculum on back. *Rec.*—FIG. 137,5. **F. hexagona* (BUSK), SW.IndianO.; $\times 25$ (134).

Kenella LEV., 1909 [**Flustra biseriata* BUSK, 1884]. Biserial. No spines or avicularia. *Rec.*, E.Indies. **Nellia** BUSK, 1852 [**N. oculata*]. Zoarium of deli-

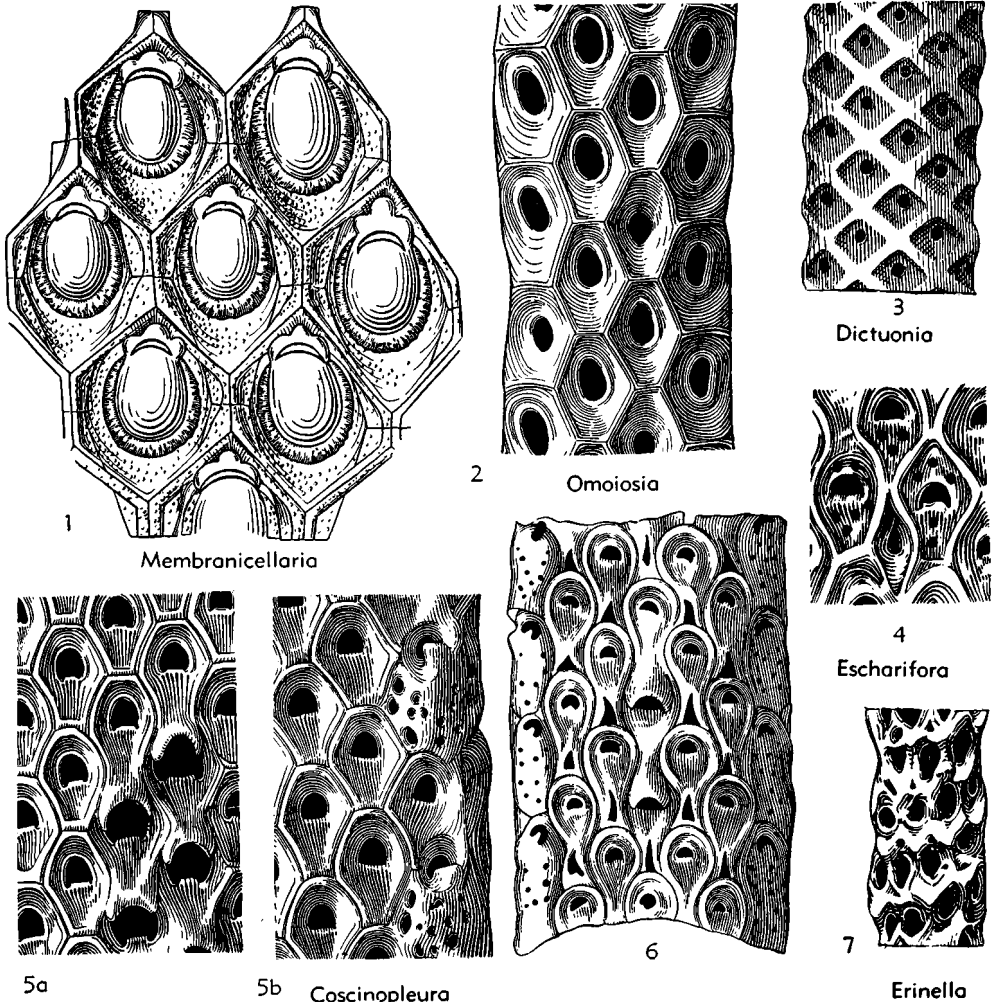


FIG. 136. Membranicellariidae, Coscinopleuridae (p. G178).

cate, erect 4-sided joints. Zoecia elongate, lacking spines. Ovicell small, endozoecial, deeply immersed. Pair of small avicularia on basal gymnocyst. *Eoc.-Rec.*—FIG. 137,2. **N. oculata*, Rec., Torres Strait; 2a,b, ×25 (134).

Family BUGULIDAE Gray, 1848

[=Euplozoidae HARMER, 1923; Halophylidae Vic., 1949]

Zoaria erect, nonarticulated, flexible, radiceled, chitinous, unilaminar. Zoecia sub-

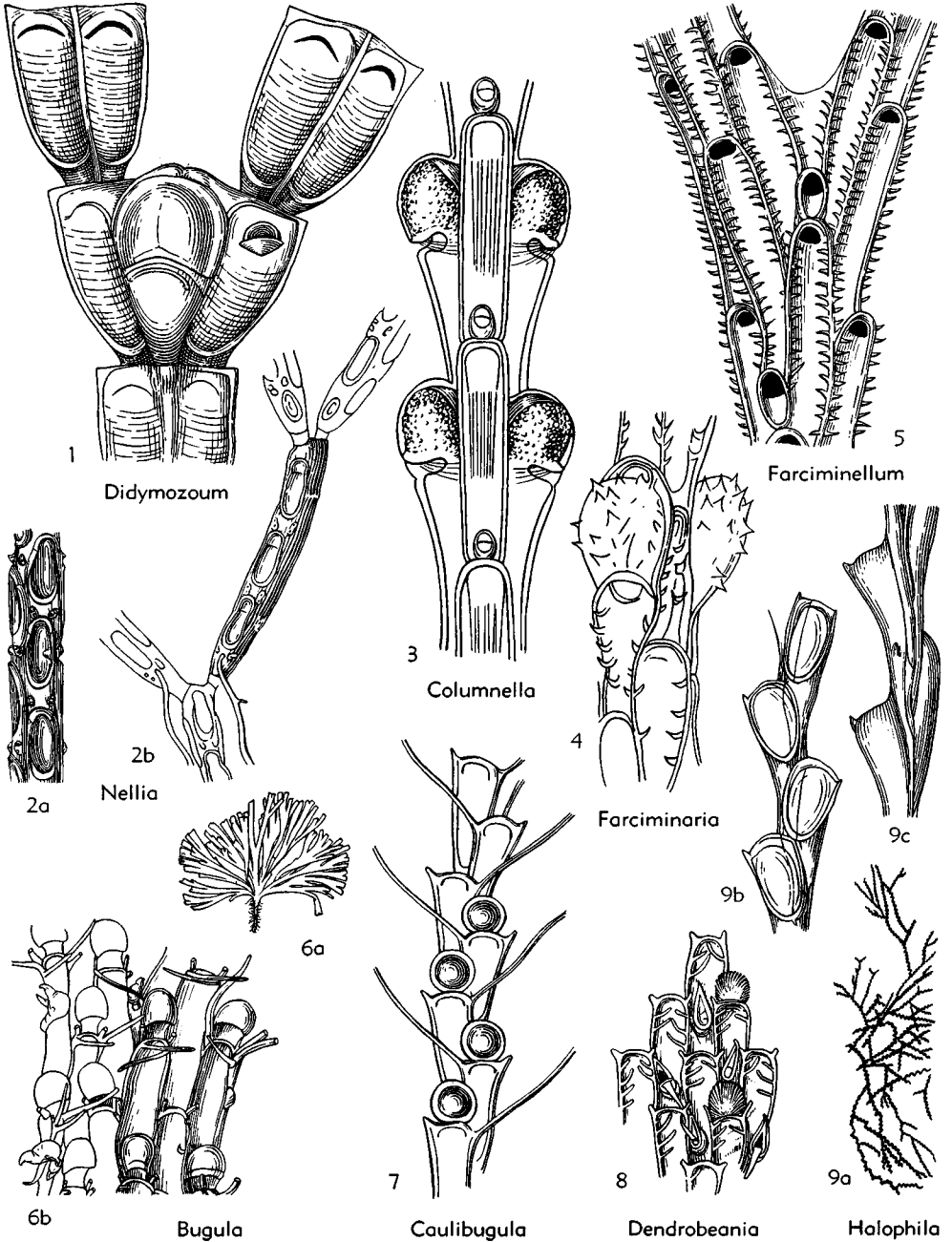


FIG. 137. Farciminariidae, Bugulidae (p. G179-G181).

rectangular, all opening in same direction on front side; gymnocyst absent or very small. Ovicell hyperstomial. Avicularia pedunculate, "bird's head" type, short, pedicellate; no vibracula or scutum. Larva higher (longer) than wide (31). *Rec.*

The Bugulidae, although dropped in recent years in favor of Bicellariellidae (LEV., 1909), is retained here because the name Bugulidae has priority and because of judgment that the different shape of larvae and club-shaped zoecia and presence of a gymnocyst in the Bicellariellidae are sufficient for family distinction. The bizarre zoecial shape of so many species of Beaniidae (CANU-B., 1927) seems sufficient as a family character of its own.

Bugula OKEN, 1815 [*Sertularia neritina* LINNÉ, 1758] [= *Acamarchis* LAMX., 1816; *Bugulina*, *Avicularia*, *Crisularia* GRAY, 1848; *Avicella* VAN BENEDEK, 1848; *Ornithopora*, *Ornithoporina* D'ORB., 1852]. Bushy zoaria with biserial to multiserial rows of zoecia. Capitae, pedunculate avicularia on lateral zoecia.—FIG. 137,6. **B. neritina* (LINNÉ), Atl.; 6a,b, $\times 1$, $\times 25$ (137).

Bugularia LEV., 1909 [*Carbasa dissimilis* BUSK, 1852]. Sessile avicularia on much reduced proximal gymnocyst. SW.Pac.

Camptolites HARMER, 1923 [*Bugula bicornis* BUSK, 1881]. Avicularia with long flexible peduncle. SE.IndianO.

Caulibugula VERRILL, 1900 [*pro Stirparia* GOLDSTEIN, 1880 (non LEUCKHARDT, 1841)] [**C. armata*] [= *Stirpariella* HARMER, 1923]. Zoarium biserial, with jointed stem of long narrow kenozoecia.—FIG. 137,7. **C. armata*, *Rec.*, Bermuda; $\times 50$ (137).

Dendrobeania LEV., 1909 [**Flustra murrayana* JOHNSTON, 1847]. Erect fronds with 3 or more parallel rows of zoecia bearing freely movable avicularia.—FIG. 137,8. **D. murrayana* (JOHNSTON), *Rec.*, N.Atl.; $\times 25$ (137).

Euoplozoum HARMER, 1923 [**Cellularia cirrata* BUSK, 1884]. Biserial, with large zoecia, alternating. SW.Pac.

Eupaxia HASENBANK, 1932 [**E. incarnata*]. W.IndianO.

Halophila GRAY, 1843 [**H. johnstoniae*]. Biserial; no ovicell or avicularia.—FIG. 137,9. **H. johnstoniae*, *Rec.*, N.Z.; 9a, $\times 1$; 9b,c, front, back, $\times 25$ (137).

Himantozoum HARMER, 1923 [**Bugula mirabilis* BUSK, 1884]. Biserial, asymmetrical zoecia with median row of symmetrical ones. E.Atl.

Kinetoskias DANIELSEN, 1868 [**K. smitti*] [= *Narcesia* W. THOMPSON, 1872; *Cinetoskias* VON MARTENS, 1879]. Arct.

Semibugula KLUGE, 1929 [**S. biruli*]. Arct.

Semikinetoskias SILÉN, 1942 [**S. dubia*]. NW.Pac.

Sessibugula OSBURN, 1950 [**S. translucens*]. In-crusting, gymnocyst with paired avicularia. Gulf Calif.

Watersia LEV., 1909 [**Flustra militaris* WATERS, 1887]. SW.Pac.

Family BICELLARIELLIDAE Levinsen, 1909

Zoaria free, bushy, with radical fibers. Zoecia little calcified, club-shaped, with narrowed gymnocyst; planes of opesium and front oblique. Avicularia long, pedunculate; vibracula and scuta absent. Ovicell hyperstomial and free. Larvae wider than high (31). *Rec.*

Bicellariella LEV., 1909 [*pro Bicellaria* BLAINV., 1830 (non MACQUART, 1823)] [**Sertularia ciliata* LINNÉ, 1758]. Zoecia twinned, constricted into a distal funnel-shaped part, a median elongate cylindrical part, and proximal tubular part.—FIG. 138,1. **B. ciliata* (LINNÉ), N.Atl.; 1a,b, back, front, $\times 25$ (134).

Bicellarina LEV., 1909 [**Bicellaria alderi* BUSK, 1860]. Like *Bicellariella* but zoecia not constricted into 3 parts.—FIG. 138,2. **B. alderi* (BUSK), NE.Atl.; 2a,b, back, front, $\times 25$ (134).

Calyptozoum HARMER, 1926 [**C. operculatum*]. Zoecia extremely elongate, alternating. IndianO.

Cornucopina LEV., 1909 [**Bicellaria grandis* BUSK, 1852]. Long, funnel-shaped zoecia with ovicell on distal margin.—FIG. 138,5. **C. grandis* (BUSK), SW.Pac.; $\times 50$ (134).

Corynoporella HINCKS, 1888 [**C. tenuis*]. Slender, uniserial elongate zoecia with an articulated buguloid avicularium attached to side of opesium. Gulf St.Lawrence.

Dimetopla BUSK, 1852 [**D. cornuta*] [= *Bifrons* MACGILL., 1860]. Zoecia in alternate pairs, back to back.—FIG. 138,3. **D. cornuta*, SW.Pac.; $\times 25$ (134).

Dimorphozoum LEV., 1909 [**Flustra nobilis* HINCKS, 1891]. W.IndianO.

Erymophora HASTINGS, 1943 [**Brettia gracilis* NICHOLS, 1911]. Uniserial, with longitudinal connecting tubes. SW.Pac., Antarct.

Klugella HASTINGS, 1943 [**Flustra echinata* KLUGE, 1914]. SW.Pac.

Petalostegus LEV., 1909 [**Catenaria bicornis* BUSK, 1884]. Zoecial front covered with leaflike spines.—FIG. 138,4. **P. bicornis* (BUSK), S.Pac.; $\times 50$ (134).

Family BEANIIDAE Canu & Bassler, 1927

Zoecia recumbent, more or less separated, attached by radicles, little calcified,

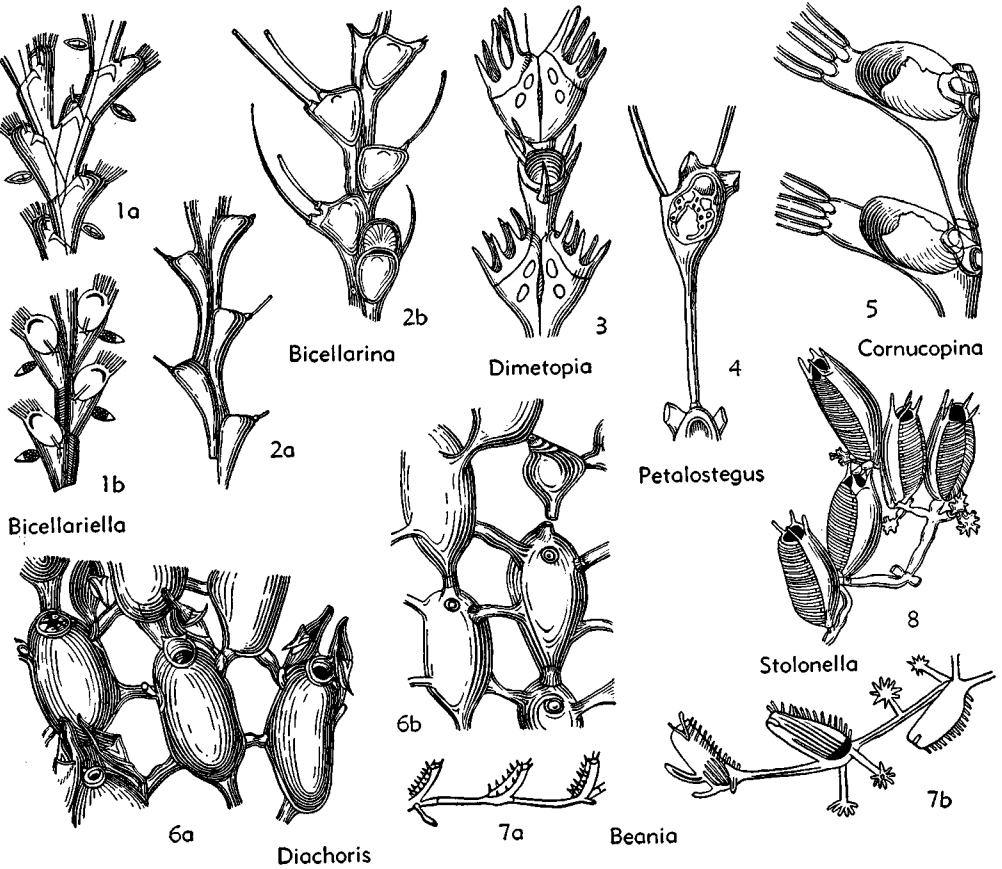


FIG. 138. Bicelliariellidae, Beaniidae (p. G181, G182).

uni- or multiserial, all facing in one direction and jointed by stoloniform prolongations; no gymnocyst; opesia occupy all of front; avicularia commonly pedunculate (31). *Rec.*

Beania JOHNSTON, 1840 [**B. mirabilis*]. Zoarium uniserial, without connecting tubes, to laminate, with zooecia connected by 4 or 6 radiating tubes; mural rim with areal spinules and apertural spines. —FIG. 138,7. **B. mirabilis*, E.Atl.; 7a,b, side, front, $\times 16.7$ (168).

Chaunosia BUSK, 1867 [**Diachoris hirtissima* HELLER, 1867]. Multiserial with 2 connecting tubes. Adriatic.

Diachoris BUSK, 1852 [**D. crotali*] [= *Diachoseris* ORTMANN, 1889]. Multiserial, with 6 connecting tubes. S.Atl.-SW.Pac. —FIG. 138,6. *D. magellanica* BUSK, Straits Magellan; 6a,b, front, back, $\times 25$ (134).

Stolonella HINCKS, 1883 [**S. clausa*]. Like *Beania*

but areal spines jointed together at extremities to form false cribrimorph front above ectocyst. E.Ind. O. —FIG. 138,8. **S. clausa*, W.Austral.; $\times 25$ (167).

Family SCRUPOCELLARIIDAE

Levinsen, 1909

Zoaria free, erect, unilaminar, radiclellate, mostly articulated. Zooecia attached to each other; front sessile. Avicularia, dorsal vibracula, or avicularia and scutum in opesium partially protecting aperture (31). *Eoc.-Rec.*

Scrupocellaria VAN BENEDEN, 1845 [**Sertularia scruposa* LINNÉ, 1758] [= *Crisina* VAN BENEDEN, 1850 (non d'ORB., 1853); *Licornia*, *Savignella* VAN BENEDEN, 1850]. Biserial branches not attached to each other; avicularia, vibracula and scutum; ovicell hyperstomial. *Rec.* —FIG. 139,1. **S. scruposa* (LINNÉ), N.Atl.; 1a-c, front, back, ovicell, $\times 25$ (134).

Amastigia BUSK, 1852 [**A. nuda*] [= *Caberiella* LEV., 1909; *Anderssonia* KLUGE, 1914; *Anderiola* STRAND, 1928]. Fibrous radicular bundles on zoarial margin. *Rec.*, S.Atl.

Bugulopsis VERRILL, 1880 [**Cellularia peachi* BUSK, 1851]. Like *Tricellaria* but without avicularia. *Rec.*—FIG. 139,5. **B. peachi* (BUSK), N. Atl.; 5*a,b*, ×1, ×25 (134).

Caberea LAMX., 1816 [**C. dichotoma*; SD HARMER, 1923] [= *Selbia* GRAY, 1843; *Scutularia* BUSK,

1860]. Not regularly jointed. Long denticulated cilium on back; spines, scutum and frontal avicularium present. *Oligo.-Rec.*—FIG. 139,2. *C. ellisi* FLEMING, *Rec.*, Atl.; 2*a,b*, front, back, ×25 (211).

Cabereopsis HASENBANK, 1932 [**C. elongata*]. *Rec.*, IndianO.

Canda LAMX., 1816 [**C. arachnoides*]. Not articulated but branches united by cross radicles. *Eoc.-Rec.*—FIG. 139,3. **C. arachnoides*, *Rec.*, Timor; 3*a*, ×1; 3*b,c*, ×25 (137).

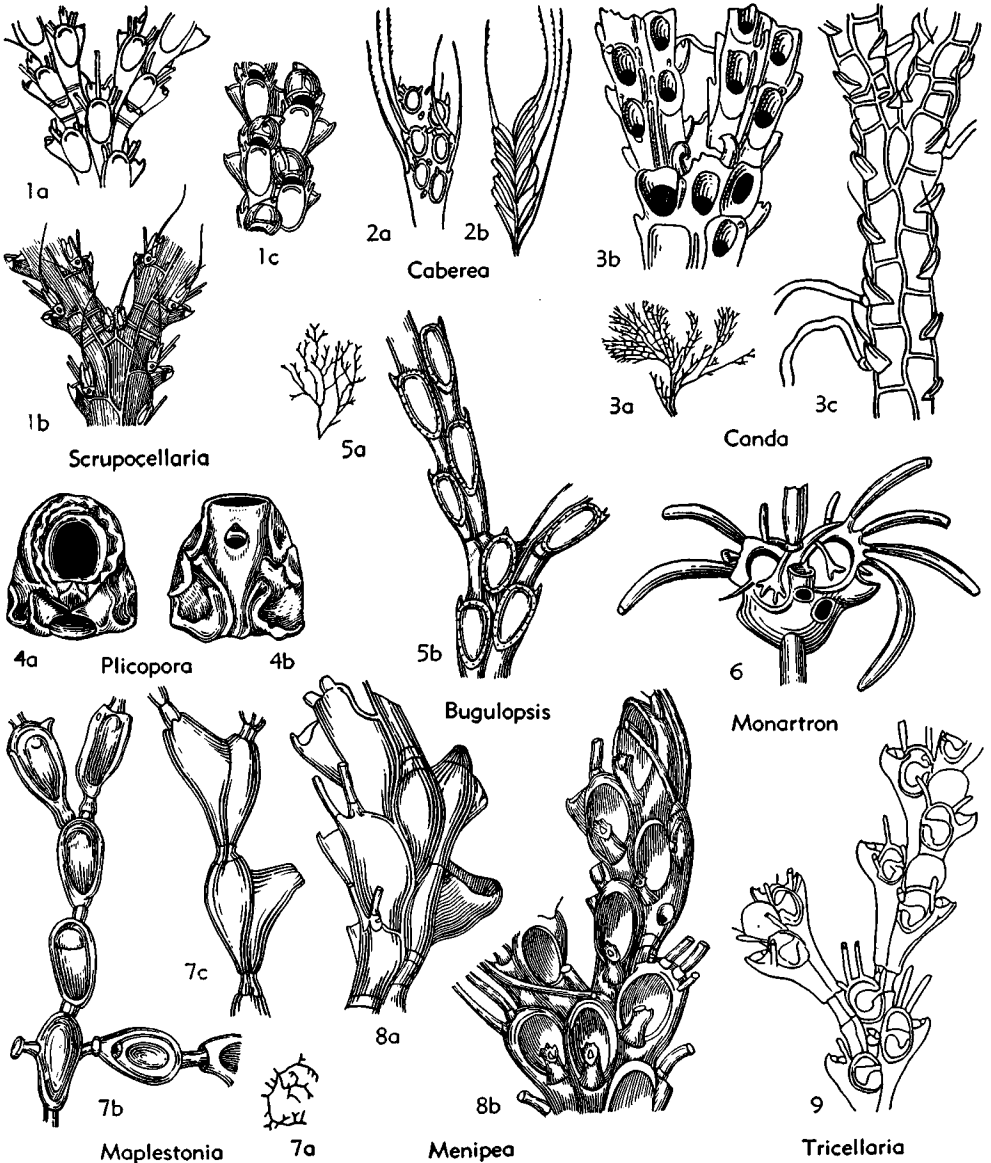


FIG. 139. Scrupocellariidae (p. G182-G184).

Craspedozoum MACGILL., 1886 [**Membranipora roborata* HINCKS, 1881] [= *Flabellaris* WATERS, 1898; *Flabellina* LEV., 1902 (obj.)]. *Rec.* SW.Pac.
Hoplitella LEV., 1909 [**Carbasea armata* BUSK, 1852]. Not articulated, multiserial. No ovicells. *Rec.*, S.Atl.

Jubella JULLIEN, 1882 [**J. enucleata*]. No heterozooecia on back. *Rec.*, E.Atl.

Maplestonia MACGILL., 1885 [**M. cirrata*]. Articulated with segments of 1 or 2 zooecia. Ovicell endozooecial. *Rec.*—FIG. 139.7. **M. cirrata*, SW.Pac.; 7a, $\times 1$; 7b,c, $\times 50$ (181).

Menipea LAMX., 1812 [**Cellaria cirrata* ELLIS-S., 1786] [= *Emma* GRAY, 1843]. Biserial, articulated, with segments of 2 to 5 zooecia. Endozooecial ovicells. *Rec.*—FIG. 139.8. **M. cirrata* (ELLIS-S.), IndianO. 8a,b, $\times 25$ (137).

Monartron CANU-B., 1929 [**Menipea cyathus* W. THOMPSON, 1858]. Uniserial, with short segments. *Rec.*—FIG. 139.6. **M. cyathus* (W. THOMPSON), SW.Pac., $\times 50$ (137).

Notoplites HARMER, 1923 [**N. rostratus*]. Articulated, biserial, with long internodes. *Rec.*, E.Indies.

Plicopora MACGILL., 1895 [**P. daedala*]. Uniserial, with each internode a single zooecium. *Tert.*—FIG. 139.4. **P. daedala*, SW.Pac.; 4a,b, front, back, $\times 25$ (181).

Rhabdozoum HINCKS, 1882 [**R. wilsoni*]. Segments at end of long radicular pedicels. *Rec.*, SW.Pac.

Tricellaria FLEMING, 1828 [**Cellaria ternata* ELLIS-S., 1786] [= *Cellarina* VAN BENEDEN, 1848; *Ternicellaria* D'ORB., 1849]. Short internodes of 2 or 3 zooecia; no dorsal vibracula or avicularia. *Rec.*—FIG. 139.9. **T. ternata* (ELLIS-S.), N.Atl.; $\times 25$ (137).

Family EPISTOMIIDAE Gregory, 1903

[=emend. Notamiidae HINCKS, 1880]

Zoaria erect or partially prostrate, commonly jointed, attached by rootlets. Zooecia in back-to-back pairs, each beginning in short tubular processes. Avicularia sessile or pedunculate (31). *Rec.*

Epistomia FLEMING, 1828 [**Sertularia bursaria* LINNÉ, 1858]. Two long avicularia above zooecial pairs.—FIG. 140.1. **E. bursaria* (LINNÉ), E.Atl.; $\times 25$ (137).

Synnotum PIEPER, 1881 [**Gemellaria avicularis* PIEPER, 1881 (= *Loricaria aegyptiaca* AUDOUIN, 1826)] [= *Mononota* PIEPER, 1881 (obj.)]. Sessile lateral avicularia and an articulated one at summit.—FIG. 140.2. **S. aegypticum* (AUDOUIN), Adriatic; 2b, $\times 25$; 2a, $\times 50$; (137).

Division CRIBRIMORPHA Lang, 1916

[= *Acanthostega* LEVINSSEN, 1902]

Zooecia with more or less of front membranous, protected by a roof formed of

fused overarching circumareal spines; parietal muscles as in *Milacostega*; no compensation sac. *Cret.-Rec.*

The position of this division comprising the Cribrilinidae of HINCKS (1880), Pelmatoporidae, and several other families of LANG (1916), mainly Cretaceous, has been under question since LEVINSSEN (1902) proposed the name *Acanthostega* for it. HARMER (1926) recognized LANG's designation Cribrimorpha instead, interpreting the assemblage as a transitional group with relations to both *Anasca* and *Ascophora*. Other students have classified them as *Ascophora*, judging that early assumption of ascophoran characters by some genera should determine systematic position of the division. OSBURN (1940, 1950) preferred to leave them since the ascophoran type of zooecial front is not yet well developed. LANG has summed up his extensive studies of Cretaceous families in catalogs of Cretaceous Bryozoa (LANG, 1921, 1922).

Family CRIBRILINIDAE Hincks, 1880

[= *Costulac* JULLIEN, 1888]

Zooecia with membranous frontal area covered by 2 rows of flattened ribs (costulae) directed from their outer border to the median line where they unite intimately but leave a shield (pericyst) perforated by pores or slits. Ovicell hyperstomial (31). *Cret.-Rec.*

Cribrilina GRAY, 1848 [**Lepralia punctata* HASSALL,

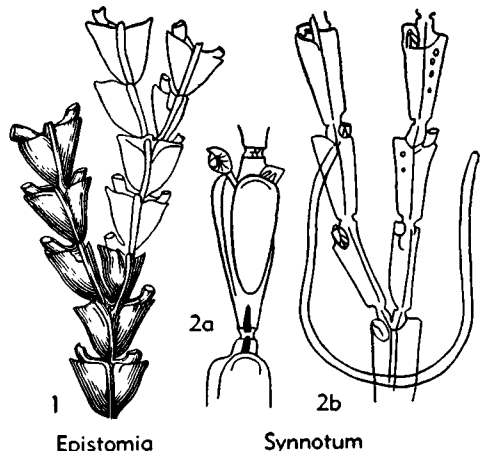


FIG. 140. Epistomiidae (p. G184).

1841]. Zoecial front a pericyst of fused costules so united along their length to give appearance of large perforations in regular rows. Orifice semi-

lunar without marginal spines. Dietellae present, frontal shield without spiramen, with rows of transverse pores between the costae. *Eoc.-Rec.*—

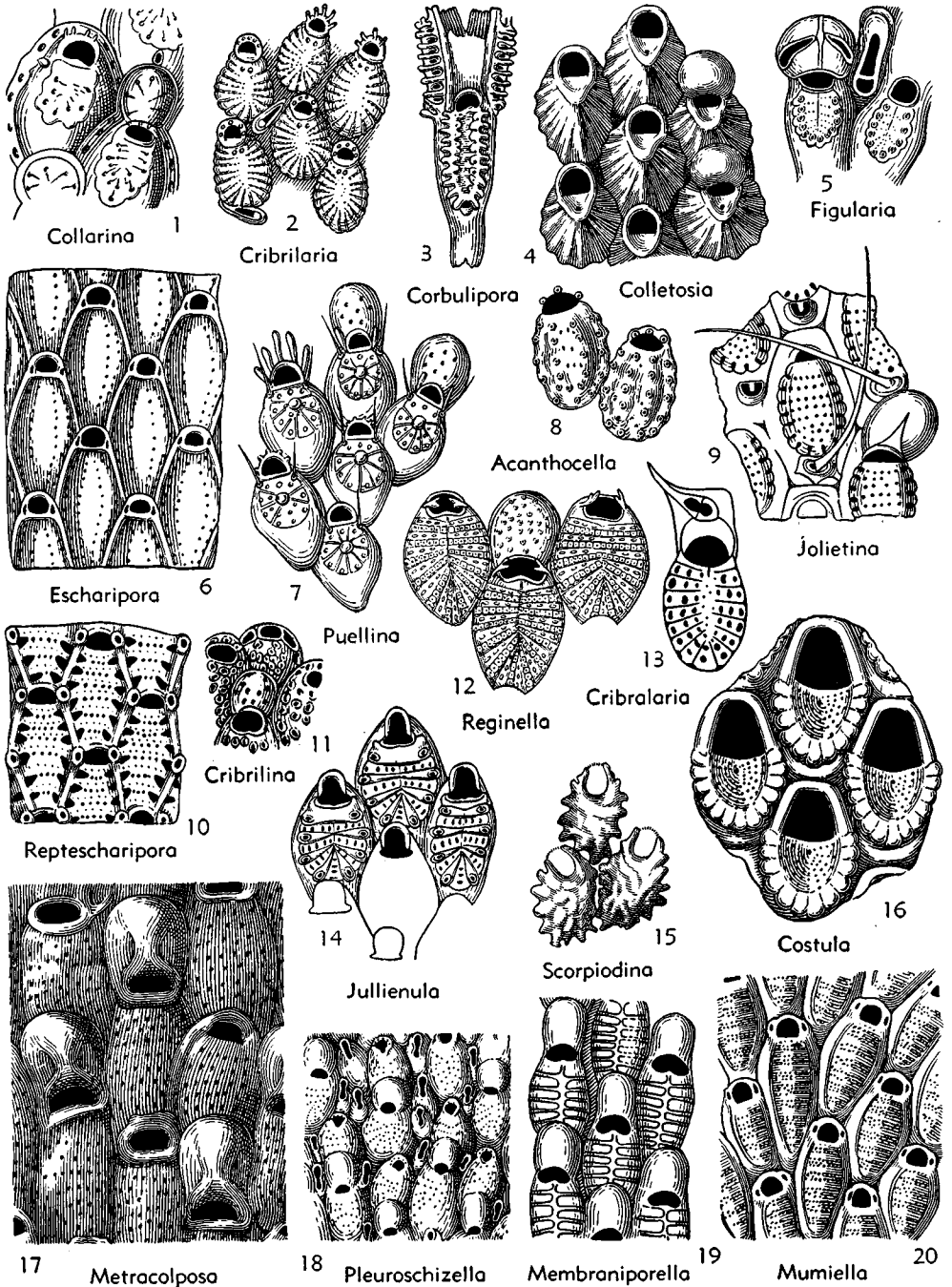


FIG. 141. Cribriliniidae (p. G184-G186).

- FIG. 141,11. **C. punctata* (HASSALL), Rec., Ire.; $\times 37.5$ (177).
- Acanthocella** CANU-B., 1917 [**Cribrilina tubulifera* HINCKS, 1881]. Like *Cribrilina* but with tubular lumen pores. *Eoc.-Rec.*—FIG. 141,8. **A. tubulifera* (HINCKS), Rec., SW.Pac.; $\times 25$ (167).
- Collarina** JULLIEN, 1886 [**Lepralia cribrrosa* WATERS, 1879 (non HELLER, 1867)]. Zoecia with border pierced by wide pores except proximally. *Cret.-Rec.*—FIG. 141,1. **C. cribrrosa* (WATERS), Rec., Medit.; $\times 25$ (137).
- Colletosia** JULLIEN, 1886 [**Lepralia endlicheri* REUSS, 1874]. Zoecial front with radiating ribs separated by wide furrows without pores. *Mio.*—FIG. 141,4. **C. endlicheri* (REUSS), Tort., Aus.; $\times 25$ (210).
- Corbulipora** MACGILL., 1895 [**C. ornata*]. Erect, narrow branches. Elongate quadrate zoecia with elliptical aperture; front covered by vertical ribs turning abruptly inward, uniting to form a flat plate. *Eoc.-Mio.*—FIG. 141,3. **C. ornata*, Tert., Austral.; $\times 25$ (181).
- Costula** JULLIEN, 1886 [**Escharella arge* D'ORB., 1852]. Distal half of zoecial front with membraniporoid orifice; proximal half with minute ribs separated by small pores, all directed to a central point. *Cret.*—FIG. 141,16. **C. arge* (D'ORB.), Maastr., Fr.; $\times 25$ (202).
- Cribralaria** SILÉN, 1942 [**C. curvirostris*]. Like *Cribrilina* but ovicell immersed in square vicarious avicularia. *Rec.*—FIG. 141,13. **C. curvirostris*, NW.Pac.; $\times 25$ (216).
- Cribrilaria** CANU-B., 1929 [**Eschara radiata* MOLL, 1803]. Front bearing costulae with lumen and interzoecial furrows with lacunae, oral spines, and interzoecial avicularia. *Eoc.-Rec.*—FIG. 141,2. **C. radiata* (MOLL), Rec., Atl.; $\times 25$ (167).
- Escharipora** D'ORB., 1852 [**E. inornata*]. *Cret.*—FIG. 141,6. **E. inornata*, Maastr., Fr.; $\times 25$ (202).
- Figularia** JULLIEN, 1886 [**Lepralia figularis* JOHNSTON, 1847] [= *Figulina* LEV., 1909 (obj.)]. Costular area limited to centro-distal region of zoecial front. Ovicell large, with median suture and 2 pear-shaped lateral perforations. Avicularia large, interzoecial. *Eoc.-Rec.*—FIG. 141,5. **F. figularis* (JOHNSTON), Rec., Atl.; $\times 25$ (167).
- Jolietina** JULLIEN, 1886 [**Cribrilina lateromarginata* BUSK, 1884]. Ovicell endozoecial; aperture semicircular; large interzoecial, long, sporadic vibracula. *Rec.*—FIG. 141,9. **J. lateromarginata* (BUSK), SW.Atl.; $\times 25$ (167).
- Jullienula** BASSLER, *nom.nov.* [pro *Lyrula* JULLIEN, 1886[†] (non WOLLARTON, 1878)] [**Cribrilina hippocrepis* HINCKS, 1882]. Aperture inverted, lyriiform, without marginal spines; frontal formed by a few voluminous ribs separated by usually wider furrows with pores. *Rec.*—FIG. 141,14. **J. hippocrepis* (HINCKS), NE.Pac.; $\times 25$ (167).
- Lepralina** KÜHN, 1925 [**L. auriculata*]. *Mio.*, Aus.
- Membraniporella** SMITT, 1873 [**Lepralia nitida* JOHNSTON, 1838; SD NORMAN, 1903] [= ?*Reptescharella*, *Semiescharipora* D'ORB., 1853]. Incrusting to erect, with zoecial front formed of coalesced depressed spines (costules) recumbent over the membranous ectocyst and partly separated by transverse slits (lacunae). *Cret.-Rec.*—FIG. 141,19. **M. nitida* (JOHNSTON), Rec., NE.Atl.; $\times 25$ (167).
- Metracolpota** CANU-B., 1917 [**M. robusta*]. Like *Cribrilina* but costules separated by lacunae; ovicell large, deeply embedded in distal zoecium, with larger aperture. *Eoc.*—FIG. 141,17. **M. robusta*, Claib., N.Car.; $\times 25$ (137).
- Mumiella** JULLIEN, 1888 [**Semiescharipora mumiella* D'ORB., 1852]. Frontal of flattened parallel ribs separated by wide spaces with many rows of small pores. Small avicularium on each side of aperture. *Cret.*—FIG. 141,20. **M. mumiella* (D'ORB.), Senon., Fr.; $\times 25$ (202).
- Pleuroschizella** CANU, 1918 [**P. anaticula*]. Aperture with rimule and spines; ovicelled zoecia larger and without rimule. Numerous small narrow interzoecial avicularia. *Eoc.*—FIG. 141,18. **P. anaticula*, Lut., Fr.; $\times 25$ (136).
- Puellina** JULLIEN, 1886 [**Cribrilina gattyae* BUSK, 1854]. Costular shield occupying distal half of frontal, lacunae very small; prominent oral marginal spines. *Tert.-Rec.*—FIG. 141,7. **P. gattyae* (BUSK), Rec., NE.Atl.; $\times 25$ (167).
- Reginella** JULLIEN, 1886 [**Cribrilina furcata* HINCKS, 1882]. Like *Lyrula* but aperture is arched in front with mucronate inferior lip and marginal spines. *Rec.*—FIG. 141,12. **R. furcata* (HINCKS), NE.Pac.; $\times 25$ (167).
- Reptescharipora** D'ORB., 1853 [**R. meudonensis*]. Pair of round avicularia borders aperture laterally. *Cret.*—FIG. 141,10. **R. meudonensis*, Maastr., Fr.; $\times 25$ (202).
- Scorpiodina** JULLIEN, 1886 [**Lepralia scorpioides* MANZONI, 1869]. Frontal of fused robust ribs giving rise to irregular excrescences. *Tert.*—FIG. 141,15. **S. scorpioides* (MANZONI), *Mio.*, Aus.; $\times 25$ (183).

Family MYAGROPORIDAE Lang, 1916

Zoaria incrusting or erect. Zoecia about 0.66 mm. long; costae spiniform, widely separated, those forming the apertural bar seldom fused; 4 apertural spines. Ovicells hyperstomial, lacking pelmata (broken ends of large spines) and pelmatidia (same but smaller). Avicularia small, subcircular; much interzoecial tissue (79). *Cret.*

Myagropora LANG, 1916 [**M. muscipula*].—FIG. 142,1. **M. muscipula*, Coni., Eng.; $\times 37.5$ (175).

[†]JULLIEN, J., 1886, Soc. zool. Fr. Bull., vol. 11, p. 606.

Family OTOPORIDAE Lang, 1916

Like Myagroporidae but avicularian rostra elongate, tending to curve; little or no interzoecial secondary tissue (79). *Cret.*

Otopora LANG, 1916 [**O. auricula*]. Incrusting, unilaminar; costae firmly fused in mid-line and close together laterally.—FIG. 142,6. **O. auricula*, Cenom., Eng.; $\times 37.5$ (175).

Anaptopora LANG, 1916 [**A. disjuncta*]. Like *Otopora* but with widely separated thin costae not fused along mid-line, first pair like others.—FIG. 142,5. **A. disjuncta*, Cenom., Eng.; $\times 37.5$ (175).

Anotopora LANG, 1916 [**A. inaurita*]. Erect, cylindrical; no avicularia; costae thin, widely separated, first pair larger than rest and standing vertically.—FIG. 142,7. **A. inaurita*, Cenom., Eng.; $\times 37.5$ (175).

Family CTENOPORIDAE Lang, 1916

Like Myagroporidae but costae fused firmly to subjacent ground tissue forming a complete intraterminal front wall (79). *Cret.*

Ctenopora LANG, 1916 [**C. pecten*]. Incrusting, multiserial.—FIG. 142,3. **C. pecten*, Cenom., Eng.; $\times 50$ (175).

Family THORACOPORIDAE Lang, 1916

Ovicell hyperstomial, lacking pelmata and pelmatidia. Symmetrical apertural bar present, costae spinelike, widely separated; 4 apertural spines. Long spatulate avicularia (79). *Cret.*

Thoracopora LANG, 1916 [**T. costata*]. Incrusting,

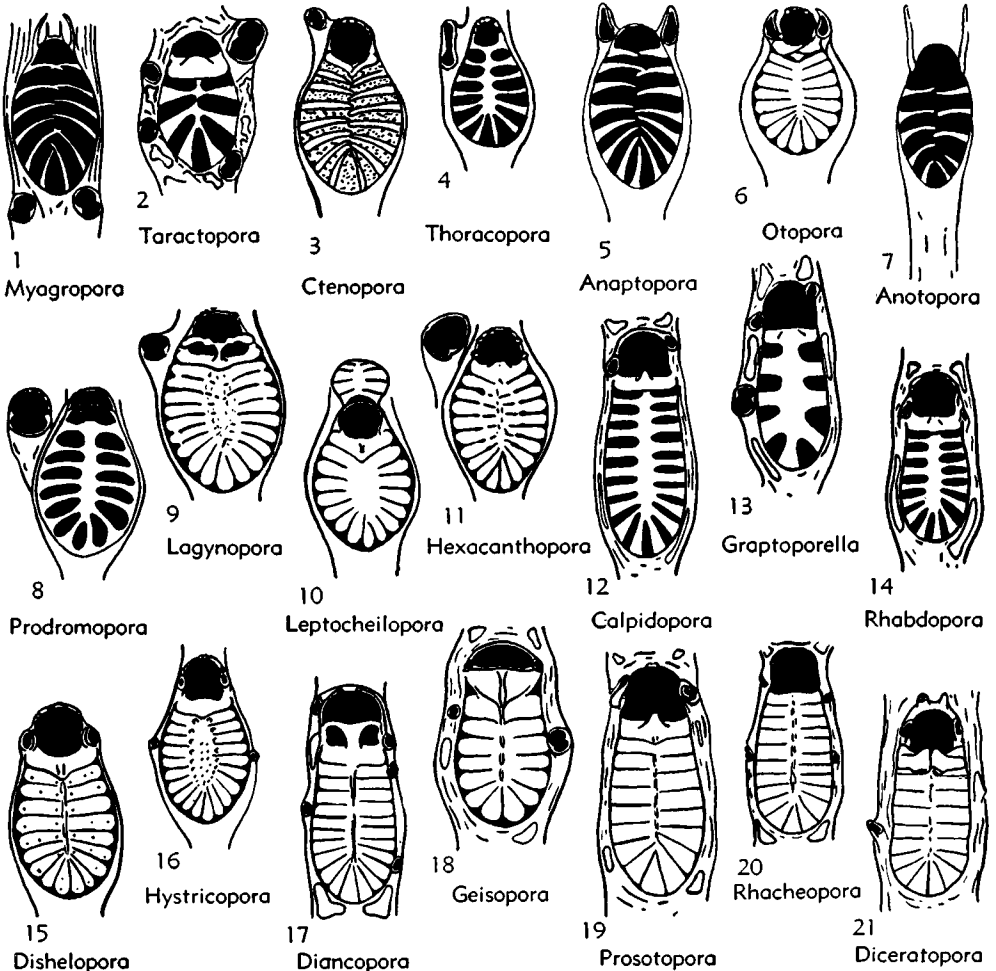


FIG. 142. Myagroporidae, Otoporidae, Ctenoporidae, Thoracoporidae, Taractoporidae, Lagynoporidae, Calpidoporidae, Disheloporidae, Rhacheoporidae (p. G186-G189).

unilaminar.—FIG. 142,4. **T. costata*, Santon., Eng.; $\times 50$ (175).

Family TARACTOPORIDAE Lang, 1916

Like Thoracoporidae but costae flattened, widely spaced, and wide proximally; avicularia subcircular, much interzoecial secondary tissue, 4 apertural spines and well-formed apertural bar (79). *Cret.*

Taractopora LANG, 1916 [**T. confusa*]. Incrusting, unilaminar.—FIG. 142,2. **T. confusa*, Coni., Eng.; $\times 50$ (175).

Family LAGYNOPORIDAE Lang, 1916

[as Lagynoporinae]

Ovicell hyperstomial, lacking pelmata and pematidia; apertural bar present, costae closely spaced, commonly 6 apertural spines and large subcircular avicularia (79). *Cret.*
Lagynopora LANG, 1916 [**L. lagena*]. Incrusting,

unilaminar. Median process of apertural bar fused with proximal pair of apertural spines to form proximal shield of a secondary aperture; costae wide, closely spaced; 4 to 6 apertural spines.—FIG. 142,9. **L. lagena*, L.Senon., Eng.; $\times 37.5$ (175).

Canupora KÜHN, 1930 [**C. prima*]. Dan., Aus.

Hexacanthopora LANG, 1916 [**H. sexspinoso*]. Most adult zoecia (epheboecia) with 6 apertural spines.—FIG. 142,11. **H. sexspinoso*, Santon., Eng.; $\times 37.5$ (175).

Prodromopora LANG, 1916 [**P. praecursor*]. Like *Lagynopora* but adult zoecia with only 4 apertural spines, thin, widely separated costae and median process of apertural bar also thin.—FIG. 142,8. **P. praecursor*, Santon., Eng.; $\times 37.5$ (175).

Leptocheilopora LANG, 1916 [**L. tenuilabrosa*] [= ?*Reptoporella* D'ORB., 1853]. No median process on proximally bent apertural bar; 4 minute apertural spines; avicularia rare.—FIG. 142,10. **L. tenuilabrosa*, Santon., Eng.; $\times 37.5$ (175). [Leptocheiloporinae LANG, 1916].

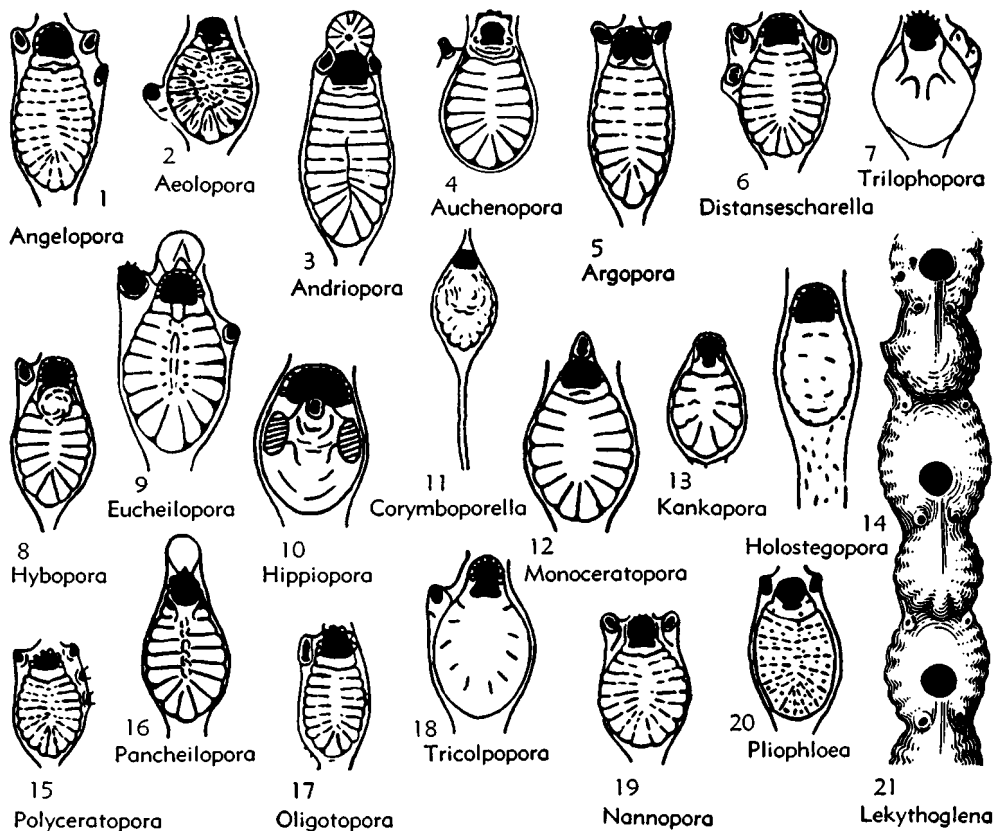


FIG. 143. Andrioporidae (p. G189, G190).

Family CALPIDOPORIDAE Lang, 1916

Multiserial zooecia, about 0.75 mm. long, with endozooecial ovicells lacking pelmata; costae widely separated, much interzooecial tissue; avicularia small, tending to have curved rostra (79). *Cret.*

Calpidopora LANG, 1916 [**C. diota*]. Median area of fusion narrow; avicularia with pointed apertures in pairs.—FIG. 142,12. **C. diota*, Cenom., Czech.; $\times 37.5$ (175).

Graptoporella BASSLER, nov. [*pro Graptopora* LANG, 1916 (non SALTER, 1858; nec ULR., 1882)] [**G. scripta*]. Erect, unilaminar. Broad median area of fusion; costae few; avicularia blunt.—FIG. 142, 13. **G. scripta*, Santon., Fr.; $\times 37.5$ (175).

Rhabdopora LANG, 1916 [**R. virgata*]. Incrusting. Median fused area narrow; avicularia sporadic or located proximally to aperture.—FIG. 142,14. **R. virgata*, Turon., Fr.; $\times 37.5$ (175).

Family DISHELOPORIDAE Lang, 1916

Multiserial zooecia, large, long (0.6-1.0 mm.); endozooecial ovicells with pelmatidia; costae closely spaced; little interzooecial secondary tissue (79). *Cret.*

Dishelopora LANG, 1916 [**D. bicuspis*]. Incrusting. Apertural spines of distal pair do not fuse to form distal shield.—FIG. 142,15. **D. bicuspis*, Senon., Eng.; $\times 37.5$ (175).

Hystriopora LANG, 1916 [**H. horrida*]. Erect. Distal pair of spines fuse to form shield.—FIG. 142,16. **H. horrida*, Coni., Fr.; $\times 37.5$ (175).

Family RHACHEOPORIDAE Lang, 1916

Like Disheloporidae but zooecia long, delicate; endozooecial ovicells, pelmatidia absent or inconspicuous; costae closely spaced, flattened, with upturned edges forming a median seam; 4 apertural spines (79). *Cret.*

Rhacheopora LANG, 1916 [**R. suta*]. Erect cylindrical. Apertural bar with no median process, spines simple; no secondary aperture.—FIG. 142,20. **R. suta*, L.Senon., Eng.; $\times 37.5$ (175).

Diancopora LANG, 1916 [**D. ancora*]. Like *Rhacheopora* but unilaminar; secondary aperture present.—FIG. 142,17. **D. ancora*, L.Senon., Eng.; $\times 37.5$ (175).

Diceratopora LANG, 1916 [**D. bivia*]. Incrusting, unilaminar. Proximal shield formed by fusion of pair of apertural avicularia over apertural bar.—FIG. 142,21. **D. bivia*, Senon., Eng.; $\times 37.5$ (175).

Geisopora LANG, 1916 [**G. protecta*]. Incrusting unilaminar, with only slight remnant of median

seam.—FIG. 142,18. **G. protecta*, Camp. Ger.; $\times 37.5$ (175).

Prosotopora LANG, 1916 [**P. arrecta*]. Like *Rhacheopora* but ovicelled zooecia have a modified secondary aperture.—FIG. 142,19. **P. arrecta*, Santon., Eng.; $\times 37.5$ (175).

Family ANDRIOPORIDAE Lang, 1916

Zoaria mostly incrusting; with uniserial and multiserial small zooecia (0.3-0.5 mm. long), symmetrical apertural bar, closely placed costae, 6 apertural spines and little interzooecial secondary tissue. Ovicells hyperstomial, lacking pelmata and pelmatidia (79). *Cret.-Eoc.*

Andriopora LANG, 1916 [**A. homunculus*]. Costae not specially flattened or laterally fused without median row of pores or median slit. Zoarium uniserial, generally with avicularia and intraterminal front wall composed of intimately fused costae. *Cret.*—FIG. 143,3. **A. homunculus*, Turon., Eng.; $\times 50$ (175). [Andrioporinae LANG, 1916].

Aeolopora LANG, 1916 [**A. distincta*]. Multiserial, apertural spines thickened, median area of fusion surrounded by ring of solid spines (original distal ends of costae). *Cret.*—FIG. 143,2. **A. distincta*, Santon., Eng.; $\times 50$ (175).

Angelopora LANG, 1916 [**A. nuntia*]. Multiserial, incrusting, with rudimentary proximal apertural shield; no margin of spines on median area of fusion; numerous avicularia. *Cret.*—FIG. 143,1. **A. nuntia*, Senon., Eng.; $\times 50$ (175).

Argopora LANG, 1916 [**A. segnis*]. Multiserial, incrusting, zooecia with no secondary aperture, no margin of tubercles in the median area of fusion and apertural bar not forming a hump; numerous avicularia. *Cret.*—FIG. 143,5. **A. segnis*, Senon., Eng.; $\times 50$ (175).

Auchenopora LANG, 1916 [**A. guttur*]. Multiserial, developing a secondary aperture with proximal shield formed by apertural bar. *Cret.*—FIG. 143, 4. **A. guttur*, Dan., Denm.; $\times 50$ (175).

Corymboporella LANG, 1917 [*pro Corymbopora* LANG, 1916 (non MICH., 1846)] [**Corymbopora religata* LANG, 1916]. Uniserial, zooecia bearing a long cauda; intraterminal front wall with traces of costae. Avicularia absent. *Cret.*—FIG. 143,11. **C. religata* (LANG), Cenom., Czech.; $\times 50$ (175).

Distansescharella D'ORB., 1853 [**Cellepora familiaris* HAG., 1839]. Multiserial, incrusting. Zooecia small, squat, widely separated by numerous avicularia or zooecules, median area of fusion not surrounded by spines. *Cret.-Eoc.*—FIG. 143,6. *D. d'orbignyi*, Coni., Fr.; $\times 50$ (175).

Eucheilopora LANG, 1916 [**E. labiosa*]. Apertural bar produced into a proximally directed median spine; cribriline aspect. *Cret.*—FIG. 143,9. **E. labiosa*, Coni., Eng.; $\times 50$ (175).

- Hippiopora** LANG, 1916 [**H. equestris*]. Multiserial. No secondary aperture; avicularium on middle of apertural bar; secondary tissue covers front wall. *Cret.*—FIG. 143,10. **H. equestris*, Camp., Eng.; $\times 50$ (175).
- Holostegopora** LANG, 1916 [**H. epsomensis*]. Zoarium erect, cylindrical, with completely fused, solid intraterminal front wall. *Cret.*—FIG. 143,14. **H. epsomensis*, Santon., Eng.; $\times 50$ (175).
- Hybopora** LANG, 1916 [**H. gibba*]. Like *Kankapora* but with hump of secondary tissue on apertural bar, a few avicularia and more numerous costae. *Cret.*—FIG. 143,8. **H. gibba*, Cenom., Czech.; $\times 50$ (175).
- Kankapora** LANG, 1916 [**K. kankensis*]. Multiserial, incrusting. No secondary aperture, median area of fusion not surrounded by a circle of tubercles, avicularia absent, apertural bar does not form a hump and spines decidedly thickened. *Cret.*—FIG. 143,13. **K. kankensis*, Cenom., Czech.; $\times 50$ (175).
- Lekythoglena** MARSSON, 1887 [**L. ampullacea*]. Erect, cylindrical zoarium with frontal wall more or less completely fused; hyperstomial ovicell with radial structure. *Cret.*—FIG. 143,21. **L. ampullacea*, Camp., Ger.; $\times 25$ (186).
- Monoceratopora** LANG, 1916 [**M. unicornis*]. Multiserial, with proximal pair of axial spines enlarged and distal pair minute. Avicularia few, arranged medially and distally to zooecia. *Cret.*—FIG. 143,12. **M. unicornis*, Santon., Eng.; $\times 50$ (175).
- Nannopora** LANG, 1916 [**Reptescharella pygmaea* D'ORB., 1852]. Small squat zooecia with no secondary aperture. Furrows between costae plainly visible. *Cret.-Eoc.*—FIG. 143,19. **N. pygmaea* (D'ORB.), Senon., Fr.; $\times 50$ (175).
- Oligotopora** LANG, 1916 [**O. novaiki* (= *Lepralia pediculus* NOVAK, 1877)]. Multiserial, incrusting. No secondary aperture or circle of spines around median area; avicularia few and pointed; apertural spines thickened. *Cret.*—FIG. 143,17. **O. pediculus* (NOVAK), Turon., Czech.; $\times 50$ (175).
- Pancheilopora** LANG, 1916 [**P. magnilabrosa*]. Like *Eucheilopora* but apertural bar forms a proximal shield of secondary aperture. *Cret.*—FIG. 143,16. **P. magnilabrosa*, Camp., Eng.; $\times 50$ (175).
- Pliophloea** GABB-H., 1862 [**Flustra sagena* MORTON, 1834] [= *Barroisina* JULLIEN, 1886]. Erect, bilamellar. Costae more or less flattened, some fused neighbors with median row of pores; furrows between the costae visible. *Cret.-Eoc.*—FIG. 143,20. **P. sagena* (MORTON), Eoc. (Wilcox.), N.J.; $\times 50$ (175). [Pliophloeinae LANG, 1921].
- Polyceratopora** LANG, 1916 [**Lepralia euglypha* NOVAK, 1877]. Apertures semicircular, primitive; fusions between costae plainly visible; avicularia numerous. *Cret.*—FIG. 143,15. **P. euglypha* (NOVAK), Cenom., Czech.; $\times 50$ (175).
- Tricolopora** LANG, 1916 [**T. trisinuata*]. Like *Nannopora* but costae fused to form a solid front wall. *Cret.*—FIG. 143,18. **T. trisinuata*, Coni., Fr.; $\times 50$ (175).
- Trilophopora** LANG, 1916 [**T. trifida*]. Incrusting, unilaminar. Intraterminal front wall completely fused, leaving only traces of costal furrows and pores. *Cret.*—FIG. 143,7. **T. trifida*, Dan., Denm.; $\times 50$ (175).
- Schistacanthopora** LANG, 1916 [**S. fissa*]. Incrusting, unilaminar. Costae with median slit. *Cret., Maast.*, Fr. [Schistacanthoporinae LANG, 1916].

Family PELMATOPORIDAE Lang, 1916

Multiserial zooecia (0.5-1.5 mm. long) with endozooecial ovicells; intraterminal front walls of zooecia formed of hollow terminal spines (costae) bent over archlike, fused with each other in middle lines, then bent vertically with broken ends generally forming 2 rows of conspicuous pelmata (large) and pelmatidia (small). Avicularia numerous, monomorphic, small with blunt apertures (79). *Cret.-Rec.*

Subfamily FRAN COPORINAE Lang, 1916

Costules fused in narrow mid-line area that projects distally as indentation of the aperture. *Cret.*

Francopora LANG, 1916 [**F. canui*]. Erect, cylindrical. Primary pelmatidia only present, widely separated costae with weak band of fusion. *Cret.*—FIG. 144,1. **F. canui*, Coni., Fr.; $\times 50$ (175).

Baptopora LANG, 1916 [**B. immersa*]. Erect, unilaminar. Pelmatidia partly covered by secondary tissue in which zooecia are immersed; avicularia at right angles to zooecia. *Cret.*—FIG. 144,2. **B. immersa*, Coni., Fr.; $\times 50$ (175).

Subfamily OPISTHORNITHOPORINAE Lang, 1916

Like Francoporinae but costules closely appressed, mid-line fused area not projecting into aperture, and with large avicularia, occurring singly and directed obliquely. *Cret.*

Opisthornithopora LANG, 1916 [**Reptescharella flabellata* D'ORB., 1852]. Incrusting. Costae close together. *Cret.*—FIG. 144,3. **O. flabellata* (D'ORB.), Coni., Fr.; $\times 50$ (175).

Subfamily KELESTOMINAE Lang, 1922

Opposite costae near aperture bifurcate toward mid-line forming a spiramen. *Cret.-Rec.*

Kelestoma MARSSON, 1887 [**K. elongatum*]. Incrusting. Zooecia elongate; each half of apertural

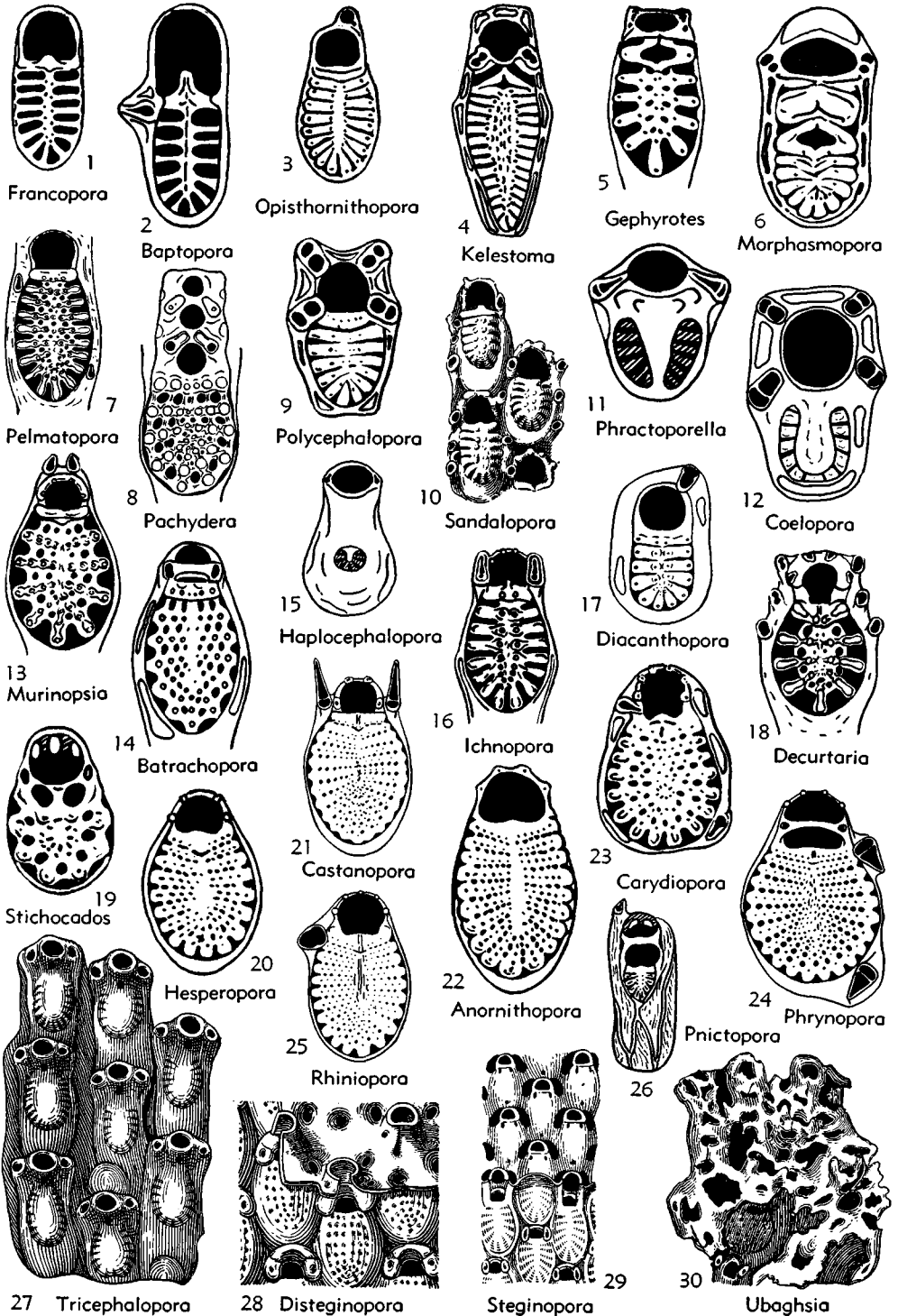


FIG. 144. Pematoporidae (p. G190-G193).

bar bifid; costae numerous. Primary pelmatidia only. *Cret.-Eoc.*—FIG. 144,4. **K. elongatum*, Camp., Ger.; $\times 37.5$ (175).

Gephyrotes NORMAN, 1903 [**Escharipora figularis nitidopunctata* SMITT, 1868]. The 2 distal costules bifurcate to form spiramen. *Cret.-Rec.*—FIG. 144,5. **G. figularis nitidopunctata* (SMITT), Rec., N.Atl.; $\times 37.5$ (175).

Morphaspopora LANG, 1916 [**Cribrilina jukestrounei* BRYDENE, 1906]. Costae relatively few, nearly touching. *Cret.*—FIG. 144,6. **M. jukestrounei* (BRYDENE), Camp., Eng.; $\times 50$ (175).

Subfamily PELMATOPORINAE Lang, 1916

Costae with pelmata and corresponding lateral costal connections, mid-line area of fusion relatively wide. *Cret.-Mio.*

Pelmatopora LANG, 1916 [**P. pero*]. Incrusting, generally unilaminar. Secondary aperture consists of a distal shield formed only of a rim of secondary tissue and a pair of avicularia-like structures. *Cret.*—FIG. 144,7. **P. pero*, Santon., Eng.; $\times 25$ (175).

Batrachopora LANG, 1916 [**B. ranunculus*]. Secondary aperture formed of both proximal and distal shields. *Cret.*—FIG. 144,14. **B. ranunculus*, Camp., Ger.; $\times 37.5$ (175).

Decurtaria JULLIEN, 1886 [**Semiescharipora cornuta* BEISSEL, 1865] [= *Prosoporella* MARSSON, 1887]. Distinguished by collar-like distal shield of secondary aperture and absence of any proximal shield. *Cret.-Mio.*—FIG. 144,18. **D. cornuta* (BEISSEL), Maastr., Ger.; $\times 37.5$ (175).

Ichnopora LANG, 1916 [**I. vestigium*]. Like *Pelmatopora* with a secondary aperture of a proximal shield only. *Cret.*—FIG. 144,16. **I. vestigium*, Senon., Eng.; $\times 37.5$ (175).

Murinopsia JULLIEN, 1886 [**Semiescharipora galeata* BEISSEL, 1865] [= *Lagodiopsis* MARSSON, 1887]. Distal shield a rim of secondary tissue connecting apertural spines. Avicularia, a group in front of aperture. *Cret.*—FIG. 144,13. **M. galeata* (BEISSEL), Maastr., Ger.; $\times 37.5$ (175).

Pachyderma MARSSON, 1887 [**P. grandis*]. Secondary aperture is a tubular structure extended forward by fusion of the proximal and distal shields. *Cret.*—FIG. 144,8. **P. grandis*, Camp., Ger.; $\times 25$ (175).

Sandalopora LANG, 1916 [**S. soccata*]. Like *Pelmatopora* but secondary aperture is only an imperfect proximal shield formed by a median projection of the apertural bar. *Cret.*—FIG. 144,10. **S. soccata*, Coni., Eng.; $\times 25$ (175).

Subfamily TRICEPHALOPORINAE Lang, 1922

Mid-line area of frontal broadly fused, aperture well rounded, with 2 or 4 adjoin-

ing, generally rounded avicularia. *Cret.-Rec.*

Tricephalopora LANG, 1916 [**Cribrilina triceps* MARSSON, 1887]. Generally incrusting. Each half of apertural bar not bifid. Avicularia blunt, circular in outline. *Cret.*—FIG. 144,27. **T. triceps* (MARSSON), Camp., Ger.; $\times 25$ (186).

Coelopora LANG, 1917 [*pro Antropora* LANG, 1916 (non NORMAN, 1903)] [**Antropora cavernosa* LANG, 1916]. Zoarium erect, solid, cylindrical. *Cret.-Rec.*—FIG. 144,12. **C. cavernosa* (LANG), Camp., Ger.; $\times 25$ (175).

Haplocephalopora LANG, 1916 [**H. uniceps*]. Erect, cylindrical. Avicularia a small apertural pair on the prolonged apertural rim. *Cret.*—FIG. 144,15. **H. uniceps*, Dan., Denm.; $\times 25$ (175).

Phractoporella LANG, 1917 [*pro Phractopora* LANG, 1916 (non HALL, 1883)] [**Phractopora constrata* LANG, 1916]. *Cret.*—FIG. 144,11. **P. constrata* (LANG), Camp., Ger.; $\times 37.5$ (175).

Polycephalopora LANG, 1916 [**P. hydra*] [= *Multescharipora* D'ORB., 1853]. Like *Tricephalopora* but has 3 to 5 apertural avicularia. *Cret.*—FIG. 144,9. **P. hydra*, Camp., Ger.; $\times 37.5$ (175).

Subfamily DIACANTHOPORINAE Lang, 1922

Bilamellar, costae bearing a proximal pelma and distal pelmatidia. *Cret.*

Diacanthopora LANG, 1916 [**D. bispinosa*]. *Cret.*—FIG. 144,17. **D. bispinosa*, Dan., Denm.; $\times 25$ (175).

Subfamily CASTANOPORINAE Lang, 1916

Costae numerous, with pelmatidia of several orders and corresponding lateral fusions; mid-line area of fusion not sharply differentiated. *Cret.-Eoc.*

Castanopora LANG, 1916 [**C. castanea*]. Zoaria generally incrusting, unilamellar. Large zoecia. Pair of distally directed avicularia with long rostra. *Cret.*—FIG. 144,21. **C. castanea*, Camp., Ger.; $\times 25$ (175).

Anornithopora LANG, 1916 [**A. involucris*]. Like *Carydiopora* but without avicularia. *Cret.*—FIG. 144,22. **A. involucris*, Camp., Eng.; $\times 50$ (175).

Carydiopora LANG, 1916 [**C. nucula*]. Zoecia small, with few costae and numerous, variously oriented avicularia. *Cret.*—FIG. 144,23. **C. nucula*, Santon., Eng.; $\times 37.5$ (175).

Disteginopora D'ORB., 1852 [**Eschara horrida* D'ORB., 1850] [= *Disteganopora* CANU, 1922; *Thoracophora* JULLIEN, 1886]. Erect, bilamellar *Steginopora* with distal unbranched apertural spines. Lower layer with regular transverse rows of tremopores. *Cret.*—FIG. 144,28. **D. horrida* (D'ORB.), Maastr., Fr.; $\times 50$ (175).

Hesperopora LANG, 1916 [**H. occidentalis*]. Differs from *Anornithopora* in secondary aperture not perforated by fenestrae, finer costae, and solid apertural ring. *Cret.-Eoc.*—FIG. 144,20. **H. occidentalis*, Eoc. (Wilcox.), N.J.; $\times 50$ (175).

Phrynopora LANG, 1916 [**P. bufo*]. Like *Rhyniopora* but with secondary aperture. *Cret.*—FIG. 144,24. **P. bufo*, Camp., Ger.; $\times 25$ (175).

Rhyniopora LANG, 1916 [**R. aspera*]. Like *Carydiopora* but has 2 kinds of avicularia, one with long and the other short rostra. *Cret.*—FIG. 144,25. **R. aspera*, Camp., Ger.; $\times 25$ (175).

Steginopora D'ORB., 1853 [**S. ornata*]. With tertiary front wall formed by upgrowth and lateral expansion of paired apertural avicularia. *Cret.*—FIG. 144,29. **S. ornata*, Senon., Fr.; $\times 50$ (202).

Stichocados MARSSON, 1887 [**S. verruculosus*]. Like *Carydiopora* but with few costae and few or no avicularia. *Cret.*—FIG. 144,19. **S. verruculosus*, Camp., Ger.; $\times 37.5$ (175).

Ubaghia JULLIEN, 1886 [**Steginopora reticulata* UBAGHS, 1865]. Like *Disteginopora* but apertural spines are more irregularly arranged. *Cret.*—FIG. 144,30. **U. reticulata* (UBAGHS), Maastr., Holl.; $\times 5$ (175).

Subfamily PNICTOPORINAE Lang, 1922

Frontal wall greatly reduced, with secondary tissue much developed; avicularia few, pointed. *Cret.*

Pnictopora LANG, 1916 [**P. suffocata*]. Erect, cylindrical. Halves of apertural bar not bifid. Avicularia few, pointed. *Cret.*—FIG. 144,26. **P. suffocata*, Senon., Eng.; $\times 25$ (175).

Suborder ASCOPHORA Levinsen, 1909

[=Camarostega LEV., 1902]

Characterized by zoecia with calcified frontal surface, beneath which a compensation sac (compensatrix) serves as hydrostatic system for protrusion or withdrawal of the tentacles. This sac generally opens at proximal border of the aperture but a more proximally placed special pore (ascopore) may constitute opening for the sac. The hinged operculum is so constructed that the larger distal part moves upward for passage of the tentacles while coincidentally the proximal part swings downward to allow entrance of a compensating equal volume of water to the compensatrix. *Cret.-Rec.*

Family PORINIDAE d'Orbigny, 1852

[=Acroporidae CANU, 1913]

Zoaria free, erect, cylindrical to narrow bifoliate branches. Zoecia indistinct, with thick front perforated by an ascopore, opening below operculum; aperture buried at bottom of a long peristomie. Ovicell hyperstomial, deeply immersed, invisible exteriorly. Frontal and peristomial avicularia present (24). *Cret.-Eoc.*

Porina D'ORB., 1852 [**Eschara gracilis* LAMARCK, 1816; SD LANG, 1917] [=Acropora REUSS, 1869 (non OKEN, 1815); Acroporana STRAND, 1928]. Front a thick tremocyst with tubules; ascopore at midlength; avicularia on peristome. *Cret.-Rec.*—FIG. 145,3. *P. saillans* (CANU-B.), Oligo., Ala.; $\times 25$ (137).

Beisselina CANU, 1913 [**Eschara striata* GOLDF., 1828]. Like *Porina* but pores and ascopore large, commonly replaced by small avicularia, hiding zoecial form. *Cret.-Eoc.*—FIG. 145,8. **B. striata* (GOLDF.), Maastr., Holl.; $\times 25$ (137).

Beisselinopsis VOIGT, 1951 [**B. hiltermanni*]. Zoarium flabelliform, bifoliate, with pointed base. *Cret.*, Ger.

Columnotheca MARSSON, 1887 [**C. cribrosa*]. Slender cylindrical branches. Zoecial apertures in transverse rows; ascopore inconspicuous. *Cret.*—FIG. 145,7. **C. cribrosa*, Camp., Ger.; $\times 25$ (186).

Gastropella CANU-B., 1917 [**G. ventricosa*]. Like *Porina* but front smooth, with a few lateral areolae and large central ascopore. *Paleoc.*—FIG. 145,4. **G. ventricosa*, Midway., Ark.; $\times 25$ (137).

Pachytheccella CANU-B., 1934 [*pro Pachythecca* CANU, 1913 (non SCHLÜTER, 1885)] [**Porina filiformis* D'ORB., 1852]. Cylindrical stems; zoecial front a thick olocyst with small ascopore opening exteriorly distant from peristome. *Cret.-Eoc.*—FIG. 145,2. **P. filiformis* (D'ORB.), Camp., Ger.; $\times 10$ (202).

Rotiporina BRYDENE, 1930 [**Acropora producta* HAG., 1840]. Circular stems or segments; zoecia in longitudinal rows. *Cret.*—FIG. 145,1. **R. producta* (HAG.), Camp., Ger.; $\times 10$ (160).

Family CYCLICOPORIDAE Hincks, 1884

Typically incrusting, with zoecial front a tremocyst. Ovicell hyperstomial, closed by operculum. Compensation sac opens in aperture which is entire, without rimule or cardelles (24). *Eoc.-Rec.*

Cyclicopora HINCKS, 1884 [**C. praelonga* (=Lepralia longipora MACGILL., 1882)]. Incrusting. Frontal pores in quincunx; aperture entire, somewhat concave proximally. *Eoc.-Rec.*—FIG. 145,6.

**C. longipora* (MACGILL.), Rec., SW.Pac.; $\times 50$ (181).
Aptonella CANU-B., 1928 [*A. violacea*]. Operculum pyriform, operating in a locella; 2 small avicularia converge above aperture. Rec.—FIG. 145,11. **A. violacea*, SW.Atl.; $\times 25$ (137).
Cyclocolpota CANU-B., 1920 [*C. perforata*]. Like *Cyclicopora* but zoecial front a granular pleurocyst with double row of areolar pores. Ovicell embedded in distal zooecium. *Mio-Plio.*—FIG. 145,12. **C. perforata*, Plio., S.Car.; $\times 25$ (137).
Houzeauina PERGENS, 1889 [*Eschara parallela*

REUSS, 1869]. Bifoliate. Zoecial front an olocyst with areolae, an avicularium on mid-line. *Eoc.*—FIG. 145,10. **H. parallela* (REUSS), Priabon., Italy; $\times 25$ (210).
Kymella CANU-B., 1917 [*Cyclicopora polaris* WATERS, 1904]. Bilaminar. Zoecial front a pleurocyst with one row of minute, widely spaced areolae; aperture with wide rimule. Rec.—FIG. 145, 5. **K. polaris* (WATERS), Antarct.; $\times 25$ (230).
Magnea VIG., 1949 [*M. pileata*]. Incrusting. Zoecia separated by a series of zooeciules; aperture entire; front with olocyst. No avicularia. *Mio.*—

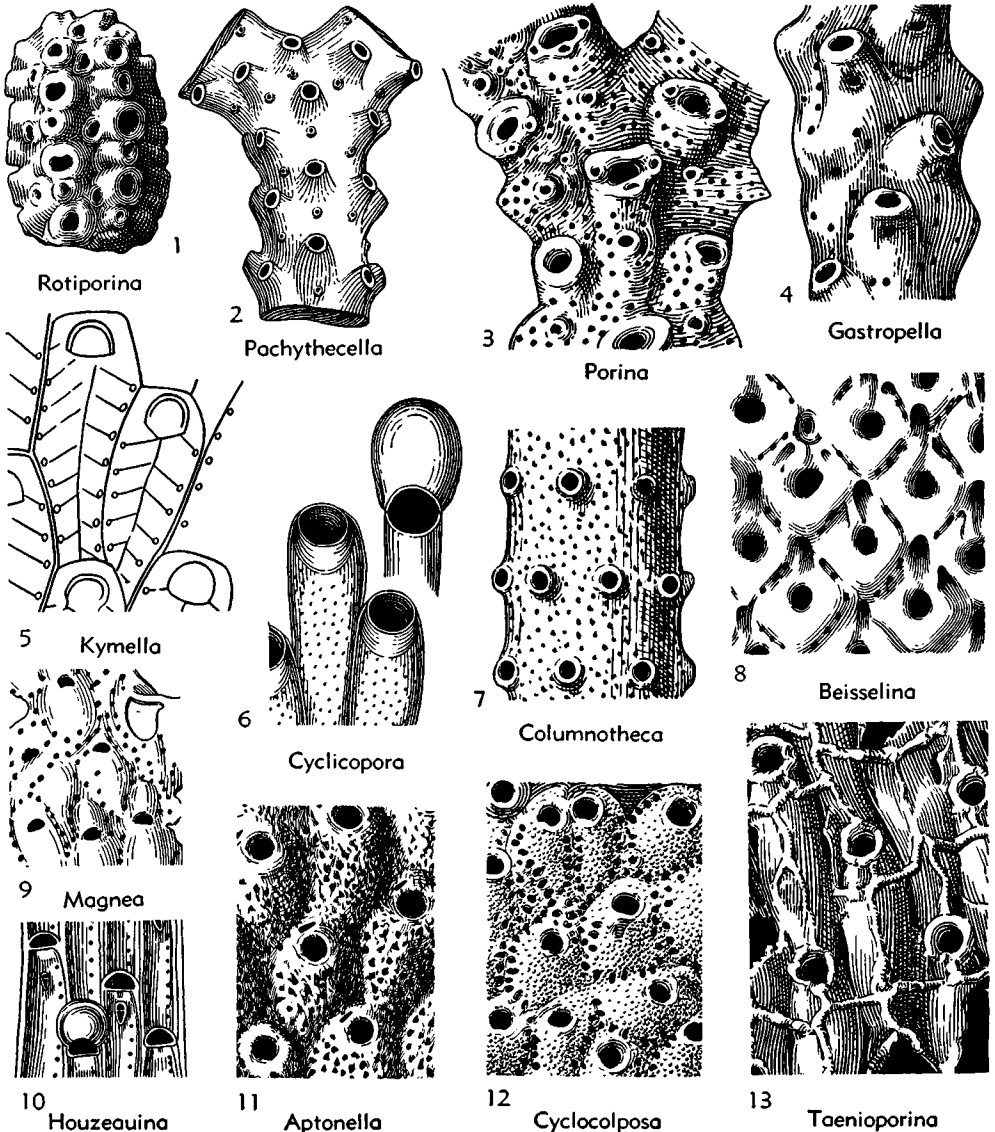


FIG. 145. Porinidae, Cyclicoporidae (p. G193-G195).

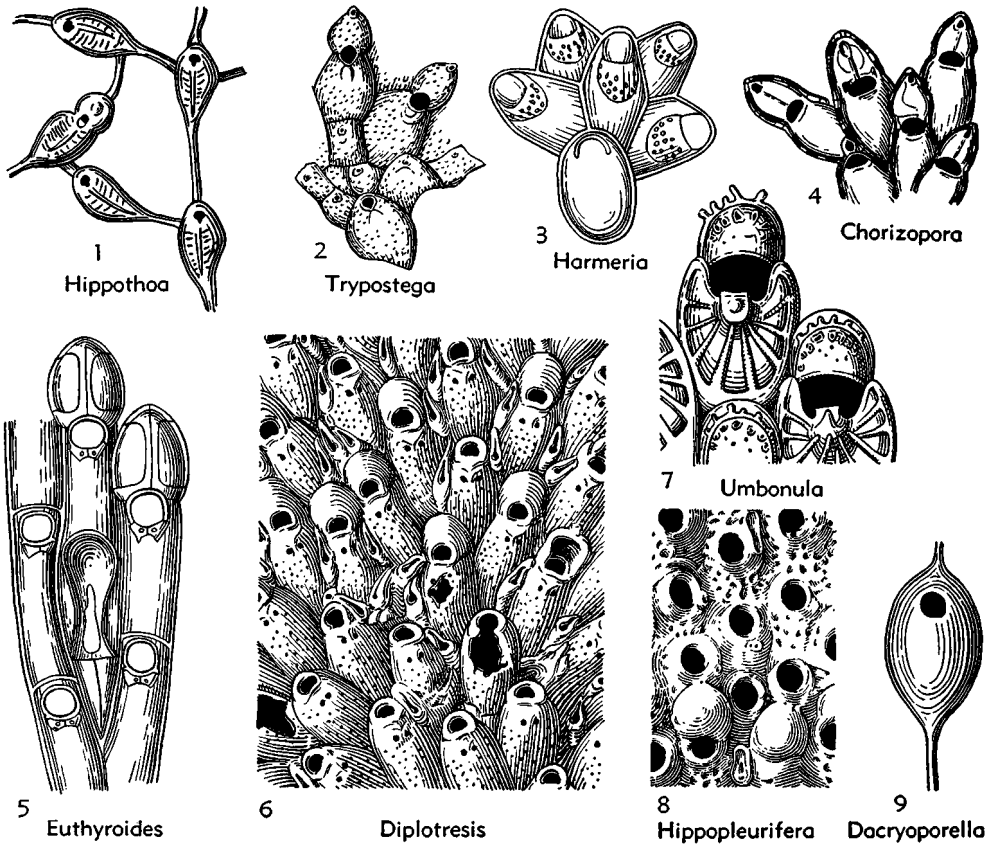


FIG. 146. Hippothoidae, Euthyroididae, Umbonulidae (p. G195, G196).

FIG. 145,9. **M. pileata*, Helv., Fr.; $\times 25$ (224). *Taenioporina* MARSSON, 1887 [*Eschara arachnoidea* GOLDF., 1826]. Bilamellate. Zooecial surface marked off in rectangular areas by elevated threads. *Cret.*—FIG. 145,13. **T. arachnoidea* (GOLDF.), Maastr., Holl.; $\times 25$ (131).

Family HIPPOTHOIDAE Levinsen, 1909
[=Chorizoporidae Vig., 1949]

Incrusting sheets or unilinear series. Zooecia without covering membrane, calcified from behind in successive zones forward, leaving more or less salient lines of growth (24). *Cret.-Rec.*

Hippothoa LAMX., 1821 [*H. divaricata*] [= *Celleporella* GRAY, 1848; *Hippothoidea* VINE, 1893; *Diazeuxia* JULLIEN, 1888]. Zooecia generally in single series, with front a transversely wrinkled olocyst, apertures with sinus and strong cardelles; gonozooecia small, without polypide, conspicuous ovicell covered by kenozooecia. No avicularia,

spines, or vibracula. *Cret.-Rec.*—FIG. 146,1. **H. divaricata*, Rec., Medit.; $\times 25$ (167). **Chorizopora** HINCKS, 1880 [*Flustra brongniarti* AUDOUIN, 1828]. Zooecia more or less distant, connected by tubular network; aperture semicircular with inferior margin entire. Ovicell endozooecial, with avicularia. *Tert.-Rec.*—FIG. 146,4. **C. brongniarti* (AUDOUIN), Rec., Medit.; $\times 25$ (167). **Dacryoporella** LANG, 1934 [*pro Dacryopora* LANG, 1914 (*non* TERQUEM, 1885)] [*D. gutta*]. Incrusting, uniseriate, branching bilaterally, with long, thin caudal part; apertures semicircular. *Cret.*—FIG. 146,9. **D. gutta* (LANG), Senon., Eng.; $\times 25$ (175). **Diplotresis** CANU-B., 1933 [*Microporella sparsiporosa* ULR.-B., 1907]. Zooecia with 2 frontal pores like ascopores and zooecules, with pointed beak irregularly arranged between them. Ovicell hyperstomial, closed by operculum. *Eoc.*—FIG. 146,6. **D. sparsiporosa* (ULR.-B.), Wilcox., N.J.; $\times 25$ (137). **Haplopoma** LEV., 1909 [*Flustra impressa* AUDOUIN,

1826]. Median ascopore proximal to aperture; frontal with scattered pores; no avicularia. *Mio.-Rec.*, Red Sea.—FIG. 155,13. **H. impressa* (AUDOUIN), *Rec.*, *Medit.*; $\times 25$ (177).

Harmeria NORMAN, 1903 [**Lepralia scutulata* BUSK, 1855]. Discoid. Zooecia with small frontal area of numerous pores, no covering membrane. Ovicell and avicularia absent. *Rec.*—FIG. 146,3. **H. scutulata* (BUSK), *N.Atl.*; $\times 25$ (177).

Hinksipora OSBURN, 1952 [**Mucronella spinulifera* HINCKS, 1880]. Frontal a thick pleurocyst; ovicell endozooecial. *Rec.*, Bering Sea.—FIG. 147,10. **H. spinulifera* (HINCKS), $\times 25$ (204).

Trypostega LEV., 1909 [**Lepralia venusta* NORMAN, 1864]. Zooecia surmounted distally by small, elongate zooecules; aperture keyhole-shaped, with cardelles. *Eoc.-Rec.*—FIG. 146,2. **T. venusta* (NORMAN), *Rec.*, *E.Atl.*; $\times 25$ (167).

Family EUTHYROIDIDAE Levinsen, 1909

[as Euthyroidae]

Zoaria free, *Flustra*-like. Zooecia slightly calcified, without pores or ectocyst. Large interzooecial avicularia. Ovicell hyperstomial, with ectoecium bearing a pair of large fenestrae (31). *Rec.*

Euthyroides HARMER, 1903 [**Carbasea episcopalis* BUSK, 1852].—FIG. 146,5. **E. episcopalis* (BUSK), *SW.Pac.*; $\times 50$ (134).

Family UMBONULIDAE Canu, 1904

Like Petraliidae but with prominent umbo on zooecial front below aperture and median avicularium; cardelles and lyrules absent (HASTINGS, 1949). *Eoc.-Rec.*

Umbonula HINCKS, 1880 [*pro Umbonella* HINCKS, 1880 (*non* ADAMS, 1865)] [**Cellepora verrucosa* ESPER, 1791]. Incrusting, unilamellar. Frontal a pleurocyst with costules separated by areolae. *Eoc.-Rec.*—FIG. 146,7. **U. verrucosa* (ESPER), *Rec.*, *NE.Atl.*; $\times 25$ (137).

Hippopleurifera CANU, 1927 [**Eschara sedgwicki* M.EDW., 1838]. Like *Umbonula* but has minute hinge teeth and peristome with spines. *Mio.-Rec.*—FIG. 146,8. **H. sedgwicki* (M.EDW.), *Plio.* (Crag), *Eng.*; $\times 50$ (136).

Family PETRALIIDAE Levinsen, 1909

[=Hippopodiniidae LEV., 1909]

Zoaria unilaminate, radicate. Zooecia large, with tremocyst of conspicuous pores. Proximal margin of apertures with 1 to 3 teeth (lyrules) above operculum and adjacent pair of cardelles; aperture encircled

by a shield placed next to the tremocyst, a perforated area at distal extremity of each zooecial dorsal. Ovicell large, hyperstomial, recumbent, finely perforate (31; STACH, 1936). *M.Eoc.-Rec.*

Petralia MACGILL., 1869 [**P. undata*]. Subcircular fenestrules. Ovicell deeply immersed in distal zooecium. Aperture circular without cardelles or lyrules but suboral mucro with avicularium present; shield a smooth pad around aperture, with 2 small lateral avicularia. *Rec.*—FIG. 147,1. **P. undata*, *SW. Pac.*; *1a,b*, $\times 20$, $\times 33.3$ (235).

Coleopora CANU-B., 1927 [**C. verrucosa*]. Zooecia exceptionally large, frontal a tremocyst with small pores; aperture at bottom of high flaring tube representing raised peristomial shield. Ovicell not closed by operculum. *Mio.-Rec.*—FIG. 147,9. **C. verrucosa*, *Rec.*, *SW.Pac.*; $\times 25$ (137).

Cycloperrella CANU-B., 1920 [**C. rubra*]. Frontal a tremocyst with large pores; ovicell entirely covering aperture. *Mio.-Rec.*—FIG. 147,11. **C. rubra*, *Mio.*, *N.Car.*; $\times 25$ (137).

Discopora LAMARCK, 1816; SD GRAY, 1848 [= *Mucropetraliella* STACH, 1936]. Unilaminate, fenestrate. Zooecial front a tremocyst with mucro, bearing suboral avicularium; apertures subcircular, with cardelles and a lyrula. *Rec.*—FIG. 147,3. **D. verrucosa* (LAMARCK), *SW.Pac.*; *3a*, $\times 25$; *3b*, operculum, $\times 75$ (235).

Hippopetraliella STACH, 1939 [**Lepralia dorsiporosa* BUSK, 1884]. Unilaminate. A pair of cardelles placed close to the highly concave entire proximal rim. *Rec.*

H. (Hippopetraliella). Rim smooth. *SW.Pac.*—FIG. 147,5. **H. (H.) dorsiporosa* (BUSK), *SW. Pac.*; $\times 25$ (235).

H. (Serripetraliella) STACH, 1936 [**S. chuakensis hastingsae*].—FIG. 147,6. **H. (S.) hastingsae*, *SW.Pac.*; $\times 25$ (235).

Hippopodina LEV., 1909 [**Lepralia feegeensis* BUSK, 1884]. Zooecia large, inflated, granulose, with small tremopores; apertures large, elliptical, with pair of cardelles but no proximal teeth, elongate avicularia at each side. Ovicell deeply embedded, hyperstomial, large. *Eoc.-Rec.*—FIG. 147,2. **H. feegeensis* (BUSK), *S.Pac.*; *2a*, $\times 25$; *2b*, with ovicell, $\times 25$ (181).

Pachycleithonia CANU-B., 1930 [**P. nigra*]. Primary orifice (aperture closed by operculum) distinct at surface. Gigantic zooecia with tremocyst; aperture with 2 large condyles, operculum very thick, colored black. *Rec.*, *E.Pac.*

Petraliella CANU-B., 1927 [**Escharella bisinuata* SMITT, 1873]. Unilaminate. Zooecial front regularly placed tremopores; aperture subcircular with pair of well-developed cardelles, 2 or more teeth on proximal border, and median lyrule; peristomial shield broad, not elevated. Ovicell not closed by

operculum. *Mio.-Rec.*—FIG. 147.8. **P. bisinuata* (SMITT), *Rec.*, GulfMex.; $\times 50$ (236).

Robertsonidra OSBURN, 1952 [**Schizoporella oligopus* ROBERTSON, 1896]. *Rec.*, E.Pac.—FIG. 147.7. **R. oligopus* (ROBERTSON), $\times 65$ (204).

Sinupetraliella STACH, 1936 [**Petralia litoralis* LIVINGSTONE, 1932]. Unilaminar. Zoecia with suboral mucro and lacking lyrule. *Mio.-Rec.*

Utinga MARCUS, 1949 [**Mucronella castanea* BUSK,

1884]. Like *Petraliella* but lacks the 2 large sinuses in proximal rim of aperture. *Rec.*—FIG. 147.4. **U. castanea* (BUSK), SW.Atl.; $\times 20$ (185).

Family GIGANTOPORIDAE Bassler, 1935

[=emend. Galeopsidae JULLIEN, 1904]
[=Tessaradomidae JULLIEN, 1903]

Incrusting, erect, cylindrical or bilamellar branches. Ovicell hyperstomial, opening into

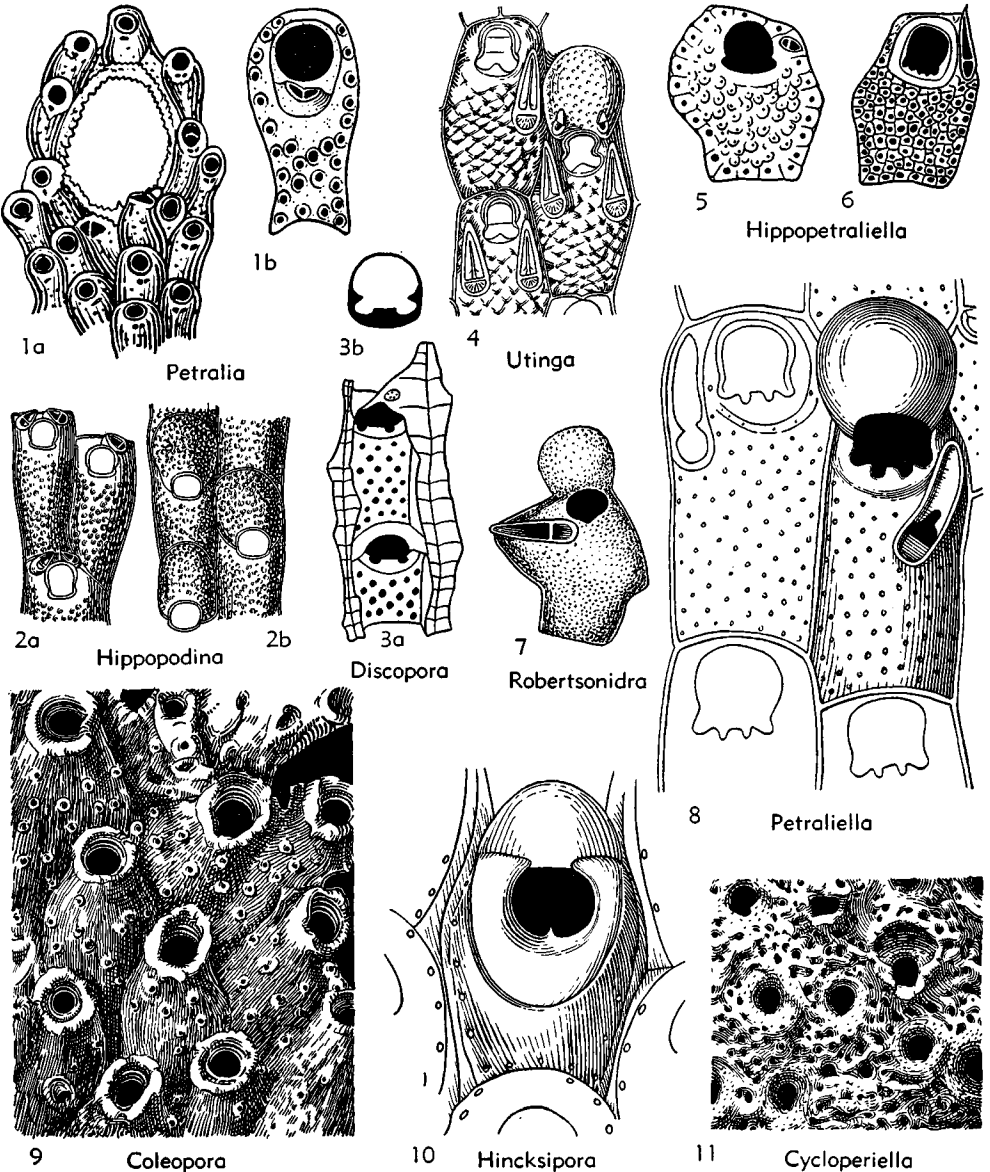


FIG. 147. Hippothoidae (*Hincksipora*), Petraliidae (p. G196, G197).

peristomice above aperture. Characterized by large pore (spiramen) leading into the peristomie for passage of water going to the compensatrix. Pair of avicularia directed across aperture (24,31). *Cret.-Rec.*

Gigantopora RIDLEY, 1881 [**G. lyncooides*; SD CANU-B., 1917] [= *Galeopsis* JULLIEN, 1903]. Incrusting to erect cylindrical branches. Frontal an olocyst; spiramen as large as aperture, the latter with rimule. *Cret.-Rec.*—FIG. 148,1. **G. lyncooides*, Rec., SW.Atl.; 1a,b, $\times 25$ (171).—FIG. 148,2. *G. rabi-dus* (JULLIEN), Rec., E.Atl.; $\times 25$ (169).—FIG. 148,3. *G. pupa* JULLIEN, Rec., Pac.; $\times 25$ (169).

Cosciniopsis CANU-B., 1927 [**C. coelatus*]. Incrusting. Ovicell closed by operculum and porous, like tremocyst frontal; aperture with cardelles placed low. *Eoc.-Rec.*—FIG. 148,5. **C. coelatus*, Rec., SW.Pac.; $\times 25$ (137).—FIG. 148,6. *C. vestita* HINCKS, Rec., S.Pac.; $\times 25$ (167).

Cylindroporella HINCKS, 1877 [**Lepralia tubulosa* NORMAN, 1868] [= *Porinula* LEV., 1916]. Zoecia incrusting, with long tubular free peristomie bearing salient spiramen at its base; frontal tremocyst

with stellate pores. No avicularia. *Rec.*—FIG. 149,1. **C. tubulosa* (NORMAN), N.Atl.; $\times 25$ (167). **Dightonia** BROWN, 1948 [**D. inarmata*]. Coarsely perforate frontal wall; aperture subcircular, with shallow, rounded median sinus; ovicell deeply immersed, with radiating, slitlike areolae. Avicularia and spines wanting. *Tert.*—FIG. 149,3. **D. inarmata*, M.Oligo., N.Z.; $\times 25$ (133).

Gephyrophora BUSK, 1884 [**G. polymorpha*]. Incrusting. Zoecial front a tremocyst, aperture with proximal rimule. Prominent avicularium on each side of peristome pointing across aperture, in some meeting to form a bridge. *Oligo.-Rec.*—FIG. 149,2. **G. polymorpha*, Rec., S.Atl.; $\times 25$ (230).

Hemicosciniopsis VIG., 1949 [**H. incrustans*]. Bilaminar. Zoecia with peristomie; aperture with 2 cardelles, different in form from ovicelled zoecium. *Mio.*—FIG. 149,5. **H. incrustans*, Aquit., Fr.; $\times 25$ (224).

Pachystomaria MACGILL., 1895 [**P. parvipuncta*]. Unilaminar. Small spiramen near peristome; 2 oral avicularia, one large with curved pivot oriented distally, the other small, elliptical or triangular. *Tert.*—FIG. 148,4. **P. parvipuncta*, Mio., S.Austral.; $\times 25$ (181).

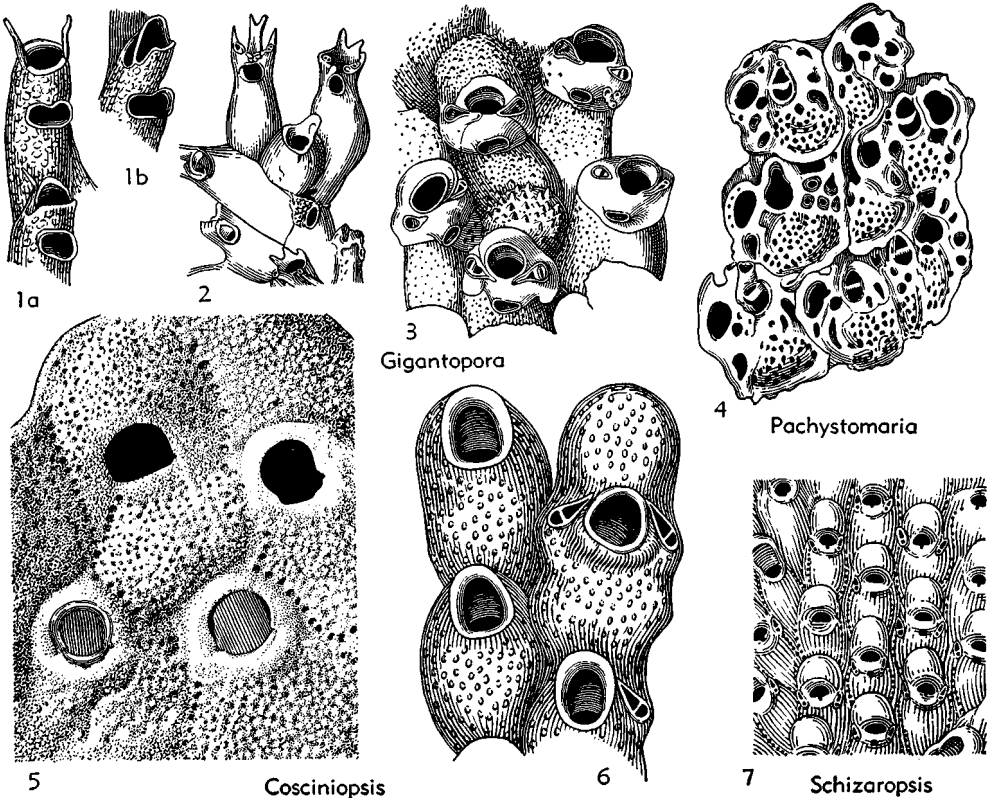


FIG. 148. Gigantoporidae (p. G198).

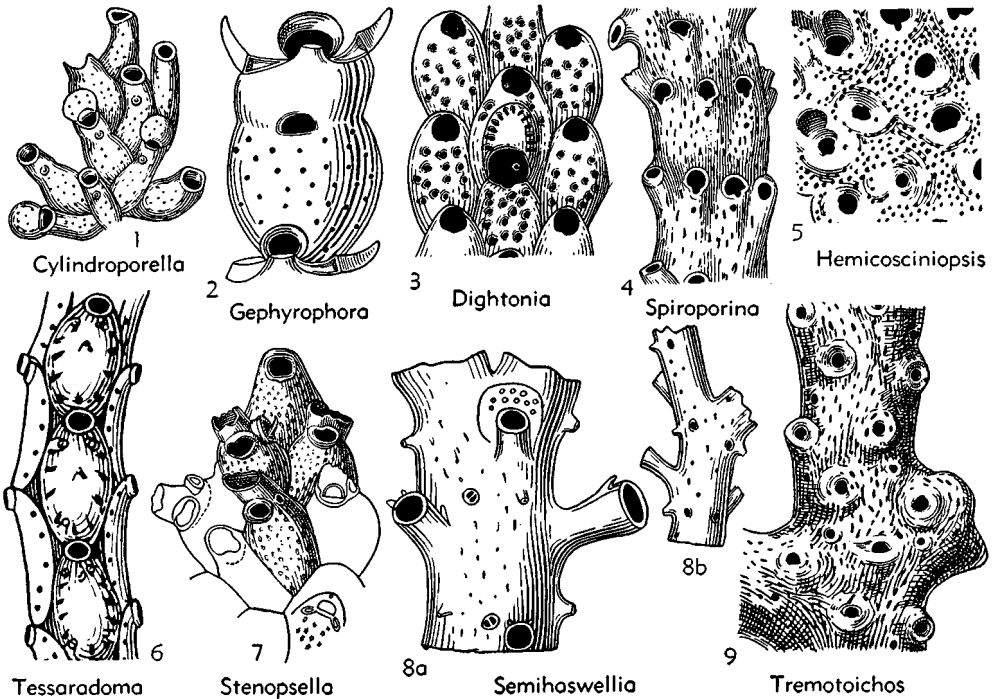


FIG. 149. Gigantoporidae (p. G198, G199).

Schizaropsis CANU-B., 1917 [**S. convexa*]. Zoecial front with small lateral areolae and pleurocyst; aperture with straight proximal border notched by narrow rimule; spiramen little visible, almost as large as peristomice. Two small avicularia. *Eoc.*—FIG. 148,7. **S. convexa*, Jackson., Miss.; $\times 25$ (137).

Semihowellia CANU-B., 1917 [**Porina proboscidea* WATERS, 1889]. Like *Spiroporina* but zoecia only on one side of cylindrical zoarium; both frontal and dorsal tremocyst with sulci but dorsal also with avicularia. *Eoc.-Rec.*—FIG. 149,8. **S. proboscidea* (WATERS), Rec., W.Indies; 8a,b, $\times 25$, $\times 10$ (230).

Spiroporina STOLICZKA, 1864 [**S. vertebralis* (= *Myriozoum australiense* HASWELL, 1880)] [= *Haswellia* BUSK, 1884 (obj.); *Haswellina* LIVINGSTONE, 1928 (obj.)]. Zoecial front a thick tremocyst; aperture notched by very wide rimule; spiramen a small salient tube. *Tert.-Rec.*—FIG. 149,4. **S. vertebralis*, Tert., N.Z.; $\times 25$ (134).

Stenopsella BASSLER, 1952 [*pro Stenopsis* CANU-B., 1927 (non RAF., 1815)] [**Porina fenestrata* SMITT, 1873]. Zoecial front a tuberosc tremocyst; aperture subquadrangular, without cardelles; spiramen large, oval and salient; peristome elongated into tube. Small avicularia. *Eoc.-Rec.*—FIG. 149,7. **S. fenestrata* (SMITT), Rec., GulfMex.; $\times 25$ (236).

Tessaradoma NORMAN, 1868 [**Pustulipora gracilis* SARS, 1850]. Erect branches. Zoecial front a pleurocyst with areolae; aperture with cardelles, operculum in opening closes spiramen. *Rec.*—FIG. 149,6. **T. gracilis* (SARS), N.Atl.; $\times 37.5$ (167).

Tremotoichos CANU-B., 1917 [**T. rectifurcatum*]. Like *Semihowellia* but spiramen rarely placed on zoecial median axis. *Eoc.*—FIG. 149,9. **T. rectifurcatum*, Claib., N.Car.; $\times 25$ (137).

Family STOMACHETOSELLIDAE Canu & Bassler, 1917

[= *Metrocryptidae* VIC., 1949]

Erect, solid, cylindrical to narrow bifoliate branches. Zoecia generally with a thick tremocyst frontal built up around the simple apertural orifice (peristomice), which become notched by a rimule spiramen (sinus), in some guarded by small avicularia. Ovicell hyperstomial, embedded in the distal zoecium, opening in the peristomie above the aperture. No lyrule, cardelles or peristome with spines (28,31). *Eoc.-Rec.*

Stomachetosella CANU-B., 1917 [**S. crassicollis*]. Bifoliate branches. Tremocyst of wide-mouthed tubules. Ovicelled zoecia with a straighter rimule-

- spiramen, ovicell entirely surrounding aperture. No avicularia. *Oligo.-Rec.*—FIG. 150,1. **S. crassicolis*, Oligo. (Vicksb.), Alaska; $\times 25$ (137).
- Cigclisula** CANU-B., 1927 [**Escharoides oclusa* BUSK, 1884]. Like *Stomachetosella* but with large sporadic interzoecial avicularia and special oral glands; ovicell frontal perforated by large grill-like pores. *Rec.*—FIG. 150,2. **C. oclusa* (BUSK), SW.IndianO.; 2a,b, $\times 25$ (134).
- Diastosula** CANU-B., 1927 [**Myriozoum marionense* BUSK, 1884]. Cylindrical branches. Frontal walls of zoecia very thick, smooth; aperture oval, with wide pseudorimule bordered by 2 peristomial avicularia. Ovicell bears triangular area bordered by pores. *Rec.*—FIG. 150,4. **D. marionense* (BUSK), NW.Atl.; $\times 25$ (134).
- Enoplostomella** CANU-B., 1917 [**E. defixa*]. Like *Stomachetosella* but cylindrical stems bear ovicells not entirely surrounding peristomice, so that a small avicularium occurs in the peristomic. *Oligo.-Rec.*—FIG. 150,9. **E. defixa*, Oligo.(Vicksb.), Ala.; $\times 25$ (137).
- Leiosella** CANU-B., 1917 [**L. rostrifera*]. Like *Stomachetosella* but frontal is an olocyst, and peristomie of ovicelled zoecia is a lunar crescent without rimule-spiramen. *Oligo.-Rec.*—FIG. 150,6. **L. rostrifera*, Oligo.(Vicksb.), Ala.; $\times 25$ (137).
- Metradolium** CANU-B., 1917 [**M. dissimile*]. Like *Stomachetosella* but ovicelled zoecia differ in form from others in having a peristomice like a lunar crescent, without rimule-spiramen. *Eoc.*—FIG. 150,7. **M. dissimile*, Claib., N.Car.; $\times 25$ (137).
- Metrocrypta** CANU-B., 1917 [**M. bucculenta*]. Cylindrical bifurcated stems. Frontal a tremocyst with tubules; rimule-spiramen wide, shallow. *Eoc.*—FIG. 150,5. **M. bucculenta*, Claib., N.Car.; $\times 25$ (137).
- Ochetosella** CANU-B., 1917 [**O. jacksonica*]. Narrow cylindrical branches. Frontal an olocyst with lateral areolae, covered by a pleurocyst; rimule-spiramen a small canal supported by a peristomial projection. *Eoc.*—FIG. 150,10. **O. jacksonica*, Claib., N.Car.; $\times 25$ (137).
- Pachyegis** OSBURN, 1952 [**Porella princeps* NORMAN, 1903]. Incrusting; proximal border without sinus. *Rec.*, N.Pac.—FIG. 150,12. **P. princeps*, $\times 30$ (204).
- Posterula** JULLIEN, 1903 [**Escharoides sarsi* SMITT, 1867]. Zoecial front a thick pleurocyst with areolar pores; peristomice with pseudorimule surrounded by avicularia. Ovicell concealed, closed by operculum. *Rec.*—FIG. 150,8. **P. sarsi* (SMITT), N.Atl.; $\times 25$ (169).
- Ragionula** CANU-B., 1927 [**Eschara rosacea* BUSK, 1856]. Short, branching stems. Zoecial front a thick granular pleurocyst; aperture semicircular with a pseudorimule bordered by small peristomial avicularium. *Rec.*—FIG. 150,3. **R. rosacea* (BUSK), N.Atl.; $\times 25$ (134).
- Schizemiella** CANU-B., 1917 [**S. claibornica*]. Bilamellar. Zoecia indistinct, with tremocystal front and schizoporellid aperture with wide rimule and inconstant rimule-spiramen. *Eoc.*—FIG. 150,11. **S. claibornica*, Claib., Ala.; $\times 25$ (137).

Family SCHIZOPORELLIDAE Jullien, 1903

[=Escharellidae LEV., 1909]

Generally incrusting. Aperture semilunar, with inferior border bearing a slit (rimule) giving access to the compensatrix. Ovicell hyperstomial, operculum semilunar (24). *Cret.-Rec.*

Schizoporella HINCKS, 1877 [**Lepralia unicornis* JOHNSTON, 1847] [=Schizopodrella CANU-B., 1917 (obj)]. Frontal a tremocyst, avicularium on each side of aperture which bears a narrow rounded sinus (rimule). *Eoc.-Rec.*—FIG. 151,6. **S. unicornis* (JOHNSTON), Rec., NE.Atl.; $\times 25$ (167).

Arthropoma LEV., 1909 [**Flustra cecillii* AUDOUIN, 1826; SD CANU-B., 1920]. Rimule straight, rectangular; operculum with mobile small tongue in middle of straight proximal border. *Eoc.-Rec.*—FIG. 151,5. **A. cecillii* (AUDOUIN), Rec., Medit.; $\times 25$ (167).

Characodoma MAPLE., 1900 [**C. halli*]. Elongate quadrate internodes with uniserial row of zoecia on each side. *Tert.*—FIG. 151,8. **C. halli*, Mio., S.Austral.; $\times 25$ (137).

Cribella JULLIEN, 1903 (*non* FORBES, 1840) [**C. nova*]. Frontal tremocyst with small pores; aperture large, almost circular; rimule wide, indistinct. *Rec.*—FIG. 151,4. **C. nova*, NW.Atl.; $\times 25$ (131).

Dakaria JULLIEN, 1903 [**D. chevreuxi*]. Like *Cribella* but rimule more distinct and not so wide. No avicularia. *Eoc.-Rec.*—FIG. 151,7. **D. chevreuxi*, Rec., SE.Atl.; $\times 25$ (169).

Emballothea LEV., 1909 [**Lepralia quadrata* MACGILL., 1880]. Bifoliate. Tremocyst with large pores covering frontal and ovicell; apertures with cardelles and wide rounded rimule. Avicularia. *Eoc.-Rec.*—FIG. 151,3. **E. quadrata* (MACGILL.), Rec., SW.Pac.; $\times 25$ (177).

Escharina M.-EDW., 1836 [**Eschara vulgaris* MOLL, 1803] [=Mastigophora HINCKS, 1880; Schizolavella CANU-B., 1920 (obj)]. Laterally placed long thin avicularia. *Oligo.-Rec.*—FIG. 152,6. **E. vulgaris* (MOLL), Rec., Medit.-Atl.; $\times 25$ (167).

Gemelliporida CANU-B., 1927 [**G. typica*]. Zoaria multilamellar. Zoecia very large, with coarse spiny tremocyst, apertures marked by a small poster and a very large orbicular anter; 2 irregular oral avicularia. *Pleisto.-Rec.*—FIG. 151,9. **G. typica*, Rec., GulfMex.; $\times 25$ (137).

Hippodiplosia CANU, 1916 [**H. verrucosa*]. Bilamellar. Zoecial front a coarse tremocyst with

spines; avicularia and wide aperture with cardelles.
Eoc.-Rec.—FIG. 151, I. **H. verrucosa*, Mio., Fr.;
 ×25 (136).

Phonicosia JULLIEN, 1888 [**P. jousseaumi*]. Like
Arthropoma but with spines and without mobile
 tongue of operculum. *Eoc.-Rec.*—FIG. 152, 5. **P.*
jousseaumi, Rec., Straits Magellan; ×25 (137).

Schismoporella GREGORY, 1893 [**Cellepora schizo-*
gaster REUSS, 1847]. Aperture orbicular with large
 sinus; frontal with special pore. *Tert.*—FIG. 152,
 1. **S. schizogaster* (REUSS), Mio., Aus.; ×25
 (210).

Schizobrachiella CANU-B., 1920 [**Hemeschara*
sanguinea NORMAN, 1868]. Like *Schizoporella* but

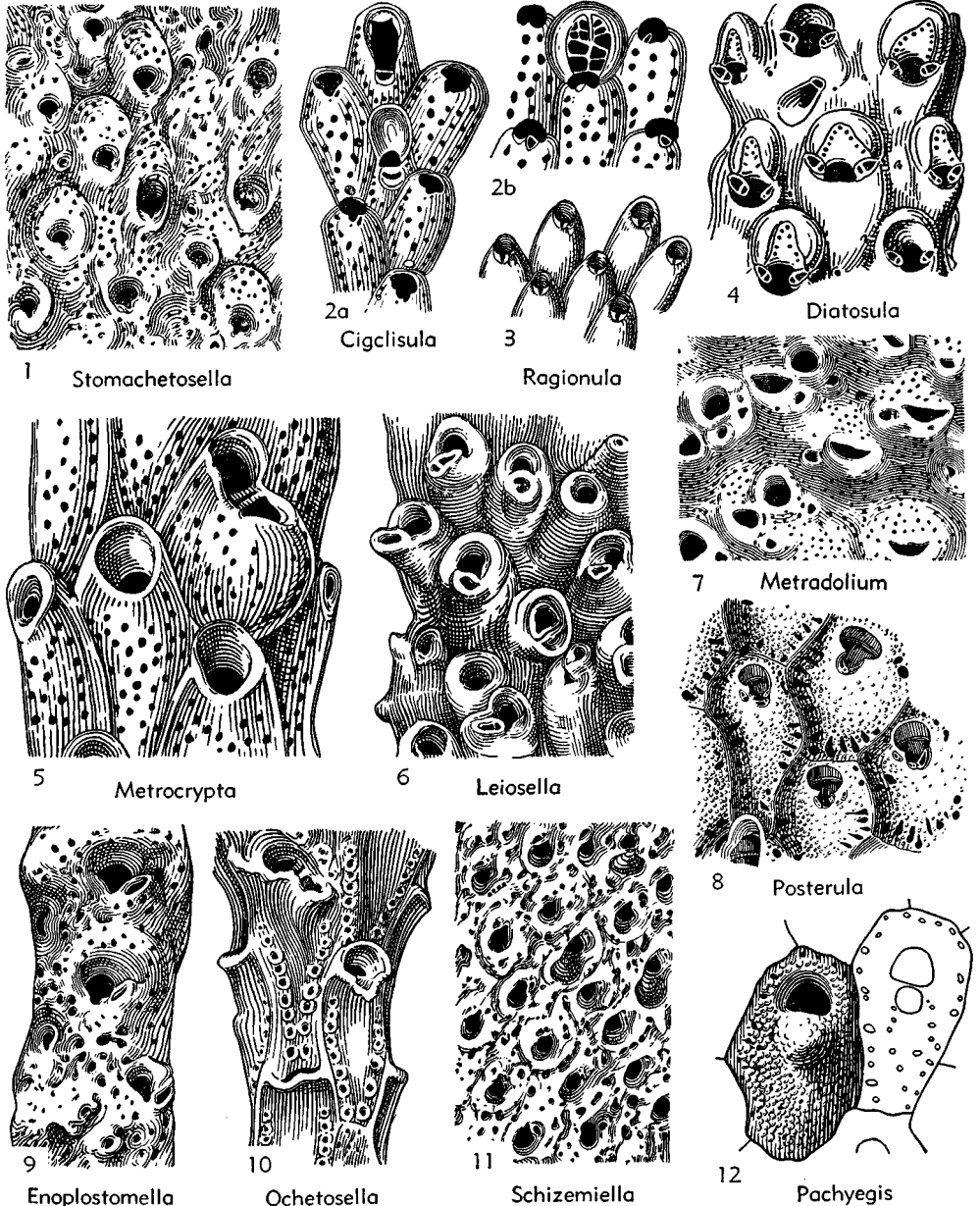


FIG. 150. *Stomachetosellidae* (p. G199, G200).

no avicularia. *Mio.-Rec.*—FIG. 152,7. **S. sanguinea* (NORMAN), *Rec.*, NE.Atl.; $\times 25$ (167).

Schizomavella CANU-B., 1917 [**Lepralia auriculata* HASSELL, 1842]. Like *Schizoporella* but with median avicularium on frontal and small oral glands. *Eoc.-Rec.*

S. (Schizomavella). *Eoc.-Rec.*, Br.I.

S. (Metroperiella) CANU-B., 1917 [**Schizoporella lepralioides* CALVET, 1903]. Ovicell surrounds aperture. *Eoc.-Rec.*—FIG. 152,2. **S. (M.) lepralioides* (CALVET), *Rec.*, E.Atl.; $\times 25$ (137).

Schizoporellopsis MAPLE., 1898 [**S. abnormis*]. Zoecia short with semicircular aperture followed by longer ones with sinus. *Tert.*—FIG. 151,2. **S. abnormis*, *Mio.*, Austral.; $\times 40$ (184).

Sphenella DUVERGIER, 1924 [**S. polymorpha*]. *Mio.* (*Helv.*), Fr.

Stellatopora LIVINGSTONE, 1929 [**S. splendida*]. Like *Schizoporella* but with frontal wall perforated by stellate pores. *Rec.*, N.Z.

Stephanollona DUVERGIER, 1921 [**S. spinifera*]. Frontal a granular pleurocyst surrounded by areolar pores. *Mio.*—FIG. 152,3. **S. spinifera*, *Helv.*, Fr.; 3a, $\times 25$; 3b, dietellae, $\times 25$ (148).

Stephanotrema VIG., 1949 [**Dakaria stricta* DUVERGIER, 1920]. Like *Dakaria* but with avicularia. *Mio.*, Fr.

Stylopoma LEV., 1909 [**Eschara spongites* PALLAS, 1766]. Like *Schizoporella* but ovicell huge, entirely covering aperture and avicularia. *Mio.-Rec.*—FIG. 152,4. **S. spongites* (PALLAS), *Rec.*, Gulf Mex.; 4a,b, $\times 25$ (4a, 177; 4b, 137).

Systemostoma MARSSON, 1887 [**S. asperulum*]. Narrow, bifoliate, cylindrical zoaria with tremocyst frontal and keyhole apertures. *Cret.*

Family HIPPOPORINIDAE Bassler, 1935
[as Hippoporininae] [= Hippozeugosellidae VIG., 1949]

Zoarium mostly incrusting. Zoecial front generally an olocyst or pleurocyst; proximal

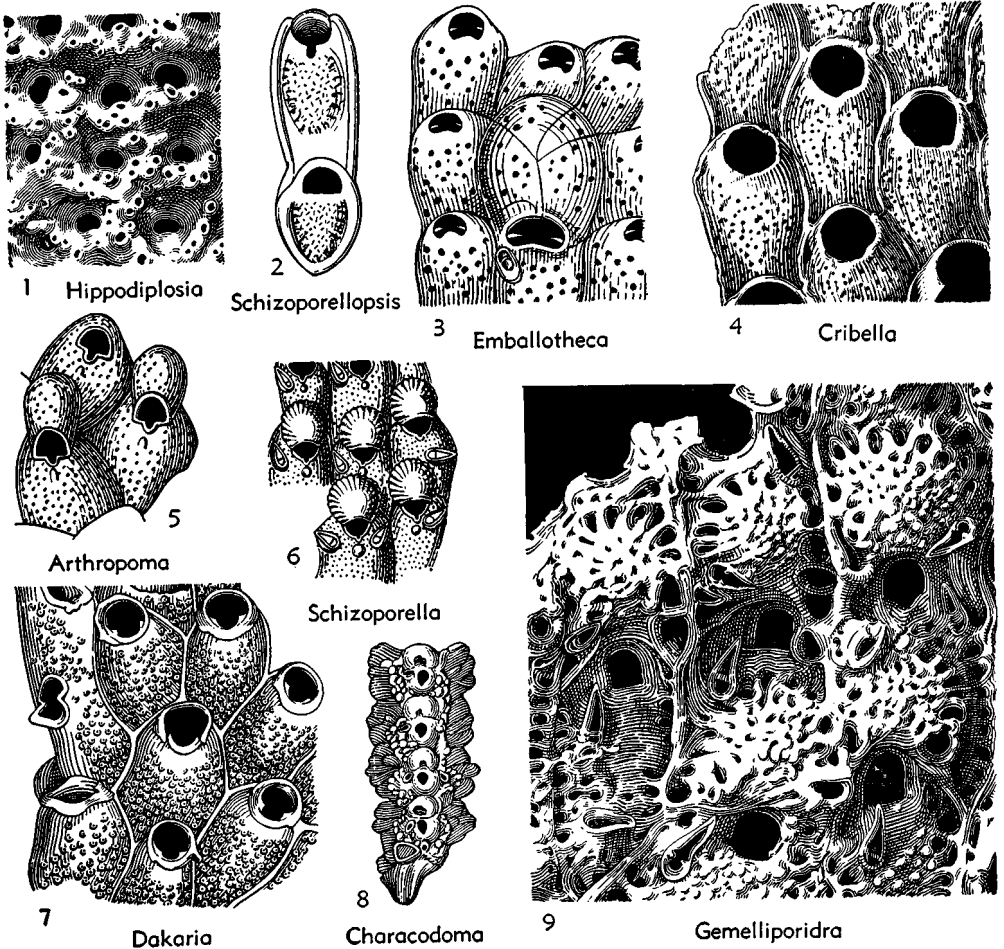


FIG. 151. Schizoporellidae (p. G200-G202).

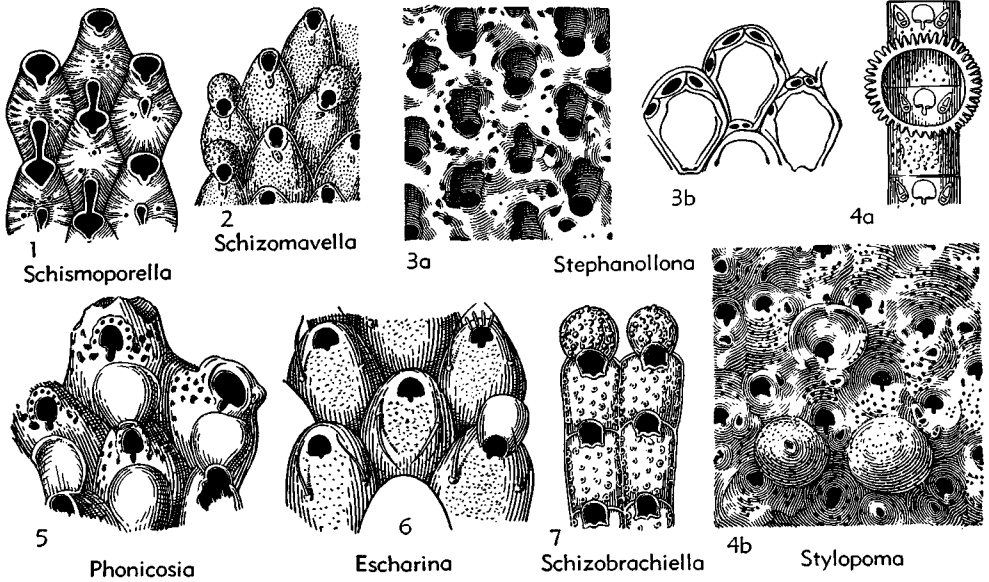


FIG. 152. Schizoporellidae (p. G200-G202).

border without sinus; aperture horseshoe-shaped with 2 lateral denticles (cardelles) serving as pivot for operculum. Ovicell hyperstomial. Compensation sac opens into poster of aperture (24). *Cret.-Rec.*

Hippoporina NEVIANI, 1895 [*Cellepora pertusa* ESPER, 1796; SD WATERS, 1918]. Frontal an olocyst; aperture elongate, with cardelles placed low. *Cret.-Rec.*—FIG. 153,1. *H. integra* NEVIANI, Pleisto., Italy; $\times 25$ (196).

Aimulosia JULLIEN, 1888 [*A. australis*]. Frontal a pleurocyst with areolae; small avicularium adjacent to semilunar aperture. *Eoc.-Rec.*—FIG. 153,2. *A. australis*, Rec., S.Atl.; $\times 25$ (169).

Bactridium REUSS, 1848 [*B. hagenowi*; SD D'ORB., 1852] [= *Hippozeugosella* CANU-B., 1917 (obj.)]. Zooecia biserial on one or both sides of the free, narrow branches. *Cret.-Rec.*—FIG. 153,3. *B. hagenowi*, Eoc., N.Italy; 3a,b, $\times 25$ (210).—FIG. 153,4. *B. arcuata* (CANU-B.), Eoc. (Jackson.), Miss., $\times 25$ (137).

Balantiostoma MARSSON, 1887 [*Cellepora marsupium* HAG., 1846]. Olocyst frontal. *Cret.*—FIG. 153,5. *B. marsupium* (HAG.), Camp., Ger.; $\times 25$ (186).

Buffonellodes STRAND, 1928 [pro *Buffonella* JULLIEN, 1888 (non KEFERSTEIN, 1868)] [*B. rimosa*]. Frontal and ovicell an olocyst; aperture with straight proximal border bearing small rimule and small avicularium in front. *Cret.-Rec.*—FIG. 153,6. *B. rimosa*, Rec., SW.Atl.; $\times 25$ (169).

Chistosella CANU-B., 1934 [*Schizoporella daedala* MACGILL., 1882]. Unilaminar. Zooecia with spines on distal margin of peristome, narrow sub-circular sinus, double row of areolar pores, and 2 long laterally directed avicularia. *Tert.-Rec.*—FIG. 153,7. *C. daedala* (MACGILL.), SW.Pac.; 7a,b, $\times 25$, $\times 20$ (181).

Cliethriellum BROWN, 1948 [*C. oamurense*]. Free erect narrow branches with areolae and smooth frontal. *Tert.*—FIG. 153,10. *C. oamurense*, Oligo., N.Z.; $\times 10$ (133).

Gemelliporella CANU-B., 1920 [*G. vorax* CANU-B., 1923]. Incrusting to narrow cylindrical branches. Zooecia with granular pleurocyst, aperture keyhole-shaped; operculum in locella. Ovicell deeply embedded in distal zooecium. *Mio.-Plio.*—FIG. 153,11. *G. vorax*, Mio., N.Car.; $\times 25$ (137).

Gemelliporina BASSLER, 1936 [*Gemellipora glabra* SMITT, 1872]. Erect narrow cylindrical branches with frontal pleurocyst, keyhole-shaped aperture and no oral avicularia. *Mio.-Rec.*—FIG. 153,12. *G. glabra* (SMITT), Rec., GulfMex.; $\times 25$ (131). [Gemelliporininae VIG., 1949].

Hippadenella CANU-B., 1917 [*Flustra margaritifera* QUOY & GAYMARD, 1833]. Frontal a thick pleurocyst with areolae and apertures; small median avicularium with glandlike body. *Mio.-Rec.*—FIG. 153,14. *H. margaritifera* (QUOY & GAYMARD), Rec., SW.Atl.; $\times 50$ (137).

Hippomenella CANU-B., 1917 [*Lepralia mucronelliformis* WATERS, 1899]. Zoarium bilamellar. Frontal an olocyst with pleurocyst and areolar pores; oral spines and pair of pointed avicularia directed out-

ward. *Eoc.-Rec.*—FIG. 153,8. **H. mucronelliformis* (WATERS), *Rec.*, E.Atl.; $\times 25$ (230).

Hippomonavella CANU-B., 1934 [**Lepralia praeclara* MACGILL., 1895]. Frontal an olocyst with one row of areolar pores and apertures, cardelles placed low, an oral avicularium and ovicell porous. *Tert.-Rec.*—FIG. 154,4. **H. praeclara* (MACGILL.), *Tert.*, Austral.; $\times 25$ (181).

Hippoporella CANU, 1917 [*Lepralia hippopus* SMITT, 1867] [= *Hippoponella* CANU-B., 1920 (obj.)]. Like *Hippoporina* but frontal has areolar pores. *Eoc.-Rec.*—FIG. 154,5. **H. hippopus* (SMITT), *Rec.*, N.Atl.; $\times 25$ (177).

Hippoporidra CANU-B., 1927 [**Cellepora edax* BUSK, 1861] [= *Hippotrema* CANU-B., 1927]. Incrusting on gastropods, with accumulated zooecia; frontal with areolar pores; aperture keyhole-shaped, with strong cardelles; ovicell with distinct frontal area. *Mio.-Rec.*—FIG. 154,1. **H. edax* (BUSK), *Rec.*, NE.Atl.; 1a,b, $\times 1$, $\times 25$ (134). —FIG. 154,2. *H. janthina* SMITT, *Rec.*, Gulf Mex.; $\times 25$ (230).

Hipposera VIG., 1949 [**Hippodiplosia formosa* DUVERGIER, 1923]. Frontal a tremocyst with large pores, few avicularia, elliptical apertures with cardelles. *Mio.*—FIG. 154,6. **H. formosa* (DUVERGIER), Aquit., Fr.; $\times 25$ (224).

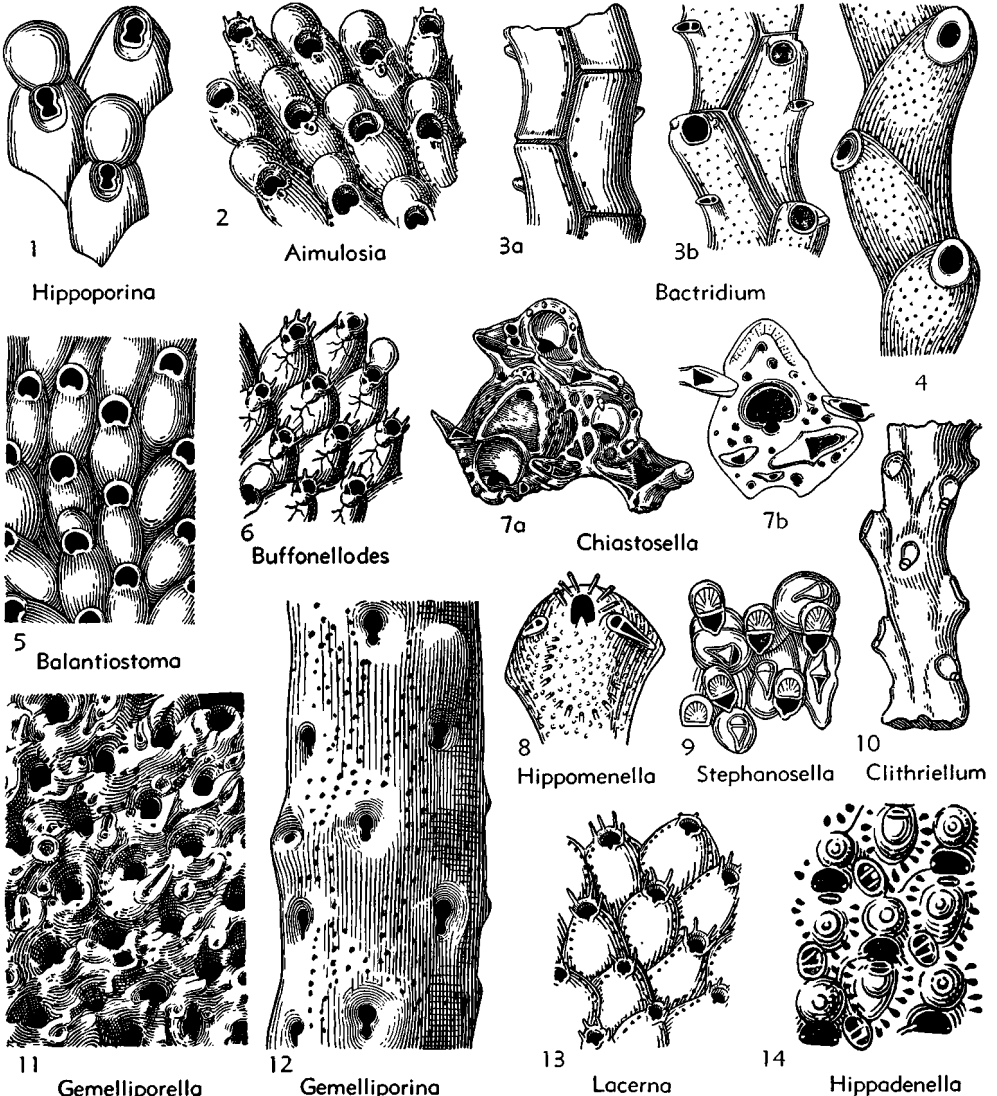


FIG. 153. Hippoporinidae (p. G203-G205).

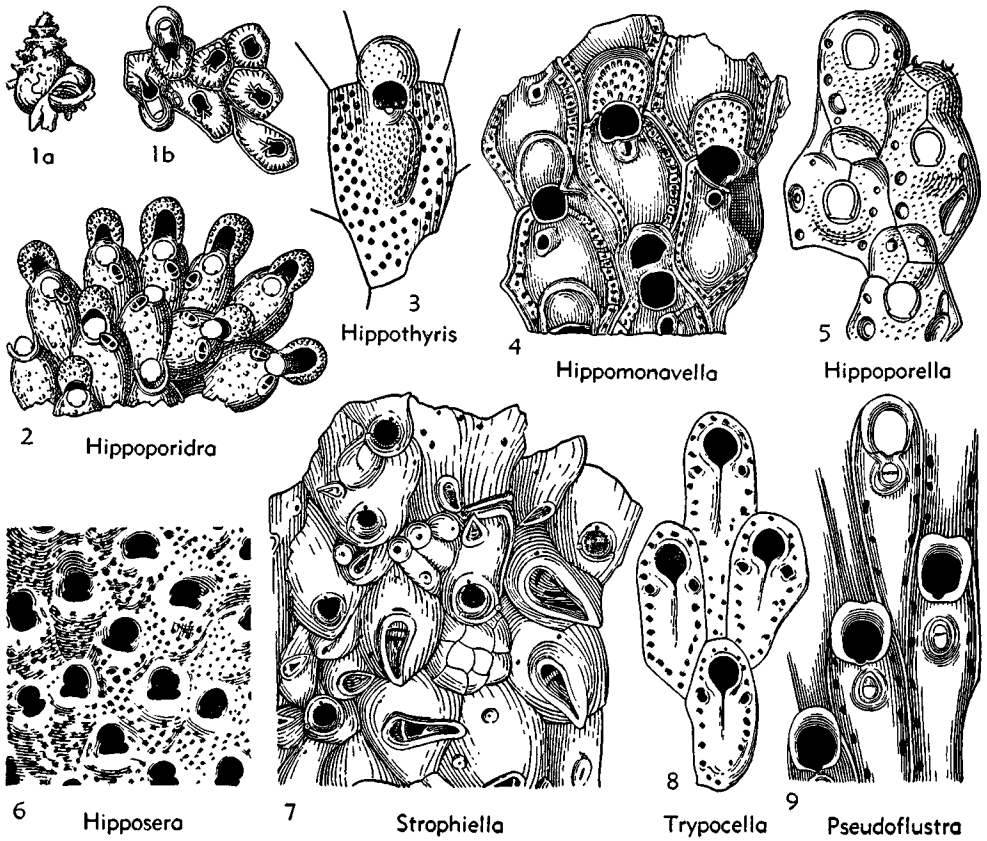


FIG. 154. Hippoporinidae (p. G204, G205).

Hippothyris OSBURN, 1952 [**H. emplasta*]. *Rec.*, E.Pac.—FIG. 154,3. **H. emplasta*, $\times 30$ (204).

Lacerna JULLIEN, 1888 [**L. hosteensis*]. Frontal incomplete, pleurocyst with areolae; apertures with oral spines; no avicularia. *Eoc.-Rec.*—FIG. 153,13. **L. hosteensis*, *Rec.*, SW.Atl.; $\times 25$ (169).

Pseudoflustra BIDENKAP, 1897 [**Flustra solida* SIMPSON, 1853]. Narrow lamellar segments united by radicle fibers. Frontal an olocyst with a row of areolae and bearing a median avicularium. *Rec.*—FIG. 154,9. **P. solida* (SIMPSON), N.Atl.; $\times 25$ (137).

Stephanosella CANU-B., 1917 [**Eschara biapertura* MICH., 1845][=*Buffonellaria* CANU-B., 1927]. Frontal a smooth olocyst with veinlike markings in young, thick and irregular in old age; ovicell radially sculptured; sinus broadly V-shaped; large lateral avicularium. *Eoc.-Rec.*—FIG. 153,9. **S. biapertura* (MICH.), Mio., Fr.; $\times 25$ (167).

Strophoella JULLIEN, 19'3 [**S. tuberigera*]. Aperture with circular rim; e, interzoocial avicularium on ordinary zoecia and triangular on ovicelled

ones. *Rec.*—FIG. 154,7. **S. tuberigera*, E.Atl.; $\times 25$ (169).

Trypocella MAPLE., 1902 [**T. excavata*]. Elongate zoecia with orbicular aperture bearing acute sinus. *Tert.*—FIG. 154,8. **T. excavata*, Mio., Austral.; $\times 25$ (184).

Family EXOCHELLIDAE Bassler, 1935

[as Exochellinae] [=Peristomellae CANU-B., 1917; Didymosellidae BROWN, 1952]

Aperture oblique, without lyrule, rimule or cardelles. Ovicell hyperstomial, embedded in distal zoecium, opening above oblique aperture and below frontal mucro in a chamber (locella) where the operculum operates (24). *Cret.-Rec.*

Exochella JULLIEN, 1888 [**Mucronella tricuspis* HINCKS, 1881; SD CANU, 1908]. Incrusting. Peristome with median and 2 lateral teeth, coalesced in some; frontal surrounded by areolae. Spines and generally an avicularium on one side. *Cret.-Rec.*

—FIG. 155.1. *E. longirostris* JULLIEN, Rec., SW. Atl.; $\times 25$ (169).
Bathosella CANU-B., 1917 [**Mucronella aspera* ULR., 1901]. Uni- and bilamellar. Zooecia indistinct, with frontal a thick olocyst more or less covered by pleurocyst; areolae rare. Avicularia simple, irregularly placed. No spines. *Cret.-Eoc.*—FIG. 155.8. **B. aspera* (ULR.), Eoc.(Wilcox.), Md.; $\times 25$ (137).

Didymosella CANU-B., 1917 [**Lepralia larvalis* MACGILL., 1869]. Unilamellar. Frontal with tremocyst and spines; 2 large pores open into zooecia under operculum. Large triangular transverse marginal avicularium with pivot. *Oligo.-Rec.*—FIG. 155.3. **D. larvalis* (MACGILL.), Rec., SW.Pac.; $\times 50$ (181).—FIG. 155.4. *D. crassa* CANU-B., Oligo.(Vicksb.), Ala.; $\times 25$ (137).
Escharoides M.EDW., 1836 [**Cellepora coccinea*

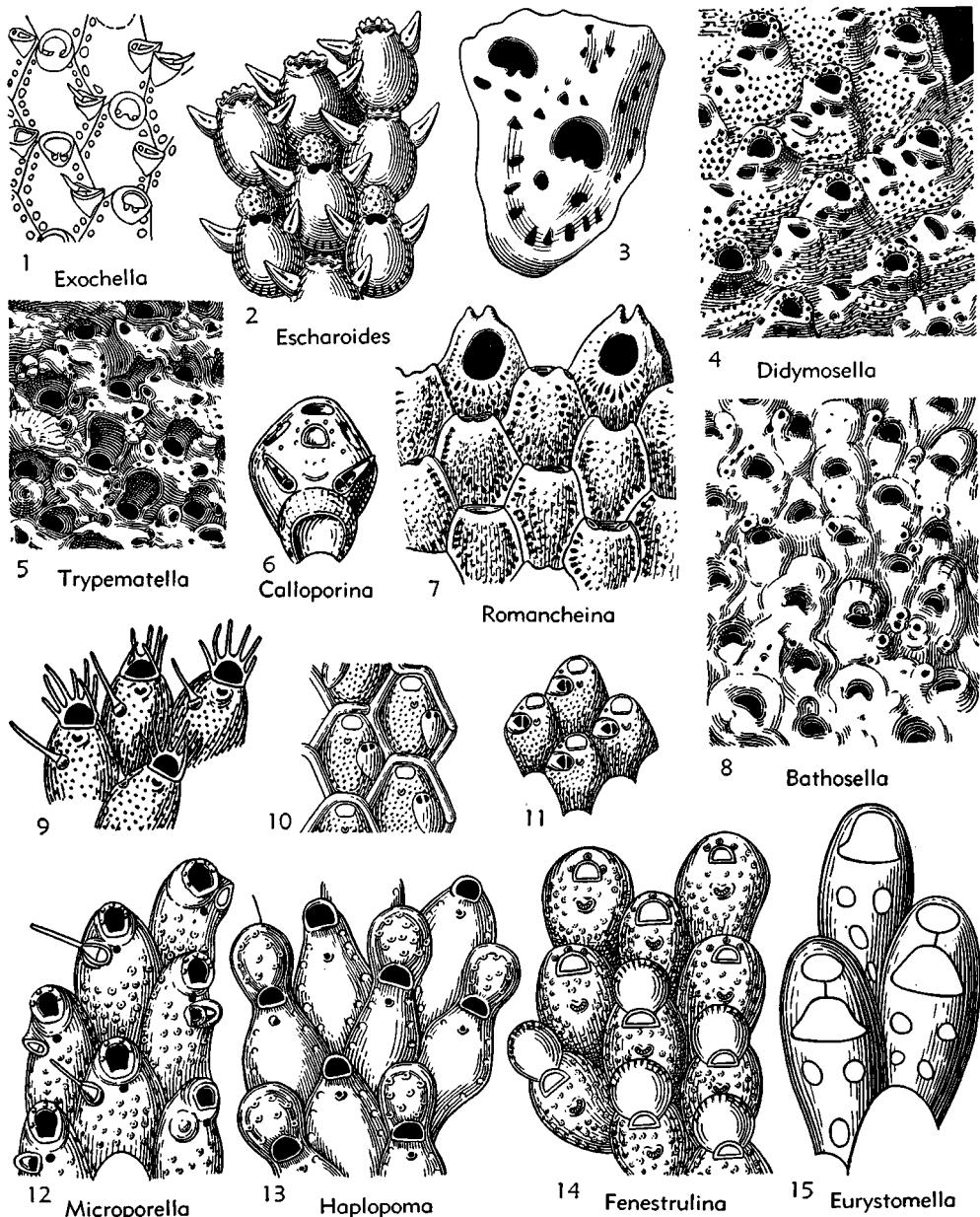


FIG. 155. Exochellidae, Microporellidae, Eurystomellidae (p. G205-G207).

ABILDGAARD, 1805; SD NORMAN, 1903] [= *Distantescharellina* D'ORB., 1852; *Escharoidea* MARTENS, 1885; *Peristomella* LEV., 1902 (obj.)]. Frontal with areolae and pleurocyst; mucro very salient, small and triangular; 4 distal spines on peristome. Large transverse avicularia. *Eoc.-Rec.*—FIG. 155,2. **E. coccinea* (ABILDGAARD), Rec., N.Atl.; $\times 25$ (137).

Romancheina JULLIEN, 1888 [**R. martiali*]. Incrusting. Frontal a tremocyst with small pores; ovicell much smaller than zoecia. Avicularia thin, transverse, triangular. *Eoc.-Rec.*—FIG. 155,7. **R. martiali*, Rec., SW.Atl.; $\times 25$ (169).

Trypametella CANU-B., 1920 [**T. papulifera*]. Frontal with lateral areolar pores (pleurocyst on olocyst); 2 large avicularia below aperture. *Pleisto.-Rec.*—FIG. 155,5. **T. papulifera*, Calif.; $\times 25$ (137).

Family MICROPORELLIDAE Hincks, 1880

Incrusting, bifoliate. Aperture more or less circular with straight, entire inferior border. Ovicell hyperstomial, closed by operculum. Orifice of compensatrix (ascopore, micropore, frontal pore) distinct, removed proximally from aperture (24,26). *Mio.-Rec.*

Microporella HINCKS, 1877 [**Eschara ciliata* PALLAS, 1766] [= *Bimicroporella* CANU, 1904]. Frontal with nonstellate tremopores, lateral avicularium, without lines of growth. Aperture semilunate; peristome with spines. Operculum semielliptical. *Mio.-Rec.*

M. (Microporella). *Mio.-Rec.*—FIG. 155,9. **M. (M.) ciliata* (PALLAS), Rec., NE.Atl.; $\times 35$ (167).

M. (Diporula) HINCKS, 1879 [**Eschara verrucosa* PEACH, 1873]. Horseshoe-shaped apertures. *Plio.-Rec.*—FIG. 155,12. **M. (D.) verrucosa* (PEACH), Rec., Atl.; $\times 25$ (167).

M. (Ellipsoidopora) CANU-B., 1923 [**Eschara flabellaris* BUSK, 1852]. Transverse elliptical apertures. *Rec.*—FIG. 155,11. **M. (E.) flabellaris* (BUSK), SE.Atl.; $\times 25$ (177).

M. (Flustramorphia) GRAY, 1848 [**Flustra marginata* KRAUSS, 1837]. Pouchlike vibracula and radicular fibers. *Rec.*—FIG. 155,10. **M. (F.) marginata* (KRAUSS), Rec., SE. Atl.; $\times 25$ (177).

Calloporina NEVIANI, 1895 [**Cellepora decorata* REUSS, 1848]. Frontal with lateral areolar pores, pleurocyst, costules, avicularia and circular ascopore. *Mio.-Rec.*—FIG. 155,6. **C. decorata* (REUSS), Mio., Aus.; $\times 35$ (177).

Fenestulina JULLIEN, 1888 [**Cellepora malusii* AUDOUIN, 1826]. Frontal with stellate tremopores, no avicularia. *Mio.-Rec.*—FIG. 155,14. **F. malusii* (AUDOUIN), Rec., Medit.; $\times 25$ (177).

Stephanopora KIRKPATRICK, 1888 [**S. cribrispinata*]. Secondary cribriform roof formed by broad

branched processes given off from peristome and walls. *Rec.*

Family EURYSTOMELLIDAE Levinsen, 1909

Incrusting. Zoecia strongly calcified, thick-walled, without covering membrane, spines, or avicularia but with several large openings (fenestrae). Ovicell a kenozoecium, with large uncalcified part in the frontal wall (30). *Pleisto.-Rec.*

Eurystomella LEV., 1909 [**Lepralia foraminigera* HINCKS, 1883; SD CANU-B., 1923].—FIG. 155, 15. **E. foraminigera* (HINCKS), Rec., S.Pac.; $\times 50$ (177).

Family MUCRONELLIDAE Levinsen, 1902

[= *Smittinidae* LEV., 1909; *Phoccanidae* VIC., 1949]

Incrusting, lamellar to bilaminate. Zoecial front generally perforate only around margin, with oral spines commonly present, peristome produced and channeled in front. Ovicell hyperstomial, embedded in distal zoecium, opening in the peristomie. Protecting organ guarding entrance to the compensation sac occurs in the aperture (lyrula) or close to the peristomie (mucron). Peristomial median avicularium present (Fig. 156) (24). *Cret.-Rec.*

Mucronella HINCKS, 1880 [**Lepralia peachi* JOHNSTON, 1847]. Incrusting. Like *Smittina* but lyrula is present in place of an avicularium. *Eoc.-Rec.*—FIG. 158,5. **M. peachi* (JOHNSTON), Rec., E. Atl.; $\times 35$ (167).

Bryocryptella COSSMAN, 1906 [*pro Cryptella* JULLIEN, 1903 (non WEBB & BERTHELOT, 1833)] [**Cryptella torquata* JULLIEN, 1903]. Erect narrow branches with claviform zoecia on one side only. Frontal a pleurocyst with minute areolae but no ribs; apertures with median avicularium but no lyrula or cardelles. *Rec.*—FIG. 157,2. **B. torquata* (JULLIEN), E.Atl.; $\times 25$ (200).

Codonellina CANU-B., 1934 [*pro Codonella* CANU-B., 1927 (non HAECKEL, 1873)] [**Lepralia galeata* BUSK, 1854]. Frontal a tremocyst with ovicell porous and marginated. Median avicularium before aperture which is orbicular and with 2 false cardelles; oral glands. *Rec.*—FIG. 157,3. **C. galeata* (BUSK), S.Atl.; $\times 20$ (134).

Cryptostomella BASSLER, *nom. nov.* [*pro Cryptostoma* MARSSON, 1887 (ref. 96, p. 96) (non BLAINV., 1818)] [**Cryptostoma gastroporum* MARSSON, 1887]. *Cret.*—FIG. 158,4. **C. gastroporum* (MARSSON), Camp., Ger.; $\times 20$ (186).

Cyphonella KOSCHINSKY, 1885 [**C. nodosa*]. Slen-

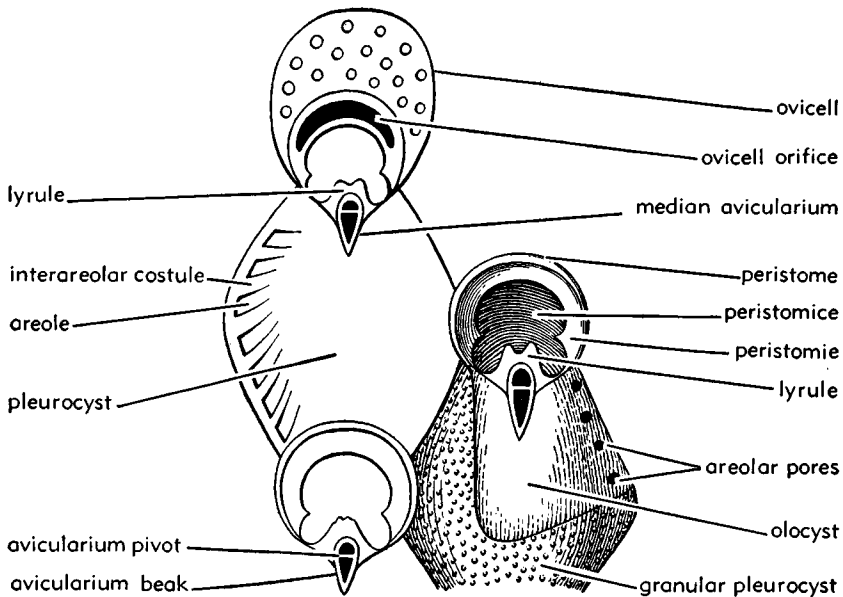


FIG. 156. Morphological features of the Mucronellidae.

der rods. Zoecia with strong frontal tremopores. *Eoc.*—FIG. 157,9. **C. nodosa*, Lut., Ger.; $\times 25$ (172).

Cystisella CANU-B., 1917 [*Eschara saccata* BUSK, 1856]. Erect branches and incrusting. Zoecial frontal an olocyst covered by a long avicularian chamber containing a pair of large glands. *Eoc.-Rec.*—FIG. 157,5. **C. saccata* (BUSK), Rec., Atl.; $\times 25$ (177).

Hemicyclopora NORMAN, 1894 [*Lepralia polita* HINCKS, 1880]. Cardelles placed low, olocyst and spines present. *Mio.-Rec.*—FIG. 157,11. **H. polita* (HINCKS), Rec., NE.Atl.; $\times 25$ (167).

Hemismittina VIG., 1949 [*Porella regularis* REUSS, 1865]. Differs from *Smittina* in absence of lyrule and peristomial notch and in having a large avicularian chamber. *Mio.*, Ger.

Jaculina JULLIEN, 1903 [*J. blanchardi*]. Like *Retepora* but with single row of zoecia; frontal olocyst. *Rec.*, Azores.

Malleatia JULLIEN, 1903 [*M. rara*]. Like *Jaculina* but zoecial front with minute pores and small avicularia. Lyrule and rimule with small triangular avicularium present. *Rec.*—FIG. 158,3. **M. rara*, E.Atl.; 3a,b, $\times 25$ (169).

Marguetta JULLIEN, 1903 [*M. pulchra*]. Free, bilamellar. Frontal bordered by areolar pores; no lyrule or cardelles; aperture entire, mucronate, with median avicularium. *Eoc.-Rec.*—FIG. 158,7. **M. pulchra*, E.Atl.; $\times 25$ (169).

Palmicellaria ALDER, 1864 [*P. elegans*]. Slender erect branches with elongate zoecia bearing thick high peristome, granular pleurocyst, frontal and

areolar pores but no lyrule or cardelles. *Mio.-Rec.*—FIG. 157,12. **P. elegans*, N.Atl.; $\times 10$ (167).

Parasmittina OSBURN, 1952 [*Lepralia jeffreysi* NORMAN, 1876]. Frontal a pleurocyst, avicularium median, lyrule well developed, porous ovicell. *Mio.-Rec.*

Phoceana JULLIEN, 1903 [*P. columnaris*]. Slender branches. Semicircular apertures with high peristome serving as a pseudolyrule; no cardelles. ?Ovicell. *Eoc.-Rec.*—FIG. 157,4. **P. columnaris*, Rec., E.Atl.; $\times 25$ (169).

Plagiosmittia CANU-B., 1917 [*P. regularis*]. Narrow bilamellar fronds. Zoecia in parallel longitudinal rows, frontal tremocyst and median avicularium in peristomie. *Eoc.-Oligo.*—FIG. 157,10. **P. regularis*, Eoc.(Claib.), N.Car.; 10a,b, $\times 25$ (137).

Porella GRAY, 1848 [*P. cervicornis* (= *Millepora compressa* SOWERBY, 1805)] [= *Marsillea* NEVIANI, 1895 (obj.); *Levineniula* COSSMAN, 1920]. Like *Smittina* but frontal is an olocyst or pleurocyst with median suboral avicularium; lyrule and cardelles absent. Ovicell imperforate. *Eoc.-Rec.*—FIG. 157,7. **P. compressa* (SOWERBY), Rec., N.Atl.; $\times 25$ (167).

Rhamphostomella VON LORENZ, 1886 [*R. costata*]. Incrusting. Frontal an olocyst with costules; asymmetrical sinus with lyrule. Large oblique salient avicularium before aperture. *Eoc.-Rec.*—FIG. 158,6. **R. costata*, Rec., N.Atl.; $\times 35$ (137).

Rimulostoma VIG., 1949 [*Peristomella costulata* DUVERGIER, 1920]. Incrusting. Frontal a costulate pleurocyst; aperture orbicular with proximal rim-

ule. *Mio.*—FIG. 157.6. **R. costulata* (DUVERGIER), Burdig., Fr.; $\times 25$ (224).
Schizosmittina VIG., 1949 [**S. planovicellata*]. Zoarium bifoliate. Frontal tremocyst; compensation sac opens by rimule in peristomie. *Tert.*—FIG. 158, 1. **S. planovicellata*, *Mio.* (Helv.), Fr.; $\times 25$ (224).
Smittina NORMAN, 1903 [*pro Smittia* HINCKS, 1879 (non HOLMGREN, 1869)] [**Lepralia landsborovii* JOHNSTON, 1847]. Frontal a granular or costate pleurocyst with marginal areolae or a tremocyst; lyrula and cardelles well developed; suboral median avicularium. Ovicell with pores. *Eoc.-Rec.*
S. (Smittina). *Eoc.-Rec.*—FIG. 157.1. **S. landsborovii* (JOHNSTON), *Rec.*, NE.Atl.; $\times 25$ (167).

S. (Reussia) NEVIANI, 1895 [**Eschara regularis* REUSS, 1865]. *Tert.*, Ger.
Smittinella CANU-B., 1934 [**Eschara tatei* T.-WOODS, 1877]. Like *Smittina* but proximal sinus of peristomie covered by peristome which thus is pierced by a spiramen. *Tert.*—FIG. 158.8. **S. tatei* (T.-WOODS), *Mio.*, S.Austral.; $\times 25$ (131).
Smittoidea OSBURN, 1952 [**Lepralia reticulata* JOHNSTON, 1847]. Frontal a pleurocyst with areolae; well-developed lyrula and median suboral avicularium; ovicell with pores. *Mio.-Rec.*—FIG. 157, 8. **S. reticulata* (JOHNSTON), *Rec.*, Atl.; $\times 25$ (137).
Vibraculina NEVIANI, 1895 [**V. conti*]. Stout

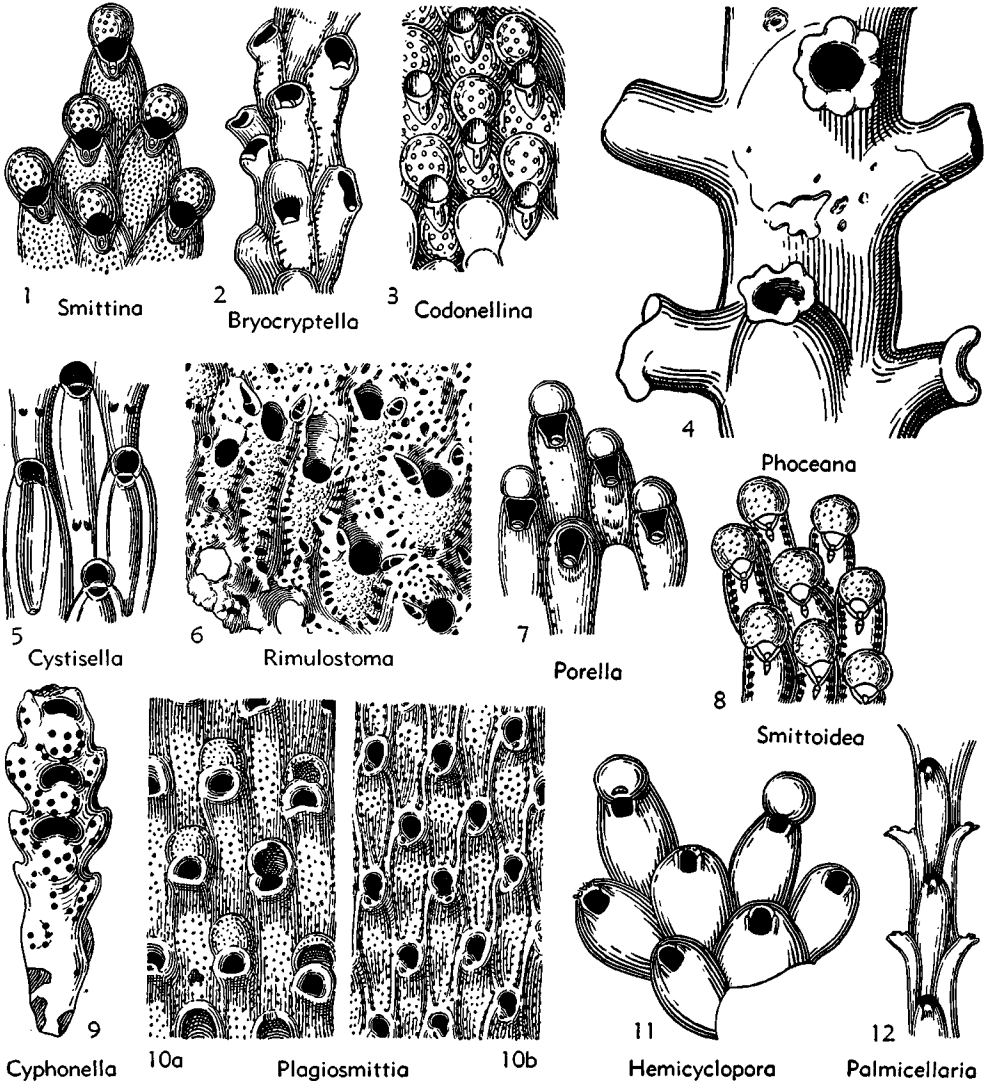


FIG. 157. Mucronellidae (p. G207-G209).

branches, large zoecia and median avicularia. *Tert.*—FIG. 158,2. **V. conti*, Plio., Italy; X25 (196).

Family TUBUCELLARIIDAE Busk, 1884

Zoaria erect, cylindrical or bilamellar, commonly jointed, radicate. Zoecia tubular, with much produced peristomie; thick-

walled porous zoecial front pierced by an ascopore; avicularia rare. Ovicell peristomial, formed by swelling of the much elongated peristomie (24). *Eoc.-Rec.*

Tubucellaria D'ORB., 1853 [**Cellaria cereoides* ELLIS-S., 1786]. Articulated, erect cylindrical segments. Zoecia with frontal ascopore just proximal

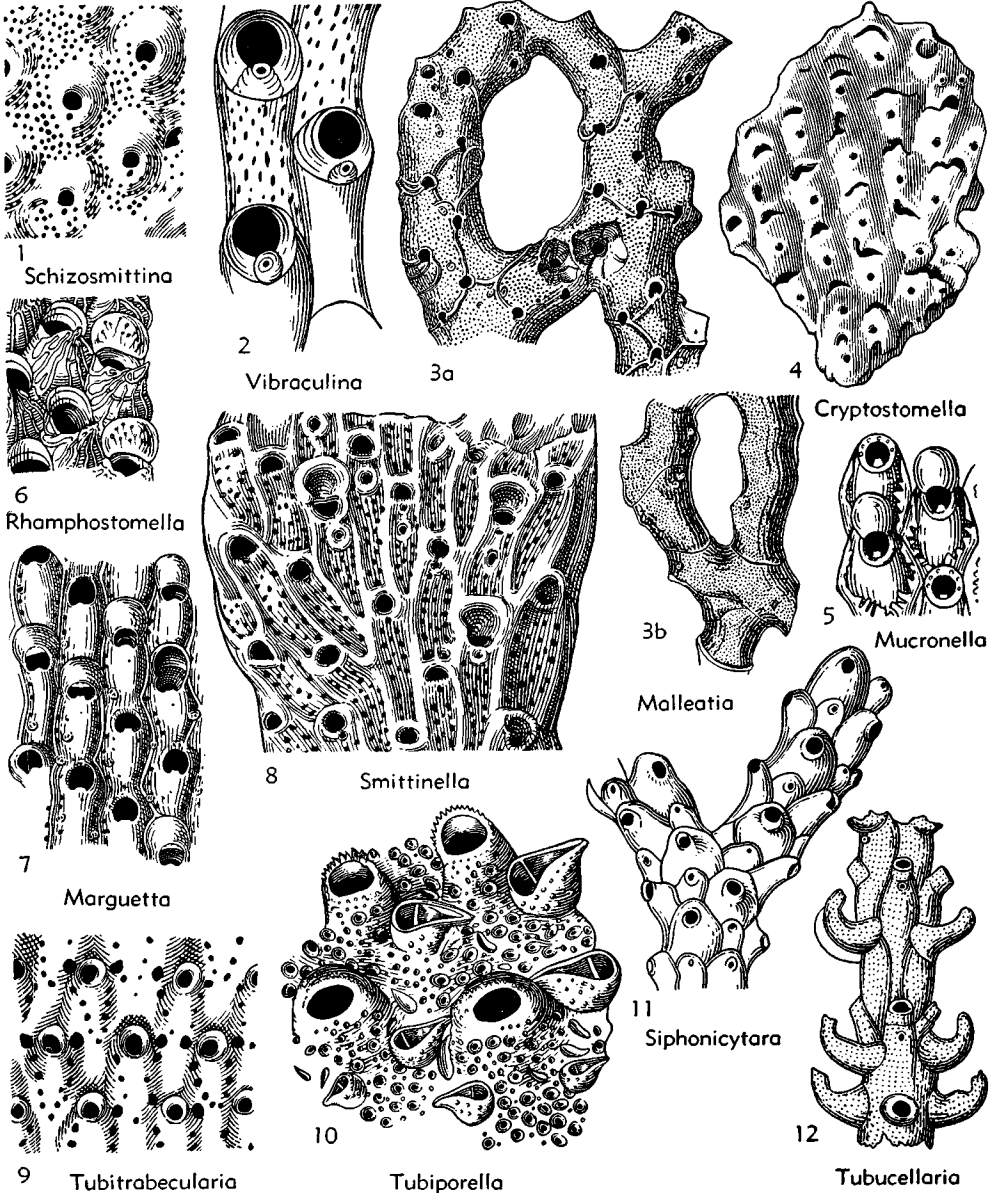


FIG. 158. Mucronellidae, Tubucellariidae (p. G207-G211).

to long peristomie. No avicularia. *Eoc.-Rec.*—FIG. 158,12. **T. cereoides* (ELLIS-S.), *Rec.*, *Medit.*; $\times 10$ (230).

Siphonicytara BUSK, 1884 [**S. serrulata*]. Continuous quadrilateral branches. Zoecia flattened, with extended tubular peristomes and a circular median pore. *Rec.*—FIG. 158,11. **S. serrulata*, E.Indies; $\times 10$ (134).

Tubiporella LEV., 1909 [**Lepralia magnirostris* MACGILL., 1883]. Foliaceous unilamellar expansions. Large avicularium at level of ascopore on each zoecium. *Tert.-Rec.*—FIG. 158,10. **T. magnirostris* (MACGILL.), *Rec.*, SW.Pac.; $\times 25$ (181).

Tubitrabecularia CANU-B., 1934 [**Eschara elevata* T.-WOODS, 1876]. Branched. Frontal an olocyst with peristomes strengthened by a trabecular net-

work. *Tert.*—FIG. 158,9. **T. elevata* (T.-WOODS), *Mio.*, Austral.; $\times 25$ (137).

Tubucella CANU-B., 1917 [**Eschara mammillaris* M.EDW., 1836]. Zoarium fixed bilamellar. Peristomial equal in length to frontal. Avicularia rare. *Eoc.*, Fr.

Family RETEPORIDAE Smitt, 1867

[=Sertellidae JULLIEN, 1903; Lepraliellidae VIG., 1949]

Zoarium generally erect or reticulate, not jointed. Zoecial front with row of areolar pores; peristomie well developed bearing rimule or spiramen (reteporidan pores); oral avicularia and spines. Projections (vibices) on back not connected with zoecia.

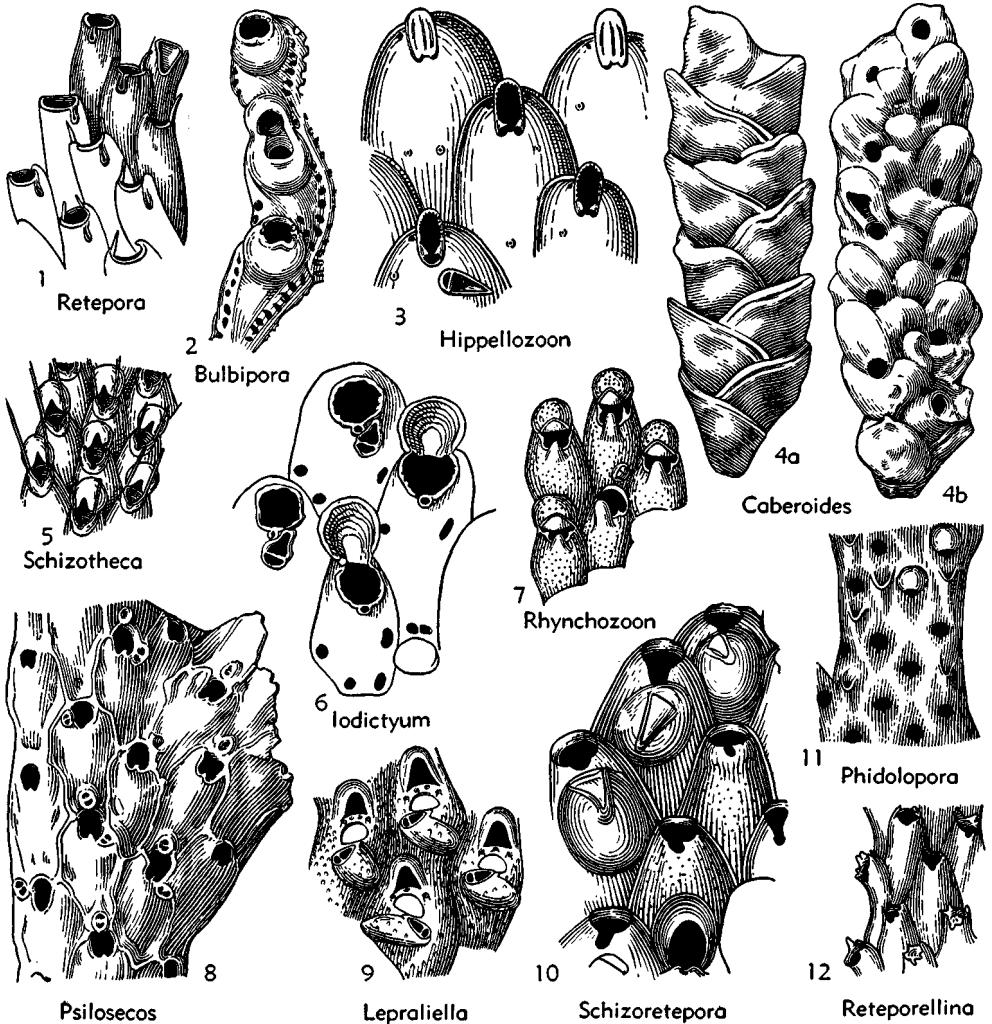


FIG. 159. Reteporidae (p. G212, G213).

Ovicell hyperstomial, deeply immersed in distal part of zoecium, opening widely or by a slot in the peristomie. (24,26,70). *Cret.-Rec.*

Retepora LAMARCK, 1801 [**Millepora cellulosa* LINNÉ, 1767][=*Elasmopora* KING, 1848 (obj.)]. Narrow, nonanastomosed branches arising from expanded base. Aperture entire, peristomie bearing a deep rimule-spiramen. Ovicell with a simple fissure. *Eoc.-Rec.*—FIG. 159,1. **R. cellulosa* (LINNÉ), *Rec.*, N.Atl.; $\times 25$ (167).

Bulbipora MACGILL, 1895 [**B. areolata*]. Incrusting. Ovicells wide open, smooth; areolae well marked. *Tert.*—FIG. 159,2. **B. areolata*, S.Austral.; $\times 25$ (181).

Caberoides CANU, 1908 [**C. canaliculata*]. Zoarium jointed. Zoecia biserial, with row of vibracula on front and elongate vibracula only on back. *Eoc.*—FIG. 159,4. **C. canaliculata*, Lut., Fr.; 4a,b, back, front, $\times 25$ (136).

Diplonotos CANU-B., 1930 [**D. costulatum*]. Reticulate, both sides covered by vibices, zoecia located on edge of branches. *Rec.*—FIG. 160,5. **D. costulatum*, E.Pac.; $\times 25$ (137).

Hippellozoon CANU-B., 1917 [**Retepora novaezealandiae* WATERS, 1895]. Fenestrate. Zoecial apertures with 2 cardelles; labial avicularium and rete-

poridan pore absent. *Rec.*—FIG. 159,3. **H. novaezealandiae* (WATERS), N.Z.; $\times 25$ (230).

Hippopozoon CANU-B., 1929 [**H. typicum*]. Like *Hippellozoon* but incrusting and with oral avicularium. *Eoc.*—FIG. 160,8. **H. typicum*, Belg.; $\times 25$ (137).

Iodictyum HARMER, 1933 [**Retepora phoenicea* BUSK, 1854]. Fenestrate. Ovicell with projecting lip (labellum) bearing a median keel. *Rec.*—FIG. 159,6. **I. phoenicea* (BUSK), SW.Pac.; $\times 50$ (164).

Leprabiella LEV., 1916 [**Cellepora ramulosa contigua* SMITT, 1867]. Zoecia with vestibular spine-bearing arch; aperture with cardelles; frontal a tremocyst. Ovicell widely open. *Rec.*—FIG. 159,9. **L. contigua* (SMITT), Balt.; $\times 25$ (177).

Phidolopora GABB-H., 1862 [**P. labiata*]. Reticulate. Frontal an olocyst; aperture semilunar, with concave proximal rim and a rimule-spiramen. *Pleisto.-Rec.*—FIG. 159,11. **P. labiata*, Pleisto., Calif.; $\times 25$ (154).

Plagiopora MACGILL., 1895 [**P. disticha*]. Erect narrow branches with biserial apertures on one side only. *Tert.*—FIG. 160,3. **P. disticha*, S. Austral.; 3a,b, $\times 25$ (181).

Psileschara BUSK, 1860 [**P. maderensis* BUSK, 1861]. Like *Plagiopora*. *Rec.*—FIG. 160,2. **P. maderensis* BUSK, E.Atl.; $\times 25$ (134).

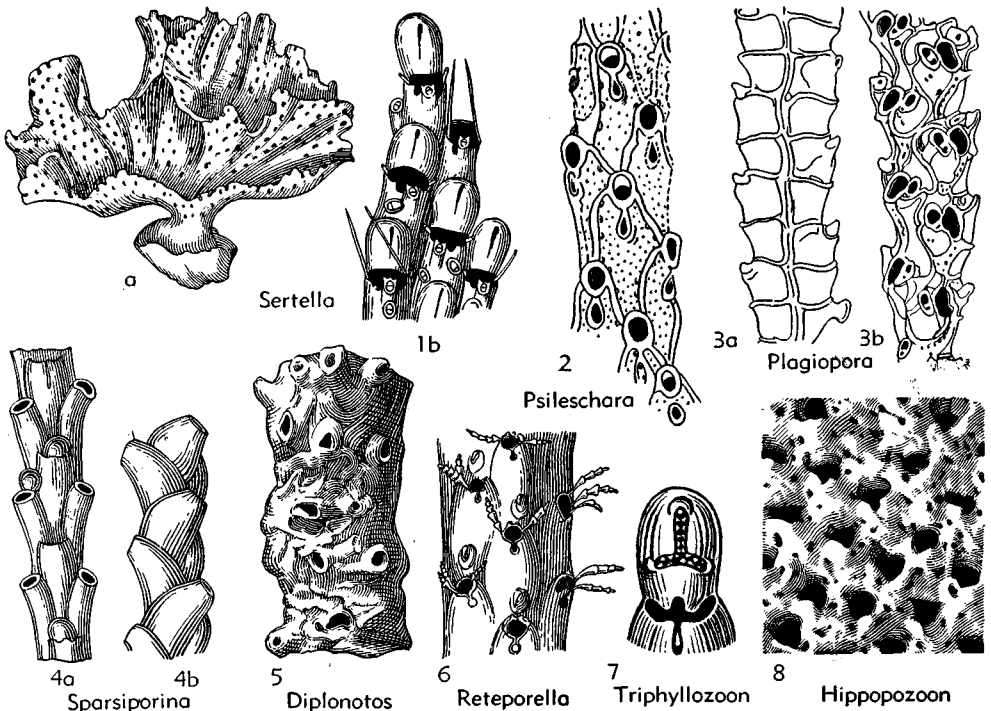


FIG. 160. Reteporidae (p. G212, G213).

- Psilosecos** CANU-B., 1933 [**Escharinella muralis* GABB-H., 1862]. Bifoliate branches with zoecial front an olocyst and aperture bearing a lyrula. *Eoc.*—FIG. 159,8. **P. muralis* (GABB-H.), Wilcox., N.J.; $\times 25$ (137).
- Reteporella** BUSK, 1884 [**R. flabellata*] [= *Radulina* MEISSNER, 1902]. Free branches in one plane, not reticulate. Apertures orbicular, with long labial fissure and 1 to 3 flat articulated spines on each side. *Rec.*—FIG. 160,6. **R. flabellata*, S.IndianO.; $\times 25$ (134).
- Reteporellina** HARMER, 1933 [**Retepora denticulata* BUSK, 1884]. Like *Reteporella* but zoarium not fenestrate and small pyriform ovicell. *Rec.*—FIG. 159,12. **R. denticulata* (BUSK), S.Pac.; $\times 25$ (134).
- Rhynchozoon** HINCKS, 1895 [pro *Rhynchopora* HINCKS, 1877 (non KING, 1850)] [**Lepralia bispinosa* JOHNSTON, 1847]. Incrusting. Olocyst with marginal areolae; aperture with an asymmetrical sinus. Ovicell entire. *Rec.*—FIG. 159,7. **R. bispinosa* (JOHNSTON), North Sea; $\times 25$ (167).
- Schizoretopora** GREGORY, 1893 [**Retepora tessellata* HINCKS, 1878] [= *Schizellozoon* CANU-B., 1917]. Fenestrate zoarium. Ovicell widely open with semi-circular slit. No reteporidan pore. Poster of aperture has wide sinus. *Rec.*—FIG. 159,10. *S. imperati* (BUSK), SW.Pac.; $\times 25$ (134).
- Schizotheca** HINCKS, 1877 [**Lepralia fissa* BUSK, 1858]. Incrusting. Zoecial aperture sinuate and notched. Ovicell terminal, with broad fissure. *Rec.*—FIG. 159,5. **S. fissa* (BUSK), NE.Atl.; $\times 25$ (167).
- Sertella** JULLIEN, 1903 [**Retepora beaniana* KING, 1846; SD CANU-B., 1920] [= *Ellipsia* JULLIEN, 1903]. Reticulate. Zoecial front smooth, with areolar pores. Ovicell with long median fissure. *Rec.*—FIG. 160,1. **S. beaniana* (KING), Rec., E.Atl.; *1a,b*, $\times 1$, $\times 25$ (137).
- Sparsiporina** D'ORB., 1852 [**Retepora elegans* REUSS, 1848]. Linear, erect, compressed branches with 3 or 4 rows of apertures. *Tert.*—FIG. 160,4. **S. elegans* (REUSS), Mio., Aus.; *4a,b*, front, back, $\times 25$ (137).
- Triphylozoon** CANU-B., 1917 [*Retepora monilifera* MACGILL., 1860]. Fenestrate. Apertures entire; trifoliate fissure in ovicell. *Rec.*—FIG. 160,7. **T. monilifera* (MACGILL.), SW.Pac.; $\times 50$ (230).
- Uniretopora** D'ORB., 1849 [**Retepora granulosa* MICH., 1847] [(?*=Hornera*)]. *Tert.*, Fr.
- Family ADEONIDAE** Jullien, 1903
[=Adeonellidae, Inversiliidae, Smittistomidae VIG., 1949]
- Zoaria incrusting to erect, anastomosing. Zoecial front a thick pleurocyst with tubular areolar pores (parietal areolae) closed over at the surface and connecting with septulae arranged in line with them; primary aperture at bottom of deep peristomial tube. Ovicells developed on special gonozoecia larger than the ordinary zoecia.
- Rubbing away one face of the zoarium, so as to reveal the areolae, is a sure test for the family (24). *Eoc.-Rec.*
- Adeona** LAMX., 1812 [**A. grisea* LAMX., 1816; SD GREGORY, 1893] [= *Reptoporellina* D'ORB., 1853; *Multiporina* GABB-H., 1862 (non D'ORB., 1852); *Dictyopora* MACGILL., 1868 (obj.); *Reptadeonella* BUSK, 1884; *Heckelia* NEVIANI, 1895]. Typically bilamellar anastomosing. Frontal thick, with ascopore opening into compensatrix near center. Gonozoecia larger and with wider apertures than ordinary zoecia. *Tert.-Rec.*—FIG. 161,1. **A. grisea* LAMX., Rec., SW.Pac.; *1a,b*, $\times 0.5$, $\times 25$ (181).
- Adeonella** BUSK, 1884 [**A. polymorpha*] [= *Reusina* NEVIANI, 1895]. Narrow, flat bilamellar branches. Peristomie perforated by spiramen but no median ascopore. *Eoc.-Rec.*—FIG. 161,9. **A. polymorpha*, Rec., SW.Pac.; $\times 50$ (134).
- Adeonellopsis** MACGILL., 1886 [**A. foliacea*] [= *Cribricella* CANU, 1904 (non LEV., 1909)]. Like *Adeonella* with one or more ascopores grouped at base of a cribriform area in middle line. *Eoc.-Rec.*
- A. (Adeonellopsis)**. *Eoc.-Rec.*—FIG. 161,4. **A. (A.) foliacea*, Rec., SW.Pac.; $\times 25$ (181).
- A. (Lobopora)** LEV., 1902 [**Eschara coscinophora* REUSS, 1847] [= *Cribricella* CANU, 1904 (obj.) (non LEV., 1909)]. Mio., Eur.
- A. (Ovaticella)** MAPLE., 1900 [**O. turbinata*]. *Tert.*, Austral.
- A. (Poricella)** CANU, 1904 [**P. macconica*]. *Eoc.*, Tunisia.
- Anarthropora** SMITT, 1868 [**Lepralia monodon* BUSK, 1868]. Incrusting. Like *Triporula* but lacks the 2 proximal avicularia. *Eoc.-Rec.*—FIG. 161,2. **A. monodon* (BUSK), Rec., NE.Atl.; $\times 25$ (134).
- Bracebridgia** MACGILL., 1886 [**Mucronella pyriformis* BUSK, 1884] [= *Porostoma* CANU, 1907]. Like *Adeonella* but suboral and larger vicarious avicularia present. *Eoc.-Rec.*—FIG. 161,8. **B. pyriformis* (BUSK), Rec., SW.Pac.; $\times 50$ (177).
- Calvetina** CANU, 1908 [**C. ventricosa*]. Bilamellar. Zoecia celloporoid with porous front bearing a large avicularium and gonozoecia with large elliptical aperture. *Eoc.*—FIG. 161,11. **C. ventricosa*, Lut., Fr.; $\times 25$ (136).
- Cyclostomella** ORTMANN, 1889 [**C. articulata*]. Erect branches. Zoecia narrow, elongate, articulated. *Rec.*—FIG. 161,10. **C. articulata*, NW.Pac.; $\times 20$ (203).
- Dimorphocella** MAPLE., 1903 [**D. pyriformis*]. An ascopore on gonozoecia only, oral sinus on other zoecia. *Tert.*—FIG. 161,5. **D. pyriformis*, Austral.; $\times 25$ (184).
- Duvergiera** VIG., 1949 [**Meniscopora? patens* DUVERGIER, 1928]. Incrusting. Frontal a tremocyst; peristome orbicular with cardelles. *Mio.*—FIG. 161,7. **D. patens* (DUVERGIER), Burdig., Fr.; $\times 25$ (224).

Inversiula JULLIEN, 1888 [*I. nutrix*]. Frontal a tremocyst with stellate pores. Avicularia but no spines, no ovicells. Convexity of ascopore turned toward elliptical aperture. *Mio.-Rec.*—FIG. 161, 3. *I. nutrix*, Rec., SW.Atl.; $\times 25$ (169).

Laminopora MICH., 1842 [*L. contorta*] [= *Tremadeona* CANU-B., 1920]. Narrow bilamellar branches. Zoecial front a tremocyst with nonstellate pores; aperture very elongate with 2 cardelles. *Mio.-Rec.*—FIG. 161, 6. *L. contorta*, Rec., Atl.; $\times 25$ (230).

Meniscopora GREGORY, 1893 [*M. bigibbera*]. Bifoliate expansion. Frontal with lateral areolae. No ascopore on either gonozoecia or ordinary zoecia. *Paleoc.-Mio.*—FIG. 162, 7. *M. bigibbera*, Paleoc., Eng.; $\times 40$ (158).

Schizostomella CANU-B., 1927 [*pro Schizostoma* CANU, 1907 (*non* LEA, 1842)] [*Schizostoma crassum* CANU, 1908]. Bilamellar. Frontal with

large oval gonozoecia. *Eoc.*—FIG. 162, 5. *S. crassum* (CANU), Lut., Fr.; $\times 25$ (137).

Schizotremopora VIG., 1949 [*Meniscopora irregularis* CANU, 1915]. Bilamellar. Tremocyst with rimule; marginal zoecia wider than axial ones. *Mio.*—FIG. 162, 1. *S. irregularis* (CANU), Aquit., Fr.; $\times 25$ (224).

Smittistoma CANU, 1907 [*Eschara mortisagum* STOLICZKA, 1862]. Bilamellar. Like *Smittina* but bears large gonozoecia and oral avicularia. *Eoc.*—FIG. 162, 8. *S. mortisagum* (STOLICZKA), Latt., Ger.; $\times 25$ (137).

Teichopora GREGORY, 1893 [*T. clavata*]. Foliaceous. Pyriform zoecia with large orbicular apertures, marginal areolae and avicularium just below orifice. Gonozoecia irregularly placed. *Eoc.*—FIG. 162, 4. *T. clavata*, Barton., Eng.; $\times 50$ (158).

Trigonopora MAPLE., 1902 [*T. vermicularis*] [= *Metrarabdotos* CANU, 1914]. Incrusting to bila-

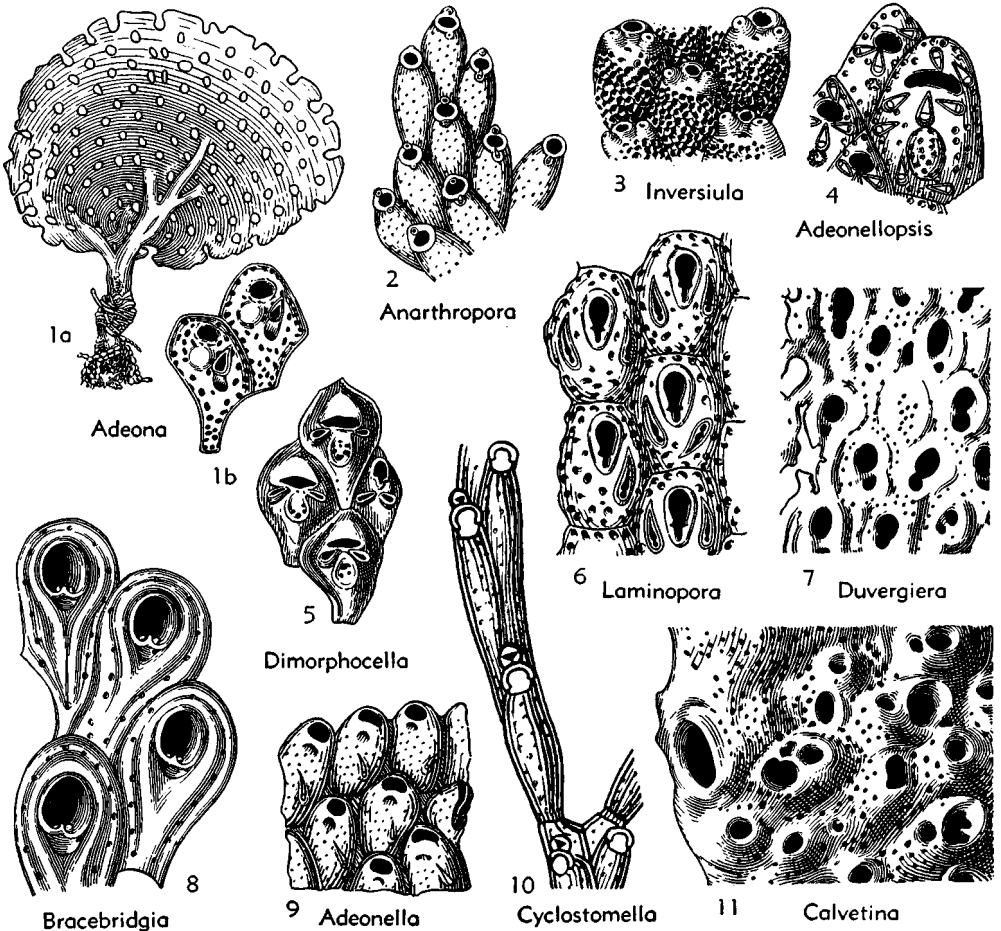


FIG. 161. Adeonidac (p. G213, G214).

mellar fronds. Zooecial front a pleurocyst with areolae; ordinary apertures semilunar, with rounded sinus and cardelles. Very large ovicells borne on gonozooecia with much larger lunate apertures. *Eoc.-Rec.*—FIG. 162,2. *T. monilifera* (M.EDW.), *Plio.*, Eng.; $\times 25$ (134).—FIG. 162,3. **T. vermicularis*, *Mio.*, Austral.; $\times 25$ (131).

Triporula CANU-B., 1927 [**Escharipora stellata* SMITT, 1873]. Incrusting. Frontal with semicircular apertures and stellate pores; 3 avicularia; no ovicell or spines. *Mio.-Rec.*—FIG. 162,6. **T. stellata* (SMITT), *Rec.*, GulfMex.; $\times 25$ (236).

Family CHEILOPORINIDAE Bassler, 1936

[=Cryptosulidae, Watersporidae VIG., 1949]

Zoarium incrusting to bilamellar. Frontal wall thin, with tremocyst pores; aperture without peristome, anterior and posterior parts separated by 2 cardelles. Ovicell endozooecial (24). *Cret.-Rec.*

Cheiloporina CANU-B., 1923 [**Hippoporina circumcincta* NEVIANI, 1896]. Incrusting. Apertures with cardelles and pair of small converging avicularia. Ovicell aperture broader than others. *Eoc.-Rec.*—FIG. 163,2. *C. haddoni* (HARMER), *Rec.*, SW.Pac.; $\times 25$ (164).

Cheilopora LEV., 1909 [**Discopora sincera* SMITT, 1867]. Incrusting. Frontal with minute tremocyst pores in quincunx. No cardelles. *Rec.*—FIG. 163,7. **C. sincera* (SMITT), N.Atl.; $\times 25$ (199).

Cianotremella CANU, 1911 [**C. gigantea*]. Incrusting. Frontal smooth. Ovicell opens by a large salient transverse pore. *Cret.*—FIG. 163,4. **C. gigantea*, Rocanean, Arg.; $\times 25$ (136).

Cryptosula CANU-B., 1925 [**Eschara pallasiana* MOLL, 1803]. Incrusting, lamellate. Frontal with wide open pores and broad aperture. No external ovicell. *Plio.-Rec.*—FIG. 163,10. **C. pallasiana* (MOLL), *Rec.*, NE.Atl.; $\times 25$ (137).

Cucullipora MACGILL., 1895 [**C. tetrasticha*]. Ribbon-like, bifoliate. Aperture elongate with cardelles at mid-height. Tremocyst of large pores. *Tert.*—FIG. 163,1. **C. tetrasticha*, *Mio.*, S.Austral.; $\times 25$ (181).

Diploecium KIRKPATRICK, 1888 [**D. simplex*]. Like *Tetraplaria* but segments with only 2 zooecia. *Rec.*—FIG. 163,6. **D. simplex*, IndianO.; 6a,b, with ovicell, $\times 25$ (171).

Enantiosula CANU-B., 1930 [**E. manica*]. Superposed lamellae. Frontal tremocyst; operculum bell-shaped; 2 large, converging oral avicularia. *Rec.*—FIG. 163,11. **E. manica*, E.Pac.; $\times 25$ (137).

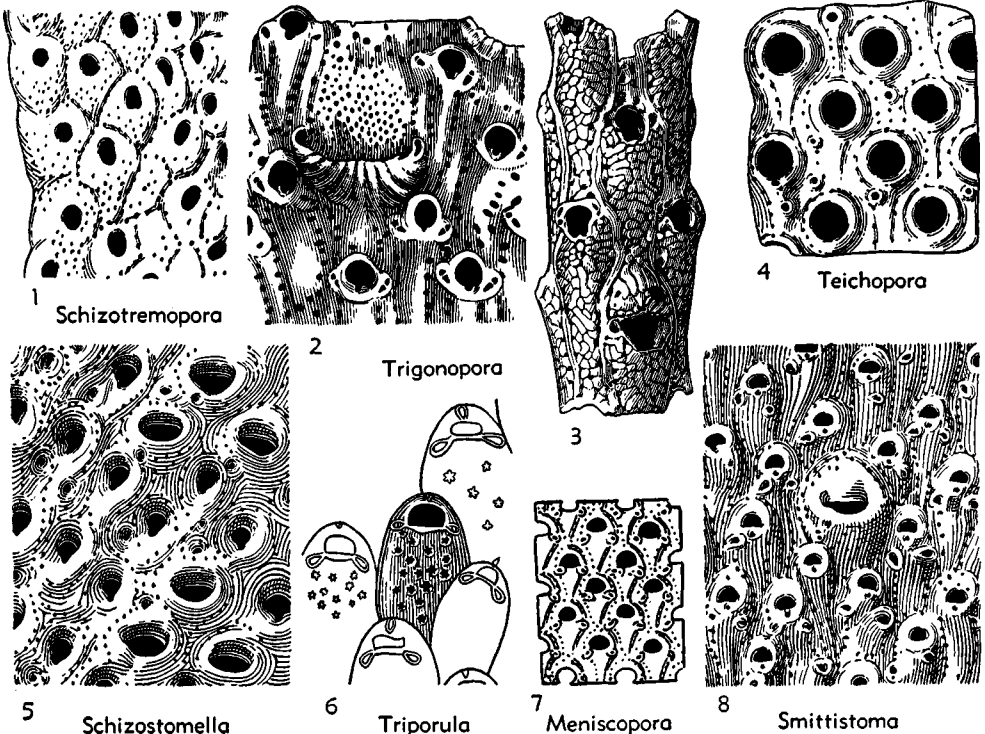


FIG. 162. Adeonidae (p. G214, G215).

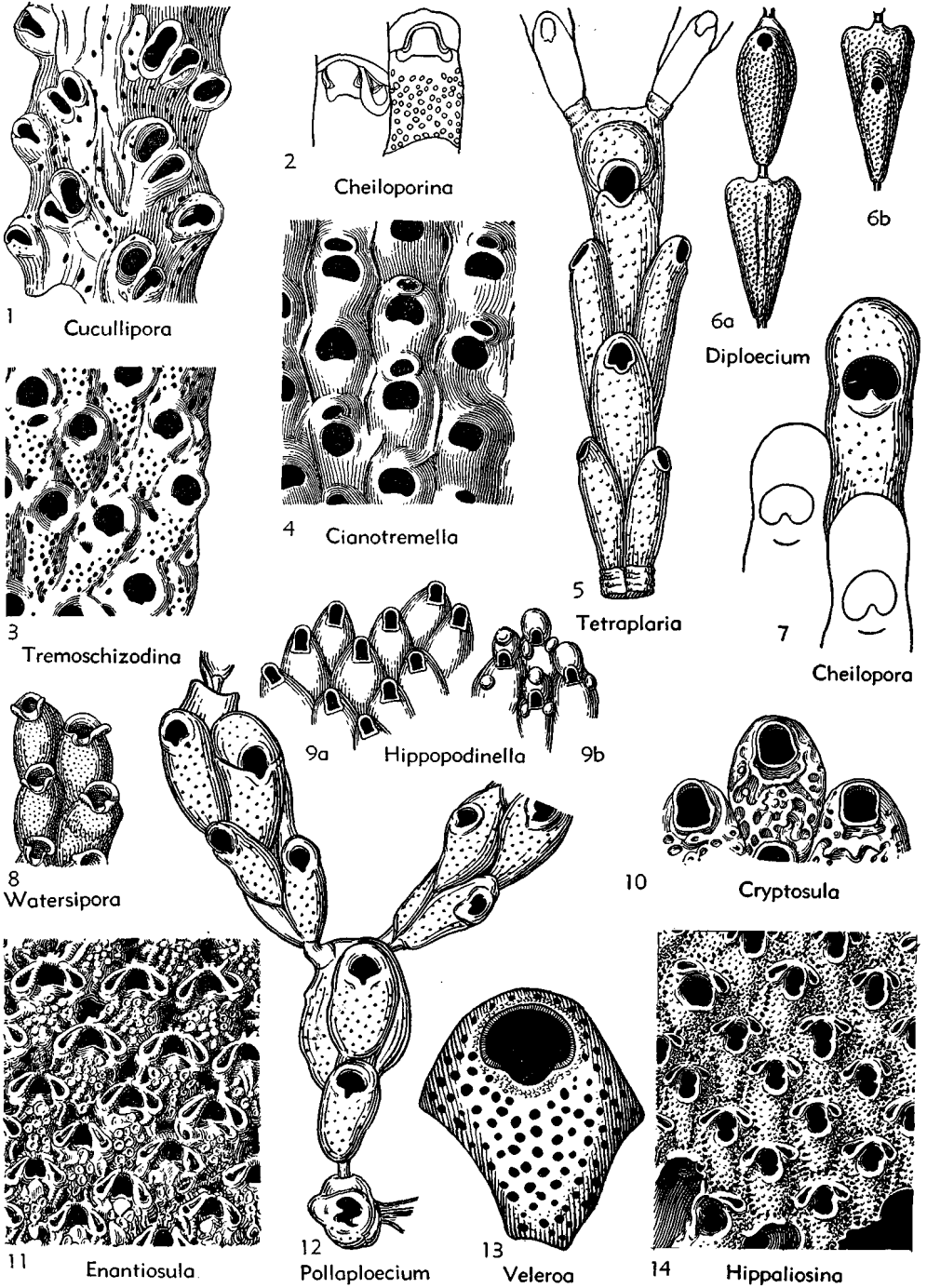


FIG. 163. Cheiloporinidae (p. G215-G217).

Hippaliosina CANU, 1918 [**Escharella rostrigera* SMITT, 1872]. Incrusting. Frontal a granular pleurocyst with prominent areolae. Aperture elongate with distinct cardelles and avicularium on each side. *Cret.-Rec.*—FIG. 163,14. **H. rostrigera* (SMITT), *Rec.*, Gulf Mex.; $\times 25$ (137).

Hippopodinella BARROSO, 1926 [**Lepralia adpressa* BUSK, 1854]. Generally incrusting on gastropods. Frontal a tremocyst with minute pores and lateral walls perforated by parietal dietellae. Aperture with cardelles. *Plio.-Rec.*—FIG. 163,9. **H. adpressa* (BUSK), *Rec.*, SE.Pac.; 9a,b, normal zoecia, ovicells, $\times 25$ (134).

Pollaplocium MAPLE., 1909 [**P. gilbertensis*]. Like *Tetraplaria* but segments of 6 to 8 zoecia. *Rec.*—FIG. 163,12. **P. gilbertensis*, C.Pac.; $\times 25$ (184).

Tetraplaria T.WOODS, 1878 [**T. australis*] [= *Bigemellaria* MACGILL., 1895; *Arborella* OSBURN, 1914]. Zoarium erect, jointed, with 4 longitudinal alternating rows of zoecia, back to back. *Eoc.-Rec.*—FIG. 163,5. **T. australis*, Tert., Austral., $\times 25$ (204).

Tremoschizodina DUVERGIER, 1921 [**T. pisciformis*]. Bilamellar. Frontal a tremocyst with small pores unpigmented. Aperture with broad proximal sinus (rimule). Avicularia rare but large. *Mio.-Rec.*—FIG. 163,3. **T. pisciformis*, Mio.(Helv.), Fr.; $\times 25$ (148).

Veleroa OSBURN, 1952 [**V. veleronis*]. Like *Watersipora* in nature of frontal and absence of ovicell. *Rec.*, E.Pac.—FIG. 163,13. **V. veleronis*, $\times 60$ (204).

Watersipora NEVIANI, 1895 [**Lepralia cucullata* BUSK, 1854]. Incrusting, dark-pigmented. Frontal a tremocyst with large pores. Aperture with broad rounded sinus and conspicuous cardelles. *Mio.-Rec.*—FIG. 163,8. **W. cucullata* (BUSK), *Rec.*, E. Medit.; $\times 25$ (135).

Family PARMULARIIDAE Maplestone, 1912

Zoaria small bilamellar basally attached by stolons. Zoecia with tremocyst frontal and hyperstomial ovicells closed by operculum (31). *Cret.-Rec.*

Parmularia MACGILL., 1887 [**Eschara obliqua* MACGILL., 1868]. Zoarium irregularly lobed, bilamellar; zoecia with tremocyst frontal and schizoporidan aperture. *Tert.-Rec.*—FIG. 164,8. **P. obliqua* (MACGILL.), *Rec.*, SW.Pac.; $\times 25$ (181).

Bathystomella STRAND, 1928 [*pro Bathystoma* MARSON, 1887 (non FITZINGER, 1874)] [**Eschara cordiformis* HAG., 1846]. Zoecia convex; frontal with large tremocyst pores; deeply buried apertures. *Cret.*—FIG. 164,9. **B. cordiformis* (HAG.), Camp., Ger.; $\times 25$ (160).

Lanceopora D'ORB., 1851 (non REUSS, 1874) [**L. elegans*] [= *Lanceolopora* JELLY, 1889]. Probably same as *Parmularia* although zoecia figured with circular aperture. *Rec.*—FIG. 164,7. **L. elegans*, E.Indies; $\times 25$ (202).

Family PHYLACTELLIPORIDAE Bassler, nov.

Incrusting. Zoecia with well-developed peristomie bearing a protective organ (lyrula, mucron) for the compensatrix. Aperture entire or with cardelles. Ovicell hyperstomial, recumbent, with large orifice on distal wall and closed by special operculum. Frontal a tremocyst with small pores and in some with areolae (24). *Cret.-Rec.*

Phylactellipora BASSLER, *nom. nov.* [*pro Phylactella* CANU-B., 1929 (ref. 31, p. 407) (non HINCKS, 1880)] [**Lepralia collaris* NORMAN, 1867]. Zoecia with circular aperture, bearing cardelles and a lyrula. Peristome funnel-shaped, ovicell salient, globular. *Eoc.-Rec.*—FIG. 164,1. *P. hincksi* BASSLER, *nom. nov.* [*pro Phylactella labrossa* HINCKS, 1880 (ref. 75, p. 357, pl. 41, fig. 1-2) (non BUSK, 1854)], *Rec.*, Atl., Eng.; $\times 25$ (167).

Cheilonea KOSCHINSKY, 1885 [**C. gigas*]. Large uniserial zoecia with smooth frontal, fine marginal pores and minute proximal denticles. *Eoc.*—FIG. 164,2. **C. gigas*, Lut., Ger.; $\times 25$ (172).

Hippolyrula VIG., 1949 [**Peristomella crassilabiata* DUVERGIER, 1920]. Frontal a granular pleurocyst, much developed peristomie, delicate cardelles and lyrula. *Mio.*—FIG. 164,5. **H. crassilabiata* (DUVERGIER), Burdig., Fr.; $\times 25$ (224).

Phylactellina STACH, 1936 [**P. cowandillensis*]. *Tert.*, Austral.

Pleurolyrula VIG., 1949 [**Perigastrella lata* DUVERGIER, 1920]. Like *Hippolyrula* but cardelles absent. *Mio.*—FIG. 164,6. **P. lata* (DUVERGIER), Burdig., Fr.; $\times 30$ (224).

Pleuromucrum VIG., 1949 [**P. saucateusis*]. Like *Pleurolyrula* but mucron replaces lyrula. *Mio.*—FIG. 164,3. **P. saucateusis*, Burdig., Fr.; $\times 25$ (224).

Tremolyrula VIG., 1949 [**T. incrustans*]. Orbicular aperture, peristomie with lyrula; tremocyst of very fine pores. *Mio.*—FIG. 164,4. **T. incrustans*, Helv., Fr.; $\times 25$ (224).

Family PHYLACTELLIDAE Canu & Bassler, 1917

[= Perigastrellidae VIG., 1949]

Incrusting. Like Phylactelliporidae but no organs for protection of compensatrix developed in the peristomie. Ovicell recumbent (24,31). *Cret.-Rec.*

Phylactella HINCKS, 1880 [**Lepralia labrosa* BUSK, 1854; SD CANU-B., 1920][=*Alysidota* BUSK, 1856 (non AGASSIZ, 1846) (obj.); *Alysidotella* STRAND, 1928 (obj.)]. Like *Phylactellipora* but has no lyrula. *Eoc.-Rec.*—FIG. 165,2. **A. labrosa* (BUSK), *Rec.*, Atl., Ire.; $\times 25$ (134).

Hemiphylactella VIG., 1949 [**H. pulchra*]. Like *Hippophylactella* but with pleurocyst frontal. *Mio.*—FIG. 165,3. **H. pulchra*, Burdig., Fr.; $\times 25$ (224).

Hippophylactella VIG., 1949 [**Phylactella aquitanica* DUVERGIER, 1920]. Frontal a well-developed tremocyst; cardelles placed low; thick orbicular peristome. *Mio.*—FIG. 165,9. **H. aquitanica* (DUVERGIER), Aquit., Fr.; $\times 30$ (224).

Lagenipora HINCKS, 1877 (non WATERS, 1899) [**L. socialis*]. Zoecia flask-shaped with free tubu-

lar extremity; frontal a fine tremocyst. No special organs. *Cret.-Rec.*—FIG. 165,4. **L. socialis*, *Rec.*, NE.Atl.; $\times 25$ (167).

Nimba JULLIEN, 1903 [**N. praetexta*]. Like *Nimbella* but with frontal pleurocyst, cardelles separated by a rimule. *Rec.*—FIG. 165,5. **N. praetexta*, E.Atl.; $\times 25$ (169).

Nimbella JULLIEN, 1903 [**N. limbata*]. Uniserial zoecia with smooth frontal, keyhole-shaped aperture, 2 cardelles and a rimule; expanded peristome like an areola with large pores. *Rec.*—FIG. 165,6. **N. limbata*, E.Atl.; $\times 25$ (169).

Perigastrella CANU-B., 1917 [**Discopora coccinea labiata* SMITT, 1867]. Frontal with areolae and pleurocyst. Aperture semicircular entire with oral spines. *Cret.-Rec.*—FIG. 165,1. **P. labiata* (SMITT), *Rec.*, Atl.; $\times 25$ (137).

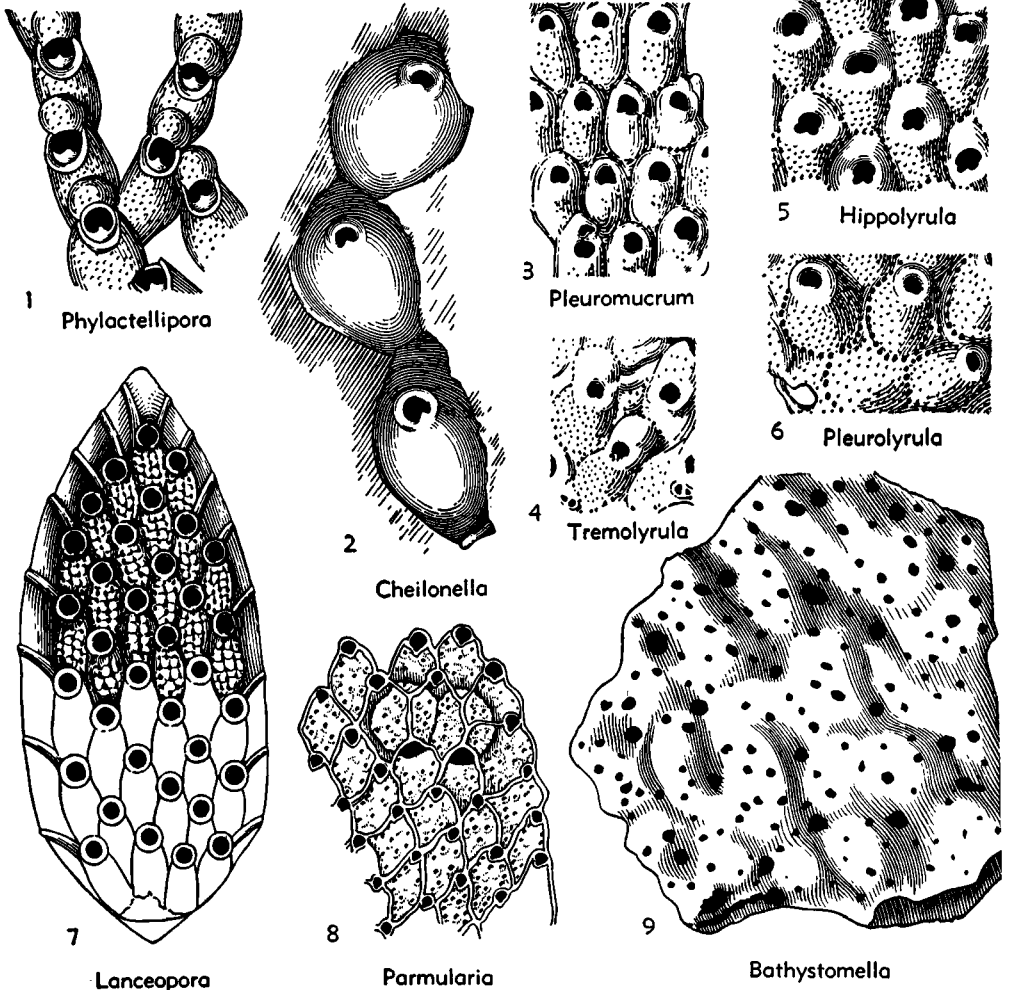


FIG. 164. Parmulariidae, Phylactelliporidae (p. G217).

Psilopsella CANU-B., 1927 [**P. uniseriata*]. Large uniserial zooecia surrounded by parietal diatellae, frontal] outlined by large areolae. *Rec.*—FIG. 165,8. **P. uniseriata*, SW.Pac.; $\times 10$ (131).
Temachia JULLIEN, 1882 [**T. opulenta*]. Suberect

zooecia narrowed like bottle neck; tremocyst. *Rec.*, E.Atl.
Teuchopora NEVIANI, 1895 [**Alecto castrocariensis* MANZONI, 1875]. Biserial generally lageniform zooecia with tremopores and salient peristomie.

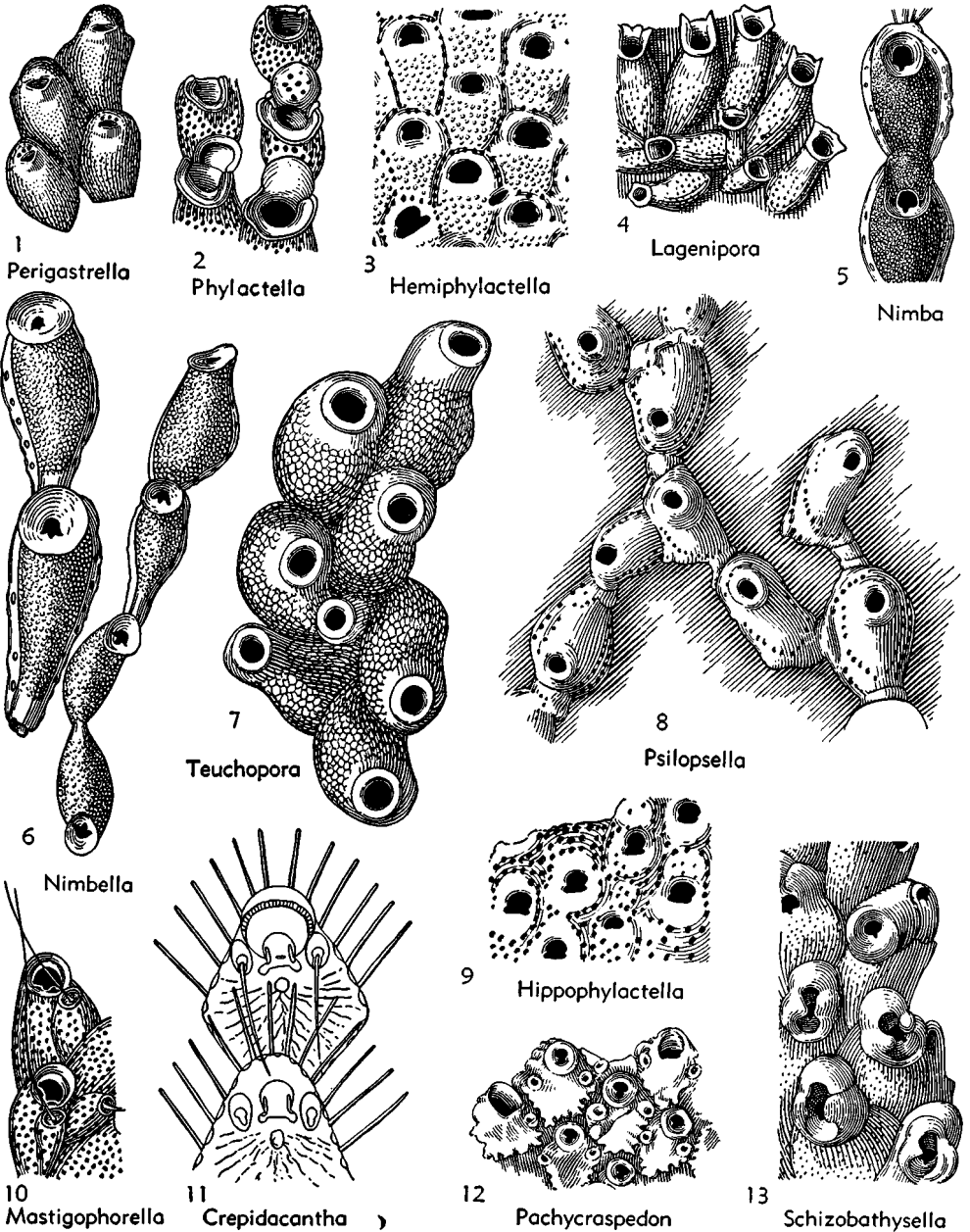


FIG. 165. Phylactellidae, Crepidacanthidae (p. G218-G220).

Plio.—FIG. 165,7. **T. castrocariensis* (MANZONI), Italy; $\times 25$ (183).

Family CREPIDACANTHIDAE Levinsen, 1909

[=Schizobathysellidae VIG., 1949]

Incrusting. Zoecial apertures with chitinized operculum, well-developed cardelles, long oral and marginal setiform spines corresponding to parietal dietellae, and paired avicularia. Ovicell hyperstomial, recumbent, closed by operculum. Frontal a fine-pored tremocyst (24,31). *Cret.-Rec.*

Crepidacantha LEV., 1909 [**C. poissoni crinispina* LEV., 1909]. Aperture broad proximally, without sinus, cardelles especially developed; long setiform spines and paired avicularia prominent. *Cret.-Rec.*—FIG. 165,11. **C. crinispina* (LEV.), Rec., SW. Pac.; $\times 50$ (177).

Mastigophorella BASSLER, *nom.nov.* [pro *Mastigophora* HINCKS, 1877¹ (non FELDER, 1875)] [**Lepralia hyndmanni* JOHNSTON, 1847]. Aperture semilunar, with narrow sinus in straight proximal border; pores of tremocyst well marked; lateral vibracula. *Eoc.-Rec.*—FIG. 165,10. **M. hyndmanni* (JOHNSTON), Rec., N.Atl.; $\times 25$ (167).

Pachycraspedon KOSCHINSKY, 1885 [**P. clarum*]. Like *Mastigophora* but frontal smooth or granulose. *Eoc.*—FIG. 165,12. **P. clarum*, Ger.; $\times 25$ (172).

Schizobathysella CANU-B., 1917 [**S. saccifera*]. Frontal of minute tremopores; aperture with salient peristomie interrupted by large incomplete spiramen. Avicularium vibraculoid. *Eoc.*—FIG. 165,13. **S. saccifera*, Claib., N.Car.; $\times 25$ (137).

Family CELLEPORIDAE Busk, 1852

[=Aulopocellidae, Kleidionellidae, Schismoporidae, Tegminulidae VIG., 1949]

Zoaria incrusting, ramose, or massive. Zoecia erect, heaped up and unoriented except at zoarial growing edge. Oral and vicarious avicularia of many sizes, shapes, and variously posed. Ovicell hyperstomial, recumbent (24). *Cret.-Rec.*

WATERS (1913) divided the family into groups based on apertural characters, as holostomatous (without sinus) and schizostomatous (with sinus); CANU & BASSLER (1920) added a clithridiate (keyhole) group. VIGNEAUX (1949) defined these as new families. Until better known, it seems preferable to unite them and with addition of 2 other families of VIGNEAUX to designate the whole assemblage by the well-known, although poorly defined name of Celleporidae.

Cellepora LINNÉ, 1767 [**C. pumicosa*; SD HINCKS, 1880]. Cumulate (celleporid) zoecia. Name employed loosely for many species of doubtful affinities. *Eoc.-Rec.*—FIG. 166,1. **C. pumicosa*, Rec., Atl.; 1a,b, $\times 25$ (167).

Acanthionella CANU-B., 1917 [**Escharifora typica* GABB-H., 1862]. Narrow bifoliate branches. Aperture oval with a long lyrula. Frontal a thick olocyst with avicularia. *Cret.-Eoc.*—FIG. 166,3. **A. typica* (GABB-H.), Eoc.(Wilcox.), N.J.; $\times 25$ (154).

Aulopocella MAPLE., 1903 [pro *Solenopora* MAPLE., 1903 (non DYBOWSKI, 1877)] [**Solenopora tubulifera* MAPLE., 1903]. Celleporid with recumbent ovicell. Oval aperture with a tubular process bearing circular pore at summit. *Rec.*—FIG. 166,14. **A. tubulifera* (MAPLE.), SW.Pac.; $\times 25$ (184).

Costazia NEVIANI, 1895 [**Cellepora costazii* AUDOUIN, 1826] [= *Cyclopora* NEVIANI, 1895; *Lagenipora* WATERS, 1899 (non HINCKS, 1877); *Siniopelta* LEV., 1909 (obj.)]. Aperture sinuate; frontal bordered by pores and tall, erect process on each side of aperture. *Oligo.-Rec.*—FIG. 166,9. **C. costazii* (AUDOUIN), Rec., Medit.; 9a,b, ovicells, normal zoecia, $\times 25$ (167).

Dentiporella BARROSO, 1926 [**Cellepora sardonica* WATERS, 1879]. Incrusting. Toothed anter; pleurocyst; aperture with cardelles. *Rec.*—FIG. 166,4. **D. sardonica* (WATERS), Medit.; $\times 25$ (230).

Harmerella LAGAATJ, 1952 [**Cellepora dichotoma* HINCKS, 1852]. Lateral spiramen in proximal lip of peristome and suboral avicularium on opposite side of lip. *Rec.*, Eng.

Holoporella WATERS, 1909 [**Cellepora descostilsii* AUDOUIN, 1828; SD CANU-B., 1917]. Proximal lip of aperture more or less straight. Ovicell widely open. *Eoc.-Rec.*—FIG. 166,2. **H. descostilsii* (AUDOUIN), Rec., Medit.; $\times 25$ (230).

Kleidionella CANU-B., 1917 [**K. grandis*]. Bilamellar fronds. Zoecia with thick olocyst, aperture oval to keyhole-shaped, no lyrula. *Cret.-Oligo.*—FIG. 166,13. **K. grandis*, Claib., N.Car.; $\times 25$ (137).

Monocerina NEVIANI, 1900 [**Cellepora monoceros* REUSS, 1847]. *Mio.*, Aus.

Omalosecosa CANU-B., 1925 [**Cellepora ramulosa* LINNÉ, 1767] [= *Cellepora* LINNÉ, 1767 (obj.)]. Erect narrow, branches. Zoecia with smooth frontal and semicircular apertures with concave proximal border. *Plio.-Rec.*—FIG. 166,7. **O. ramulosa* (LINNÉ), Rec., N.Atl.; $\times 25$ (137).

Osthimosia JULLIEN, 1888 [**O. evexa*]. Thick branches. Zoecia with pleurocyst; frontal surrounded by arcolae; aperture with proximal rimule, no spines. *Eoc.-Rec.*—FIG. 166,5. **O. evexa*, Rec., SW.Atl.; $\times 25$ (169).

Schismopora MACGILL., 1888 [**Cellepora coronopus* SEARLES WOOD, 1850] [= *Cyclopora* JULLIEN, 1903 (non PROUT, 1860)]. Small rounded massive zoaria with recumbent ovicell bearing small pores; frontal an olocyst, with proximal sinus and con-

¹HINCKS, T., 1877, Ann. Mag. Nat. Hist., ser. 4, vol. 20, p. 527.

spicuous suboral avicularia. *Eoc.-Rec.*—FIG. 166, 15. **S. coronopus* (SEARLES WOOD), *Rec., NE.Atl.*; $\times 25$ (137).

Tegminula JULLIEN, 1882 [**T. venusta*]. Urceolate, irregularly erect zooecia with smooth frontal, circular aperture surmounted by tubular peristome.

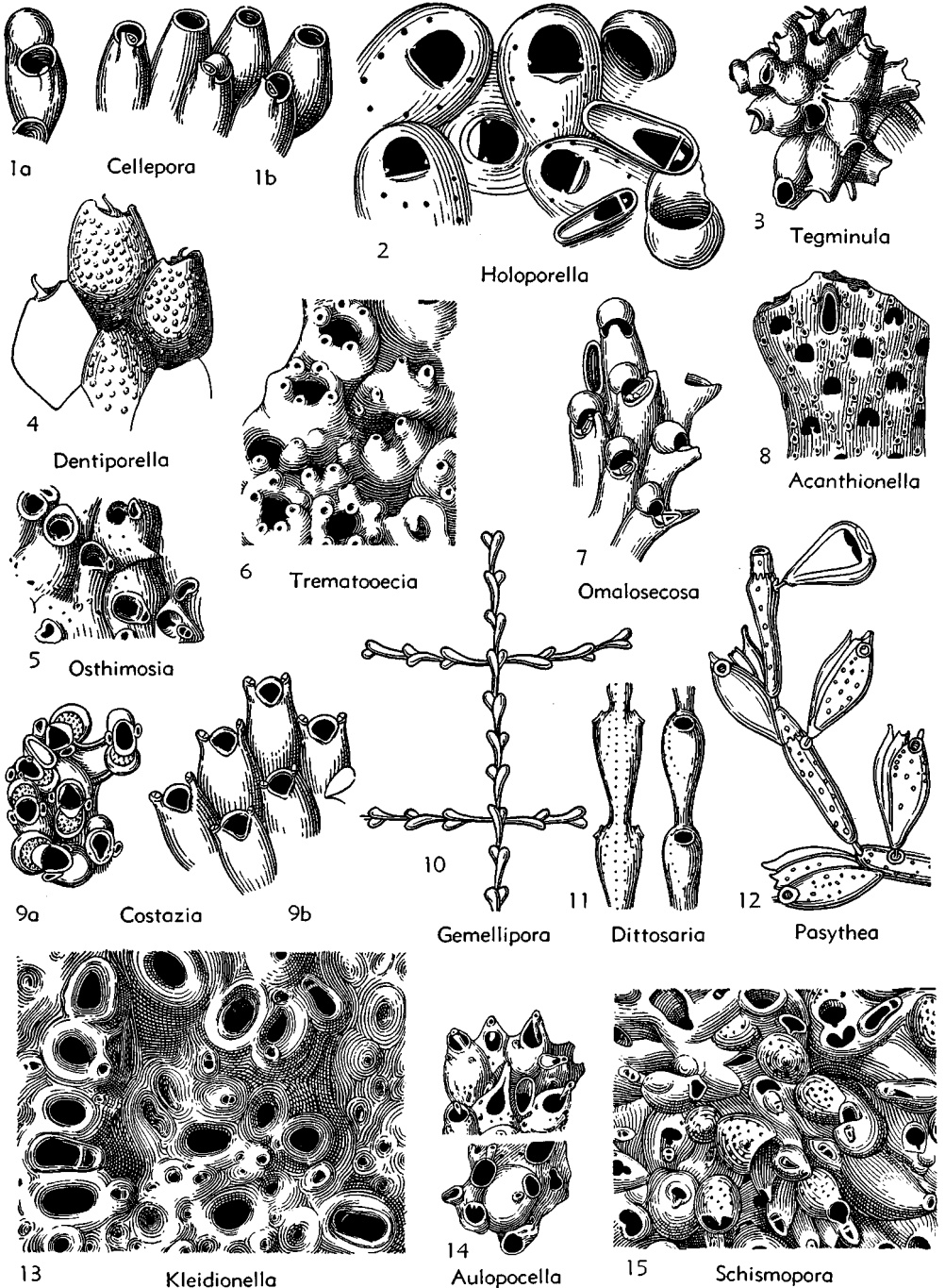


FIG. 166. Celleporidae, Pasytheidae (p. G220-G222).

Rec.—FIG. 166,3. **T. venusta*, Rec., E.Atl.; Gulf Gascogne; $\times 25$ (169).

Trematoecia OSBURN, 1940 [**Lepralia turrita* SMITT, 1873]. Incrusting. Zooecia erect, unoriented; frontal with large marginal areolae, aperture with thick peristomes bearing strong spines, ovicell with large central pore. *Pleisto.-Rec.*—FIG. 166,6. **T. turrita* (SMITT), Rec., GulfMex.; $\times 20$ (137).

Family PASYTHEIDAE Davis, 1934

[=emend. Liriozoidae LEV., 1909]

Zoaria composed of flexible, free, jointed branches arising from creeping stolons. Zooecia slender, elongate, with scattered pores; arranged in pairs or triads; apertures with broad shallow sinus. Avicularia and ovicells not known (31). *Eoc.-Rec.*

Pasythea LAMX., 1812 [**Cellaria tulipifera* ELLIS-S., 1786] [=Liriozoa LAMX., 1816 (obj.); *Tuliparia* BLAINV., 1834 (obj.); *Epicaulidium* HINCKS, 1880]. Branches formed of an axis of kenozoecia, with zooecia emerging from opposite sides in paired triads. Rec.—FIG. 166,12. **P. tulipifera* (ELLIS-S.), W.Indies; $\times 25$ (137).

Dittosaria BUSK, 1866 [**D. wetherelli*] [=Notamia GREGORY, 1893; *Gemellaria* CANU-B., 1920]. Calcareous erect branches, internodes of 2 to 4 zooecia back to back, apertures of each row facing in same direction. Frontal an olocyst with 1 to 3 rows of areolae. *Eoc.*—FIG. 166,11. **D. wetherelli*, Ypres., Eng.; $\times 25$ (134).

Gemellipora SMITT, 1872 [**G. eburnea*]. Like *Pasythea* but kenozoecia wanting, zooecia biserial, back to back. *Mio.-Rec.*—FIG. 166,10. **G. eburnea*, Rec., GulfMex.; $\times 10$ (236).

Family CATENICELLIDAE Busk, 1852

Zoaria delicate, erect, articulated, branching, some with radicles for attachment; each segment (internode) formed of 1, 2 (biglobulus), or 3 (triglobulus) zooecia, all facing in same direction and connected with a number of lateral chambers (suprascapular, scapular, infrascapular, pedal). Frontal porous or provided with fenestrae (chitinous interruptions) occupying sternal area or sunken longitudinal perforated grooves in the calcareous wall (vittae) which seem to correspond to pore chambers. Gonoecia with endozoecial ovicells arranged in different positions according to genus. Compensatrix, opercula and avicularia present. Abundant in Tertiary and Recent of Australasia but little known north of equator (31; STACH, 1935). *Tert.-Rec.*

Catenicella BLAINV., 1834 [pro *Catenaria* LAMX., 1824 (non Zeder, 1800)] [**C. savignii* (=Eucratea contei AUDOUIN, 1826)] [=Caloporella MACGILL., 1895]. Vittate zooecia with small scattered frontal pores; suprascapular compartments uncalcified. Ovicell pertains to mother zoecium of a triglobulus. (Loosely employed for species of uncertain affinities.) Rec.—FIG. 167,1. **C. contei* (AUDOUIN), Medit., Atl.; 1a-c, $\times 10$, $\times 50$, $\times 50$ (137). [Catenicellinae STACH, 1935].

Calpidium BUSK, 1852 [**C. ornatum*]. Aperture with triangular sinus ending in a point, 2 strong hinge teeth and sternal area with 5 fenestrae. *Tert.-Rec.*—FIG. 167,10. **C. ornatum*, Rec., SW.Pac.; 10a,b, $\times 25$ (134).

Catenicellopsis J. B. WILSON, 1880 [**C. delicatula*]. Like *Catenicella* but ovicell perforated all over; unusual mode of branching. Rec.—FIG. 167,8. **C. delicatula*, SW.Pac.; $\times 25$ (231).

Claviporella MACGILL., 1895 [**Catenicella geminata* W. THOMPSON, 1858]. Like *Catenicella* but aperture clithriate, sternal structure aberrant. *Tert.-Rec.*—FIG. 167,3. **C. geminata* (W. THOMPSON), Rec., SW.Pac.; $\times 50$ (181).

Cornuticella CANU-B., 1927 [**Catenicella cornuta* BUSK, 1852]. Vittate species with tuberculate imperforate ovicell at end of mother zoecium of a globulus. Rec.—FIG. 167,9. **C. cornuta* (BUSK), SW.Pac.; $\times 50$ (134). [Cornuticellinae STACH, 1935].

Costaticella MAPLE., 1899 [**Catenicella lineata* MACGILL., 1895] [=Costicella LEV., 1909; *Costaticellina* STACH, 1934]. Sternal area formed by a number of generally hollow spines springing from sternal sinus and separated by fissures. *Tert.-Rec.*—FIG. 167,14. **C. lineata* (MACGILL.), Tert., Austral.; 14a,b, $\times 50$, $\times 25$ (181).

Cribricellina CANU-B., 1927 [pro *Cribricella* LEV., 1909 (non CANU, 1904)] [**Catenicella rufa* MACGILL., 1868]. Sternal area perforated by scattered pores; uncalcified suprascapular compartments present. *Tert.-Rec.*—FIG. 167,12. **C. rufa* (MACGILL.), Rec., SW.Pac.; 12a,b, basal side, gonoecium, $\times 50$ (181).

Digenopora MAPLE., 1899 [**D. compta* (=Catenicella retroversa MACGILL., 1895)]. Zooecia with 2 sets of pores or fenestrae, one submarginal, segregated or oval, the other on zoecial frontal below aperture. *Tert.*—FIG. 167,5. **D. retroversa* (MACGILL.), Austral.; $\times 25$ (184).

Ditaxipora MACGILL., 1895 [**Catenicella internodia* WATERS, 1881]. Zoarium with multizoecial internodes. Ovicell deeply immersed in distal zoecium. *Tert.*—FIG. 167,6. **D. internodia* (WATERS), S.Austral.; 6a,b, back, front, $\times 25$ (137).

Pterocella LEV., 1909 [**Catenicella alata* W. THOMPSON, 1858]. Lateral chambers form winglike marginal portion along zoecial length. *Tert.-Rec.*—FIG. 167,7. **P. alata* (W. THOMPSON), Rec., Ant-arct.; $\times 50$ (181).

Scuticella LEV., 1909 [**Catenicella plagiostoma* BUSK, 1852] Fenestrate sternal area, noncalcified suprascapular compartments. *Tert.-Rec.*—FIG.

167,13. **S. plagiostoma* (BUSK), Rec., SW.Pac.; ×25 (137). [*Scuticellinae* STACH, 1935].
Strongylopora MAPLE., 1899 [**Catenicella pulchella*

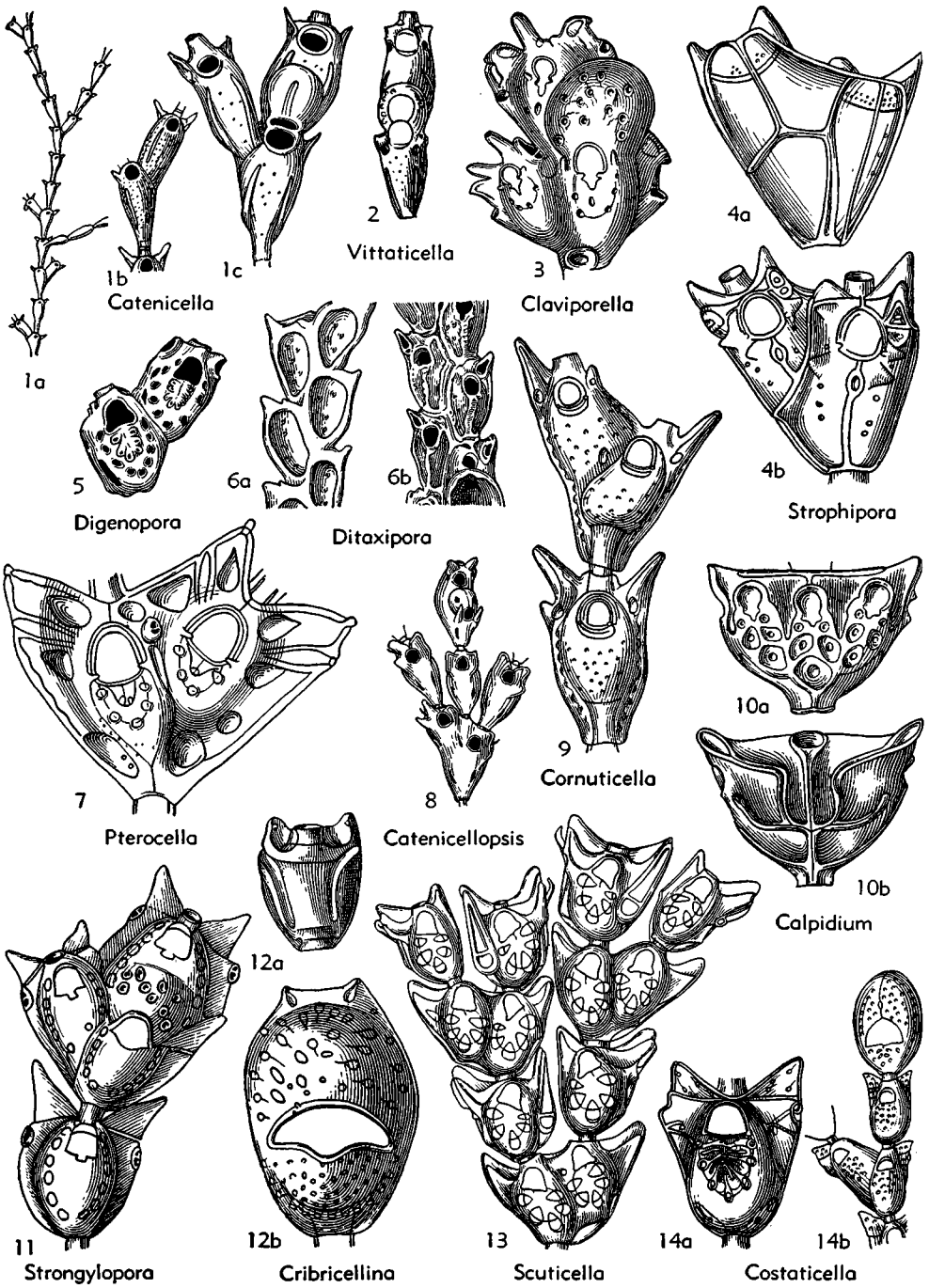


FIG. 167. Catenicellidae (p. G222-G224).

MAPLE., 1880 [= *Hincksia* LEV., 1909 (obj.)]. Submarginal row of large pores; completely calcified suprascapular compartments. *Tert.-Rec.*—FIG. 167, 11. **S. pulchella* (MAPLE.), Rec., SW. Pac.; $\times 50$ (137).

Strophipora MACGILL. [**Catenicella harveyi* W. THOMPSON, 1858]. No sternal area. Frontal surface with a thickened longitudinal ridge. *Tert.-Rec.*

S. (Strophipora). *Tert.-Rec.*—FIG. 167, 4. **S.* (*S.*) *harveyi* (W. THOMPSON), Rec., SW. Pac.; 4a, b, $\times 25$ (137).

S. (**Microstomaria**) MACGILL., 1895 [**M. tubulifera*]. *Tert.*, Austral.

S. (**Stenostomaria**) MACGILL., 1895 [**Catenicella solida* WATERS, 1881]. *Tert.*, Austral.

Vittaticella MAPLE., 1900 [pro *Caloporella* MACGILL., 1895 (non *Caloporella* ULR., 1882)] [**Catenicella elegans* BUSK, 1852] [= *Catenaria* LEV., 1909 (non LAMX., 1824, nec ZEDER, 1800); *Caloporella* LEV., 1909 (non ULR., 1882)]. Frontal with fine scattered pores and vittae (grooves) on each side. Aperture with concave thickened proximal rim. *Tert.*—FIG. 167, 2. **V. elegans* (BUSK),

Austral.; $\times 33.3$ (134). [Vittaticellinae STACH, 1933].

Family SAVIGNYELLIDAE Levinsen, 1909

[= emend. Catenariidae D'ORB., 1851]

Erect threadlike slightly calcified branches, jointed chainlike, with only one zoecium per segment. Ovicell recumbent. Zoecia narrow elongate, with avicularia, spines, and scattered pores on frontal surface (30). *Rec.*

Savignyella LEV., 1909 [**Eucreata lafontii* AUDOUIN, 1826] [= *Catenariella* STRAND, 1928 (obj.)]. Aperture with spines, concave poster (but no sinus) and proximally placed avicularium.—FIG. 168, 1. **S. lafontii* (AUDOUIN), N. Atl., 1a, b, $\times 10$, $\times 1$ (177).

Cheilidozoum STACH, 1935 [**Claviporella vespertilio* MACGILL., 1895]. Like *Savignyella* but lacks suboral avicularium. Austral.—FIG. 168, 4. **C. vespertilio* (MACGILL.), $\times 30$ (235).

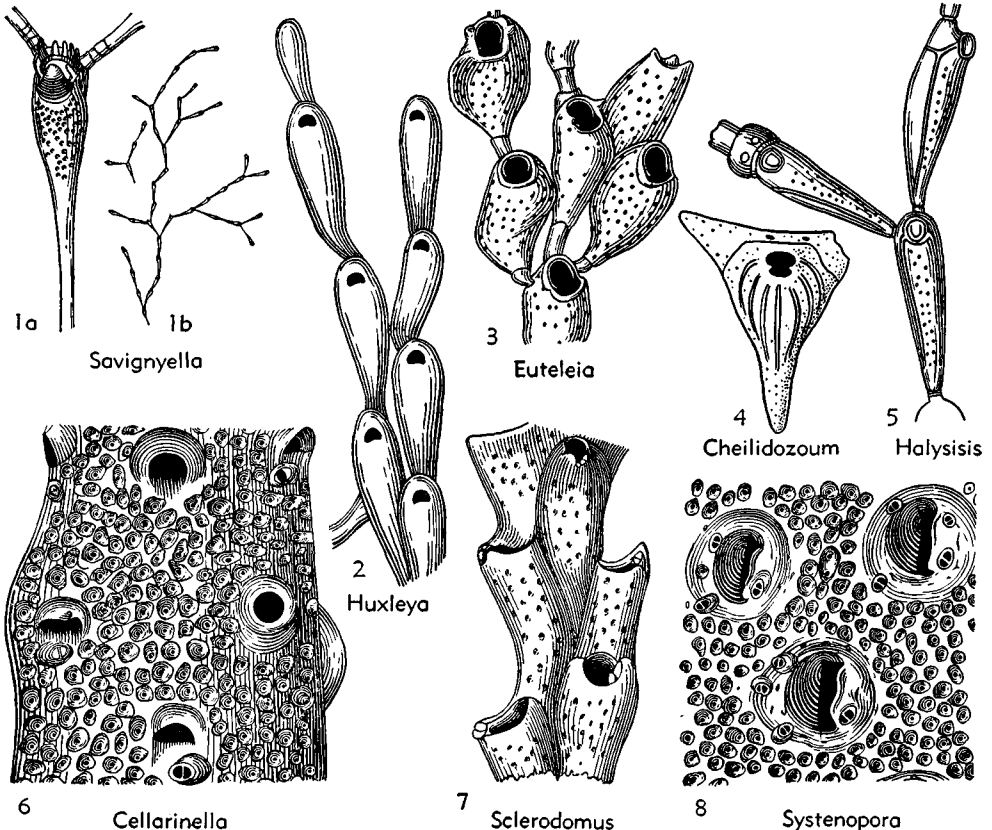


FIG. 168. Savignyellidae, Sclerodomidae (p. G224, G225).

Euteleia MARCUS, 1938 [**E. evelinae*]. Zoaria creeping. Orifice horseshoe-shaped.—FIG. 168,3. **E. evelinae*, W.Atl.; $\times 40$ (185).

Halysisis NORMAN, 1909 [**Scruparia diaphana* BUSK, 1860]. Narrow elongate zoecia with rounded aperture and sinus: no spines or avicularium.—FIG. 168,5. **H. diaphana* (BUSK), E.Atl.; $\times 25$ (137).

Huxleya DYSTER, 1858 (non CLAPARÈDE & LACHMANN, 1858) [**H. fragilis*]. Aperture semicircular with straight poster but without spines or avicularium.—FIG. 168,2. **H. fragilis*, NE.Atl.; $\times 25$ (137).

Family SCLERODOMIDAE Levinsen, 1909

Zoaria free, erect, branched. Zoecia with thick tubulate tremocyst; aperture at bottom

of long peristomie. Ovicell hyperstomial, visible only on young zoecia (31). *Rec.*

Sclerodomus LEV., 1909 [**Bifaxaria denticulatus* BUSK, 1884]. Peristomic funnel-shaped, immersed. Ovicell separated from zoecium by thickened crenulate margin of expanded distal wall.—FIG. 168,7. **S. denticulatus* (BUSK), SW.Atl.; $\times 25$ (134).

Cellarinella WATERS, 1904 [**C. foveolata*]. Aperture at bottom of long peristomie into which ovicell opens.—FIG. 168,6. **C. foveolata*, Antarct.; $\times 25$ (230).

Systemopora WATERS, 1904 [**S. contracta*]. Peristomie auricular, consisting of a longitudinal slit between concave and convex lamellae, latter bearing a proximal avicularium.—FIG. 168,8. **S. contracta*, Antarct.; $\times 25$ (230).

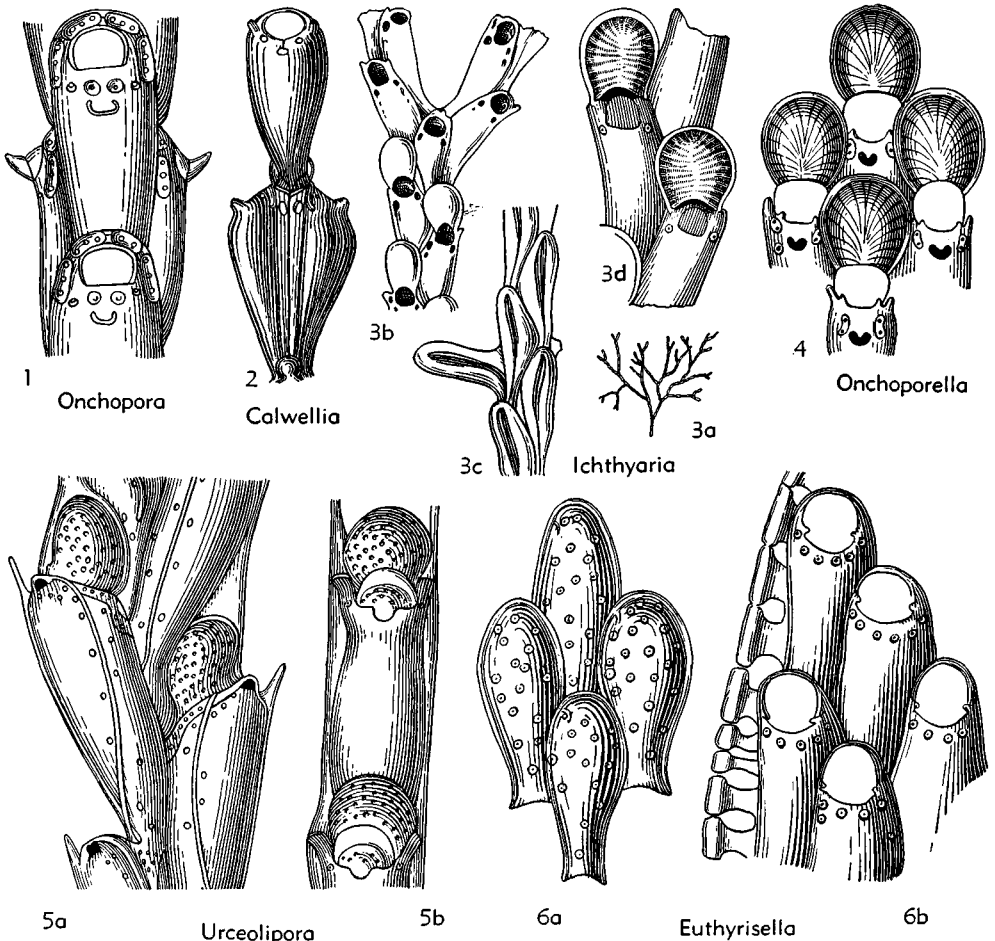


FIG. 169. Onchoporidæ, Euthyrisellidæ (p. G226, G227).

Family ONCHOPORIDAE Levinsen, 1909

Free, ramified, flexible, slightly calcified branches. Zooecia claviform, ornamented by apertural and frontal septulae. Ascopore crescentic. Ovicell hyperstomial (31). *Rec.*

Onchopora BUSK, 1852 [**O. sinclairi*] [= *Malakosaria* GOLDSTEIN, 1881 (obj.)]. Bi-quadriseserial colonies. Ovicell with free riblike processes. At least 6 apertural septulae with 2 small ones between ascopore and aperture.—FIG. 169,1. **O. sinclairi*, N.Z.; $\times 50$ (134).

Calwellia W. THOMPSON, 1859 [**C. bicornis*]. Horn-shaped zooecia with narrow caudal portion, joined back to back with alternate pairs between.—FIG. 169,2. **C. bicornis*, SW.Pac.; $\times 50$ (134).

Ichthyaria BUSK, 1884 [**I. oculata*]. Unilamellar, erect, biserial branches. Apertural septulae; ovicell not closed by operculum.—FIG. 169,3. **I. oculata*, SW.Atl.; 3a, $\times 1$; 3b,c, $\times 10$; 3d, ovicells, $\times 25$ (134).

Onchoporella BUSK, 1884 [**Carbasea bombycina* BUSK, 1852 (= *O. buski* HARMER, 1923)]. Unilamellar, foliate zoarium. Zoecial frontal an olo-

cyst; aperture with crescentic ascopore; operculum composite.—FIG. 169,4. **O. bombycina* (BUSK), SE.Atl.; $\times 50$ (134).

Onchoporoides ORTMANN, 1890 [**Carbasea moseleyi* BUSK, 1884]. Zoarium unilamellar, clavulate. Ascopore not visible. SW.Pac.

Family EUTHYRISELLIDAE Bassler, nov.
[=emend. Euthyridae LEV., 1909] [=Urceoliporidae BASSLER, 1936]

Zoaria free, branched, flexible, with slightly calcified claviform zooecia. Ectocyst kept distended by ridgelike processes from the subjacent olocyst. Ovicell wanting or endozoecial (31). *Rec.*

Euthyrisella BASSLER, 1936 [*pro Euthyris* HINCKS, 1882 (non QUENST., 1869)] [**E. obtecta*]. Two forms of zooecia but no ovicell. Aperture with 2 cardelles; frontal a continuous calcareous layer.—FIG. 169,6. **E. obtecta* (HINCKS), SW.Pac.; 6a,b, $\times 50$ (181).

Neoeuthyris BRETNALL, 1921 [*Euthyris woosteri* MACGILL., 1891]. SW.Pac.

Pleurotoichus LEV., 1909 [**Euthyris clathratus* HARMER, 1902]. SW.Pac.

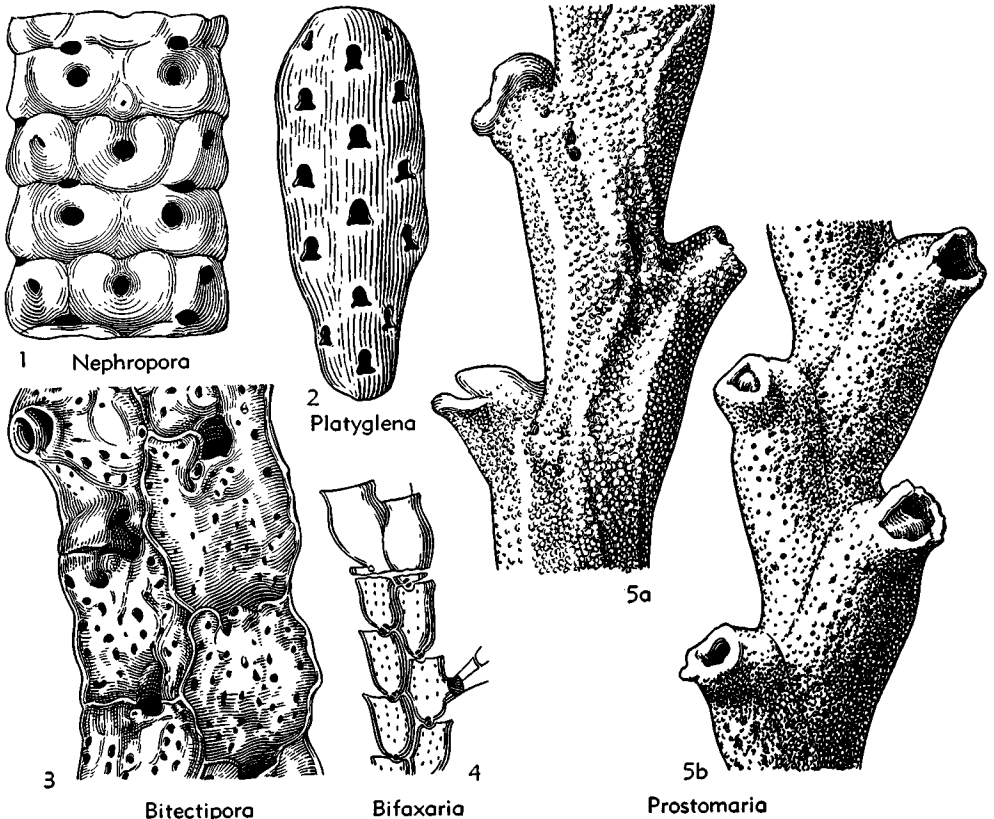


FIG. 170. Bifaxariidae, Bitectiporidae, Nephroporidae, Platyglenidae, Prostomariidae (p. G227).

Urceolipora MACGILL., 1881 [**U. nana*] [= *Calymnophora* BUSK, 1884]. Aperture with narrow sinus; walls with uniporous septules.—FIG. 169,5. **U. nana*, SW.Pac.; 5*a,b*, ×50 (181).

Family BIFAXARIIDAE Busk, 1884

Zoaria rigid, continuous or articulated, narrow, branched, with radical tubes. Biseriate zooecia, alternate, back to back; small circular avicularium; deeply embedded ovicell (15). *Rec.*

Bifaxaria BUSK, 1884 [**B. submucronata*].—FIG. 170,4. **B. submucronata*, SW.Atl.; ×10 (134).

Family BITECTIPORIDAE MacGillivray, 1895

Zoaria cylindrical, hollow. Zooecia in longitudinal rows bounded by platelike ridges. Sinus at base of funnel-shaped depression (87). *Tert.*

Bitectipora MACGILL., 1895 [**B. lineata*].—FIG. 170,3. **B. lineata*, S.Austral.; ×25 (181).

Family NEPHROPORIDAE Marsson, 1887

Zoaria small solid suboval stems. Zooecia kidney-shaped, in longitudinal rows, central aperture surmounted by a small avicularium (96). *Cret.*

Nephropora MARSSON, 1887 [**N. elegans*].—FIG. 170,1. **N. elegans*, Camp., Ger.; ×25 (186).

Family PLATYGLENIDAE Marsson, 1887

Small stems with zooecia in alternating longitudinal rows. *Onychocella*-like apertures (96). *Cret.*

Platyglena MARSSON, 1887 [**P. clava*].—FIG. 170,2. **P. clava*, Camp., Ger.; ×25 (186).

Family PROSTOMARIIDAE MacGillivray, 1895

Zoaria erect, branched, with 2 alternating rows of large uniseriate zooecia (87). *Tert.*

Prostomaria MACGILL., 1895 [**P. gibbericollis*].—FIG. 170,5. **P. gibbericollis*, Austral.; 5*a,b*, ×25 (131).

Family MAMILLOPORIDAE Canu & Bassler, 1927

Zoaria small, orbicular. Zooecia juxtaposed, without pit (zoarial cavity); proximal

border of aperture oriented toward apex. Ovicell hyperstomial, with special interzoecial cavity, closed by the operculum (31). *Eoc.-Rec.*

Mamillopora SMITT, 1873 [**M. cupula*]. Zoarium conical, both sides bearing mammilloid protuberances. Aperture subelliptical with 2 submedian cardelles. Elliptical or oval avicularia between zooecia. Ovicelled zooecia much larger, deeply embedded, with elongate apertures. *Eoc.-Rec.*—FIG. 171,3. **M. cupula*, Rec., GulfMex.; ×25 (236).

Anoteropora CANU-B., 1927 [**A. magnicapitata*]. Like *Mamillopora* but with distal large transverse triangular avicularium. Inferior base porous. *Phio.-Rec.*—FIG. 171,4. **A. magnicapitata*, Rec., SW.Pac.; ×25 (137).

Ascosia JULLIEN, 1882 [**A. pandora*]. Zooecia erect, joined only at base. Apertures oval, with 1 or 2 vibracula on sides. Ovicell globular, sunk within hood on back of zoecium. Dorsal formed by convex bases of zooecia. *Rec.*—FIG. 171,1. **A. pandora*, E.Atl.; 1*a,b*, ×10 (169).

Discofustrellaria D'ORB., 1853 [**D. clypeiformis*]. Free, convex zoaria with concave base. *Cret.*—FIG. 171,2. **D. clypeiformis*, Maastr., Fr.; 2*a,b*, ×5 (202).

Discosella CANU, 1925 [**D. porosa*]. *Eoc.*, Fr.-Belg.

Fedora JULLIEN, 1882 [**F. edwardsi*]. Internodes of large zoaria connected by chitinous tubes. Zooecia subhexagonal, with circular orifice indented on posterior fourth. Ovicell nonsalient, indicated by a smooth bend. Avicularia not constant, lateral outside of orifice. *Rec.*—FIG. 171,5. **F. edwardsi*, E.Atl.; 5*a,b*, ×25, ×50 (169).

Fedorella SILÉN, 1947 [**F. minima*]. Like *Fedora* but special chambers absent; ovicells hyperstomial. *Rec.*

Kionidella KOSCHINSKY, 1885 [**K. excelsa*]. Zoarium free, convex to elongate, concave below. Apertures with median cardelles and 2 triangular avicularia with beaks pointing toward apertures. *Eoc.-Oligo.*—FIG. 171,6. **K. excelsa*, Lut., Ger.; 6*a,c*, ×25, ×2, ×10 (172).

Prattia D'ARCHIAC, 1847 [**P. glandulosa*]. Zoarium long, tubular. Apertures suborbicular, without cardelles; some cells transformed into large oblique avicularia with pivot. Ovicell small. *Eoc.*—FIG. 171,7. **P. glandulosa*, Auver., Fr.; ×25 (137).

Stenopora CANU-B., 1927 [**Stichoporina protecta* KOSCHINSKY, 1885]. Zoaria cupuliform. Zooecia with hexagonal, porous base and convex front; aperture elliptical, bearing 2 low cardelles and 2 lateral avicularia. Ovicell embedded in distal zoecium, no larger than others. *Eoc.*—FIG. 171,8. **S. protecta* (KOSCHINSKY), Lut., Ger.; 8*a-c*, ×25 (172).

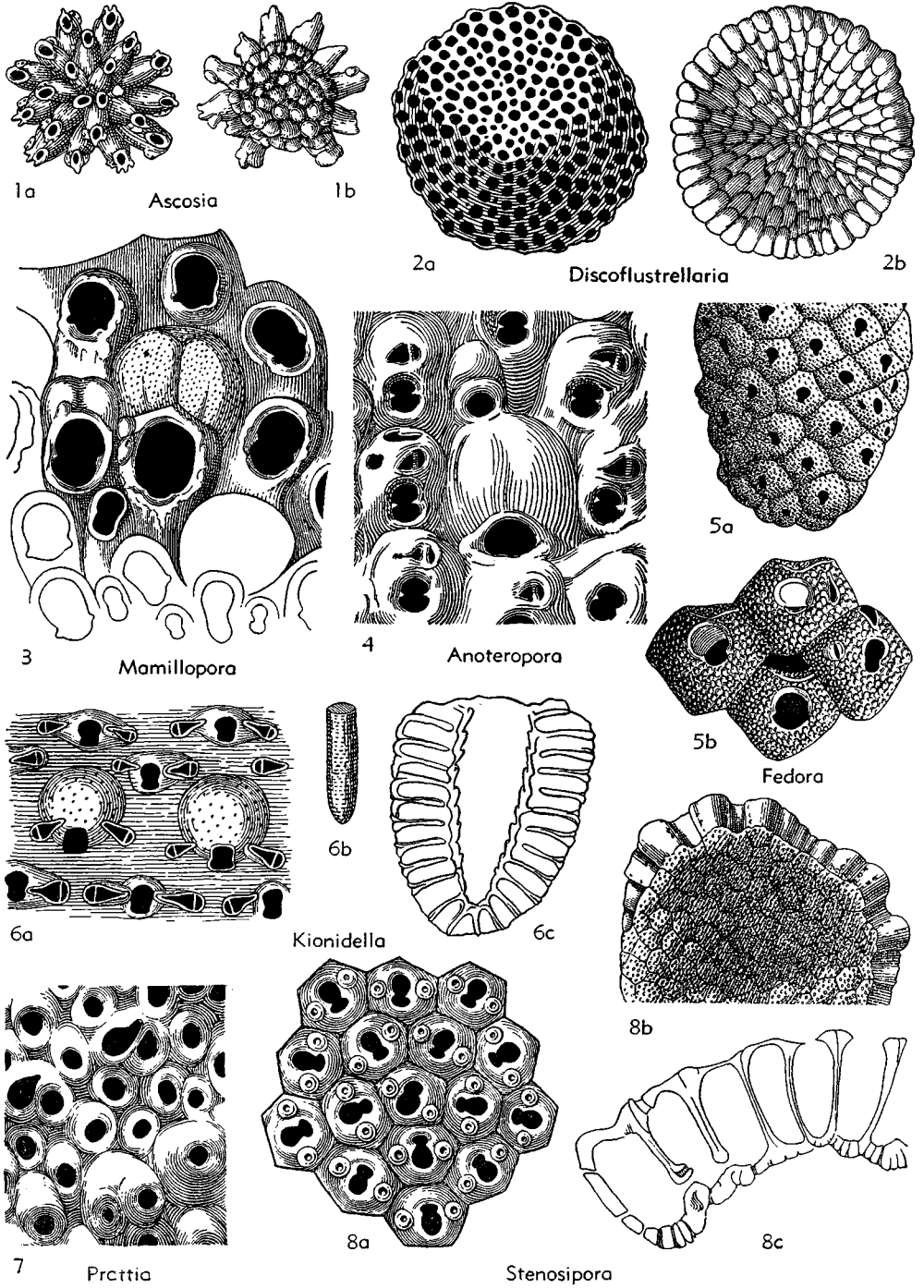


FIG. 171. Mamilloporidae (p. G227).

Family ORBITULIPORIDAE Canu & Bassler, 1923

Zoaria orbicular to cupuliform, with central or terminal pit (zoecial cavity) toward

which vertically arranged juxtaposed zooecia are directed. Ovicell hyperstomial, recumbent, oriented toward pit (26). *Cret.-Rec.*

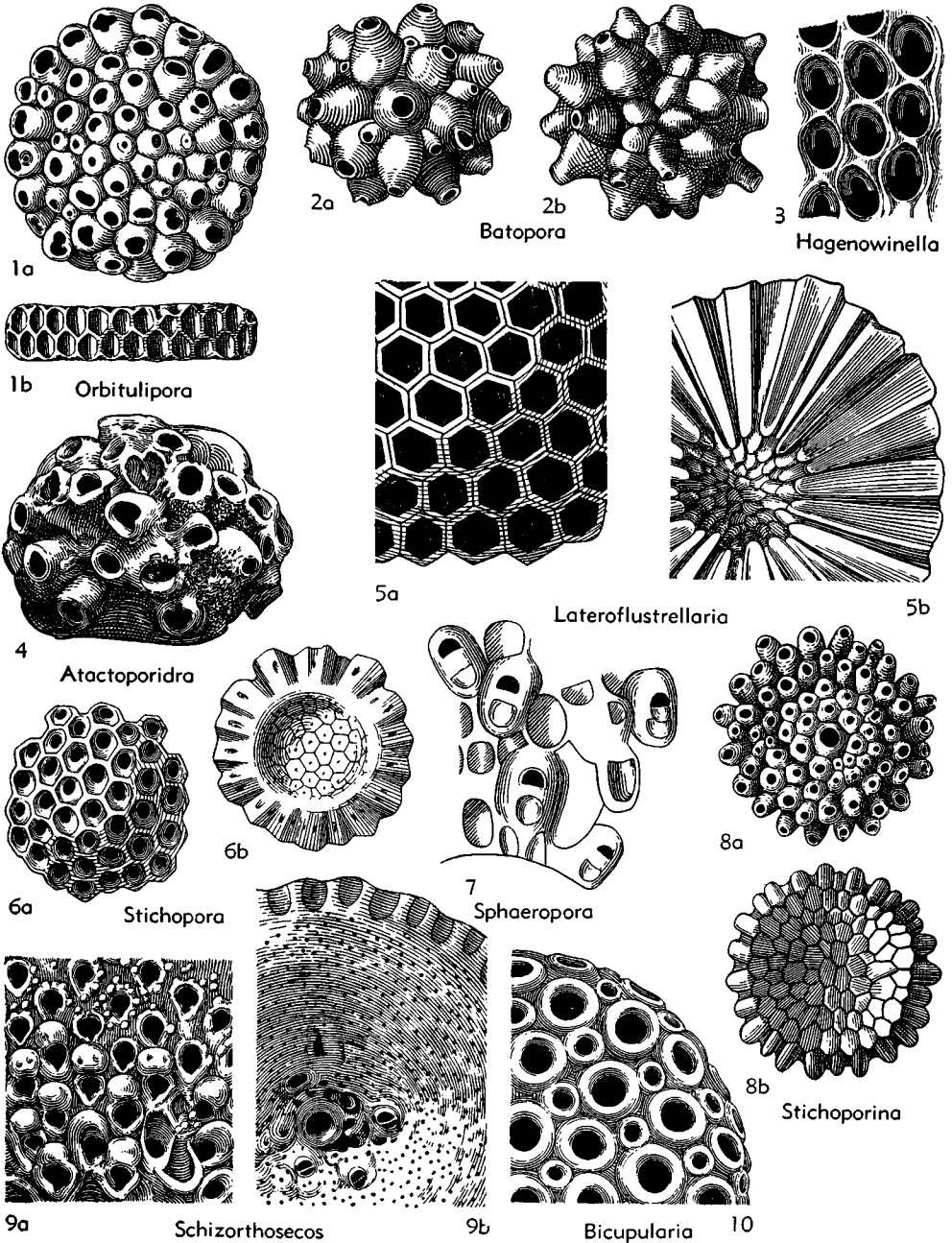


FIG. 172. Orbituliporidae (p. G230).

- Orbitulipora** STOLICZKA, 1861 [**O. haidingeri*]. Bilamellar. Zoecial front a tremocyst; aperture large with straight lower edge. *Eoc.-Oligo.*—FIG. 172, 1. *O. petiolus* LONSD., Tongr., Belg.; 1*a,b*, $\times 25$ (218).
- Atactoporida** CANU-B., 1931 [*pro Atactopora* CANU-B., 1929 (*non* ULR., 1879)] [**Manon bredaniana* MORREN, 1828]. Claviform. Zoecia accumulated in disorder on each other; aperture suborbicular, with proximal border little concave. *Oligo.*—FIG. 172,4. **A. bredaniana* (MORREN), Tongr., Belg.; $\times 25$ (136).
- Batopora** REUSS, 1867 [**B. stoliczkai*]. Zoarium conical to rounded, 2 superposed lamellae. Frontal a granular olocyst; aperture small, nearly round, with straight lower edge. *Eoc.-Oligo.*—FIG. 172, 2. **B. stoliczkai*, Latt., Ger.; 2*a,b*, $\times 25$ (210).
- Bicupularia** REUSS, 1864 [**B. lenticularis*]. Zoarium cupuliform. Zoecia rounded, with small intermediate openings. *Tert.*—FIG. 172,10. **B. lenticularis*, Ger.; $\times 25$ (210).
- Hagenowinella** CANU, 1900 [**Cellepora vaginata* HAG., 1851]. Zoarium uni- or bilamellar. Zoecia bearing horseshoe-shaped lamella attached to superior part of mural rim. *Cret.*—FIG. 172,3. **H. vaginata* (HAG.), Maastr., Holl.; $\times 10$ (136).
- Lateroflustrarella** D'ORB., 1853 [**L. hexagona*]. Zoarium convex, with deep hexagonal zoecia radiating in quincunx around ancestrula. *Cret.*—FIG. 172,5. **L. hexagona*, Maastr., Fr.; 5*a,b*, $\times 10$ (202).
- Schizorthosecos** CANU-B., 1917 [**Orbitolites interstitia* LEA, 1833]. Zoarium free, thin, cupuliform. Apertures oval, with rounded proximal rimule; numerous zoecules. Inner face marked by hexagons perforated by tremopores. *Eoc.*—FIG. 172,9. **S. interstitia* (LEA), Claib., Ala.; 9*a,b*, $\times 25$ (137).
- Sphaeropora** HASWELL, 1881 [**S. fossa*] [= *Sphaerophora* BASSLER, 1935 (*non* ZETTERSTEDT, 1849)]. Zoarium multilaminar. Apertures with straight lower edge. *Mio.-Rec.*—FIG. 172,7. **S. fossa*, Rec., SW.Pac.; $\times 25$ (166).
- Stichopora** HAG., 1846 [**S. clypeata*]. Concavoconvex disks of zoecia with equal hexagonal cells in quincunx; basal side smooth but with traces of zoecia. *Cret.*—FIG. 172,6. **S. clypeata*, Maastr., Ger.; 6*a,b*, $\times 5$ (160).
- Stichoparina** STOLICZKA, 1862 [**S. reussi*] [= *Discoescharites* ROEMER, 1863]. Unilaminar disks with zoecia directed toward central pit; interior side showing bases of juxtaposed zoecia. *Eoc.-Rec.*—FIG. 172,8. **S. reussi*, Latt., Ger.; 8*a,b*, $\times 10$ (218).

Family CONESCHARELLINIDAE

Levinsen, 1909

Zoaria varied in form, hanging in thin tubes from foreign objects, with ancestrula

and later-formed zoecia separated from substratum. Zoecia prismatic, hexagonal, erect, juxtaposed; apertures terminal, with distal sinus accompanied by a proximal pore (terms reversed on basal side). Avicularia abundant. Ovicells hyperstomial. The mode of formation of the zoarium has produced a peculiar reversal of the aperture (and oecium) to the basal wall of the zoecium. (Type family of Ascophora, division Simostomia, section Gymnocystidae, SILÉN, 1937). (24; SILÉN, 1947). *Tert.-Rec.*

Conescharellina D'ORB., 1852 [**C. angustata*]. Zoarium cone-shaped, outer layer composed of hexagonal zoecia arranged from apex to the flat zoarial base; heterozoecia form inner layer and flat base; cones suspended base downward by several thin tubes. Aperture on distal wall, with its sinus distal toward growing edge of zoarium. Avicularia small, placed at inner zoecial angles. *Tert.-Rec.*—FIG. 173,6. **C. angustata*, Rec., SW.Pac.; 6*a,b*, $\times 25$ (202).

Bipora WHITELEGGE, 1887 [**Eschara umbonata* HASWELL, 1881] [= *Zeuglora* MAPLE., 1909]. Bifoliate, fan-shaped. Apertures with proximal rimule. *Rec.*—FIG. 173,3. **B. umbonata* (HASWELL), SW.Pac.; $\times 25$ (166).

Crucescharellina SILÉN, 1947 [**C. japonica*]. Zoarium flattened, divided into branches and suspended by several chitinous tubes so that it rests horizontally; zoecia confined to upper surface of zoarium, heterozoecia to lower surface. Ovicells not known. *Rec.*—FIG. 173,4. **C. japonica*, NW.Pac.; $\times 5$ (216).

Flabellopora D'ORB., 1852 [**F. elegans*]. Zoaria bifoliate, flat, flabelliform, vertically placed. Zoecia hexagonal, in linear rows issuing from ancestrular base and covering both sides of colony. Aperture excentric, suborbicular, with small proximal pore and distal sinus. Avicularia common. *Rec.*—FIG. 173,2. **F. elegans*, W.Pac.; 2*a,b*, $\times 25$ (202).

Trochosodon CANU-B., 1927 [**T. linearis*]. Differs from *Conescharellina* in its convex zoarium and absence of avicularia. *Rec.*—FIG. 173,5. **T. linearis*, SW.Pac.; 5*a,b*, $\times 25$ (131).

Family FUSICELLARIIDAE d'Orbigny, 1851

Zoaria comprising fusiform, elongate, jointed segments with acuminate ends. Zoecial structure doubtful. *Cret.*

Fusicellaria D'ORB., 1851 [**F. pulchella*].—FIG. 173,1. **F. pulchella*, Turon., Fr.; 1*a*, $\times 1$; 1*b,c*, $\times 25$ (202).

Family MYRIOZOIDAE Smitt, 1867

Zoaria incrusting or free-branching stems. Zooecia juxtaposed, with thick frontal, formed of a tremocyst with tubules. Ovicell hyperstomial, lodged in depression in distal

zooecium. Uniporous septules or diatellae present (26). *Mio.-Rec.*

Myriozoum DONATI, 1750 [*Millepora truncata* PALLAS, 1766] [= *Myriopora* BLAINV., 1830; *Myriopora* EHR., 1830; *Leieschara* SARS, 1862]. Zoar-

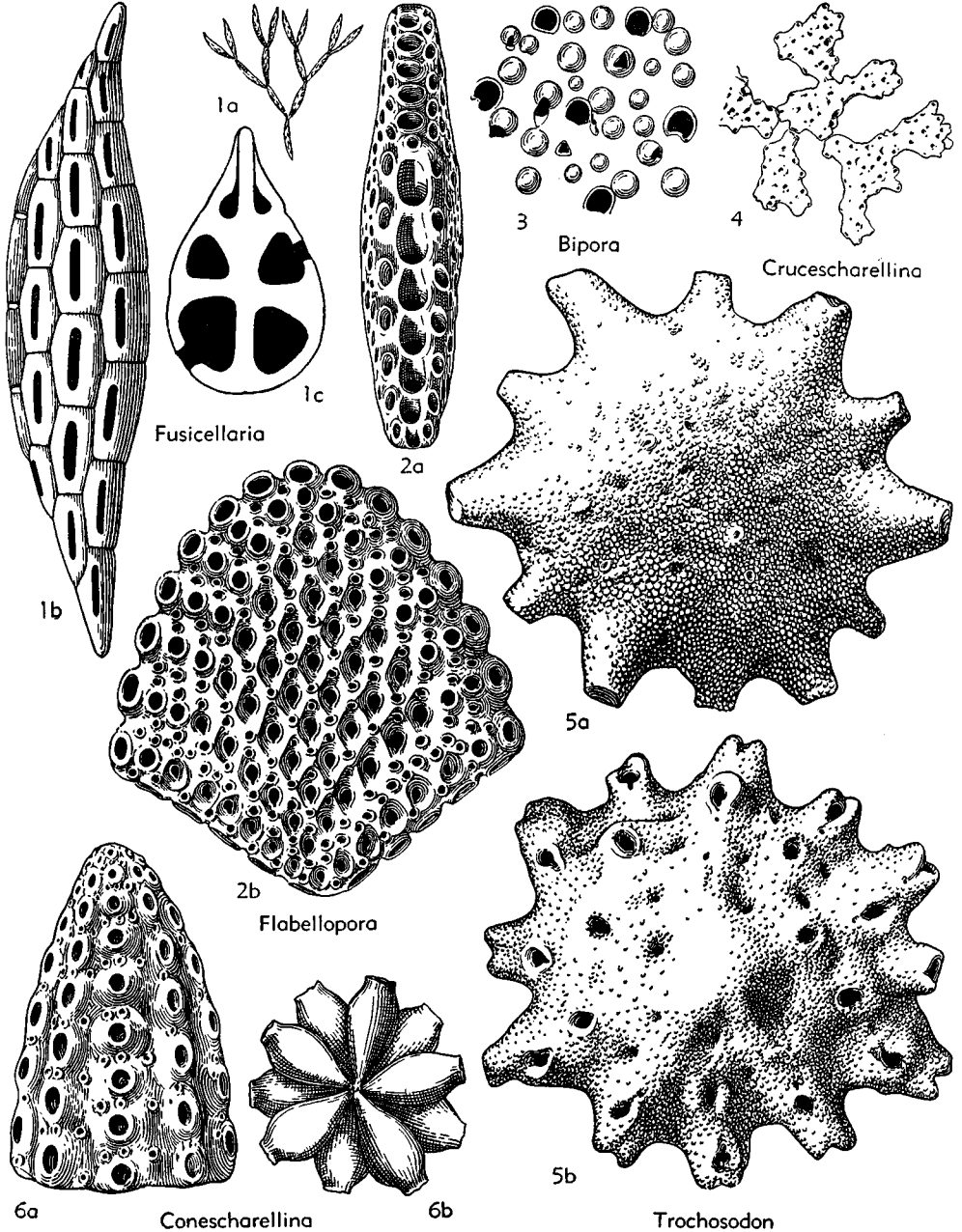


FIG. 173. Conescharellinidae, Fuscellariidae (p. G230).

ium free, cylindrical branches. *Mio.-Rec.*—FIG. 174.1. **M. truncata* (PALLAS), *Rec., Medit.*; 1a,b, $\times 10$, $\times 25$ (183).

Myrizoella LEV., 1909 [**Myrizozium crustaceum* SMITT, 1868]. Like *Myrizozium* but zoarium incrusting, diatellae present. *Rec.*—FIG. 174.2. **M. crustacea* (SMITT), *N.Atl.*; 2a,b, $\times 25$ (236).

Family LEKYTHOPORIDAE Levinsen, 1909

Zoaria incrusting, orbicular, or free-branching. Zooecia with long tubular peristomie followed by salient peristome bearing

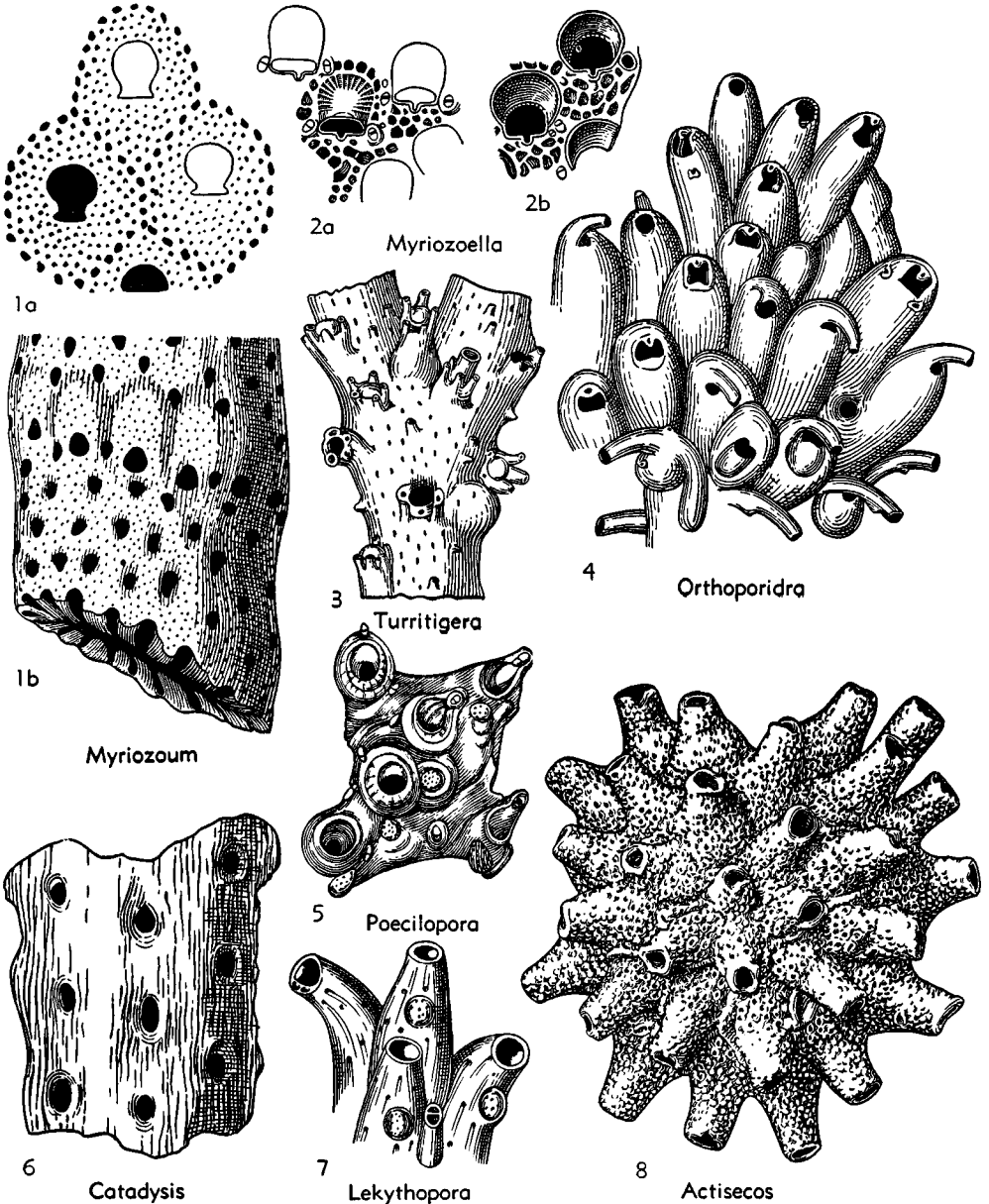


FIG. 174. Myrizooidae, Lekythoporidae (p. G231-G233).

1 to 5 avicularia. Aperture buried at base of peristomie on proximal, instead of distal side of ovicell opening. Family characterized by position of ovicell opening (31). *Tert.-Rec.*

Lekythopora MACGILL., 1883 [**L. hystrix*]. In-crusting. Peristomie free above ovicell, with very salient peristome bearing small avicularium. Interzoecial avicularia. *Tert.-Rec.*—FIG. 174,7. **L. hystrix*, Rec., SW.Pac.; $\times 25$ (181).

Actisecos CANU-B., 1927 [**A. regularis*]. Orbicular convex zoarium with hexagonal zoecial bases on inner face. *Rec.*—FIG. 174,8. **A. regularis*, SW.Pac.; $\times 25$ (131).

Catadypsis CANU-B., 1927 [**Schizoporella challengeriana* WATERS, 1888]. Cylindrical branches. Zoecia indistinct, with frontal longitudinally striate, walls much thickened by tremocyst with very small tubes. *Rec.*—FIG. 174,6. **C. challengeriana* (WATERS), SW.Atl.; $\times 25$ (230).

Orthoporidra CANU-B., 1927 [*pro Orthopora* WATERS, 1904 (*non* HALL, 1886)] [**Orthopora compacta* WATERS, 1904]. Colony free, branched. Zoecia with long and partially free peristomie, terminated by peristome bearing long process with avicularium. *Rec.*—FIG. 174,4. **O. compacta* (WATERS), Antarct.; $\times 25$ (230).

Poecilopora MACGILL., 1886 [**P. anomala*]. Erect, bilaminar, branched. Zoecia indistinct, with sinus in aperture; peristome first an elevation surmounted by a small avicularium, becomes a tumid ring. *Rec.*—FIG. 174,5. **P. anomala*, Antarct.; $\times 25$ (181).

Turrigera BUSK, 1884 [**T. stellata*]. Zoecia on one side of the erect colony with thick walls, united by connecting tubes; aperture at bottom of peristomie with proximal rimule; peristome bears small salient avicularia. *Rec.*—FIG. 174,3. **T. stellata*, SW.Atl.; $\times 25$ (134).

Class PHYLACTOLAEMATA Allman, 1856

Fresh-water Ectoprocta characterized by horseshoe-shaped arrangement of tentacles around the mouth, which is protected by an overhanging lip (epistome); mineralized skeleton lacking. *Cret.-Rec.*

By reason of their fresh-water habitat, the Phylactolaemata are specialized for existence under conditions where change of temperature and danger of drying up are ever present. A peculiarity is the habit of dying down in winter with formation of so-called **statoblasts**, which are hard-shelled reproductive bodies consisting of internal buds protected by a chitinous shell, capable of

resisting unfavorable conditions for a relatively long period and then forming new zooids. Sexual reproduction also occurs as in other bryozoans. The Phylactolaemata have a body structure somewhat similar to that of the Ctenostomata, belonging to the class Gymnolaemata, some of which also show a tendency to live in fresh water. The exclusively fresh-water Phylactolaemata may have been derived from these Ctenostomata. Quite common in a zone about 2 feet below the water surface, their colonies are found attached to plants or stones, locally in currents but mostly in still water.

In the Phylactolaemata, the outermost layer of the body wall is a flexible uncalcified cuticle (ectocyst), beneath which follow in succession the ectoderm, muscular layers, and the coelomic epithelium. The zoarium may consist of gelatinous masses of varying size, of aggregations of parallel tubes, or of single branching tubes, in all of which the body cavities of the zooids are continuous with each other, whereas among species of the Gymnolaemata each zooid has its own body wall. As in the Entoprocta, the body wall is uncalcified, and fossil forms are not to be expected. Protrusion of the polypide is effected by contraction of the muscular body wall which compresses the fluid of the body cavity. The tentacles may interlace to form a sort of cage in which infusoria used for food are imprisoned.

Cristatella (Fig. 175), a typical member of the Phylactolaemata, consists of a slug-shaped gelatinous mass, as much as 8 inches long but only 0.5 inch wide, with a flattened sole upon which it crawls. The protruding polypides form a delicate fringe along the upper side, while around the edge of the mass a zone of budding tissue gives rise to new zooids. *Fredericella*, another typical genus, is a member of the deep-water fauna of lakes in Switzerland. *Plumatella* forms aggregations of parallel tubes. *Lophopus* and *Pectinatella*, like *Cristatella*, show powers of locomotion. Owing probably to their reproduction by statoblasts, these genera have wide geographical distribution, being found in Europe, North America, South America, Africa, and Australia.

Although species of Phylactolaemata are comparatively few, they give rise to such in-

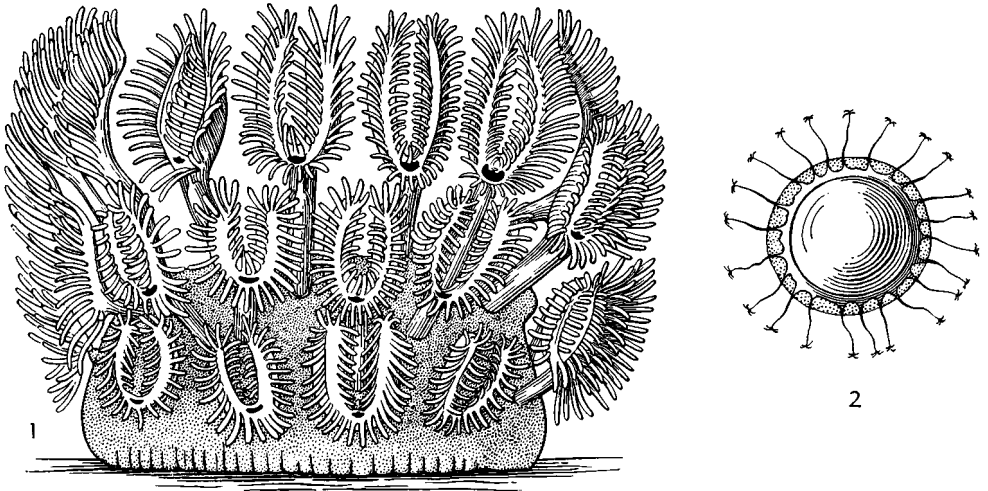


FIG. 175. Typical member of the Phylactolaemata, the fresh-water bryozoan *Cristatella mucedo* CUVIER, Rec., Eng., $\times 24$. 1, Slug-shaped body of the colony, which is able to move about slowly; the horseshoe-shaped lophophores of the individual zooids are prominent. 2, Statoblast reproductive body of the same species, $\times 28$ (137).

teresting phenomena that literature on these bryozoans is quite extensive. The monographs of ALLMAN (1856) and JULLIEN (1885) should be consulted for a general review, as also the more recent papers on North American faunas by MARY D. ROGICK (1934-1949). Other students are BRAEM (1890, 1897), CORI (1893), DAVENPORT (1890, 1891, 1893), MARCUS (1894), and ANNA B. HASTINGS (1929).

These soft-bodied animals cannot be expected to be found fossil except under unusual conditions of preservation. The fresh-water Cretaceous (Cenomanian) beds of Bohemia have yielded an organism incrusting a *Unio* resembling the Recent genus *Plumatella*. Although the structure is too

imperfectly preserved for certain identification, this specimen, 8 mm. long with branches 0.6 to 1.00 mm. wide (*Plumatellites proliferus* FRIC, 1901; *Plumatellidae* FRIC, 1901), may be accepted as a fossil representative of the Phylactolaemata. Certain organisms supposed to be statoblasts of this order have been described from the Quaternary.

Important genera of Phylactolaemata are *Cristatella* CUVIER (1798), *Fredericella* ALLMAN (1884), *Hyallinella* JULLIEN (1885), *Australella* ANNANDALE (1910), *Lophopodella* ROUSSELET (1904), *Lophopus* DUMORTIER (1835), *Pectinatella* LEIDY (1852), *Plumatella* LAMARCK (1852), and *Rhabdopleura* ALLMAN (1867).

UNRECOGNIZED GENERIC NAMES APPLIED TO BRYOZOANS

Acrivclusa GABB-H., 1860, *Eoc.*, N.J.
Angularia BUSK, 1881 (no species), *Rec.*
Anellina GREGORIO, 1930 (?fistuliporoid cyclostome), *Perm.*, Italy.
Aprutinopora PARONA, 1909, *Cret.*, Italy.
Archaeopora EICHW., 1860, *Ord.*, Balt.
Arboricladia NEKH., 1933 (*nom. nud.*), *L.Carb.*, E.Asia.
Bauncia PETERHANS, 1927, *Jur.*, Switz.
Buccula EICHW., 1860, *Carb.*, Russ.
Buskia REUSS, 1864 (*non* ALDER, 1857), *Oligo.*, Ger.
Buskia T.WOODS, 1877 (*non* ALDER, 1857).

Cambroporella KORDA, 1950.
Ceidmonea PERGENS, 1892, *Cret.*, Holl.
Celleporaria LAMX., 1821, *Rec.*, SW.Pac.
Celleporina GRAY, 1848 (?=*Costazia*), *Rec.*, Atl.
Celleporina D'ORB., 1852 (*non* GRAY, 1848), *Rec.*, Atl.
Celomma STECHOW, 1921 (*nom. nud.*), *Rec.*, SE. Atl.
Cellularia PALLAS, 1766, *Rec.*, Atl.
Coeschchara BUSK, 1860 (*nom. nud.*), *Rec.*
Cumulipora MÜNSTER, 1835, *Tert.*, Ger.
Cupularia BLAINV., 1830.
Cycleschara ROEMER, 1863, *Tert.*, Ger.

- Diaphragmopora** McFARLAN, 1926, *U.Miss.*, Ky.
Diotropora MARSSON, 1887 (?cheilostome), *Cret.*, Ger.
Disteichia SHARPE, 1853, *Sil.*, Portugal.
Ennallipora GABB-H., 1862, *Mio.*, Va.
Eschara LINNÉ, 1758, *Rec.*
Escharella GRAY, 1848, *Rec.*, N.Atl.
Escharella D'ORB., 1852 (*non* GRAY, 1848), *Cret.*, Holl.
Escharellina D'ORB., 1852, *Mio.*, Aus.
Escharinella D'ORB., 1852 (types lost), *Cret.*, Fr.
Escharopsis GREGORIO, 1882, *Cret.*, Italy.
Escharopsis VERRILL, 1879, *Rec.*, Atl.
Favositella MANSUY, 1912 (*non* ETH.-F., 1884) (stenoporoid trepostome), *Dev.*, China.
Filiflustra D'ORB., 1852 (membraniporoid cheilostome), *Cret.*, Fr.
Filiflustraria D'ORB., 1853 (membraniporoid cheilostome), *Cret.*, Fr.
Filiflustrina D'ORB., 1853, *Cret.*, Fr.
Flabellaria GRAY, 1848 (*non* LAMARCK, 1816). *Rec.*, Fr.
Flabellina GREGORIO, 1930 (*non* VOIGT, 1934, *nec* LEV., 1902), *Perm.*, Italy.
Flustrella EHR., 1839, *Cret.*
Flustrella D'ORB., 1852 (*non* EHR., 1839, *nec* GRAY, 1848), *Cret.*, Fr.
Flustrina D'ORB., 1852 (*non* VAN BENEDEN, 1850), *Cret.*, Fr.
Glauconome GOLDF., 1829, *Tert.*, Ger. (based on unrecognizable *Vincularia*-type of bryozoan).
Hemeschara BUSK, 1850 [= *Hemieschara* REUSS, 1869] (unilamellar ascophoran cheilostome), *Rec.*
Herentia GRAY, 1848, *Rec.*, Atl.
Heteroflustra LEV., 1909 (no type)(unplaced Flustridae).
Heterotrypella VINASSA, 1921 (undefined), *Ord.*
Holopora POČTA, 1902, *Dev.*, Czech.
Keruniella STECHŮV, 1921 (*nom. nud.*).
Kirchenpaueria KIRCHENPAUER, 1869.
Latereschara D'ORB., 1853, *Cret.*, Fr.
Lepralia JOHNSTON, 1838. This generic name, widely but loosely used in early literature, has been employed by various workers in later years for unidentified or unidentifiable Hipporinidae. Since the species first listed by JOHNSTON (*L. hyalina*) belongs to *Hippothoa* LAMX., 1821, NORMAN (1903, p. 99) proposed to designate the second named species (*L. nitida*) as type of *Lepralia*, overlooking the fact that SMITH (1873) had chosen this species as type of *Membraniporella*. Other species included by JOHNSTON are so involved generically that *Lepralia* is here treated as undeterminable. *Rec.*
Liriozoaria VAN BENEDEN, 1849 (*nom. nud.*), *Rec.*
Membraniporina LEV., 1909 (no type)(unplaced Membraniporidae), *Cret.-Rec.*
Mesosecos FAURA SANS & CANU, 1916, *Eoc.*, Sp.
Microstoma GRAY, 1848 (*non* CUVIER, 1817), *Rec.*, NE.Atl.
Millestroma GREGORY, 1898, *Cret.*, Egypt.
Monopora CANU, 1910 (*non* SALENSKY, 1884).
Monotrypella VINASSA, 1911 (*non* ULR., 1882), *Trias.*, Aus.
Multescharellina D'ORB., 1852, *Cret.*, Ger.
Multescharinella D'ORB., 1852, *Mio.*, Aus.
Multinodicrescis D'ORB., 1854 (*nom. nud.*), *Cret.*, Fr.
Multiporina D'ORB., 1852 (*non* GABB-H., 1862), *Cret.*, Fr.
Myriolithes, EICHW., 1860 (monticuliporoid trepostome), *Ord.*, Balt.
Nebrodensia GREGORIO, 1930 (fenestellid cryptostome), *Trias.*, Italy.
Nebulipora MCCOY, 1850, *Sil.*, Eng.
Nicholsonelloides McFARLAN, 1926 (*nom. nud.*), *Miss.*, Ill.
Nicholsonia BOGATIREV, 1899 (*non* DAVIS, 1885, *nec* WAAGEN-W., 1886)(monticuliporoid), *Dev.*, Russ.
Palaeoflustra JULLIEN, 1896, *Carb.*, Fr.
Patinella GRAY, 1848 (?=*Plagioecia* CANU, 1918), *Rec.*, Atl.
Petalotrypella VINASSA, 1920, *Trias.*, Timor.
Poikilia JULLIEN, 1903 (no species), *Rec.*, Atl.
Polyeschara REUSS, 1867, *Oligo.*, Ger.
Porellina D'ORB., 1851 [?= *Umbonula*], *Mio.*, Aus.
Pseudotromatopora SIMIONISCU, 1927, *Cret.*, Rumania.
Pumiscaria GABB-H., 1862, *Rec.*, W.Atl.
Reptescharellina D'ORB., 1852, *Cret.*, Fr.
Reptoflustra D'ORB., 1851, *Rec.*, Medit.
Reptoflustraria D'ORB., 1852, *Cret.*, Fr.
Reptolatereschara D'ORB., 1852, *Rec.*, SE.Atl.
Reptonodicrescis D'ORB., 1854, *Jur.*, Fr.
Reptoporina D'ORB., 1852 (membraniporoid cheilostome), *Cret.*, Fr.
Semicelleporaria D'ORB., 1853, *Mio.*, Fr.
Semiescharella D'ORB., 1853, *Rec.*, Medit.
Semiescharellina D'ORB., 1852 (type lost), *Cret.*, Fr.
Semiescharinella D'ORB., 1852, *Cret.*, Fr.
Semiflustra D'ORB., 1853, *Rec.*, E.Indies.
Semiflustraria D'ORB., 1853 (membraniporoid cheilostome), *Cret.*, Fr.
Semiflustrina D'ORB., 1853 [?= *Callopora*], *Cret.*, Fr.
Semiporina D'ORB., 1852, *Eoc.*, Fr.
Semizonopora LORIOL, 1863 (heteroporoid cyclostome), *Cret.*, Switz.
Siphonella HAG., 1850 (*non* MACQUART, 1835), *Cret.*, Holl.
Sphaerostyomella YABE & SUGIYAMA, 1935, *Perm.*, Japan.
Spirella HAG., 1851, *Cret.*, Holl.
Sulcopora D'ORB., 1849 [?= *Rhinidictya*], *Ord.*, N.Y.
Tata VAN BENEDEN, 1849 (membraniporoid), *Rec.*, Atl.

Trochopora KETTNER, 1913 (*non* D'ORB., 1849) [*?=Diplotrypa*], *Dev.*, Czech.
Tuberculopora RINGUEBERG, 1886, *Sil.*, N.Y.
Vaginopora DEFRANCE, 1828 (*non* HAG., 1846).

Vetofistula ETH., 1917 [**V. mirabilis*], *Dev.*, Austral.
Vincularina D'ORB., 1851, *Cret.*, Fr.
Zeapora PENECKE, 1893 (trepostome), *Dev.*, Alps.

GENERIC NAMES APPLIED TO BRYOZOANS BUT BELONGING TO OTHER ORGANISMS

Astroporites LAMBE, 1896 (echinoderm), *Ord.*, Ont.
Chaetetes FISCHER, 1837 (tabulate coral), *Dev.-Carb.*
Crisioides MICH., 1846 (?auloporoid coral), *Carb.*, Belg.
Cymbalopora HAG., 1851 (foraminifer), *Cret.*, Holl.
Mastopora EICHW., 1860 (?sponge related to *Pasceolus*), *Ord.*, Balt.
Melobesia LAMX., 1812 (calcareous alga), *Rec.*, Fr.
Omniretepora D'ORB., 1849 (?cladoporoid tabulate coral), *Dev.*, Ky.-Ind.

Orbitolites LAMARCK, 1801 (foraminifer), *Eoc.*, Ala.-Miss.
Paronipara CAPEDE, 1904 (?coral), Italy.
Ptychocladia ULR.-B., 1904 (foraminifer), *Penn.*, Ill.
Rhabdinopora EICHW., 1855 (graptolite), *Ord.*, Balt.
Rhaphidopora NICH.-F., 1886 (?tabulate coral related to *Chaetetes*), *Dev.*, Ger.
Sertularia LINNÉ, 1758 (hydroid), *Rec.*

REFERENCES

The following list of publications relating to bryozoans includes only references which are judged by the writer to be most helpful in furnishing additional information concerning this group of organisms and in offering a guide to extensive literature which is not cited.

The index numbers enclosed in parentheses in the column at left are employed in the text for identification of the publications.

Bassler, R. S.

- (1) 1906, *A study of the James types of Ordovician and Silurian Bryozoa*: U. S. Natl. Mus. Proc., vol. 30, p. 1-66, pl. 1-6.
- (2) 1906, *The bryozoan fauna of the Rochester shale [Silurian]*: U. S. Geol. Survey Bull. 292, p. 1-137, pl. 1-31.
- (3) 1911, *The early Paleozoic Bryozoa of the Baltic provinces*: U. S. Natl. Mus. Bull. 77, p. 1-382, pl. 1-13, fig. 1-226.
- (4) 1911, *Bryozoa [Middle Devonian, Wisconsin]*: Wis. Geol. Survey Bull. 21, p. 49-67, pl. 5-11.
- (5) 1927, *Bryozoa [Silurian, Anticosti]*: Can. Geol. Survey Mem. 154, p. 143-168, pl. 5-12.
- (6) 1929, *The Permian Bryozoa of Timor*: Paläont. Timor, Lief. 16, Abh. 28, p. 37-90, pl. 225-247 (Stuttgart).
- (7) 1939, *The Hederelloidea, a suborder of Paleozoic cyclostomatous Bryozoa*: U. S. Natl. Mus. Proc., vol. 87, no. 3068, p. 25-91, pl. 1-16, fig. 14.
- (8) 1941, *Generic descriptions of upper Paleozoic Bryozoa*: Washington Acad. Sci. Jour., vol. 31, p. 173-179, fig. 1-24.

Borg, Folke

- (9) 1926, *Studies on Recent cyclostomatous Bryozoa*: Uppsala Zool. Bidrag, B. 10, p. 182-507, pl. 1-13.
- (10) 1933, *Revision of Recent Heteroporidae*: Same, Bd. 14, p. 263-394, pl. 1-14.
- (11) 1944, *The stenolaematous Bryozoa*: Further Zool. Results Studies Swed. Antarct. Exped. 1901-03, vol. 3, no. 5, p. 1-276, pl. 1-16.

Brown, D. A.

- (12) 1952, *The Tertiary cheilostomatous Polyzoa of New Zealand*: Br. Mus. (Nat. Hist.), p. 1-399, fig. 1-296 (London).

Busk, George

- (13) 1852-75, *Catalogue of marine Polyzoa in the collection of the British Museum*: I, 1852, Cheilostomata, p. 1-54, pl. 1-68; II, 1854, Cheilostomata, p. 55-120, pl. 69-124; III, 1875, Cyclostomata, p. 1-41, pl. 1-38 (London).
- (14) 1859, *A monograph of the fossil Polyzoa of the Crag*: Paleontogr. Soc. Mon., p. v-xiii, 1-136, pl. 1-22, fig. 1-7 (London).
- (15) 1884, *Report on the Polyzoa—The Cheilostomata*: Rept. Voyage Challenger, Zool., vol. 10, p. 1-216, pl. 1-36, fig. 1-59.

Calvet, Louis

- (16) 1900, *Contributions à l'histoire naturelle des bryozoaires ectoproctes marins*: Montpellier Univ. Inst. zool. Trav., n.s., t. 8, p. 1-488, pl. 1-13.
- (17) 1902, *Bryozoaires marins de la région de Cette*: Same, Mém. 11, p. 1-103, pl. 1-3.
- (18) 1902, *Bryozoaires marins des côtes de Corse*: Same, Mém. 12, p. 1-52, pl. 1-2.

Canu, Ferdinand

- (19) 1900, *Revision des bryozoaires du Crétacé figurés par d'Orbigny—Cheilostomata*: Soc. géol. Fr. Bull., ser. 3, t. 28, p. 334-463, pl. 1-4, fig. 1-71.
- (20) 1907-10, *Bryozoaires des terrains tertiaires des environs de Paris*: Annales paléont., t. 2, 1907,