

Scythophyma POMEL, 1872 [**C. crassa*; SD DE LAUB., herein] (31). *Tert.*, N.Afr.
Trachycinclis POMEL, 1872 [**Spongia ramosa* MANTZELL, 1822] (31). ?Age, ?loc.
Tragalimus POMEL, 1872 [**Dimorpha balanus* COURT., 1861] [= *Glyphalimus* POMEL, 1872] (31). *Cret.*, Eu.

Class HYALOSPONGEA Vosmaer, 1886

[*nom. correct.* DE LAUB., herein (ex *Hyalospongiae* VOSMAER, 1886)] [= *Hexactinellida* SOLLAS, 1887]

Skeletal structure siliceous, very open, generally with large central cloaca as in sycons; flesh of simple rhagon type but much less compact than in Demospongea. Some Paleozoic forms may have been ascon. ?*Precam.*, *L.Cam.-Rec.*

The rays of hyalosponge spicules typically form a right angle where they diverge from one another, whereas spicules of demosponges tend to have rays separated by

angles of 60 or 120 degrees. A very common type of spicule in the Hyalospongea is a tetraxon with all 4 rays in the same plane; these are termed stauracts. Spicules with 5 rays (pentacts) or 6 rays (hexacts) are like stauracts with extra rays meeting the others perpendicularly. Octactinal and so-called polyactinal spicules (with more than 8 rays) also occur. The name Hexactinellida, which has been used for the class, is inappropriate because spicules other than hexacts are prevalent in some genera and because Hexactinellida is almost identical with the family name Hexactinellidae.

Living Hyalospongea invariably contain, among other spicules, microscleres which are either a rod with disclike expansions at each end (amphidisc) or a spicule with many rays diverging from a center (aster). Accordingly, the class has been divided in two orders: Amphidiscophora (with amphi-

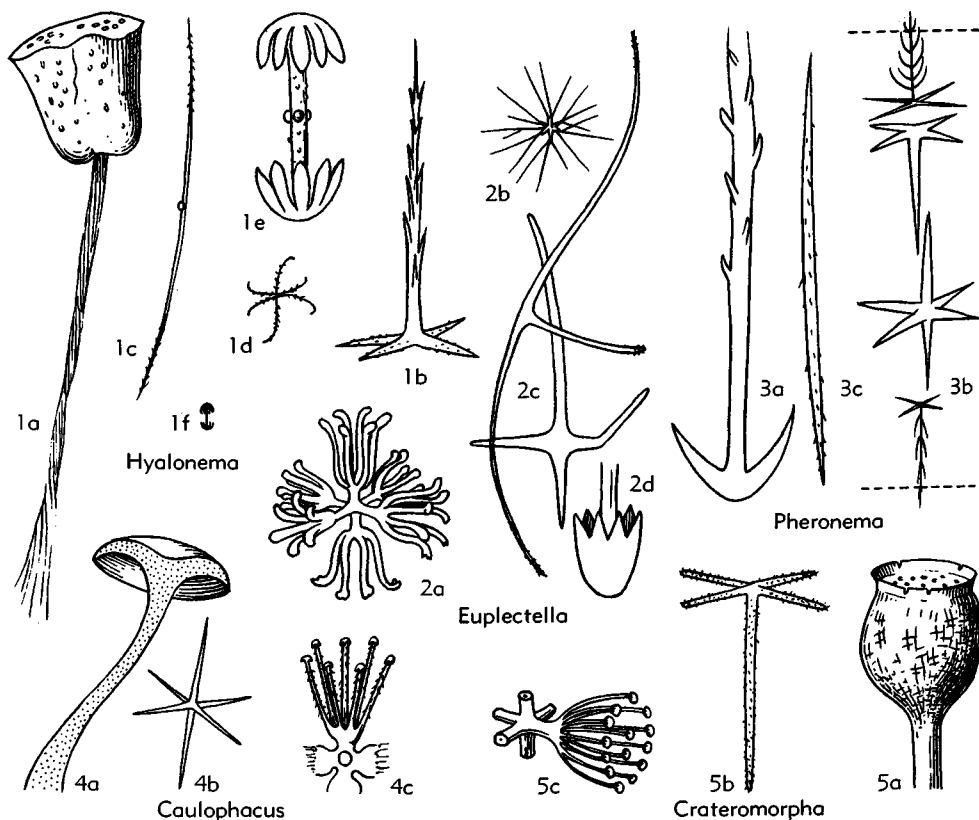


FIG. 50. Lyssakida: Hyalonematidae, Pheronematidae, Euplectellidae, Sympagellidae, Lanuginellidae (p. E67-E68).

discs) and Hexasterophora (with asters). The latter is divisible into 3 suborders called Lyssakinosa, characterized by lack of firm union of the megasclere spicules during part or all of the life of the sponge; Hexactinosa, with tips of spicules fused very early in ontogeny to form a netlike (dictyine) rigid skeleton; and Lychniskosa, distinguished from Hexactinosa by spicules with peculiar hollow axial nodes. The Amphidiscophora resemble the Lyssakinosa in lacking a firmly knit skeleton.

Fossil hyalosponges cannot be classified like living forms on the basis of microsclere characters, for these spicules rarely are preserved in association with individuals to which they belong. Consequently, in paleontological study 4 orders are recognized: Lyssakida, which comprises the lysacine Hexasterophora combined with all Amphidiscophora; Dictyida, which is essentially equivalent to the hexasterophoran suborder Hexactinosa; Lychniskida, similarly corresponding to the hexasterophoran suborder Lychniskosa; and Heteractinida, which contains sponges characterized by polyactinal or heteractinal spicules, all of Paleozoic age.

Order LYSSAKIDA Zittel, 1877

[*nom. correct.* DELAUB., herein (*ex* Lyssakina ZITTEL, 1877)]

Mostly vase-shaped or globular sponges, walls with stauractine spicules and commonly diactine and more complex types also; anchorage generally effected by large tuft of long hairlike spicules. *L.Cam.-Rec.*

Members of this group attain maximum variety and abundance in Devonian strata. They are less important in the Carboniferous, unknown in Permian and Triassic deposits, represented by a single Jurassic example, fairly common in Cretaceous and Tertiary rocks, and abundant at the present time.

Family HYALONEMATIDAE Gray, 1857

[*nom. correct.* DELAUB., herein (*ex* Hyalonemadae GRAY, 1857)]

Principal skeleton composed of diacts; basal tuft of spicules extending as axial part of massive main skeletal structure. Living forms included in Amphidiscophora. *Eoc.-Rec.*

Hyalonema GRAY, 1832 [**H. sieboldi* GRAY, 1835].

Basal tuft of spirally twisted hairlike spicules very long (30 cm. or more) and narrow (about 1 cm.), their proximal ends bearing recurved clads (22). *Eoc.-Rec.*, cosmop.—FIG. 50,1. **H. sieboldi* GRAY, *Rec.*, Japan; *1a*, side view, $\times 0.15$; *1b*, pinule, $\times 160$; *1c*, diact, $\times 80$; *1d*, hexact, $\times 160$; *1e*, amphidisc, $\times 80$; *1f*, small amphidisc, $\times 160$ (83).

Family PHERONEMATIDAE Gray, 1872

[*nom. correct.* DELAUB., herein (*ex* Pheronemadae GRAY, 1872)]

Principal skeleton composed of hexacts; attachment by several separate basal tufts. Living forms included in Amphidiscophora. *Cret.-Rec.*

Pheronema LEIDY, 1868 [**P. annae*]. Thick-walled cup (22). *Tert.-Rec.*, cosmop.—FIG. 50,3. **P. annae*, *Rec.*, W. Indies; *3a*, proximal end of root tuft spicule, $\times 120$; *3b*, spicules of body wall placed as in living sponge, outer surface above and cloacal surface below, $\times 50$; *3c*, uncinata spicule known as a cleme, $\times 120$ (83).

Semperella GRAY, 1868 [**Hyalonema schultzei* SEMPER, 1868]. Like *Pheronema* but club-shaped, not hollow, with oscules in longitudinal grooves on sides (22). *Cret.-Rec.*, cosmop.

Family EUPLECTELLIDAE Gray, 1867

Skeleton composed almost wholly of hexacts that form rigid framework but not by tip-toe union of the spicules; body tubular. Living forms included in Amphidiscophora. *U.Cret.-Rec.*

Euplectella OWEN, 1841 [**E. aspergillum*]. Oscule closed by sieve; attached by root tuft. Modern forms known as "Venus's flower basket" (22). *Mio.-Rec.*, cosmop.—FIG. 50,2. **E. aspergillum*, *Rec.*, Philippines; *2a*, floricome, $\times 235$; *2b*, oxyhexaster, $\times 150$; *2c*, spicules of main skeleton associated with hexacts (not shown), $\times 50$; *2d*, proximal tip of root tuft spicule, $\times 150$ (83).

Regadrella SCHMIDT, 1880 [**R. phoenix*]. Like *Euplectella* but firmly attached and skeletal lattice-work diagonally disposed (22). *U.Cret.-Rec.*, cosmop.

Proeuplectella MORET, 1936 [**P. fragilis*] (26). *U.Cret.*, Fr.—FIG. 51,2. *P. cenomaniensis* MORET, Cenom.; $\times 10$ (72*).

Family SYMPAGELLIDAE Schulze, 1887

[*nom. transl.* DELAUB., herein (*ex* Sympagellinae SCHULZE, 1887)]

Goblet- or mushroom-shaped sponges attached by a stalk. Living forms included in Hexasterophora. *Eoc.-Rec.*

Caulophacus SCHULZE, 1886 [**C. elegans*]. Umbrella-like (22). *Eoc.-Rec.*—FIG. 50,4. **C. latus*

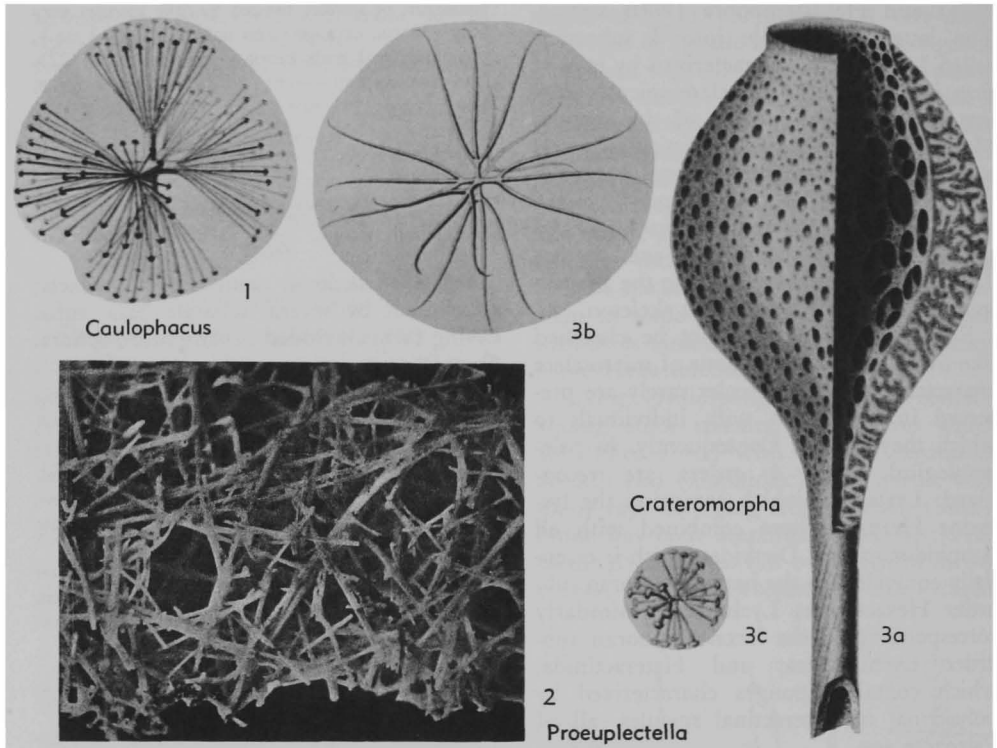


FIG. 51. Lyssakida: Euplectellidae, Sympagellidae, Lanuginellidae (p. E67-E68).

SCHULZE, Rec., Ind.O.; *4a*, part of sponge sectioned longitudinally, cut surface stippled, $\times 1$; *4b*, hexact of main skeleton, $\times 12$; *4c*, discohexaster, $\times 150$ (83).—FIG. 51,1. *C. elegans* SCHULZE, Rec., cosmop.; discohexaster, $\times 100$ (83*).

Family LANUGINELLIDAE Schulze, 1887

[*nom transl.* DELAUB., herein (*ex* Lanuginellinae Schulze, 1887)]

Cup- or sac-shaped, with or without root tufts, surface covered by pentacts and hexacts, each with 4 or 5 projecting exposed rays and a long one extending into the body. Living forms included in Hexasterophora. *Eoc.-Rec.*

Crateromorpha CARTER, 1872 [**C. meyeri*]. Stalked, with large cloaca; besides hexacts and pentacts, spicules include stauracts, diacts, hexasters, and discohexasters (22). *Eoc.-Rec.*, cosmop.—FIG. 50,5. **C. meyeri*, Rec., Philippines; *5a*, side view, $\times 0.25$; *5b*, pentact, $\times 80$; *5c*, discohexaster (other 5 rays like that drawn unbroken), $\times 500$ (83).—FIG. 51,3. *C. thierfelderi* Schulze, Rec., E.Indies; *3a*, side showing surface and sec-

tion, $\times 1$; *3b*, oxyhexaster, $\times 300$; *3c*, discohexaster, $\times 250$ (83*).

Rosella CARTER, 1872 [**R. antarctica*]. Like *Crateromorpha* but unstalked, with root tuft, rim of cloaca without collar (22). *Tert.-Rec.*, cosmop.

Family STAURACTINELLIDAE de Laubenfels, nov.

Globular sponges, spicules a mass of hexacts, other types unknown (hence misnamed, for stauracts are lacking). *Jur.*

Stauractinella ZITTEL, 1877 [**S. jurassica*]. Rays of hexacts unequal in length (49). *Jur.*, Eu.

Family PROTOSPONGIIDAE Hinde, 1887

Very thin-walled hollow spheroidal or inverted cone-shaped sponges, commonly with root tufts; spicules chiefly tetraxons, stauracts in body, diacts in some root tufts and around oscule. *L.Cam.-U.Sil.*

The occurrence of only a single layer of spicules in the wall of various members of this family suggests that soft parts were of ascon type. Seemingly, pentact and hexact

spicules had not yet evolved. The protospongiids are closely similar to contemporary forms having only monacts and diacts, classed as belonging to the Demospongea, which points to lack of wide divergence between classes of sponges in early Paleozoic time.

Protospongia SALTER, 1864 [**P. fenestrata*]. Hollow sphere of walnut size or smaller, with root tuft of diacts; semirigid wall formed of stauracts more or less joined at ray tips, smaller stauracts in meshes and commonly a coronal fringe of erect oxeas around oscule. Some whole forms have only 23 stauracts and 3 root spicules. *L.Cam.-Ord.*, NW.Eu.-N.Am.-China.—FIG. 52,1. *P. mononema* DAWSON-H., *Ord.*, Can.; 1a, side view, $\times 0.5$; 1b, spicules of wall, $\times 3$ (57).

Cyathophycus WALC., 1879 [**C. reticulatus*] [= *Cyathospongia* DAWSON, 1888 (non HALL, 1882)]. Like *Protospongia* but funnel-shaped, probably without root tuft. *Ord.*, N.Y.-Can.—FIG. 52,2. *C. quebecensis* DAWSON-H., Can.; diagrammatic sketch, $\times 0.8$ (57).

Phormosella HINDE, 1887 [**P. ovata*]. Globular, small without root tuft (13). *Ord.*, Eng.—FIG. 52,5. **P. ovata*; part of thin wall, $\times 3$ (13).

Megastylia RUED., 1934 [**M. calyciformis*]. Vase-shaped, spicules larger than in *Protospongia*, probably attached to floating seaweed. *L.Ord.*, N.Y.

Diagoniella RAUFF, 1894 [**Protospongia coronata* DAWSON-H., 1889; SD WALC., 1920]. Differs from *Protospongia* in having diagonal pattern formed by stauract rays (33). *Ord.*, Can.—FIG. 52,4. **D. coronata* (DAWSON-H.); side view, $\times 1$ (57).

Plectoderma HINDE, 1884 [**P. scitulum*]. Larger and coarser than *Protospongia*, with stauracts locally in bundles, so that more than one spicule may occur in thickness of wall. *U.Sil.*, Scot.

Palaeosaccus HINDE, 1893 [**P. dawsoni*]. Skeleton more symmetrical than that of *Protospongia*. *Ord.*, Que.

Stephanella HINDE, 1891 [**S. sancta*]. Radially arranged fine lines in patches 18 to 24 mm. dia., presumed to be imprints of *Protospongia*-type sponge bases. *Cam.-Ord.*, Can.

Kiwetinokia WALC., 1920 [**K. utahensis*]. Probably sac-shaped sponges anchored by long spicules, preserved as tangled masses of spicules, including stauracts, triacts, prodiaenes, and spirally intertwined diacts (45). *Cam.-Ord.*, Can.-Idaho-Utah.—FIG. 52,3. **K. utahensis*, Cam., Utah; 3a, stauracts; 3b,c, triacts; 3d, diact; all $\times 3$ (88).

Family LEPTOMITIDAE de Laubenfels, nov.

Like Protospongiidae but only diactinal spicules certainly present. *L.Cam.-Ord.*

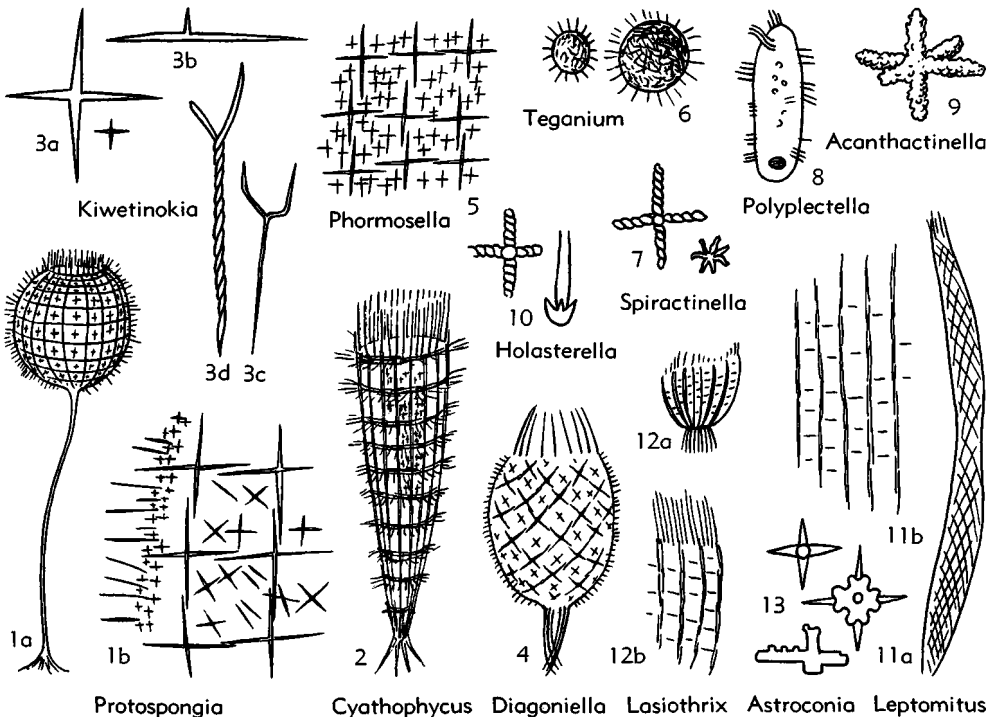


FIG. 52. Lyssakida: Protospongiidae, Leptomitidae, Teganiidae, Holasterellidae (p. E69-E70)

This assemblage appropriately could be classified among haplosclerine demosponges on some characters but they also resemble closely lyssakid Hyalospongea of *Protospongia* type. In early Paleozoic time the classes of sponges seem not to have been sharply differentiated.

Leptomitus WALC., 1886 [**L. zitteli*] [= *Tuponia* WALC., 1920]. Thin-walled vase-like, attaining height of 80 cm. and diameter of 4 cm., with root fringe; spicules comprise crisscrossed long diacts locally joined ladder-wise with short diacts (45). *L. Cam.-M. Cam.*, Vt.-B.C.—FIG. 52,11; 53,1. *L. lineata* (WALC.), type of *Tuponia*, M. Cam., B.C.; 52,11a, sketch of sponge, $\times 1$; 52,11b, long and short diacts, $\times 5$ (41); 53,1, part of specimen, $\times 3$ (88,88*).

Halichondrites DAWSON-H., 1889 [**H. confusus*]. Resembles *Leptomitus*; remains fragmentary. *Cam.-Ord.*, Can.—53,2. *H. elissa* WALC., M. Cam., B.C.; $\times 0.75$ (88*).

Lasiotrix DAWSON-H., 1889 [**L. curvicostata*]. Small hollow spheroids with root tufts and coronal erect fringe at rim of apical aperture (osculum); spicules much as in *Leptomitus*. *Ord.*, Can.—FIG. 52,12. **L. curvicostata*; 12a, side view of sponge, $\times 1$; 12b, part of skeleton, $\times 5$ (57).

Family TEGANIIDAE de Laubenfels, nov.

Hollow spheroidal or sac-shaped forms with protruding long thin diacts. *Ord.*

Teganium RAUFF, 1894 [**T. subsphaericum*]. Pea-size globular forms with fringe or complete cover of radiating spicules, skeleton of body wall composed of stauracts (33). N.Y.—FIG. 52,6. **T. subsphaericum*; two specimens, $\times 1$ (62).

Polyplectella RUED., 1925 [**P. mira*]. Differs from *Teganium* in elongate form and grouping of projecting spicules in tufts. N.Y.—FIG. 52,8. **P. mira*; $\times 1$ (80).

Foerstella RUED., 1925 [**F. rotunda*]. Like *Polyplectella* but protruding spicules very long (to 70 mm.) and without root tufts. N.Y.

Sycodictya RUED., 1925 [**S. rara*]. Thicker walled than *Polyplectella* and with small, apical osculum leading to central cloaca. N.Y.

Family HOLASTERELLIDAE de Laubenfels, nov.

Spicules of skeleton not coherent, some smooth but most of them rough and lumpy, as in lithistids. *Sil.-Carb.*

These sponges of strongly lyssakid type are a small, probably polyphyletic group which seem to represent a development in the Hyalospongea corresponding to that

of the Lithistida in the Demospongea. Also, they show some resemblances to the division of hyalosponges called Heteractinida. The holasterellids are found chiefly in Carboniferous formations.

Holasterella CARTER, 1879 [**H. wrightii*]. Spicules commonly have annular markings. *L. Carb.*, Ire.—FIG. 52,10. **H. wrightii*; spicules, $\times 12$ (63).

Astroconia SOLLAS, 1881 [**A. grantii*]. Exceptionally large spicules. *Sil.*, Eng.-Can.—FIG. 52,13. **A. grantii*; spicules, $\times 6$ (78).

Rhakistella WELLER, 1931 [**R. alba*]. Spicules lumpy and spinose, somewhat as in *Astroconia*. *Penn.*, Ill.

Spiractinella HINDE, 1887 [**Holasterella wrighti* CARTER, 1880]. Like *Holasterella* but spicules with spiral ridges and some stelliform (13). *Carb.*, Eng.—FIG. 52,7. **S. wrighti* (CARTER); spicules, $\times 4$ (94).

Acanthactinella HINDE, 1887 [**Holasterella benniei* HINDE, 1884]. Differs from *Holasterella* in granular surface of spicules (13). *Carb.*, Eng.—FIG. 52,9. **A. benniei* (HINDE); spicule, $\times 6$ (63).

Family DICTYOSPONGIIDAE Hall, 1882

[*nom. correct.* DE LAUB., herein (ex Dictyospongiidae ZITTEL-E., 1913, ex Dictyospongiac HALL, 1882)]

Like Protospongiidae but mostly larger, generally vase-shaped, with more rigid skeleton that is almost of dictyid type, consisting typically of a single layer of longitudinal and transverse spicule strands which form a quadrate-meshed network; almost invariably a primary reticulation of coarser, more widely spaced strands is distinguishable from secondary meshwork composed of fine, closely spaced strands, and projecting spicules may occur along lines of the primary network. *Ord.-Carb.*

This is one of the most important families of Paleozoic sponges, represented by many large and beautiful fossils, especially from Devonian rocks of New York. The Dictyospongiidae clearly are derived from protospongiid stocks, characterized by their rectangular, stauract-based wall pattern of extreme thinness which indicates a probably ascon architecture. As demonstrated by living species, the relatively inefficient hydraulic system of ascon sponges is not adapted for bodies much larger than those of the Protospongiidae, with height attaining 3 cm. and diameter 1 cm., and thus

the more strongly built, considerably larger Dictyospongiidae, with bodies commonly ranging in diameter from 10 to 30 cm., almost surely possessed semi-rhagon architecture such as prevails in modern hyalosponges. Indeed, the family of Dictyospongiidae contains genera like *Phragmodictya* which have all essential attributes of ancestors of the living lyssakid sponges belonging to the order Amphidiscophorida, and the dictyospongiids *Mastodictya* and *Lyrodactya* contain recognizable uncinates and clavules corresponding to spicule types that occur together in modern Farreidae of the Hexasterophorida. The farreid sponges have relatively thin reticulate walls, closely resembling Paleozoic genera in appearance. Comparative studies support judgment that several sorts of Recent sponges, widely scattered in accepted classifications, are products of evolution from dictyospongiid ancestors.

The family is divided here into somewhat artificial subfamilies on the basis of body shape, genera characterized by prismatic form being assigned to the Prismodictyinae

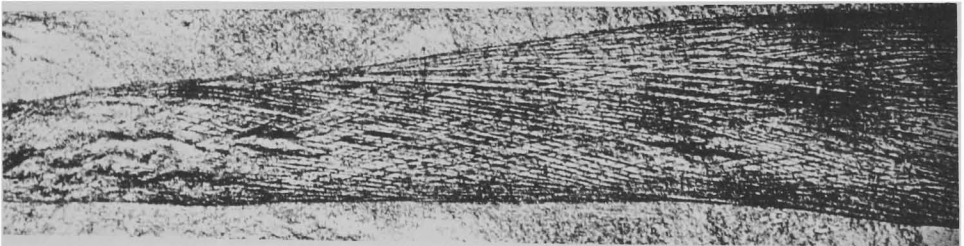
and others which lack this form being included in the Dictyospongiinae. Among the Prismodictyinae is *Acanthodictya*, from Ordovician rocks of Canada, which is the oldest known member of the family; this subfamily is chiefly developed in the Devonian of North America, 2 genera only (*Hydnoceras*, *Rhabdosispongia*) being known from Europe. With exception of a species of *Griphodictya*, all described Dictyospongiinae come from North America, about one half of the genera occurring in Devonian formations and one half in the Carboniferous.

Subfamily DICTYOSPONGIINAE Hall, 1882

[*nom. transl.* DELAUB., herein (*ex* Dictyospongiidae *nom. correct.* *ex* Dictyospongiae HALL, 1882)]

Shape not prismatic. *Sil.-Carb.*

Dictyospongia HALL-C., 1898 [**Dictyophyton sceptrum* HALL, 1890]. Elongate vasselike, with root tuft of long hairlike spicules; reticulate skeleton formed by longitudinal strands about 5 mm. apart crossed by transverse spicules 10 to 15 mm. apart, with secondary much smaller reticulation. Well-preserved specimens may show loose spicules resembling those of living hyalosponges (10).



2

Halichondrites

FIG. 53. Lyssakida: Leptomitidae (p. E70).

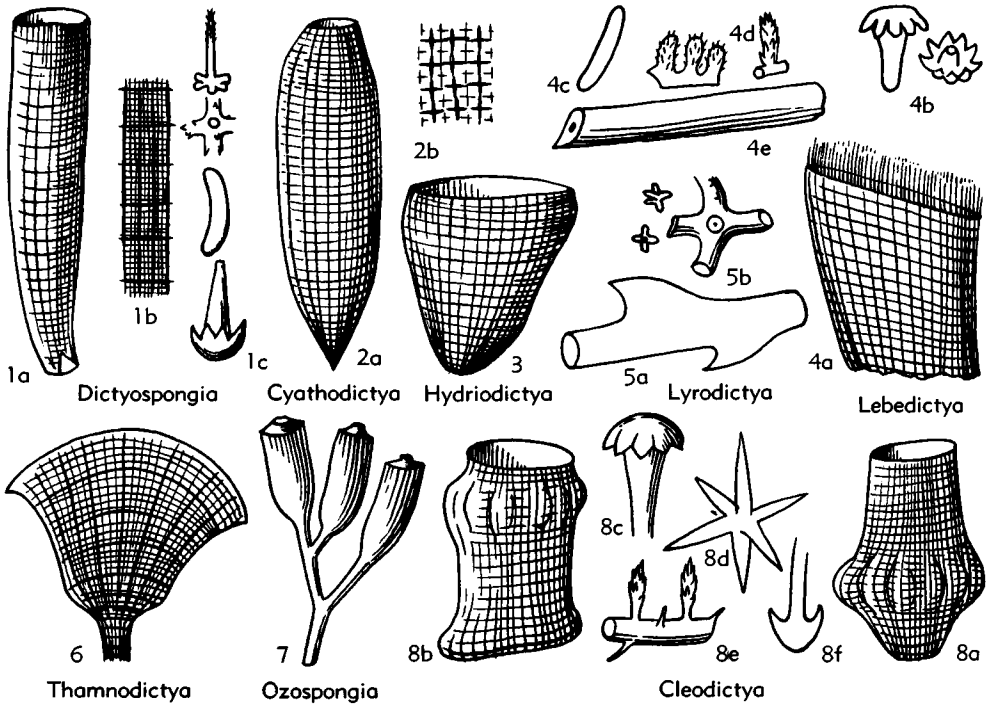


FIG. 54. Lyssakida: Dictyospongiidae (p. E72).

Dev., N.Y. (other records probably erroneous).—FIG. 54,1. **D. sceptrum* (HALL); 1a, side view, $\times 0.2$; 1b, reticulate skeleton, $\times 1$; 1c, spicules, $\times 250$ (62).

Cyathodictyia HALL-C., 1900 [**Cyathophycus reticulatus* WALC., 1879]. Symmetrical rounded vase-like forms (10). *Sil.-Dev.*, Iowa-N.Y.—FIG. 54,2. **C. reticulata* (WALC.), *Dev.*, N.Y.; 2a, side view, $\times 0.1$; 2b, reticulate skeleton, $\times 3$ (62).

Hydriodictyia HALL-C., 1900 [**Dictyophyton patulum* HALL, 1884]. Obconical or straight-sided cups or vases. *Dev.*, N.Y.—FIG. 54,3. *H. cylinx* HALL-C.; side view, $\times 0.3$ (62).

Lebedictyia HALL-C., 1900 [**L. crinita*]. Like *Hydriodictyia* but with coronal fringe (10). *Carb.*, Ind.—FIG. 54,4. **L. crinita*; 4a, part of sponge from side $\times 0.2$; 4b, clavules; 4c, strongyle; 4d, pinule; 4e, part of principal skeleton; 4b-e, $\times 250$ (62).

Thamnodictyia HALL, 1884 [**Dictyophyton newberryi* HALL, 1864]. Funnel- or lotus-shaped (10). *Carb.*, Ohio.—FIG. 54,6. **T. newberryi* (HALL); side view, $\times 0.4$ (62).

Ozospongia CLARKE, 1918 [**O. johnstoni*]. Several individuals on branching stalk; longitudinal strands of reticulate skeleton prominent; truncate summit with moderately large oscule. *Dev.*, N.Y.—FIG. 54,7. **O. johnstoni*; side view, $\times 0.2$ (55).

Lyrodictyia HALL, 1884 [**L. romingeri*]. Probably like *Hydriodictyia* in shape; longitudinal strands of skeleton each formed by several rows of large spicules, transverse elements suppressed, some loose spicules (10). *Carb.*, N.Y.-Iowa.—FIG. 54,5. **L. romingeri*; 5a, part of large uncinat spicule; 5b, other spicules, $\times 100$ (62).

Actinodictyia HALL, 1890 [**A. placenta*]. Known only from large leaflike fragments which combine dictyospongiid and protospongiid characters (10). *Dev.*, N.Y.-Pa.—FIG. 55,5. **A. placenta*; part of skeleton, $\times 0.5$ (62).

Arystidictyon HALL-C., 1900 [**A. elegans*]. Like *Hydriodictyia* in shape but skeleton as in *Actinodictyia* (10). *Dev.*, N.Y.

Cleodictyia HALL, 1884 [**C. gloriosa*]. [= *Tylo-dictyia* HALL-C., 1900]. Vase- or tubelike, with girdle of bulges (10). *Carb.*, Ind.-Pa.—FIG. 54,8a. **C. gloriosa*; side view, $\times 0.1$ (62).—FIG. 54,8c-f. *C. mohri* HALL; loose spicules, $\times 40$ (62).—FIG. 54,8b. *C. warranensis* (HALL-C.) (type of *Tylo-dictyia*); side view, $\times 0.4$ (62).

Hallodictyia HALL-C., 1900 [**H. aciensis*]. Fragments (to 9 by 19 mm.) like a wad of paper, probably from wall of very large vase-shaped sponges with irregular primary skeleton (10). *Dev.*, N.Y.

Iowaspongia THOMAS, 1923 [**I. annulata*]. Vase-like with annular sharp ridges. *U.Dev.*, Iowa.—FIG. 55,1. **I. annulata*; side view, $\times 0.2$ (87).

Agliothictya HALL-C., 1900 [**A. nummulina*]. Like *lowaspongia* but much smaller (10). *U.Dev.*, Pa.—FIG. 55,6. **A. nummulina*; side view, $\times 1$ (62).

Griphodictya HALL-C., 1900 [**G. epiphanes*]. Vase-like, constricted at midheight; distinctive loose spicules (10). *Dev.-Carb.*, Fr.-Ind.—FIG. 55,3. **G. epiphanes*, Carb., Ind.; 3a, hexaster; 3b, streptaster; 3c-g, tips of clavules (?amphidiscs); 3h,i, ends of long diacts, $\times 175$ (62).

Ectenodictya HALL, 1884 [**E. implexa*] [= *Calathospongia* HALL-C., 1898]. Somewhat like *Griphodictya*; types fragmentary (10). *Carb.*, Pa.

Ceratodictya HALL-C., 1898 [**Dictyophyton annulatum* HALL, 1863]. Large tubular body with several rounded annular swellings (10). *Dev.-Carb.*, N.Y.-Pa.-Ohio.—FIG. 55,7a. **C. annulata* (HALL), Dev., N.Y.; side, $\times 0.4$ (62).—FIG. 55,7b. *C. carpenteriana* HALL-C., Dev., N.Y.; side, $\times 0.2$ (62).

Mastodictya HALL-C., 1900 [**Dictyospongia osculata* HALL-C., 1898]. Compound, narrowing apically (10). *Carb.*, Ind.—FIG. 55,9. **M. osculata* (HALL-C.); side, $\times 0.6$ (62).

Cryptodictya HALL, 1890 [**C. alleni*]. Inverted saucer-shaped with low mammiform prominences (10). Dev., Pa.

Rhombodictyon WHITE., 1886 [**R. reniforme*]. Subglobular, with rhomb-shaped meshes in primary skeleton (10). Dev., N.Y.

Sphaerodictya HALL-C., 1900 [**S. subsphaerica*]. Small, globular or discoid (10). Dev., N.Y.

Acloeodictya HALL-C., 1900 [**A. marsipus*]. Sac-shaped with deeply sculptured surface, possibly with root tuft (10). *Carb.*, Ind.—FIG. 55,4. **A. marsipus*; 4a, side, $\times 0.2$; 4b, spicules, $\times 100$ (62).

Phragmodictya HALL, 1882 [**Dictyophyton cattiliforme* WHITE., 1881]. Truncate inverted cone probably with *Hyalonema*-type root tuft (10). *Carb.*, Ind.—FIG. 55,2. **P. cattiliformis* (WHITE.); 2a, side (restoration), $\times 0.2$ (91); 2b, spicules, $\times 200$ (62).

Pseudohydroceras REIMANN, 1934 [**P. erraticum*]. Small stalked sponge with bulbous prominences on upper side. Dev., N.Y.—FIG. 55,8. **P. erraticum*; side, $\times 0.3$ (79).

Dictyorhabdus WALC., 1892 [**D. priscus*]. Fragments of tube with bulbous swellings along one

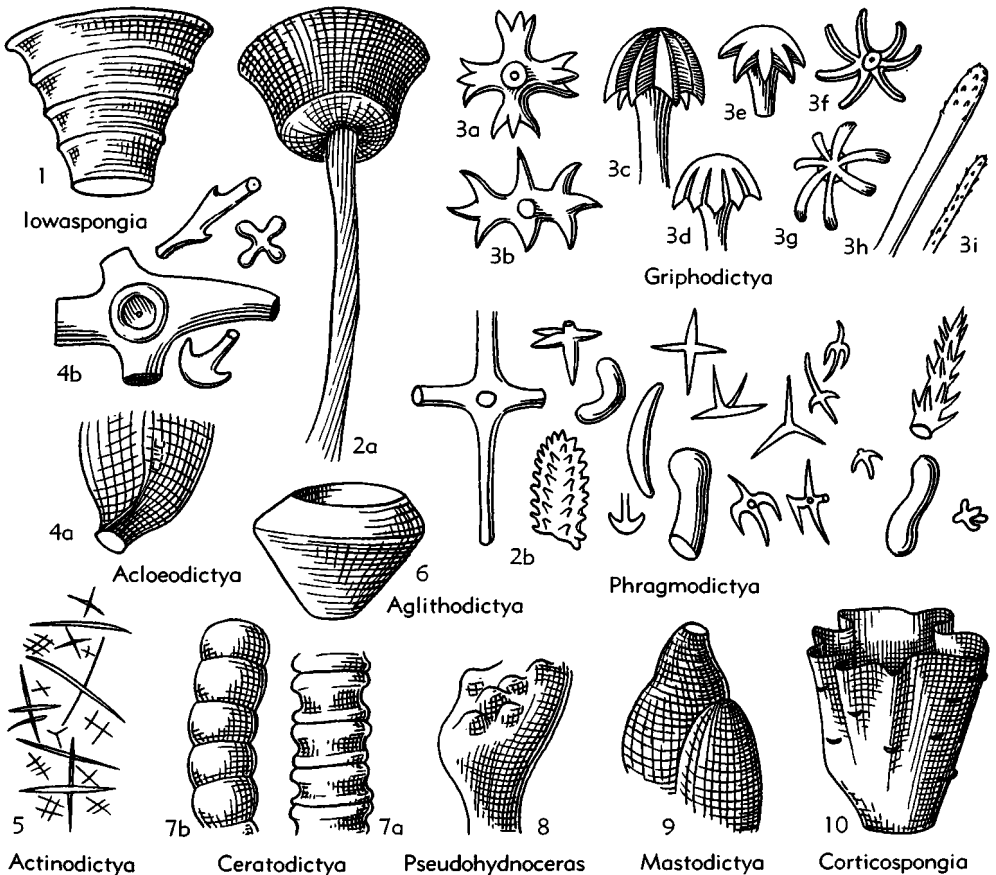


FIG. 55. Lyssakida: Dictyospongiidae (p. E72-E74).

side only. Thick wall as in Brachiospongiidae but lattice-work skeleton as in Dictyospongiidae. *Dev.*, Colo.

Corticospingia CASTER, 1939 [**C. bradfordensis*]. Vase-like, with folded walls and transverse lenticular swellings (3). *U.Dev.*, Pa.—FIG. 55,10. **C. bradfordensis*; side, $\times 0.3$ (54).

Subfamily PRISMODICTYINAE de Laubenfels, nov.

Prismatic forms with polygonal transverse section, generally 8-sided. *Ord.-Carb.*

Prismodictya HALL-C., 1898 [**Dictyophyton telum* HALL, 1884]. Regular form without peculiarities (10). *U.Dev.-L.Carb.*, N.Y.-Ind.—FIG. 56,1. **P. telum* (HALL), *U.Dev.*, N.Y.; side, $\times 0.7$ (62).

Helicodictya HALL-C., 1898 [**H. trypania*]. Like *Prismodictya* but spirally twisted (10). *U.Dev.*, N.Y.-Pa.—FIG. 56,4. **H. trypania*; side, $\times 0.7$ (62).

Ithacadietia CASTER, 1939 [**I. cornelli*]. Small *Prismodictya*-like forms with conspicuous spicule tufts at intersections of longitudinal and transverse ridges; corona of oscular spicules present (3). *Dev.*, N.Y.—FIG. 56,3. **I. cornelli*; side, $\times 1$ (54).

Acanthodictya DAWSON-H., 1889 [**A. hispida*]. Longitudinal ridges with continuous row of bristle-like projecting spicules. *Ord.*, Can.—FIG. 56,12. **A. hispida*; side, $\times 0.5$ (57).

Clathrospongia HALL-C., 1900 [**Dictyophyton abacus* HALL, 1884]. Vase-like, expanding from very small base; deep boxlike meshes between elevated strands of primary skeleton (10). *U.Dev.*, N.Y.—FIG. 56,2. **C. abacus* (HALL); side, $\times 0.4$ (62).

Thysanodictya HALL-C., 1900 [**Dictyophyton halli* HALL, 1890]. Like *Clathrospongia* but has broad flat base (10). *Dev.*, N.Y.

Dictyophyton HALL, 1863 [**D. flitextile*; SD MILLER, 1889] [= *Dictyophytra* RAUFF, 1894]. Differs from *Prismodictya* in having regular rings

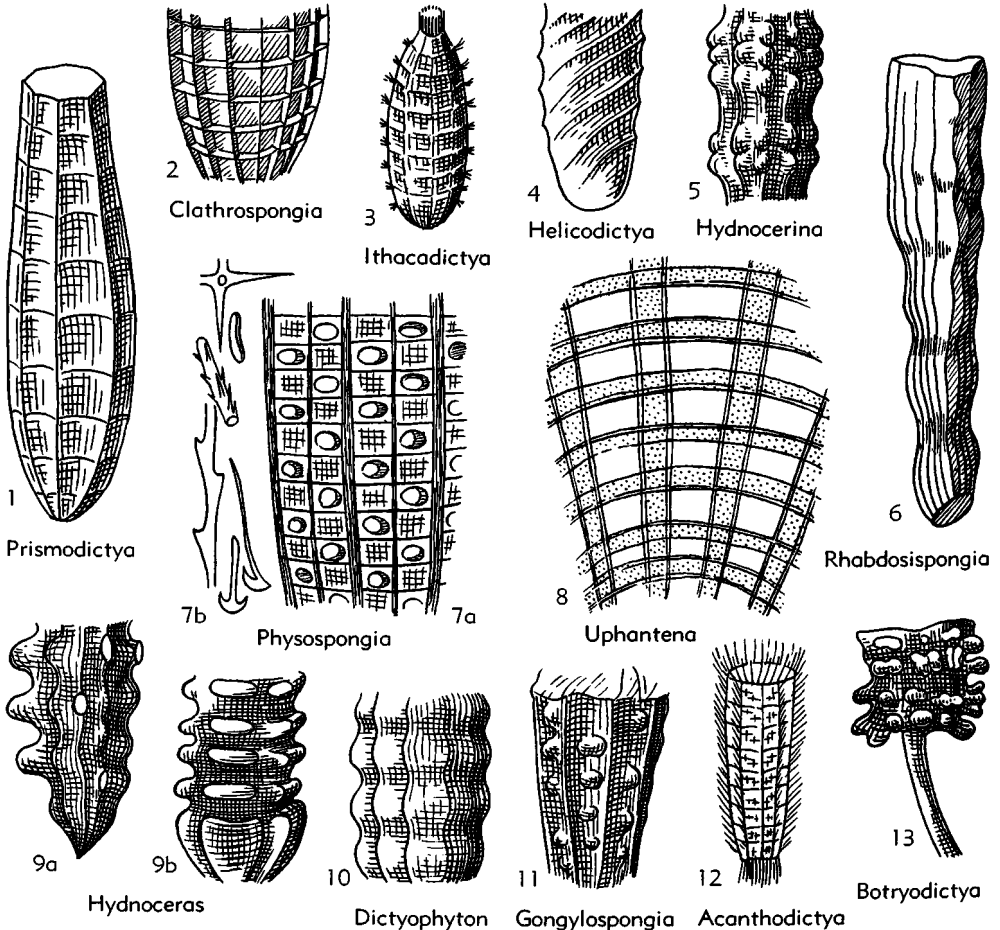


FIG. 56. Lyssakida: Dictyospongiidae, Uphantenidae (p. E74-E76).

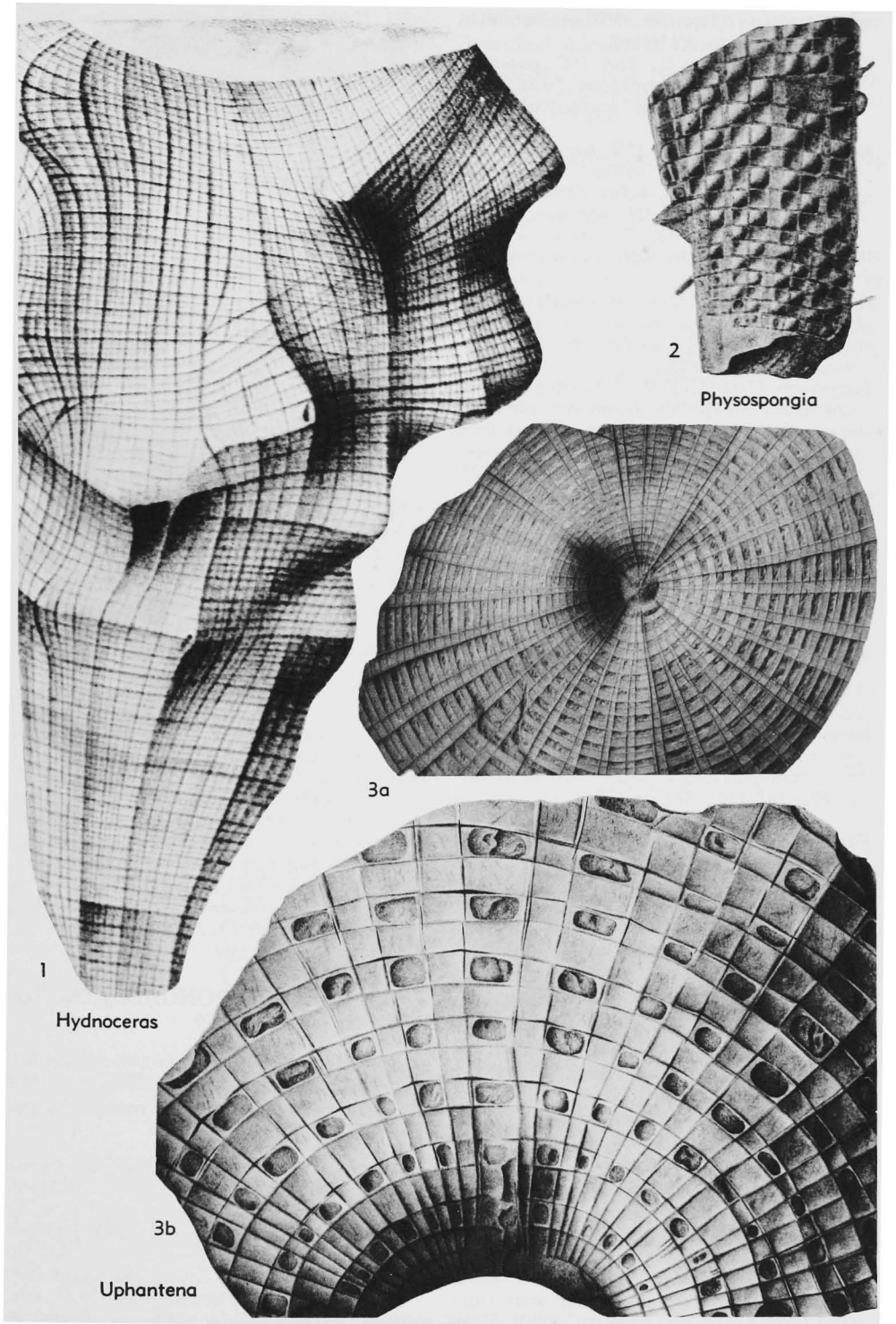


FIG. 57. Lyssakida: Dictyospongiidae, Uphantenidae (p. E76).

of prominences (10). *Dev.*, N.Y.—FIG. 56,10. **D. filitextile*; side, $\times 1$ (68n).

Clepsydrosporgia HALL-C., 1900 [**C. matutina*]. Less regular than *Dictyophyton*, with small rounded projections along longitudinal ridges (10). *Dev.*, N.Y.

Hydnoceras CONRAD, 1842 [**H. tuberosum*]. Distinguished by annular bulbous swellings on longitudinal ridges (10). *U.Dev.-Carb.*, N.Y.-Pa.-Fr.—FIG. 56,9a; 57,1. **H. tuberosum*, *U.Dev.*, N.Y.; 56,9a, side, $\times 0.3$; 57,1, same, $\times 1$ (62, 62*).—FIG. 56,9b. *H. walcotti* CLARKE, *U.Dev.*, N.Y.; $\times 0.3$ (55).

Hydnocerina CLARKE, 1918 [**H. armstrongi*]. Differs from *Hydnoceras* in grouping of annular prominences. *Dev.*, Pa.—FIG. 56,5. **H. armstrongi*; side, $\times 0.4$ (55).

Botryodictya HALL-C., 1900 [**Dictyophyton ramosum* LESQ., 1884]. Like *Hydnoceras* but seemingly stalked and with annular prominences much produced; coronal fringe (10). *U.Dev.*, Pa.—FIG. 56,13. **B. ramosa* (LESQ.); side, $\times 0.3$ (62).

Gongylosporgia HALL-C., 1898 [**G. marshi* HALL-C., 1900]. Like *Prismodictya* but with bulbous prominences on nearly flat sides (10). *U.Dev.*, N.Y.—FIG. 56,11. **G. marshi*; side, $\times 0.25$ (62).

Rhabdosisporgia HALL-C., 1900 [**Dictyophyton amalthaea* HALL, 1890]. Subcylindrical form with several longitudinal ridges with annular swellings as in *Ceratodictya*; transverse skeletal strands hardly perceptible (10). *U.Dev.*, Pa.-Fr.—FIG. 56,6. **R. amalthaea* (HALL), Pa.; side, $\times 0.2$ (62).

Roemerispongia HALL-C., 1900 [**Dictyophyton gerolsteinense* RÖMER, 1883]. Obconical cup with many prismatic faces; secondary skeleton reduced or obliterated (10). *M.Dev.*, Ger.

Family UPHANTENIDAE de Laubenfels, nov.

Large bowl-shaped hyalosponges characterized by relatively wide-shaped straplike bands of spicules arranged longitudinally and transversely, with double thickness at their nearly right-angle intersections; no trace of secondary reticulation but meshes of primary skeleton evidently occupied by fleshy tissue except for openings to the interior. *U.Dev.-Carb.*

Uphantena VANUXEM, 1842 [**U. chemungensis*] [= *Hyphantaenia* HALL-C., 1900]. Discoid (probably by flattening), some with diameter more than 35 cm.; radially disposed skeletal straps narrow, concentric ones 5 mm. or more wide; apertures rectangular (indicated by impression of fleshy film) (10). *U.Dev.*, N.Y.—FIGS. 56,8; 57,3. **U. chemungensis*; 56,8, part of surface showing skeletal strands and fleshy areas (stippled) with rectangular apertures, $\times 0.3$; 57,3a,

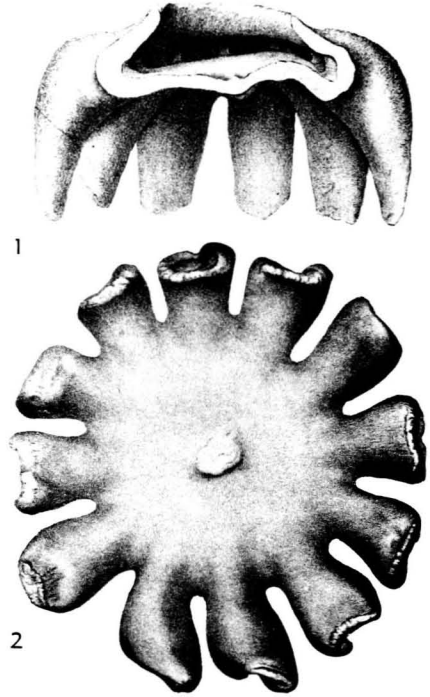


FIG. 58. *Brachiospongia digitata* (OWEN), Ord., Ky. (p. E76).

mold of surface, $\times 0.25$; 57,3b, part of surface showing "windows," $\times 0.3$ (62,62*).

Physospongia HALL, 1882 [**P. dawsoni*; SD MILLER, 1889]. Smaller and finer structure than in *Uphantena*, with rounded apertures that may have been covered by blister-like domes; skeletal nodes with long tufts of projecting spicules; some loose spicules preserved (10). *Carb.*, Ind.—FIGS. 56,7; 57,2. **P. dawsoni*; 56,7a, part of wall, $\times 0.4$; 56,7b, spicules, $\times 20$; 57,2, side view, $\times 1$ (62,62*).

Family BRACHIOSPONGIIDAE Beecher, 1889

Radially lobate hyalosponges resembling dictyospongiids, especially *Cleodictya*, but thicker-walled and more like modern forms. *Ord.-Sil.*

Brachiospongia MARSH, 1867 [**Scyphia digitata* OWEN, 1858; SD BEECHER, 1889] [= *Rhaeospongia* LAMONT, 1935]. Body with 8 to 12 (generally 10) hollow radial projections, without root tuft. *Ord.*, Ky.-Scot.—FIGS. 58; 59,1. **B. digitata* (OWEN), Ord., Ky.; 59,1a, ?upper (distal) surface, with one arm cut open; 59,1b, side, oriented as in 1a; 59,1c, spicules as arranged in

wall, exterior toward left; *1a,b*, $\times 0.25$ (68n); *58,1,2*, side in section and ?upper surface, $\times 0.5$, $\times 0.25$ (51*).

Colpospongia LAMONT, 1935 [**C. lineata*]. Bowl-shaped, with circular attachment disk, thin walls longitudinally folded. Comparison with *Brachiospongia* indicates correctness of orientation shown in fig. 59,1. *Ord.*, Scot.

Pattersonia MILLER, 1882 [**P. difficilis*] [= *Strobilospongia* BEECHER, 1889]. Walls produced in successive rings of lobate prominences, with basal tuft of long hairlike root spicules. *Ord.*, Ky.-?N.Y.-?Ohio.—FIG. 59,2. *P. tuberosa* (BEECHER) (type of *Strobilospongia*), *Ord.*, Ky.; side, $\times 0.3$ (79).

Oncosella RAUFF, 1894 [**O. catinus*]. Broad-based cylindrical sponge with root tuft; skeleton includes ectosomal spiny hexacts and endosomal smooth hexacts (33). *Sil.*, Eng.

Family MULTIVASCULATIDAE de Laubenfels, nov.

Incrusting lyssakids with many tubular proliferations, a growth form which is common in Demospongia but nearly unknown in Hyalospongia. *U.Cam.*

Multivasculus HOWELL & VAN HOUTEN, 1940 [**M. ovatus*]. Skeleton formed by common types of hexacts, straight diacts, and deformed spicules (16). *U.Cam.*, Wyo.—FIG. 59,5. **M. ovatus*; *5a*, part of surface, $\times 0.5$; *5b*, vertical section, $\times 0.7$ (84).

Family VAUXIIDAE de Laubenfels, nov.

Thin-walled tubular lyssakids with or

without branches, characterized by peculiar triactinal spicules. *M.Cam.*

Vauxia WALC., 1920 [**V. gracilentia*]. *Can.* (45). —FIG. 59,4. **V. gracilentia*; spicules arranged as in wall, $\times 7$ (88).

Family AMPHISPONGIIDAE Rauff, 1894

Proximal (lower) part radiate, distal part tubular. *U.Sil.*

The radiate structure of the lower part of these sponges, although common in demosponges, is very rare in the Hyalospongia. It is possible that some early Paleozoic presumed demosponges are actually basal portions of amphispongiids.

Amphispungia SALTER, 1861 [**A. oblonga*]. A mass of very thick styles radiating from a central point forms skeleton of lower part, whereas stauracts, pentacts, and thin diacts comprise the reticulate skeleton of the upper part. *U.Sil.*, Scot. —FIG. 59,3. **A. oblonga*; *3a*, side, $\times 0.8$; *3b,c*, spicules of upper and lower parts, $\times 5$ (63).

Family TITUSVILLIIDAE Caster, 1939

Skeletal framework lyssakid to later distinctly dictyid, cup-shaped individuals budded in linear succession to form branching colonies. Central cloaca continuous, walls 3 layers thick, otherwise resembling *Ceratodictya*. *L.Carb.-Rec.*

Titusvillia CASTER, 1939 [**T. drakei*]. Individuals complex in structure, each fairly distinct, the

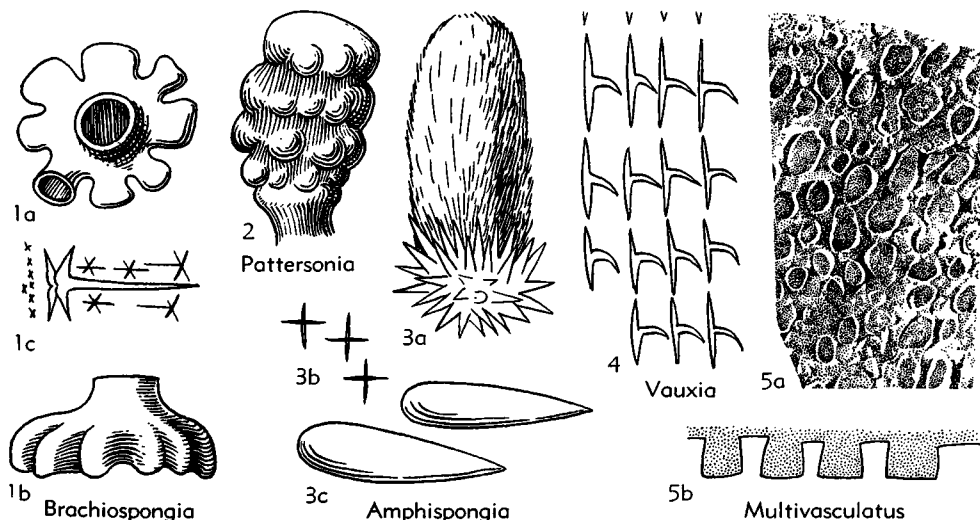


FIG. 59. Lyssakida: Brachiospongiidae, Multivasculatidae, Vauxiidae, Amphispongiidae (p. E76-E77).

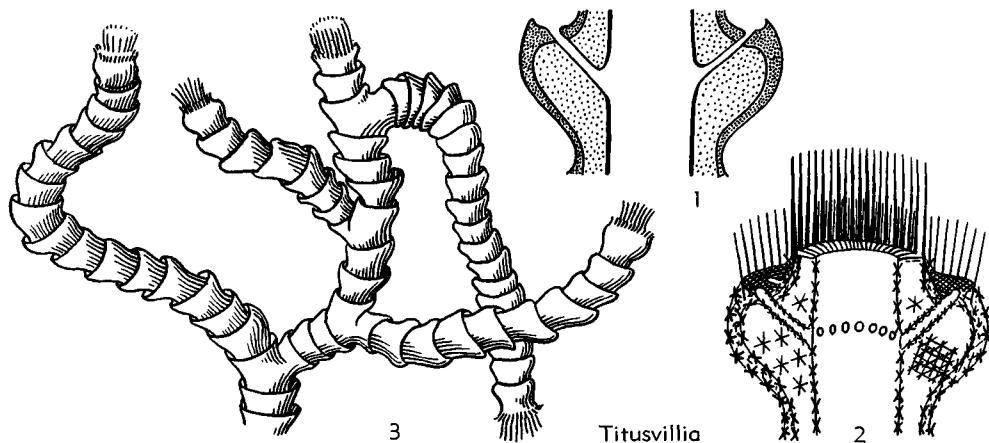


FIG. 60. *Titusvillia drakei* CASTER, Miss., Pa. (p. E78).

terminal one on a branch having a conspicuous coronal fringe of long straight spicules; some branches of colony seem to have grown backward (3). *L.Carb.*, Pa.—FIG. 60. **T. drakei*; 1, diagrammatic longitudinal section; 2, similar section of terminal individual; 3, part of colony showing growth habit; 1, 2, $\times 2$; 3, $\times 0.4$ (54).

Armstrongia CLARKE, 1920 [**Ceratomyx oryx* CLARKE, 1918]. Simpler and evidently more primitive than *Titusvillia*; diagnosis mainly based on form later named *A. clarkei* CASTER (1941), which may not be congeneric with the poorly preserved type. *U.Dev.*, Pa.

Protoarmstrongia CASTER, 1941 [**P. ithacensis*]. Branching strands with simple annular swellings but no cuplike individuals. *U.Dev.*, N.Y.

Sclerothamnus MARSHALL, 1875 [**S. clausi*]. Shape and size much like *Titusvillia* but branching simpler; dictyonine strands spined. Microscleres (tylohexasters) known. *Rec.*, E.Ind.

Family UNCERTAIN

Pyrtonema M'COY, 1850 [**P. fasciculatus*; SD DE LAUB., herein]. Name applied to masses of parallel hairlike spicules which seemingly comprise root tufts of lyssakid sponges; possibly useful but not valid as a distinct genus. *Sil.*, Eng.

Acanthospongia RÖMER, 1861 [**A. siluriensis*; SD DE LAUB., herein] [= *Acanthospongia* GRIFFITH, 1862]. *Sil.*, Eire.

Opeainorphus DE LAUB., *nom. nov.* [*pro Acestra* C. F. RÖMER, 1861¹ (*non* DALLAS, 1852)] [**Acestra subularis* C.F. RÖMER, 1861]. Awl-shaped spicules. *Ord.-Carb.*, Eu.

¹ RÖMER, C. F. (1861) *Die fossile Fauna der silurischen diluvial-Geschiebe von Sadewitz*: Breslau, p. 55.

Order DICTYIDA Zittel, 1877

[*nom. correct.* DE LAUB., herein (*pro* Dictyonina ZITTEL, 1877)]

Skeleton rigid, formed of symmetrically arranged hexacts, all joined tip to tip except in exterior ranks so as to make rectangular cribwork; no diact spicules. *M.Ord.-Rec.*

The dictyid hyalosponges closely resemble members of the Lychniskida in some respects; they form a readily distinguished group which, although rare in Paleozoic rocks, attained abundance in Mesozoic time and is flourishing today.

Family EURYPLEGMATIDAE de Laubenfels, nov.

Hexacts of main skeleton less well fused together than in most of the order; classed among dictyids because of absence of diactinal spicules, which characterize the Lyssakida. ?*Cret.*, *Rec.*

Euryplegma SCHULZE, 1886 [**E. auriculare*]. Ear-shaped, thin-walled, with pores on both sides (22). *cosmop.*

Family HEXACTINELLIDAE Schmidt, 1870

Mostly vase-shaped, relatively thick-walled dictyids distinguished by predominance of the strong ectosomal reticulate skeleton as compared with corresponding structure of the endosomal region; wall thickness may exceed diameter of the cloaca. *Jur.-Rec.*

Hexactinella CARTER, 1885 [**H. ventilabrum*]. Bowl-shaped to crumpled, irregular; spicules granulose or minutely spined (22). *U.Cret.-Rec.*, cosmop.—FIG. 61,1. **H. ventilabrum*, Rec., part of skeletal network and loose spicules, outer surface at top, $\times 35$ (83).

Tretodictyum SCHULZE, 1886 [**T. tubulosum*; SD IJIMA, 1927]. Generally elongate tubular; living forms distinguished by microscleres (22). *U.Cret.-Rec.*, cosmop.

Prohexactinella MORET, 1927 [**P. cenomanensis*]. Globular, with walls thicker than diameter of cloaca (26). *U.Cret.*, Fr.

Andreaea SCHRAM., 1902 [**A. hexagonalis*]. Like *Hexactinella* but walls thinner, with prosopores and apopores symmetrically arranged (37). *Cret.*, Ger.

Pyncocalyptra SCHRAM., 1936 [**P. calyx*]. Thick-walled cup (40). *Jur.*, Ger.

Pachyascus SCHRAM., 1936 [**P. formosus*]. Thick-walled cylinder (40). *Jur.*, Ger.

Polyopesia SCHRAM., 1902 [**P. angustata*]. (37). *U.Cret.*, Ger.

Poteridium RAUFF, 1933 [**P. cretaceum*]. Globular (33). *Cret.*, Eu.

Xenoschrammenum DELAUB., *nom. nov.* [*pro Amphiblestrum* SCHRAM., 1936 (ref. 40, p. 57) (non GRAY, 1848)] [**Amphiblestrum venosum* SCHRAM., 1936]. Thick-walled cup (40). *Jur.*, Ger.

Family EUBROCHIDIDAE
de Laubenfels, nov.

[=Callibrochididae SCHRAM., 1912]

Vase-shaped, with very compact ectosomal skeleton but exceptionally large-meshed endosomal network seen in wall of cloaca; many spicular rays with small branched appendages. *U.Cret.*

Eubrochis SCHRAM., 1902 [**E. senonica*] [=Callibrochis SCHRAM., 1912] (37). Ger.

Oxyrhizium SCHRAM., 1912 [**O. eximium*] (38). Ger.

Habrosium SCHRAM., 1912 [**H. convolutum*]. Walls folded (38). Ger.

Wollemannia SCHRAM., 1912 [**W. araneosa*] (38). Ger.—FIG. 61,4. **W. araneosa*; 4a, side, $\times 0.7$; 4b, part of skeleton, $\times 22$ (82).

Family STAURODERMATIDAE
Zittel, 1877

[*nom. correct.* DELAUB., herein (*pro* Staurodermatidae ZITTEL, 1877)]

Commonly vaselike, invariably with external skeletal layer composed typically of stauracts but in some including stauract-like hexacts, with principal skeleton beneath. *Jur.-Mio.*

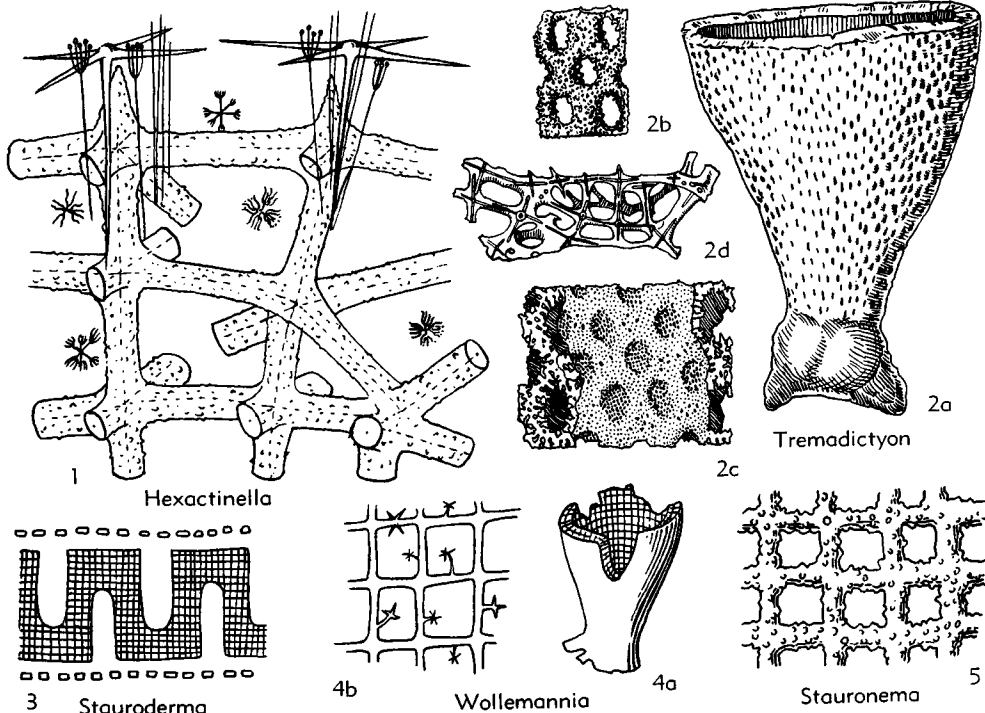


FIG. 61. Dictyida: Hexactinellidae, Eubrochididae, Staurodermatidae (p. E79-E80).

- Stauroderma** ZITTEL, 1877 [**Scyphia buchi* GOLDF., 1833; SD DELAUB., herein]. Funnel-shaped or platelike, with broad shallow cloaca; special dermal skeleton on both sides (49). *Jur.*, Eu.—FIG. 61,3. **S. buchi* (GOLDF.), diagrammatic section of wall showing regular arrangement of prosocetes and apochetes, $\times 1$ (93).
- Tremadictyon** ZITTEL, 1877 [**Scyphia reticulatum* GOLDF., 1833; SD DELAUB., herein]. Like *Stauroderma* but special skeleton not so evident on cloacal surface (49). *U.Jur.*, Eu.—FIG. 61,2. **T. reticulatum* (GOLDF.); 2a, side, $\times 0.3$; 2b, part of outer skeleton, $\times 2$; 2c, part of dermis, $\times 1$; 2d, skeletal network, $\times 8$ (94).
- Stauronema** SOLLAS, 1877 [**S. carteri*; SD DELAUB., herein]. Like *Tremadictyon* but discoid to saucer-shaped and with more regular skeleton of spinose spicules. *L.Cret.*, Eng.—FIG. 61,5. **S. carteri*, part of skeleton, $\times 1$ (63).
- Saynospongia** MORET, 1927 [**Elasmoierea palmicea* DUMORTIER, 1871]. Shape like dagger sheath, with skeleton of fine cubical cribwork (26). *Jur.*, Fr.
- Paracraticularia** SCHRAM., 1936 [**Scyphia procumbens* GOLDF., 1833; SD DELAUB., herein]. Like *Tremadictyon* but consisting of branched tubes (40). *Jur.*, Ger.
- Placotrema** HINDE, 1884 [**P. cretaceum*]. Thick flat-topped discoid form without perceptible cloaca (12). *Cret.*, Eng.
- Cincliderma** HINDE, 1884 [**C. quadratum*]. Differs from *Tremadictyon* in more delicate skeletal structure (12). *Cret.*, Eng.
- Eubrochus** SOLLAS, 1876 [**E. clausus*]. Resembles *Tremadictyon* but siliceous network covers oscule. *Cret.*, Eng.
- Polyschema** OPPL., 1915 [**P. hersbergense*; SD DELAUB., herein]. Like *Eubrochus*, with roots (28). *Jur.*, Switz.
- Feifelia** SCHRAM., 1936 [**F. gigas*]. Like *Tremadictyon* but prosopores smaller and apopores larger (40). *Jur.*, Ger.
- Zittelospongia** Malfatti, 1901 [**Z. meandriiformis*] [= *Malfattispongia* GREGORIO, 1908]. Like *Paracraticularia* but more lumpy and crumpled. *Tert.*, Eu.
- Psephosylogus** SCHRAM., 1936 [**P. diligens*]. Thicker-walled than *Tremadictyon*, with oval prosopores in rows; apopores round (40). *Jur.*, Ger.
- Placochlaenia** POMEL, 1872 [**P. protuberans*] (31). *Mio.*, N.Afr.
- Purisiphonia** Bow., 1869 [**P. colarkei*]. ?*U.Jur.*, ?*L.Cret.*, Austral.

Family LEPTOPHRAGMATIDAE Schrammen, 1912

[*nom. correct.* DELAUB., herein (*pro* Leptophragmidae SCHRAM., 1912)]

Generally vase-shaped, with body wall at least 3-layered, consisting of a dense outer

dermis perforated by many small pores, a subdermal layer commonly distinguished by delicate unsymmetrical skeletal reticulation, and an inner thick main skeleton formed of rectangular cribwork. Prosocetes and apochetes tend to be arranged in longitudinal and transverse rows, which is a character useful for family identification because outer skeletal layers tend to be lost in fossilization. *Jur.-Tert.*

- Leptophragma** ZITTEL, 1878 [**Scyphia murchisoni* GOLDF., 1833; SD DELAUB., herein]. May be *Laocaetis* with outer layers lost (49). *Jur.-Cret.*, Eu.
- Laocaetis** POMEL, 1872 [**L. crassipes*] [= *Craticularia* ZITTEL, 1878] (26). *Jur.-Tert.*, Eu.-Afr.—FIG. 62,5c. **L. crassipes*, *Mio.*, Alg., diagrammatic section of wall showing outer dense perforated layer (x), subdermal layer with fimsy reticulate skeleton (y), and main inner skeleton with prosocetes (z), $\times 1$ (72).—FIG. 62,5. *L. paradoxa* (MÜNSTER), *U.Jur.*, Ger. (here designated as type of *Craticularia*); 5a, oblique view of main skeleton, outer layers lacking, $\times 0.3$; 5b, part of reticulate skeleton, $\times 12$ (94).
- Strephinia** HINDE, 1884 [**S. convoluta*; SD DELAUB., herein]. Like *Leptophragma* but wall folded or even doubled (12). *Cret.*, Eng.
- Sphenaulax** ZITTEL, 1878 [**Scyphia costata* GOLDF., 1833]. Like *Leptophragma* but with oval prosopores (?and apopores) vertically elongate (49). *Jur.*, Eu.—FIG. 62,4. **S. costata* (GOLDF.), side, $\times 0.3$ (77).
- Sestrodictyon** HINDE, 1884 [**S. convolutum*]. Like *Leptophragma* with inverted conical form but may resemble rolled sheet of thick paper with overlapped edges; meshes of thick-fibered reticulate endosomal skeleton round rather than square (12). *L.Cret.*, Switz.—FIG. 62,8. **S. convolutum*; part of skeleton, $\times 40$ (63).
- Thyroidium** DELAUB., *nom. nov.* [*pro* *Thyridium* SCHRAM., 1936 (ref. 40, p. 31) (*non* DEJEAN, 1833)] [**Scyphia schweiggeri* GOLDF., 1833] (40). *Jur.*, Ger.

Family EMPLOCIDAE de Laubenfels, nov.

Dictyids with multilayered skeleton in which radially disposed longitudinal subdermal canals occur in successive zones separated by layers composed of rectangular cribwork, so that cross sections resemble growth rings. *M.Jur.*

- Emploca** SOLLAS, 1883 [**E. ovata*] [= *Taxoploca* SOLLAS, 1888]. Globular. Eng.—FIG. 62,3. **E. ovata*; diagrammatic sagittal sec., $\times 2$ (85).

Family POLYTHYRIDIDAE
Schrammen, 1912

[*nom. correct.* DELAUB., herein (*pro* Polythyridae SCHRAM., 1912)]

Exterior relatively smooth, cloaca with deep longitudinal furrows containing apopores in their floors. *M.Ord.-U.Cret.*

Polythyris SCHRAM., 1912 [**P. cuneata*]. Small, stalked, with spiny fibers (38). *U.Cret.*, Ger.—FIG. 62,7. **P. cuneata*; oblique view, top removed to show stellate outline of cloaca in section, $\times 1$ (82).

Ubiquiradius DELAUB., *nom. nov.* [*pro Actinocyclus* SCHRAM., 1912 (ref. 38, p. 277) (*non* EHR., 1831)] [**Actinocyclus mirus* SCHRAM., 1912] (38). *Cret.*, Ger.—FIG. 62,2. **U. mirus* (SCHRAM.); 2a, oblique view of base showing attachment area and longitudinal rows of prosopores; 2b, cloacal surface, both $\times 1$ (82).

Eclastesia RAUFF, 1933 [**E. intrinsecuscostata*]. Conjoined cone-shaped branches. *Cret.*, Eu.—FIG. 62,1. **E. intrinsecuscostata*; oblique view, $\times 1$ (78).

Okulitchina WILSON, 1948 [**O. magna*; SD DELAUB., herein]. Skeleton a 3-dimensional network of hexacts with lumpy enlargements of the fused ray tips; cloaca as in *Polythyris*. One of the extremely few Paleozoic sponges having dictyid characters (47). *M.Ord.*, Can.—FIG. 62,6. **O. magna*; oblique view, sectioned to show form of cloaca, $\times 0.6$ (92).

Family POLYSTIGMATIIDAE
Schrammen, 1912

Thin lamellate dictyonids with prosopores and oval oscules or apopores on both sides. *U.Cret.*

Polystigmatium SCHRAM., 1912 [**P. striatopunctatum*] (38). Ger.

Family PLEUROSOMATIDAE
de Laubenfels, nov.

Moderately thick-walled vasselike dictyids with many inconspicuous long narrow canals (prosochetes, apochetes) which undulate and branch, differing greatly from the prominent short, wide, straight canals in the *Leptophragmatidae*, *Myliusiidae*, and others. *Jur.-Eoc.*

Pleurostoma RÖMER, 1840 [**P. radiatum*; SD DELAUB., herein]. Cup-shaped, with 1 or 2 vertical rows of round openings that reach from exterior to cloaca. *U.Cret.*, Eu.

Guettardiscyphia FROM., 1860 [*pro Guettardia* MICH., 1847 (*non* NARDO, 1833)] [**Guettardia stellata* MICH., 1847]. Walls strongly folded, cloaca with correspondingly deep longitudinal furrows (26). *U.Cret.-Eoc.*, Eu.—FIG. 63,2a. **G. stellata* (MICH.), *Cret.*, Fr.; oblique view, top removed, $\times 0.6$ (7).—FIG. 63,2b. *G. radians* HINDE, *Cret.*, Fr.; side, $\times 0.5$ (63).

Koleostoma MORET, 1927 [**K. godeti*]. Like *Guettardiscyphia* in shape but with crescentic openings

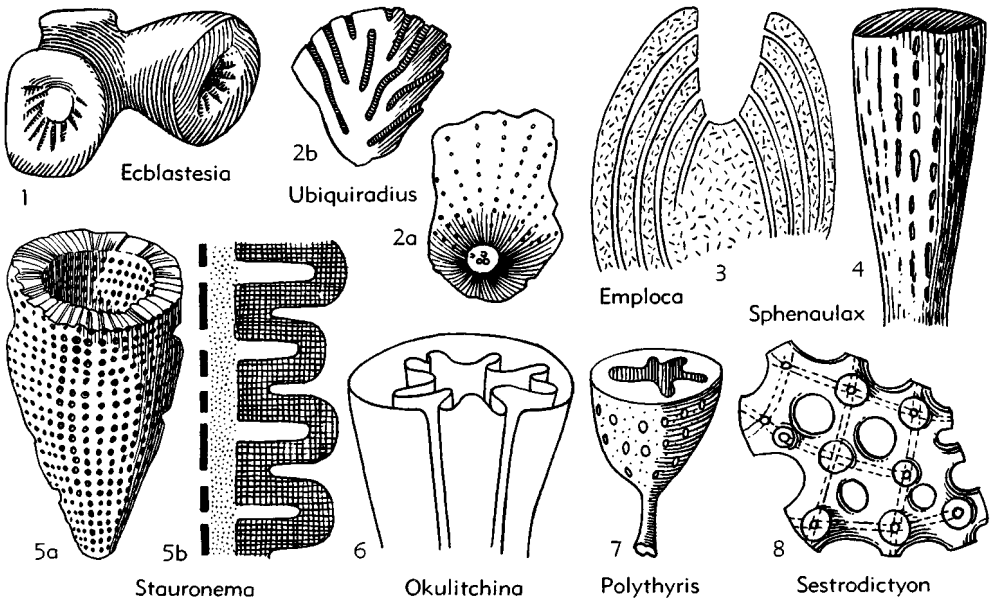


FIG. 62. Dictyida: Staurodermatidae, Leptophragmatidae, Emplocidae, Polythyrididae (p. E80-E81).

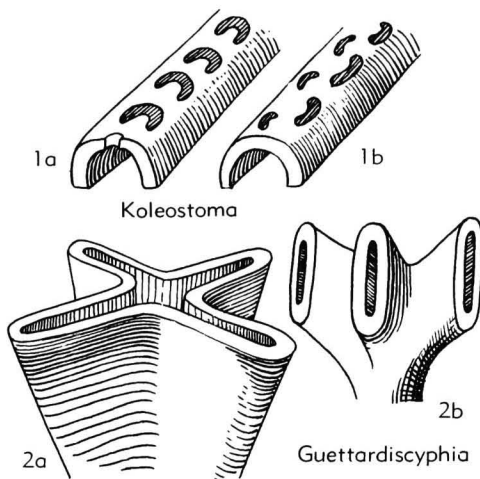


FIG. 63. Dictyida: Pleurostomatidae (p. E81-E82).

into cloaca in rows along ridges (26). *U.Jur.*, Fr. —FIG. 63,1; 64. **K. godeti*, Cenom.; 63,1a,b, oblique views of ridges with common and somewhat unusual types of wall openings, $\times 2$ (72); 64, skeleton, $\times 10$ (72*).

Lopanella POČTA, 1883 [**L. depressa*]. Less symmetrical than *Pleurostoma* and lacking window-like openings into cloaca (30). *U.Cret.*, Czech.

Petalope POČTA, 1883 [**P. auriformis*; SD DELAUB., herein]. Resembles *Pleurostoma* (30). *U.Cret.*, Czech.

Erineum SCHRAM., 1936 [**E. minutum*]. Like *Lopanella* (40). *U.Cret.*, Ger.

Caesaria QUENST., 1857 [**Scyphia articulata* GOLDF., 1833; SD DELAUB., herein]. Like *Lopanella* but cylindrical, with several annular constrictions (32). *U.Jur.*, Ger.

Rhodanospongia MORET, 1927 [**R. robusta*]. Goblet-shaped, with large pentacts having 4 recurved clads at sponge surface and straight rhabd directed inward. *Jur.*, Fr.

Gevreya MORET, 1927 [**G. synthetica*]. Long tube flaring distally in winglike folds as in *Guettardiscyphia*, with large openings (?oscules) along sides. *Jur.*, Fr.

Walcottella DELAUB., nom. nov. [*pro Rhopalicus* SCHRAM., 1936 (ref. 40, p. 36) (non FOERSTER, 1856)] [**Scyphia pertusa* GOLDF., 1833]. Like *Lopanella* (40). *U.Cret.*, Ger.

Family POROSPONGIIDAE Schrammen, 1936

[nom. correct. DELAUB., herein (pro Porospongiadae SCHRAM., 1936)]

Massive or cylindrical dictyids having several conspicuous oscules, skeleton with many stauracts and hexacts in surface

meshes forming a sort of cortex. *U.Jur.*-*U.Cret.*

Porospongia ORB., 1849 [**Manon marginatum* GOLDF., 1833; SD RAUFF, 1893] [= *Porostoma* FROM., 1860]. Lamellate, upper surface with many large oscules leading from short cloacas; dense dermis with stauracts and hexacts. Type species has rim around oscules but others do not (29). *U.Jur.*, Eu.—FIG. 65,1. *P. impressa* (GOLDF.); 1a, side, $\times 1$; 1b, part of dermal layer, $\times 6$; 1c, part of endosomal skeleton $\times 12$ (94).

Mimeticosia RAUFF, 1933 [**M. alata*]. Saucer-shaped, apochetes conspicuous, oscules prominent. *U.Cret.*, Eu.

Multiloqua DELAUB., nom. nov. [*pro Polyphemus* SCHRAM., 1936 (ref. 40, p. 47) (non BERNHAUER, 1914)] [**Polyphemus strombiformis* SCHRAM., 1936]. Resembles *Porospongia* (40). *Jur.*, Ger.

Family MYLIUSIIDAE de Laubenfels, nov.

Moderately thick-walled dictyids which lack ectosomal skeleton above a subdermal space, as in the Laocaetidae; walls commonly crumpled and in many forms having spiny tracts in the reticulate framework of the skeleton. Laocaetidids which have lost their dermis may closely resemble members of this family but with varying certainty are distinguishable by structure of the endosomal skeleton. *Jur.-Rec.*

Myliusia GRAY, 1859 [**M. callocyathus*]. Somewhat vasselike but with very contorted walls which show large apopores on inner side; skeletal fibers spiny and meshes between them not square. Many sponges belonging in the Dactylocalycidae are

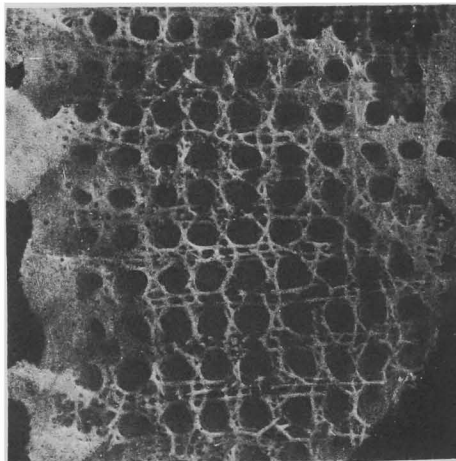


FIG. 64. *Koleostoma godeti* MORET, U.Cret., Fr. (p. E82).

assigned erroneously to this genus (22). *Cret. Rec.*, cosmop.—FIG. 65.2. **M. callocyathus*, Rec.; 2a, side view, sectioned to show cloaca, $\times 1$; 2b, part of skeleton with some loose spicules in place, $\times 40$ (83).

Linonema DELAUB., *nom. nov.* [pro *Linosoma* SCHRAM., 1936 (ref. 40, p. 55) (non EICHELBAUM, 1909)] [**Linosoma calyx* SCHRAM., 1936; SD DELAUB., herein]. Differs from *Myliusia* in having oval or slitlike prosopores (40). *Jur.*, Ger.

Chonelasma SCHULZE, 1886 [**C. lamella*; SD IJIMA, 1927]. Much like *Laocactis* without dermis. Recent species recognized by nature of loose spicules not preserved in fossils (22). ?*U.Cret.*, ?*Tert.*, *Rec.*, cosmop.

Mastodictyum SOLLAS, 1883 [**M. whidborni*]. Resembles *Chonelasma* but upper side has nipple-like processes. *M.Jur.*, Eng.

Cyrtobolia ПОЧТА, 1883 [**Achilleum formosum* REUSS, 1846; SD DELAUB., herein]. Vase-shaped

like *Chonelasma* but exterior has cushion-like projections. *U.Cret.*, Eu.

Etheridgia TATE, 1864 [**E. mirabilis*; SD DELAUB., herein]. Root-bearing inverted cone with oscule on flat summit; some dermis as in *Stauroderma*. *Cret.*, Eng.

Ordinatus DELAUB., *nom. nov.* [pro *Eutactus* SCHRAM., 1936 (ref. 40, p. 38) (non GEMMINGER & HAROLD, 1873)] [**Scyphia texturata* GOLDF., 1833]. Cylindrical to narrow vaselike with sides full of pores (40). *Jur.*, Ger.

Stereochlamis SCHRAM., 1912 [**S. praecissa*; SD DELAUB., herein]. Tubular (38). *U.Cret.*, Ger.

Ramispongia QUENST., 1878 [**R. ramosa*; SD DELAUB., herein] (32). *Jur.*, Ger.

Family BOTRYOSELLIDAE
Schrammen, 1912

Branched tubular dictyids with walls

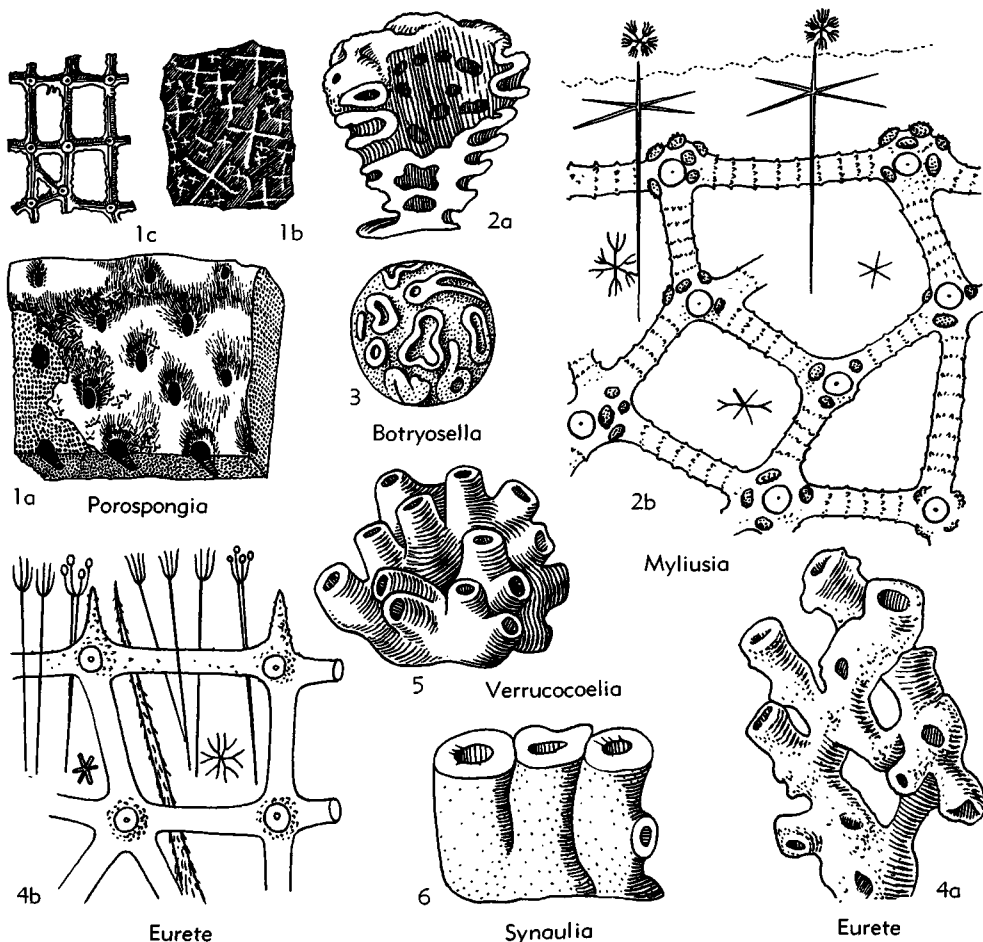


FIG. 65. Dictyida: Porospongiidae, Myliusiidae, Botryosellidae, Euretteidae (p. E82-E84).

nearly as thick as in the Myliusiidae, with few or no canals. *U.Jur.-U.Cret.*

Botryosella SCHRAM., 1912 [**B. labyrinthica*]. Globular mass with irregularly folded walls, interpreted as base from which tubular outgrowths are separated and lost (38). *U.Cret., Ger.*—FIG. 65,3. **B. labyrinthica*; sketch, $\times 1$ (82).

Verrucocoelia ÉTAL., 1859 [**Scyphia verrucosa* GOLDF., 1833; SD HINDE, 1893]. Has many short branches. *L.Cret., Eu.*—FIG. 65,5. **V. verrucosa* (GOLDF.); oblique view, $\times 0.5$ (61). **Typhlopleura** SCHRAM., 1902 [**T. dichotoma*] (37). *Cret., Ger.*

Stichmptyx SCHRAM., 1912 [**S. alatus*]. Walls folded, contorted (38). *U.Cret., Ger.*

Intextum DELAUB., *nom. nov.* [*pro Syringium* SCHRAM., 1912 (ref. 38, p. 256) (*non* PRINCIPI, 1909)] [**Syringium textum* SCHRAM., 1912]. Propores stellate, apopores round (38). *U.Cret., Ger.*

Sporadopyle ZITTEL, 1878 [**Scyphia obliqua* GOLDF., 1833; SD DELAUB., herein]. Cuplike or tubular, commonly with branches, apopores in rows (49). *U.Jur.-U.Cret., Eu.*

Synaulia POČTA, 1883 [**S. germinata*; SD DELAUB., herein]. Some tubular branches coalesce (30). *U.Cret., Czech.*—FIG. 65,6. **S. germinata*; side, $\times 1$ (75).

Botroclonium POČTA, 1883 [**B. arborescens*; SD DELAUB., herein]. Large lateral oscules (30). *U.Cret., Czech.*

Family EURETIDAE Schulze, 1886

Thin-walled tubes, generally about 1 cm. in diameter, that commonly branch and anastomose, with oscules at branch tips. Nature of loose spicules is useful in differentiating living forms but these are rarely preserved in association with firm skeletons of fossils. *Jur.-Tert.*

Eurete SEMPER, 1868 [**E. simplicissimum*]. Two or more dictyine layers in tube walls (22). *U.Cret.-Rec.*, cosmop.—FIG. 65,4a. *E. marshalli* SCHULZE, Rec., E. Ind.; side view $\times 1$ (83).—FIG. 65,4b. *E. schmidtii* SCHULZE, Rec., W.Pac.; part of skeleton showing some loose spicules in place, $\times 40$ (83).—FIG. 66,1. *E. semperi* SCHULZE, Rec., E. Indies; $\times 1$ (83*).

Proeurete SCHRAM., 1902 [**P. plicatum*]. Like *Eurete* but lacks loose spicules (37). *U.Cret., Ger.*

Farrea BOW., 1862 [**F. occa*]. Differs from *Eurete* in having only a single reticulate skeletal layer (22). *U.Cret.-Rec.*, cosmop.

Plectospyris SOLLAS, 1883 [**P. elegans*; SD DELAUB., herein]. Resembles *Eurete*. *Jur.*, Eng.

Ptychodesia SCHRAM., 1912 [**P. papillata*]. Deep grooves serve as apochetes (38). *U.Cret., Ger.*

Family DACTYLOCALYCIDAE

Gray, 1867

[=Hapalopegmidae SCHRAM., 1912]

Vase- or sheetlike dictyids composed of intercalated fine tubes, mostly less than 2 mm. in diameter, with very thin walls showing irregular reticulation that may have triangular meshes; no canals. *Cret.-Rec.*

Dactylocalyx STUTCHBURY, 1841 [**D. pumiceus*; SD DELAUB., 1936]. Contorted sheet; meshes of reticulate skeleton commonly triangular (22). *Tert.-Rec.*, Atl.(tropical).—FIG. 66,4. *D. subglobosus* GRAY, Rec., E.Indies; $\times 10$ (83*).

Periphragella MARSHALL, 1875 [**P. elisae*]. Cup- or vase-like (8). *U.Cret.-Rec.*, cosmop.—FIG. 66,2. *P. elongata* MORET, *U.Cret.*(Cenom.), Fr.; $\times 15$ (72).

Lefroyella THOMSON, 1877 [**L. decora*]. Like *Periphragella* but cloacal wall longitudinally folded (22). *U.Cret.-Rec.*, cosmop.

Auloplax SCHULZE, 1904 [**A. auricularis*]. Plate-like; in living forms distinguished from *Dactylocalyx* by characters of loose spicules (22). *U.Cret.-Rec.*, cosmop.

Meandrospongia ORB., 1849 [**M. foliacea*] [= *Maeandrospongia* RÖMER, 1864] (29). *Cret., Eu.*

Zittelispongia SINTZOV, 1879 [**Z. alcyonoides*]. *U.Cret., Russia.*

Scleroplegma SCHMIDT, 1889 [**S. lanterna*; SD DELAUB., herein]. *U.Cret.-Rec.*, Ger.-Atl.

Pyrospongia ZAHALKA, 1900 [**P. urbaei*; SD DELAUB., herein]. *Cret., Eu.*

Hapalopegma SCHRAM., 1912 [**H. fragile*]. Skeletal meshes oblong (38). *U.Cret., Eu.*—FIG. 66,3. *H. tubuliferum* MORET, Cenom., Fr.; $\times 10$ (72*).

Jima DELAUB., *nom. nov.* [*pro Pleurotoma* SCHRAM., 1912 (ref. 38, p. 257) (*non* EHR., 1839)] [**Pleurotoma jimai* SCHRAM., 1912]. Tubular (38). *U.Cret., Ger.*

Family APHROCALLISTIDAE

Gray, 1867

Generally tubular dictyids with honey-comb-type of wall formed by tubules disposed perpendicularly to wall surface. *Cret.-Rec.*

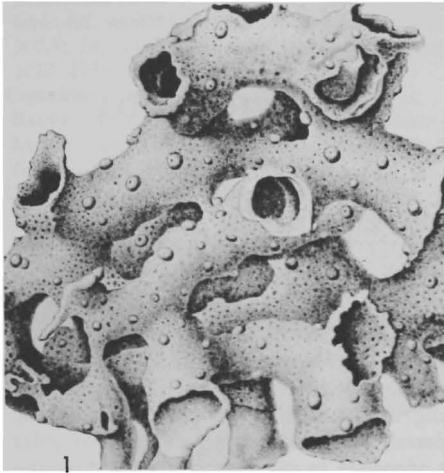
Aphrocallistes GRAY, 1858 [**A. beatrix*]. Branching tubes (22). *Rec.*, cosmop.—FIG. 66,5. *A. vastus* SCHULZE, Rec., Japan, $\times 1$ (83*).

Family WAPKIOSIDAE

de Laubenfels, nov.

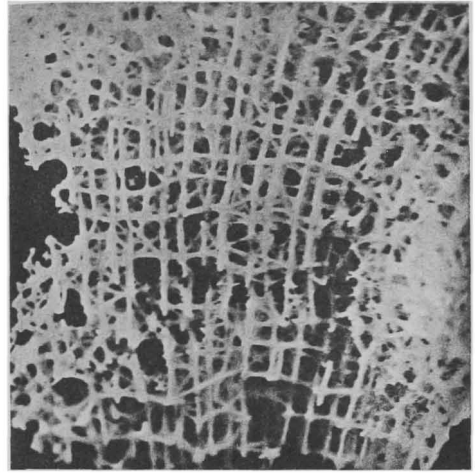
[=Pleurothyrisidae SCHRAM., 1912]

Dictyids consisting of an axial tube



1

Eurete



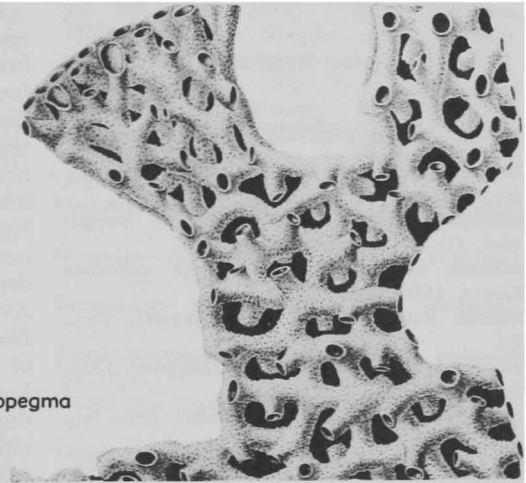
2

Periphragella



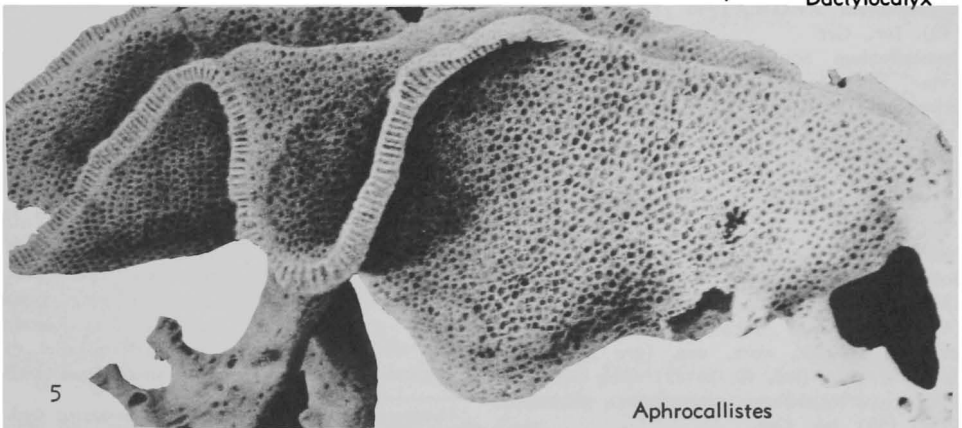
3

Hapalopegma



4

Dactylocalyx



5

Aphrocallistes

FIG. 66. Dictyida: Euretidae, Dactylocalycidae, Aphrocallistidae (p. E84).

that bears a succession of leaf- or flangelike shelves. *Cret.-Rec.*

Pleurochorium SCHRAM., 1912 [**P. feschulzei*]. Tubes branching, with many large leaflike lateral projections. *Cret.-Rec.*, Eu.-E.Indies-Ind.O. —FIG. 67,1. **P. feschulzei*, *Cret.*, Ger.; side view, $\times 1$ (82). —FIG. 67,2. *P. annandalei* (KIRKPATRICK), *Rec.*, Ind.O.; $\times 0.8$ (67).

Wapkiosia DELAUB., *nom. nov.* [*pro Pleurothyris* SCHRAM., 1912 (ref. 38, p. 251) (*non* LOWE, 1843)] [**Pleurothyris tortuosa* SCHRAM., 1912] (38). *U.Cret.*, Ger.

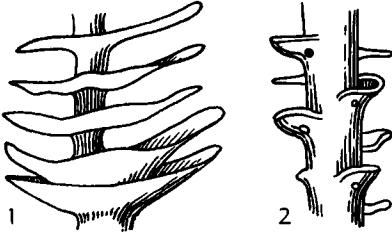


FIG. 67. Dictyida: Wapkiosidae (p. E86).

Family UNCERTAIN

Caseispongia QUENST., 1878 [**C. articulata*] (33). *Jur.*, Ger.

Pseudopemmatites FRAIÏÖUT, 1911 [**P. fourmari*]; SD DELAUB., herein]. *Dev.*, Eu.

Aulacosia RAUFF, 1933 [**Ocellaria cancellata* RÖMER, 1864]. *Cret.*, Eu.

Belonisia RAUFF, 1933 [**B. necopinata*]. *Cret.*, Eu.

Periplecium RAUFF, 1933 [**P. constrictum*]. *Cret.*, Eu.

Leptolacis SCHRAM., 1936 [**L. striata*] (40). *Jur.*, Ger.

Polysyge SCHRAM., 1936 [**P. pusilla*] (40). *Jur.*, Ger.

Rhogostomium SCHRAM., 1936 [**R. corrugatum*] (40). *Jur.*, Ger.

Rhombedonium SCHRAM., 1936 [**R. cypelliaeforme*] (40). *Jur.*, Ger.

Tremaphorus SCHRAM., 1936 [**T. punctatus*] (40). *Jur.*, Ger.

Nitidus DELAUB., *nom. nov.* [*pro Epaphroditus* SCHRAM., 1936 (ref. 40, p. 62) (*non* HERMAN, 1912)] [**Epaphroditus nitidus* SCHRAM., 1936] (40). *Jur.*, Ger.

Mysterium DELAUB., *nom. nov.* [*pro Mystrium* SCHRAM., 1936 (ref. 40, p. 60) (*non* ROGER, 1862)] [**Mystrium porosum* SCHRAM., 1936] (40). *Jur.*, Ger.

Octobrium DELAUB., *nom. nov.* [*pro Rhabdium* SCHRAM., 1936 (ref. 40, p. 63) (*non* SCHAUM, 1859)] [**Rhabdium angustatum* SCHRAM., 1936] (40). *Jur.*, Ger.

Lonsda DELAUB., *nom. nov.* [*pro Gonis* LONSD., 1849¹ (*non* BRANDT, 1835)] [**Gonis contortuplicata* LONSD., 1849]. *Cret.*, Eng.

Order LYCHNISKIDA Schrammen, 1902

[*nom. correct.* DELAUB., herein (*pro* Lychniskophora SCHRAM., 1902)]

Shape and rigid skeleton having general pattern of Dictyida but the central part of each hexact has short diagonal buttresses that connect adjacent pairs of rays so as to form an octohedral pattern resembling an open-sided lantern (*lychnos*, lamp); these so-called lantern nodes have 12 ribs consisting of the diagonal buttresses along angles of the octohedron and 8 triangular tiny openings in position of the faces of the octohedron (Fig. 69). ?*Trias.*, *Jur.-Rec.*

Except for a doubtful record of occurrence in Triassic rocks, the Lychniskida first appear as rare forms in Jurassic sponge faunas. They are extremely abundant and diversified in Cretaceous deposits, relatively uncommon in Tertiary formations, and nearly extinct today, for only 3 species belonging to 2 genera are known to be living. Not only are modern lychniskids very rare but those discovered, all from great oceanic depths, are in poor condition for study. Available examples of the Recent genus *Diapleura* are macerated specimens devoid of loose spicules; in *Aulocystis*, the other known living lychniskid, loose spicules like those of hexact-bearing dictyids have been observed. It is a curious fact that all described fossils referable to the Lychniskida come from localities in Europe.

Family VENTRICULITIDAE Smith, 1847

[=Pachyteichismatidae SCHRAM., 1936 (*nom. correct.* DELAUB., herein, *pro* Pachyteichismidae SCHRAM., 1936)]

Vase-shaped lychniskids with walls traversed by definite prosochetes and apochetes. *Jur.-U.Cret.*

Ventriculites MANTELL, 1822 [**V. radiatus*; SD POMEL, 1867] [=Retispongia ORB., 1849; Retiscyphia FROM., 1860]. Shape ranging from nearly cylindrical to saucer-like; moderately thin wall with conspicuous canals parallel to longitudinal axis of sponge; small base with

¹ LONSDALE, W. (1849) *Notes on fossil zoophytes*: Geol. Soc. London, Quart. Jour., vol. 5, p. 63.

radiating roots. *M.Cret.-U.Cret.*, Eu.—FIG. 68.1. **V. striatus* SMITH, *U.Cret.*, Ger.; 1a, side, $\times 0.5$; 1b, transv. sec., $\times 1$; 1c, part of skeleton, $\times 12$ (94).

Cephalites SMITH, 1849 [**C. perforatus*; SD RAUFF, 1893]. Differs from *Ventriculites* in having sharply truncate upper margin with fine skeletal network. *Cret.*, Eng.

Calathiscus SOLLAS, 1883 [**C. variolatus*; SD DE LAUB., herein]. Like *Ventriculites* but having some nodes without lantern structure. *Jur.*, Eng.

Rhizopterion ZITTEL, 1878 [**Scyphia cervicornis* GOLDF., 1833; SD DE LAUB., herein]. Like *Ventriculites* but with elongate-oval prosopores in floors of longitudinal furrows (49). *Cret.*, Eu.

Leiostracosia SCHRAM., 1902 [**L. punctata*]. Resembles *Rhizopterion* (38). *U.Cret.*, Ger.

Lychniscaulus SCHRAM., 1936 [**L. vannus*]. Like *Rhizopterion* but smaller and less furrowed (40). *Jur.*, Ger.

Étallonella OPPL., 1926 [*pro Étallonia* OPPL., 1915 (non OPPEL, 1861)] [**Étallonia idanensis* OPPL., 1915]. Thin-walled cup consisting of regularly reticulating minute hexacts (28). *Jur.*, Eu.

Napacana DE LAUB., *nom. nov.* [*pro Eudictyon* SCHRAM., 1902 (ref. 37, p. 15) (non MARSHALL, 1875)] [**Eudictyon striatum* SCHRAM., 1902] [= *Napaea* SCHRAM., 1912 (ref. 38, p. 273) (non ROBINEAU-DESVOIDY, 1830)]. Like *Rhizopterion* (38). *U.Cret.*, Ger.

Pleuropygge SCHRAM., 1912 [**P. plana*]. Like

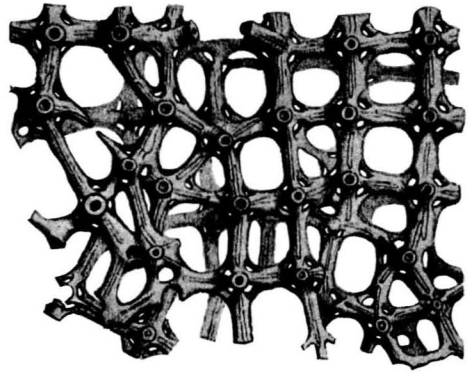


FIG. 69. *Trochobolus crassicosta* ZITTEL, U.Jur., Ger. (p. E87).

Ventriculites but with cortex (38). *U.Cret.*, Ger.
Lepidospongia F. A. RÖMER, 1862 [**L. denticulata*; SD RAUFF, 1893] [= *Chlaenia* POMEL, 1872]. Some pores on sides of tubercles (35). *Cret.*, Ger.

Licimosinia POMEL, 1872 [**L. cymoria*]. Like *Ventriculites* but leaf-shaped (31). *L.Cret.*, Alg.

Astropogma POMEL, 1872 [**Ventriculites stellata* RÖMER, 1864; SD DE LAUB., herein] (31). *L.Cret.*, Alg.

Plectoderma SCHRAM., 1902 [**P. fragilis*] (37). *Cret.*, Ger.

Microblastidium SCHRAM., 1902 [**M. decurrens*] (37). *Cret.*, Ger.

Desmoderma SCHRAM., 1936 [**D. evestigata*]. *Cret.*, Fr.

Rhizopterionopsis LACHASSE, 1943 [**R. caillauensis*]. *Cret.*, Fr.

Rhizocheton LACHASSE, 1943 [**R. jacobi*]. *Cret.*, Fr.

Pachyteichisma ZITTEL, 1878 [**P. carteri*; SD DE LAUB., herein]. [= *Lancispongia* QUENST., 1878]. Bowl- or top-shaped (49). *U.Jur.*, Eu.—FIG. 68.2. **P. carteri*; 2a, side, $\times 0.5$; 2b, part of skeleton, $\times 12$ (94).

Trochobolus ZITTEL, 1878 [**T. crassicosta*; SD DE LAUB., herein]. Resembles *Pachyteichisma* but skeletal meshes smaller and apopores more round (49). *U.Jur.*, Ger.—FIG. 69. **T. crassicosta*, U.Jur., Ger.; skeletal structure, enlarged (93*).

Pachyrachis SCHRAM., 1936 [**P. labyrinthica*] (40). *Jur.*, Ger.

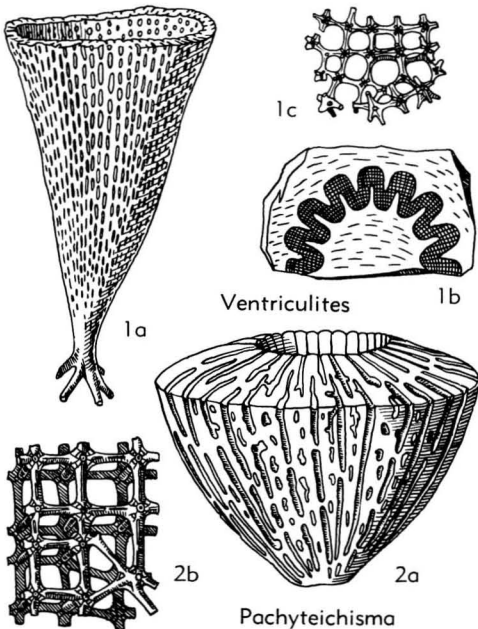


FIG. 68. Lychniskida: Ventriculitidae (p. E87).

Family COELOSYPHIIDAE
de Laubenfels, nov.

Differs from *Ventriculitidae* in growing invariably as rather narrow branching tubes. *Cret.*

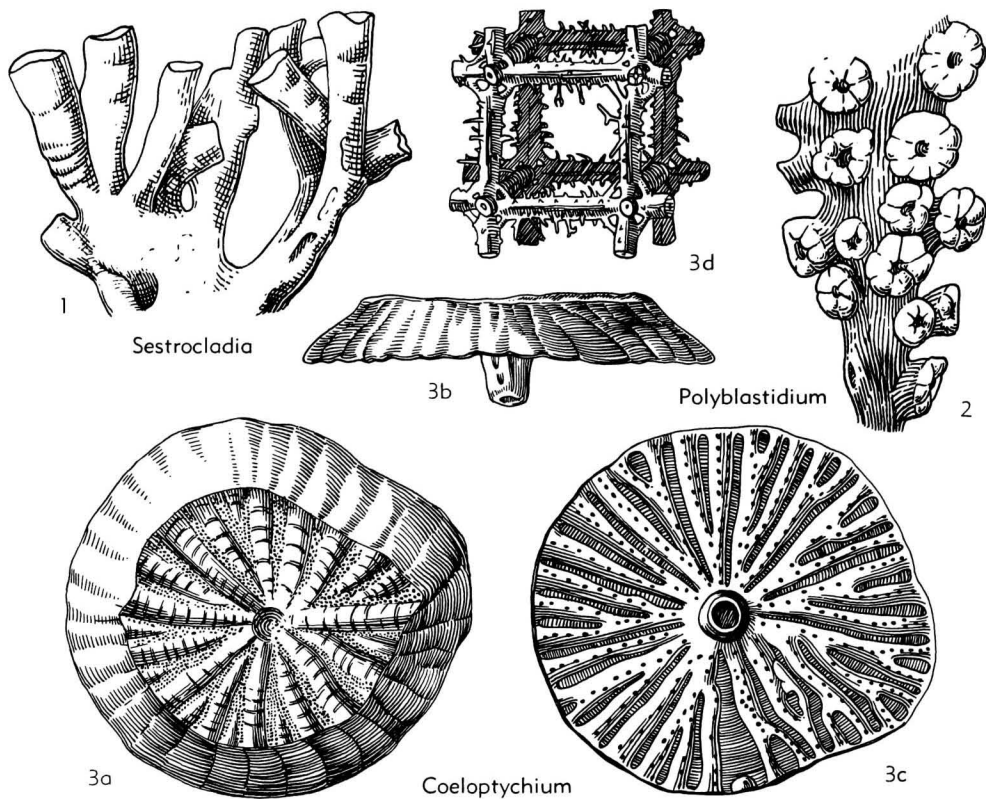


FIG. 70. Dictyida: Coeloscyphiidae, Polyblastidiidae, Coeloptychiidae (p. E89).

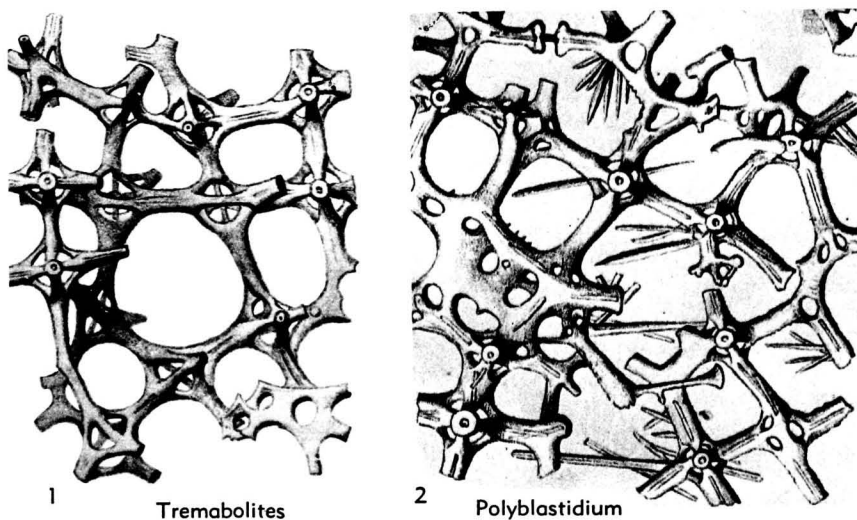


FIG. 71. Dictyida: Polyblastidiidae, Camerospongiidae (p. E89).

Coeloscyphia TATE, 1865 [**C. sulcata*; SD DE LAUB., herein]. Several thin-walled tubes branching from a center. *Cret.*, Ire.
Sestrocladia HINDE, 1884 [**S. jurcata*]. Tubes irregularly bifurcating (12). *Cret.*, Eng.—FIG. 70,1. **S. jurcata*; side, $\times 0.25$ (63).

Family POLYBLASTIDIIDAE
 Schrammen, 1912

Central vertical axis bearing numerous radially directed short cylindrical branches each containing a rather large cloaca. *Jur.-Cret.*

Polyblastidium ZITTEL, 1878 [**P. luxurians*]. Branches tending to arrangement in whorls, in some species with cloaca of stellate cross section (49). *Cret.*, Eu.—FIG. 70,2; 71,2. **P. luxurians*, Ger.; 70,2, part of sponge, $\times 1$; 71,2, skeletal structure, enlarged (93, 93*).

Phlyctaenium ZITTEL, 1878 [**Mastospongia cylindrata* QUENST., 1878; SD DE LAUB., herein]. Central axis tubular (49). *Jur.*, Ger.

Family COELOPTYCHIIDAE
 Zittel, 1877

Growth form umbrella- or mushroom-like. *U.Cret.*

Coeloptychium GOLDF., 1833 [**C. agaricoides*] [= *Coelochonia* FROM., 1860; *Lophoptychium*, *Schizoptychium* POMEL, 1872]. Underside with radial branching ridges that bear relatively large prosopores; upper surface with very numerous small apopores in radial furrows (48). *U.Cret.*, Eu.—FIG. 70,3. **C. agaricoides*; 3a-c, top, side, and bottom, $\times 0.7$; 3d, part of skeleton, $\times 60$ (94).

Myrmecioptychium SCHRAM., 1912 [**M. bodei*]. Resembles *Coeloptychium* (38). *U.Cret.*, Ger.

Family CAMEROSPONGIIDAE
 Schrammen, 1912

Subglobular stalked lychniskids with rather large cloaca, endosomal skeleton having the form of many intertwined tubular canals, upper part covered by fine-meshed dermal reticulation. *Jur.-Tert.*, ?*Rec.*

The difference between lower and upper parts of these sponges may reflect living conditions in which all but an area surrounding the oscule was buried in sediment. Thus, differences interpreted to have generic significance may be merely an expression of ecological variations. Similar gross features are seen in the *Plocoscyphiidae* (*Lychniskida*).

Camerospongia ORB., 1849 [**Scyphia fungiformis* GOLDF., 1833] [= *Cameroscyphia* FROM., 1860]. Upper and lower parts very dissimilar (29). *Cret.-Tert.*, Eu.—FIG. 72,1. **C. fungiformis* (GOLDF.); side, $\times 1$ (94).

?*Polygonatium* SCHRAM., 1936 [**P. sphaeroides*]. Resembles *Camerospongia* in form but lower and upper parts similar; irregularly placed prosopores diverse in size, skeleton formed of unequal-ray hexacts of varying size with stauracts in dermal layer (40). *Jur.*, Ger.

Tremabolites ZITTEL, 1878 [**Manon megastoma* RÖMER, 1841; SD DE LAUB., herein]. Differs from *Camerospongia* in having several oscules on summit (49). *U.Cret.*, Eu.—FIG. 71,1. *T. confluens* FISCHER, Ger.; skeletal structure enlarged (93*).

Toulminia ZITTEL, 1878 [**Cephalites catenifer*

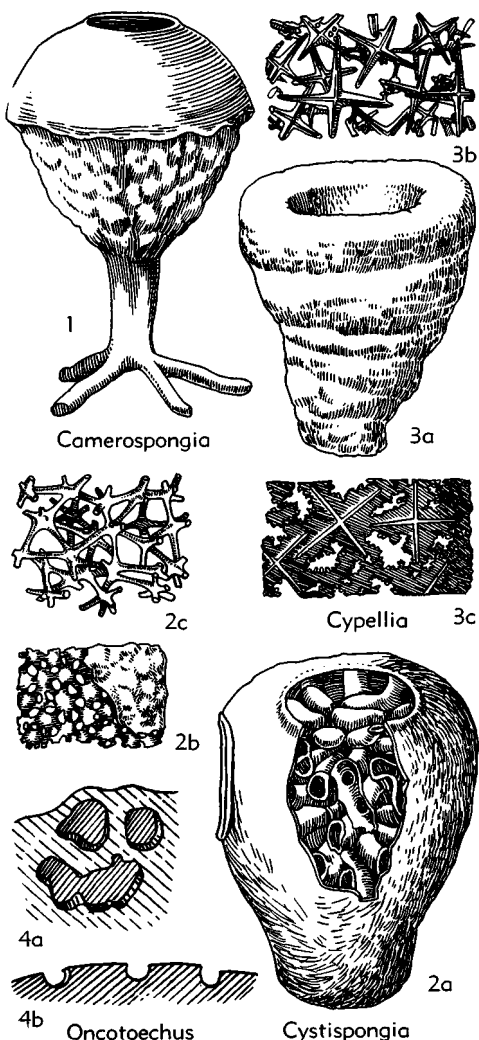


FIG. 72. Dictyida: Camerospongiidae, Cypelliidae, Oncotoechidae (p. E89-E91).

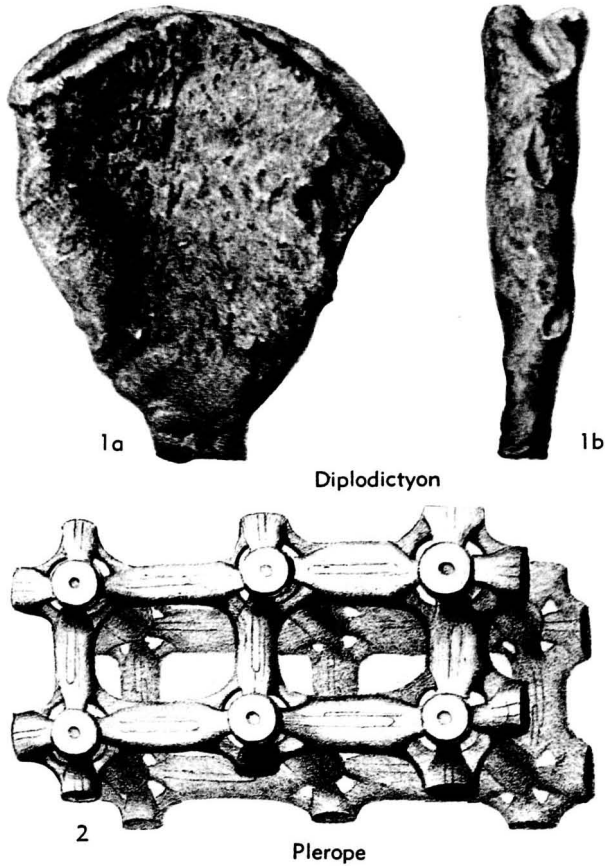


FIG. 73. Dictyida: Callodictyidae (p. E91-E92).

SMITH, 1848; SD DELAUB., herein]. Resembles *Camerospongia* (49). *Jur.-Cret.*, Eu.

Cameroptychium LEONHARD, 1897 [**C. patella*; SD DELAUB., herein]. Like *Camerospongia*. *U.Cret.*, Eu.

Ornatus DELAUB., *nom. nov.* [pro *Phalacrus* SCHRAM., 1912 (ref. 38, p. 321) (*non* PAYKULL, 1800)] [**Phalacrus expectatus* SCHRAM., 1912]. Like *Camerospongia* but oscule covered by network (38). *U.Cret.*, Ger.

Cystispongia F. A. RÖMER, 1864 [**Cephalites bursa* QUENST., 1852; SD RAUFF, 1893]. Like *Tremabolites* but fine-meshed dermal reticulation extends far down sides (35). *U.Cret.-Tert.*, ?*Rec.*, Eu.—FIG. 72,2. **C. bursa* (QUENST.), *U.Cret.*, Ger.; 2a, side, with part of dermal layer removed, $\times 1$; 2b, dermal layer and skeleton, $\times 12$; 2c, endosomal skeleton, $\times 12$ (94).

Family CYPELLIIDAE Schrammen, 1936

Like *Camerospongiidae* in having a fine-meshed dermal reticulation, commonly

formed by stauracts, but endosomal skeleton is a regular framework corresponding to that of the *Ventriculitidae*, lacking a convoluted tubular structure. *Jur.-Cret.*

Cypellia POMEL, 1872 [**Scyphia rugosa* GOLDF., 1833; SD DELAUB., herein] [= *Phanerochiderma*, *Cryptochiderma*, *Paracypellia* SCHRAM., 1936]. Subcylindrical, expanding upward, with single deep cloaca (31). *U.Jur.*, Eu.—FIG. 72,3. **C. rugosa* (GOLDF.), Ger.; 3a, side, $\times 0.5$; 3b,c, dermal layer, $\times 12$ (94).

Porocypellia POMEL, 1872 [**Scyphia pyriformis* GOLDF., 1833]. Like *Cypellia* but bean-sized, with several oscules (31). *Jur.*, Eu.

Ophrystoma ZITTEL, 1878 [**Porospongia micrommata* RÖMER, 1864]. Like *Porocypellia* but oscules on flat top (49). *Cret.*, Eu.

Cavispongia QUENST., 1878 [**Spongites cylindrata* QUENST., 1843; SD DELAUB., herein]. Fossils chiefly casts (20, 32). *Jur.*, Ger.

Discophyma OPPL., 1915 [**Stauroderma étalloni* OPPL., 1907; SD DELAUB., herein]. Cup-shaped,

with thick walls full of coarse pores (28). *Jur.*, Eu.

Placotelia OPPL., 1907 [**Porostoma marconi* FROM., 1859; SD DELAUB., herein] [= *Plakotelia* OPPL., 1907 (*nom. neg.*)] (27). *Jur.*, Eu.

Sporadopyge SCHRAM., 1936 [**S. speciosa*]. Thick-walled cup with dermal stauracts, oval oscules larger than numerous prosopores (40). *Jur.*, Ger.

Family ONCOTOECHIDAE
Schrammen, 1912

Cylindrical or rounded lychniskids with narrow cloaca, exterior marked by subdermal branched and anastomosed canals which probably were covered by protoplasmic tissue in life. *U.Cret.*

Oncotoechus SCHRAM., 1912 [**O. cavernosus*; SD DELAUB., herein] (38). *U.Cret.*, Ger.—FIG. 72,4. **O. cavernosus*; 4a, part of surface, $\times 1$; 4b, section normal to surface, $\times 1$ (82).

Family CALLODICTYIDAE
Zittel, 1877

[*nom. correct.* DELAUB., herein (*pro* Callodictyonidae ZITTEL, 1877)]

Skeletal reticulation very coarse, meshes

serving as prosopores, apopores, or both. *Cret.*

Callodictyon ZITTEL, 1878 [**C. infundibulum*] [= *Callodictyonella* STRAND, 1928]. Thin-walled cup, skeletal beams spiny (49). *U.Cret.*, Ger.

Marshallia ZITTEL, 1878 [**Pleurostoma tortuosum* RÖMER, 1864; SD DELAUB., herein]. Like *Callodictyon* but exterior with radial or longitudinal folds bearing oscules in irregular rows, resembling *Coeloptychium* (49). *Cret.*, Eu.

Pleurope ZITTEL, 1878 [**Pleurostoma lacunosum* RÖMER, 1864]. Flattened vase-like, resembling a dagger sheath; skeletal beams smooth (49). *Cret.*, Eu.—FIG. 73,2; 74,2. **P. lacunosa* (RÖMER), Ger.; 73,2, skeletal structure, enlarged (93); 74,2, side, $\times 0.3$ (93*).

Porochoxia HINDE, 1884 [**Ventriculites simplex* SMITH, 1848]. Thin-walled funnel with successively an outer delicate membrane, round-meshed network, rectangular network, and delicate cloacal membrane (12). *Cret.*, Eng.—FIG. 74,1. **P. simplex* (SMITH); impression of outer skeletal framework, $\times 20$ (63*).

Sclerokalia HINDE, 1884 [**S. cunningtoni*]. Thick-walled cup, exterior without dermis but cloacal dermis perforated by vertical rows of apopores (12). *Cret.*, Eng.

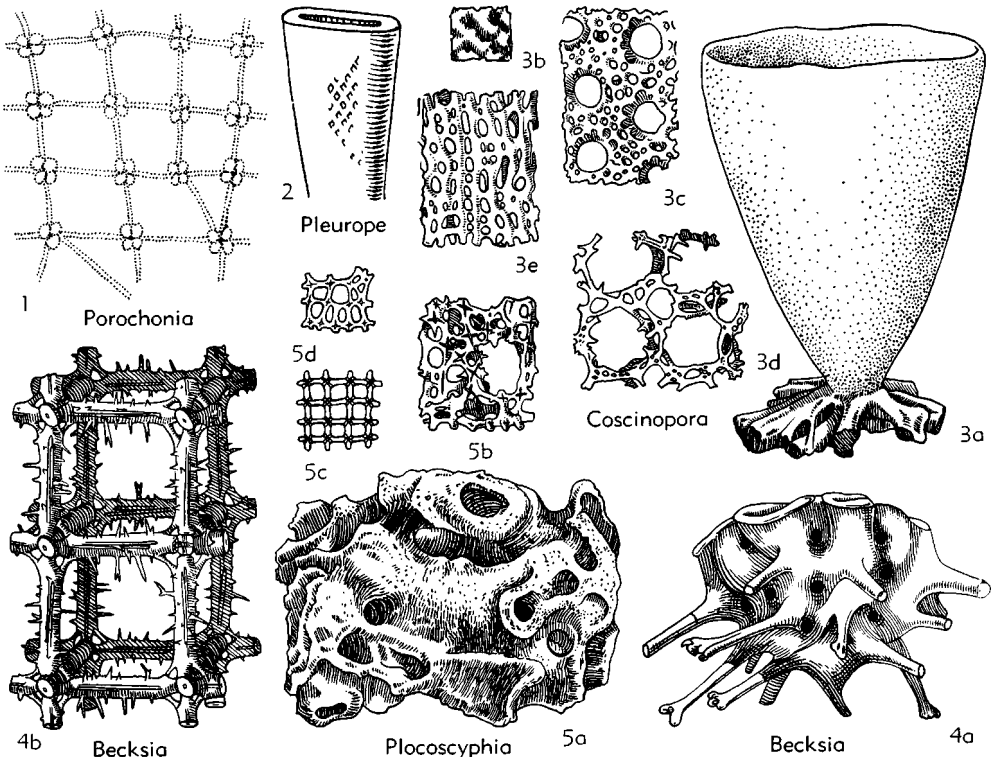


Fig. 74. Dictyida: Callodictyidae, Coscinoporidae, Becksidae (p. E91-E92).

Diplodictyon ZITTEL, 1878 [**Scyphia heteromorpha* REUSS, 1845]. Like *Pleurope* but stalked, with rather large prosopores on one or both narrow edges, without large apopores; resembles *Guertardiscyphia* (49). *U.Cret.*, Ger.—FIG. 73, I. *D. bayfieldi* HINDE, Eng.; 1*a,b*, side and edge, $\times 1$ (63*).

Elasma MORET, 1926 [**E. moreti*]. Wavy sheets of uniform thickness with pores on one side only; skeleton reticulate (28). *Cret.*, Fr.

Beaussetia MORET, 1926 [**B. membraniformis*]. Like *Elasma* but without evident pores on either side (26). *U.Cret.*, Fr.

Sporadoscina POMEL, 1872 [**Scyphia retiformis* RÖMER, 1864; SD RAUFF, 1893]. Cup-shaped, with conspicuous lacelike patterns on outer and inner sides; skeletal network with spiny beams (31). *Cret.*, Eu.

Family COSCINOPORIDAE Zittel, 1877

Thin-walled vase-shaped lychinskids.
U.Cret.

Coscinopora GOLDF., 1833 [**C. infundibuliformis*] [= *Coscinoscyphia* FROM., 1860; *Coccinopora* SCHLÜTER, 1870]. With roots (9). *U.Cret.*, Eu.—FIG. 74, 3. **C. infundibuliformis*; 3*a*, side, $\times 0.5$; 3*b,c*, outer surface, $\times 1$, $\times 3$; 3*d*, main skeletal structure, $\times 12$; 3*e*, part of root, $\times 12$ (94).

Cinclidella SCHRAM., 1912 [**C. solitaria*]. Like *Coscinopora* but form nearly tubular (38). *U.Cret.*, Ger.

Balantionella SCHRAM., 1902 [**B. elegans*]. Small fine-textured leaves (37). *U.Cret.*, Ger.

Family BECKSIIDAE Schrammen, 1912

Lychinskids with cortex and endosomal skeleton containing convoluted tubes, some of which branch and anastomose. *Jur.-U.Cret.*

Plocoscyphia REUSS, 1846 [**Spongia labyrinthicus* MANTELL, 1822; SD POMEL, 1872] [= *Brachiolites* SMITH, 1848; *Plocosmia* FROM., 1860; *Plocospongia* QUENST., 1878]. Shape irregular, moderately thick-walled. *Jur.-Cret.*, Eu.—FIG. 74, 5. *P. pertusa* GEINITZ, *Cret.*, Hungary; 5*a*, part of specimen, $\times 1$; 5*b*, cortex, $\times 5$; 5*c,d*, endosomal skeleton, $\times 12$ (5*a-d*, 94).—FIG. 75. *P. communis* MORET, *U.Cret.* (Cenom.), Fr.; $\times 1$ (72*).

Gyrispongia QUENST., 1878 [**G. subrutia*; SD DE LAUB., herein]. ?Weathered *Plocoscyphia* (32). *Cret.*, Ger.

Cyclostigma SCHRAM., 1912 [**Plocoscyphia acinosa* SCHRAM., 1902; SD DE LAUB., herein]. Differs from *Plocoscyphia* in having small hexacts in lining of tubes (38). *U.Cret.*, Ger.



FIG. 75. *Plocoscyphia communis* MORET, *U.Cret.* (Cenom.), Fr. (p. E92).

Exanthesis MORET, 1926 [**Plocoscyphia reticulata* HINDE, 1883]. Tubes with somewhat indistinct radial arrangement (26). *U.Cret.*, Eng.-Fr.

Ceriodictyon OPPL., 1907 [**C. coniformis*]. Large cloaca (27). *Jur.*, Switz.

Becksia SCHLÜTER, 1868 [**B. soekelandi*]. Cup-shaped with hollow roots at base, walls formed by laterally joined vertical tubes (26). *U.Cret.*, Ger.-Fr.—FIG. 74, 4. **B. soekelandi*; 4*a*, side, $\times 0.5$; 4*b*, part of skeleton, $\times 50$ (72).

Callicylix SCHRAM., 1912 [**C. farreides*]. Large cloaca (38). *U.Cret.*, Ger.

Family CALYPTRELLIDAE Schrammen, 1912

Like Becksidae but lacking a cortex; also resemble the dictyid family Euretidae. *Jur.-U.Cret.*

Calyptrella SCHRAM., 1912 [**C. bertae*]. Very regular meshes (38). *U.Cret.*, Ger.

Kentrosia SCHRAM., 1902 [**K. incrustans*; SD DE LAUB., herein] [= *Centrosia* MORET, 1926]. Peculiar lantern nodes bear sharp spike on external ray; may be a becksiid that has lost its cortex (37). *Cret.*, Ger.

Sarophora SCHRAM., 1912 [**S. armata*]. Like *Kentrosia* but projecting ray of lantern ends in broom-like tuft (38). *Cret.*, Ger.

Coscinaulus SCHRAM., 1936 [**C. micropora*]. Small thin-walled porous tube (40). *Jur.*, Ger.

Plectascus SCHRAM., 1912 [**Dendrospongia clathrata* RÖMER, 1864]. Saclike form with anastomosing strongly folded tubes (38). *U.Cret.*, Ger.

Family UNCERTAIN

Scolecospia RAUFF, 1933 [**S. scrobiculata*]. *U.Cret.*, Eu.

Bolitesia SCHRAM., 1912 [**B. mirabilis*]. Very coarsely reticulate (38). *U.Cret.*, Ger.

Triadocoelia VINASSA, 1911 [**T. magyara*]. Ill known but surely a lynchiskid. ?*Trias.*, Hung.

Order HETERACTINIDA
Hinde, 1888

Main skeletal framework composed of polyactinal spicules. *L.Cam.-Carb.*

No other sponges have many-rayed (astrose) siliceous spicules classifiable as megascleres, that is, composing the main body skeleton, although many demosponges and most families of Recent hyalosponges contain polyactinal microscleres. The Heteractinida are an exclusively Paleozoic group, from which later sponges characterized by spicules with fewer rays conceivably may have developed with accompanying suppression of rays to yield more simple patterns.

Family CHANCELLORIIDAE
de Laubenfels, nov.

Heteractinids with a tough ectosome and dense endosome but lacking fusion of spicules into a rigid dictyonid framework. The spicules resemble long-shafted triaenes of the demosponge order Choristida, which have 3 clads at the outer end of a long rhabd, but 2 to 9 clads occur in spicules of this family; they are recurved like the clads of tetracts called anatriaenes. *M.Cam.-U.Cam.*

Chancelloria WALC., 1920 [**C. eros*]. Main skeleton composed chiefly of anahexaenes but clads range from 4 to 9; marginal skeleton mainly formed of anadiaenes (45). *Can.(B.C.)-Mo.*—FIGS. 76; 77,1. **C. eros*; 76, specimen showing spicules, $\times 2.3$; 77,1a, anahexaene, $\times 15$; 77,1b, anadiaenes, $\times 7.5$ (88, 88*).

Family ASTRAEOSPONGIIDAE
de Laubenfels, nov.

Characterized by relatively large spicules having 6 evenly spaced rays approximately in the same plane and 2 generally short rays normal to this plane, the latter reduced to a mere lump in some spicules. *M.Cam.-Carb.*

Astraeospongium RÖMER, 1854 [**Blumenbachium meniscus* RÖMER, 1848] [= *Astraeospongia* RÖMER, 1860; *Octasium* SCHLÜTER, 1885]. Saucer- or low bowl-shaped, with rather thick walls, no trace of attachment; skeleton a felted mass of 8-rayed spicules. *Sil.-Dev.*, Eu.-N.Am.—FIG. 77,6. **A. meniscus* (RÖMER), *Sil.*, U.S.A.; 6a,b, top and side, $\times 0.7$ (94); 6c,d, spicules, $\times 6$ (68).

Eiffelia WALC., 1920 [**E. globosa*]. Spheroidal, probably hollow, for surface consists of a single layer of spicules having 6 straight clads with rhabd reduced to mere button (45). *M.Cam.*, B.C.—FIG. 77,5. **E. globosa*; spicule, $\times 7$ (88).

Hyalostelia ZITTEL, 1879 [**Hyalonema smithi* Y.-Y., 1877]. Skeleton with many hexacts, spicules of astraeospongiid type comprising a minority; root tufts present (49). *Carb.*, Ill.-Eng.—FIG. 77,2a. **H. smithi* (Y.-Y.), spicules, $\times 15$ (63). —FIG. 77,2b. *H. diabola* WELLER, *L.Penn.*, Ill.; spicule, $\times 15$ (89).

Protohyalostelia CHAPMAN, 1940 [**P. mawsoni*]. Similar to *Hyalostelia*, cup-shaped. *Cam.*, Austral.

Leptopterion ULR., 1889 [**L. mammiiferum*] [= *Leptopterion* MILLER, 1889]. Obconical, unattached. *Ord.*, Ohio.

Tholiasterella HINDE, 1887 [**T. gracilis*; SD DE LAUB., herein]. Thin-walled, spicules commonly spiny or lumpy on side toward sponge surface, some with recurved clads as in *Chancelloria* (13). *Carb.*, Eng.-Scot.-Ger.—FIG. 77,4. **T. gracilis*; 4a, fused spicules of dermal layer, $\times 5$; 4c-d, loose spicules, $\times 5$ (94, 63).



FIG. 76. *Chancelloria eros* WALC., *M.Cam.*, B.C. (p. E93).

Family ASTERACTINELLIDAE
de Laubenfels, nov.

Principal spicules profusely polyactinal. *L.Cam.-Perm.*

Asteractinella HINDE, 1887 [**A. expansa*]. Form unknown; spicules star- or flower-like (13). *Carb.*, Eng.—FIG. 77,3. **A. expansa*; 3a, stellate spicule, $\times 7$; 3b, floriform spicule, $\times 12$ (63).

Wewokella GIRTY, 1912 [**W. solida*]. Cylindrical, with deep cloaca; spicules are sphaerasters, with many rays protruding from central sphere. *U.Penn.*, Okla.-Tex.

Talpaspongia R. H. KING, 1943 [**T. clavata*]. Endosomal skeleton finer-textured than in *Wewok-*

ella (19). *L.Perm.*, Tex.—FIG. 78. **T. clavata*; transv. sec., $\times 1$ (66*).

Uranosphaera BEDF.-B., 1943 [**U. polyaster*]. Segment of bowl or hollow sphere; some rays of asters bifurcate. *L.Cam.*, Austral.

Order UNCERTAIN

Spongius MANTELL, 1822 [**S. townsendi*; SD DE LAUB., herein]. Cup-shaped. *Cret.*, Eng.

Lonsda DE LAUB., *nom. nov.* [pro *Conis* LONSD., 1849 (*Quart. Jour. Geol. Soc. London*, vol. 5, p. 63) (*non* BRANDT, 1835)] [**Conis contortuplicata* LONSD., 1835]. Many-ridged mass. *Cret.*, Eng.

Bothroconis KING, 1850 [**B. plana*]. Vaseline with flaring rim. *Perm.*, Eng.

Acanothyra POMEL, 1872 [**Camerospongia polydactyla* RÖMER, 1864; SD DE LAUB., herein] (31). *Cret.*, Eu.

Antrisporgia QUENST., 1878 [**A. dilabyrinthica*; SD DE LAUB., herein]. ?Euretidae, ?Calyptrrellidae (32). *L.Cret.*, ?Eng.

Baccisporgia QUENST., 1878 [**B. baccata*; SD DE LAUB., herein]. Cup-shaped, lumpy (32). *Jur.*, Ger.

Crucisporgia QUENST., 1878 [**C. annulata*; SD DE LAUB., herein] Annulate cup (32). *Jur.*, Ger.

Textisporgia QUENST., 1878 [**T. coarctata*; SD DE LAUB., herein] [= *Leptophyllus* QUENST., 1878] (32). *Jur.*, Ger.

Chirosporgia MILLER, 1889 [**C. wenti*] (25). *M.Ord.*, U.S.A.

Lysactinella GIRTY, 1896 [**L. gebhardi*; SD DE LAUB., herein]. *L.Dev.*, U.S.A.

Nepheliospongia CLARKE, 1900 [**N. typica*]. Vase-like, with polygonal surface net. *U.Dev.*, ?N.Y.

Pachylepisma SCHRAM., 1902 [**P. robusta*] (37). *Cret.*, Ger.

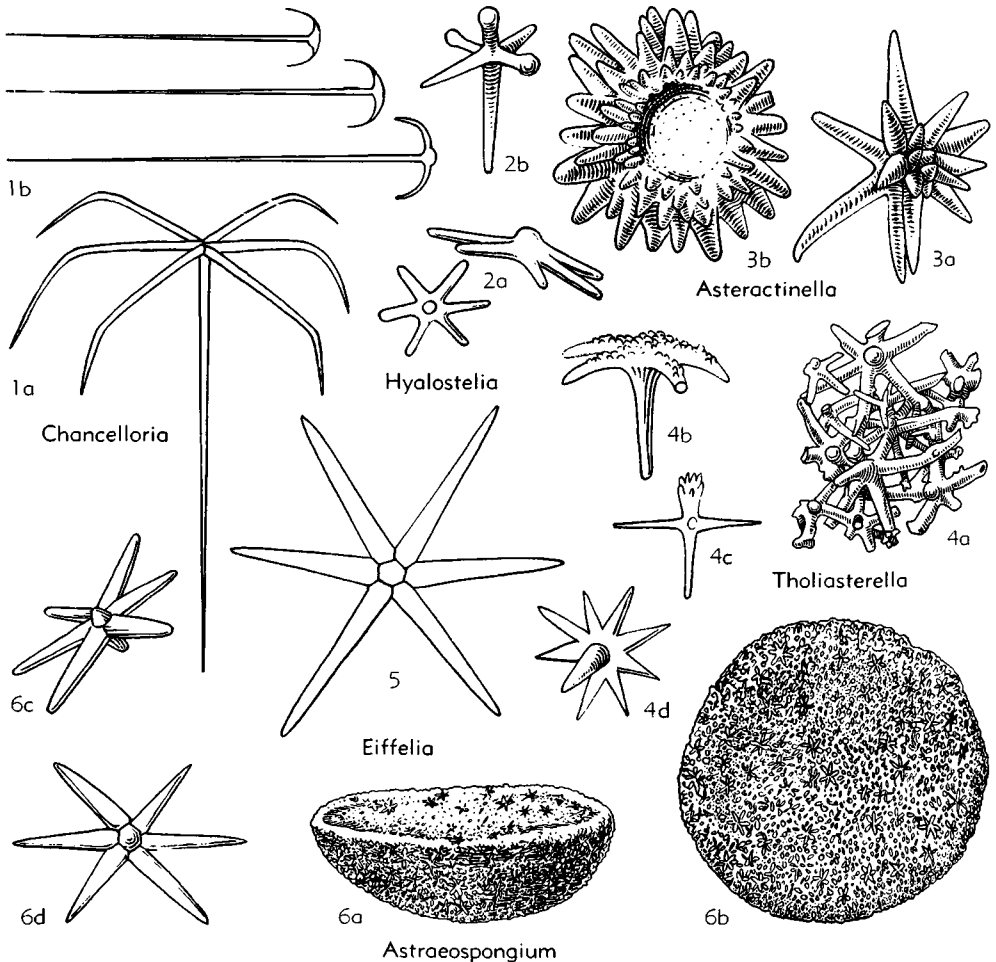


FIG. 77. Heteractinida: Chancelloriidae, Astracospongiidae, Asteractinellidae (p. E93-E94).

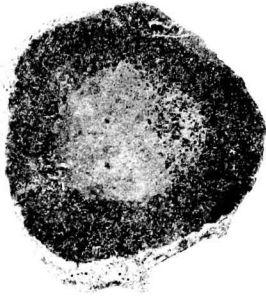


FIG. 78. *Talpaspongia clavata* R. H. KING, L. Perm., Tex. (p. E94).

Idiodictyon DE LAUB., *nom. nov.* [*pro Eudictyon* BISTRAM, 1903¹ (*non* MARSHALL, 1875)] [**Eudictyon steinmanni* BISTRAM, 1903]. *L. Jur.*, Ger. **Ammonella** WALTHER, 1904 [**A. quadrata*]. ?Age, Italy.

Oxospongia CLARKE, 1920 [**O. johnstoni*; SD DE LAUB., *herein*]. ?Age, ?loc.

Farreopsis SCHRAM., 1924 [**F. diffusa*] (39). *Cret.*, Ger.

Diplopleura REGNARD, 1927 [**D. hatoni*]. *Cret.*, Fr.

Uralonema LIBROVICH, 1929 [**U. karpinskii*]. *Carb.*, Sib.

Hodsia MOISSEV, 1939 [**H. caucasia*]. *Trias.*, Russ.

Sahraja MOISSEV, 1939 [**S. triassica*]. *Trias.*, Russ.

Class CALCISPONGEA de Blainville, 1834

[*nom. correct.* DE LAUB., *herein* (*pro Calcispongiae* BLAINV., 1834)] [= *Calcarea* Bow., 1864]

Skeleton composed of calcareous spicules.
Cam.-Rec.

This class includes not only sponges of rhagon architecture but (unlike other classes) also sponges of sycon and ascon architecture. The skeletons invariably contain spicules of calcium carbonate, which is not proper to other sponges, and no calcisponge secretes silica or spongin. Almost universally, if not entirely so, the spicules belong to the 3 types described as simple diacts, triacts of various shapes, and tetracts. The triacts may be Y- or T-shaped, and some (termed pharetrones) have a distinctive tuning-fork appearance.

Calcispongea with tuning-fork spicules, both those living today and kinds known as fossils, commonly show an interlocking

or cementing together of these spicules that produces a rigid structure. Such skeletons, which may be compared to the dictyonine Hyalospongea and lithistid Demospongea, are more likely to be preserved in manner showing the shape of the sponge than loosely knit skeletons.

HAECKEL (1870) divided the calcareous sponges into three assemblages that he named Ascones (characterized by ascon type of structure), Sycones (having sycon type of architecture), and Leucones (with rhagon architecture). DENDY & ROW (1913) rejected HAECKEL's classification on the ground of its seeming artificiality and inadequacy as expression of phylogenetic relationships. Likewise, students of living calcisponges have made little or no use of HAECKEL's system, generally recognizing instead the 2 orders Homocoela and Heterocoela defined by POLÉJAEFF (1883). The Homocoela includes only a single genus (*Leucosolenia*) of ascon type, whereas the Heterocoela contains all other calcareous sponges. In 1898, BIDDER divided the calcisponges into orders called Calcaronea and Calcinea, based on the location of nuclei of the choanocytes in apical or basal position; since this has been found to vary within the same species, BIDDER's classification has not been accepted.

DENDY & ROW (1913) concluded that all of the calcisponges should be assigned to a single order which they named Calcarea, although they pointed out evidence of diphyletic nature of the group, one stem arising from *Dendya* and another from *Syccetta*. DE LAUBENFELS (1936) concluded that the division suggested by DENDY & ROW was significant and therefore undertook to recognize it by establishing 2 orders named Asconosa and Syconosa. The first includes all of HAECKEL's Ascones and about half of his Leucones; also, it comprises POLÉJAEFF's Homocoela and about half of his Heterocoela. The order Syconosa contains all of HAECKEL's Sycones and the remainder of his Leucones; it includes much of POLÉJAEFF's Heterocoela but as now modified, excludes pharetrone sponges that POLÉJAEFF probably would have included. Little attention to fossil sponges was given by most of these authors.

¹ BISTRAM, V., (1903) *Beiträge zur Kenntnis der Fauna des unteren Lias in der Val Solda*. Ber. Ges. Freiburg, vol. 13, pp. 84, 199.

ZITTEL (1878) mentioned Ascones, Sycones, and Leucones, treating them as families, but assigned all fossil calcisponges (except one in Sycones) to his new family Pharetrones. STEINMANN (1882) ranked the Pharetrones as an order and divided it into suborders named Inozoa and Sphinctozoa. DE LAUBENFELS (herein) concludes that the Sphinctozoa differ sufficiently from typical Pharetrones to deserve separation as an independent order, leaving the virtually unused name Inozoa as a junior synonym of Pharetrones. On the other hand, use of the name introduced by STEINMANN seems inadvisable because (1) it conflicts with the generic name *Sphinctozoa* and (2) the ending -zoa (as in Protozoa, Metazoa) seems inappropriate for an ordinal division of the Calcispongea. The new name Thalamida is used instead.

The names Asconosa and Syconosa have been criticized properly on the ground of their resemblance to HAECKEL's assemblages called Ascones and Sycones. In order to avoid confusion, the new names Solenida (for Asconosa) and Lebetida (for Syconosa) are here introduced, with taxonomic emendation consisting in the removal of pharetrone genera which earlier were included in Asconosa and Syconosa. Thus, the Calcispongea are divided into 4 orders: Solenida, having most simple structure, *Cam.-Rec.* (mostly Rec.); Lebetida, somewhat less simple, *L.Jur.-Rec.* (mostly Rec.); Pharetronida, more elaborate in structure, *Perm.-Rec.* (mostly fossil); and Thalamida, most elaborate, *Carb.-Cret.* (known only as fossil).

Order SOLENIDA de Laubenfels, nov.

[=Asconosa DE LAUB., 1936]

Calcisponges either permanently of ascon architecture or (generally) progressing to rhagon architecture by enclosure of ascon structure within an ectosomal envelope. (A single genus of fossil sponges is placed here quite provisionally.) *Cam.-Rec.*

Family CAMAROCLADIIDAE de Laubenfels, nov.

Small branching tubes somewhat resembling modern Leucosoleniidae. *Cam.-Ord.* *Camarocladia* MILLER, 1889 [*C. dichotoma*]. Dia-

meter of tubes about 2 mm. (in agreement with ascon-type sponges); walls containing doubtfully identified triactinal spicules associated with puzzling globular bodies (24). Pa.-Ky.-Ill.-Minn.—
FIG. 79, 1. **C. dichotoma*; outline, $\times 1$ (71).

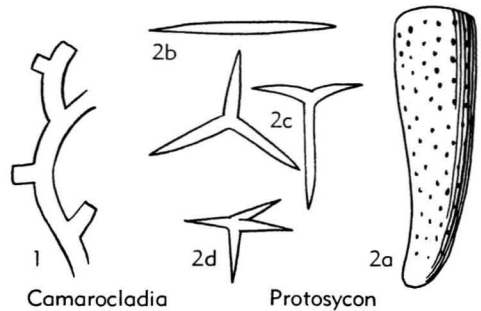


FIG. 79. Solenida, Lebetida (p. E96).

Order LEBETIDA de Laubenfels, nov.

[=Syconosa DE LAUB., 1936]

Calcisponges either permanently of sycon architecture or progressing in some to rhagon architecture by compounding sycon units; ascon structure consistently lacking. *L.Jur.-Rec.*

Family GRANTIIDAE Dendy, 1892

Sycon architecture persistent within an inclosing dermis or cortex, not exposed. *U.Jur.-Rec.*

Protosycon ZITTEL, 1878 [*Scyphia punctata* GOLDF., 1833]. Resembles modern *Grantia* (49). *U.Jur.*, Ger.—FIG. 79, 2. **P. punctatum* (GOLDF.); 2a, side, $\times 1$; 2b-d, diact, triacts, tetract (93).

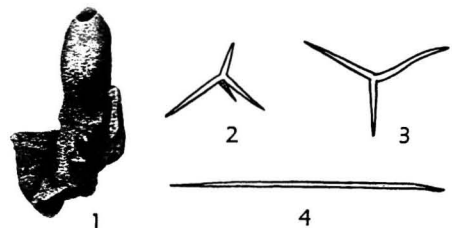


FIG. 80. *Leuconia walfordii* (HINDE), *L.Jur.*, Eng. (p. E97).

Family LEUCONIIDAE Vosmaer, 1886

[*nom. correct.* DE LAUB., herein (*pro* Leuconidae VOSMAER, 1886)]

Initially like Grantiidae but developing a simple rhagon architecture, generally with single cloaca of simple type. *L.Jur.-Rec.*

Leuconia GRANT, 1834 [**Spongia nivea* GRANT, 1826; SD BOW., 1862] [= *Leucandra* HKL., 1872]. Simple rhagon sponges with dermal triacts over endosomal diacts, triacts, and tetracts (22). *L. Jur.* (Eng.)-*Rec.* (cosmop.).—FIG. 80, 1-4. *L. walfordi* (Hinde), M.Lias, Northampton; 1, side, $\times 10$; 2-4, spicules, $\times 100$ (63*).

Protoleucon BOLK., 1923 [**P. pavlovi*]. *Cret.-Tert.*, U.S.S.R.

Order PHARETRONIDA Zittel, 1878

[*nom. correct.* DELAUB., herein (*pro* Pharetrones ZITTEL, 1878)]

Characterized by triacts of tuning-fork type, many spicules interlocked so as to form strands which often are called fibers, or the spicules may be cemented together. Much of the cement may have been added during fossilization. *Perm.-Rec.*

Suborder CHALARINA de Laubenfels, nov.

Pharetronids having skeletal strands formed of spicules that are merely interlocked, entangled, or joined side to side, not connected tip to tip (named from *chalaros*, slack, loose). *Perm.-Rec.*

Family SESTROSTOMELLIDAE de Laubenfels, nov.

Somewhat massive sponges with numerous oscules, possibly representing several individuals, as in the bath sponge and many others. *Trias.-Cret.*

Sestrostomella ZITTEL, 1878 [**S. robusta*; SD DELAUB., herein]. Oscules may be covered by a net (49). *Trias.-Cret.*, Eu.—FIG. 81, 4. *S. rugosa* HINDE, *Cret.*, Eng., pharetrone spicules, $\times 150$ (63).

Trachysinia HINDE, 1884 [**T. aspera*; SD DELAUB., herein]. Surface lumpy. *M. Jur.*, Fr.—FIG. 81, 5. **T. aspera*, specimen, $\times 0.5$ (63).

Trachytula WELTER, 1910 [**T. tuberosa*]. Prosopores conspicuous except on summit (46). *L. Cret.*, Ger.—FIG. 81, 1. **T. tuberosa*, specimen, $\times 0.7$ (90).

Winwoodia RICHARDSON & THACKER, 1920 [**W. porula*; SD DELAUB., herein]. Massive. *M. Jur.*, Eng.

Thamnonema SOLLAS, 1883 [**T. pisiforme*]. Globular, without cloaca; skeletal strands radiating from center of base, commonly branched. *M. Jur.*, Eng.

Family STELLISPONGIIDAE de Laubenfels, nov.

Shape rounded, with fine-textured com-

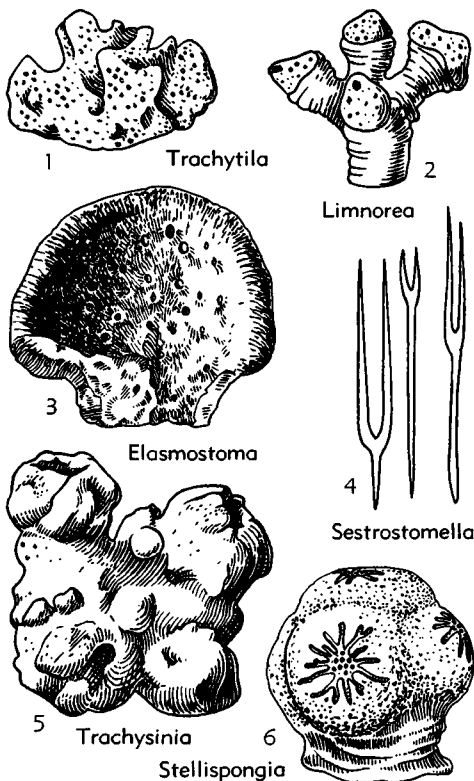


FIG. 81. Pharetronida (Chalarina): Sestromellidae, Stellispongiidae, Elasmostomatidae (p. E97-E98).

monly wrinkled dermis around sides but not on summit; radiating grooves around oscules probably denote apochetes which originally were covered by soft tissue with or without loose spicules; in life, the dermis may have been flexible. *Trias.-Cret.*

Stellispongia ORB., 1849 [**Cnemidium variabile* MÜNSTER, 1841; SD HINDE, 1893] [= *Ceriospongia* ÉTALLON, 1860; *Dvoracia* POMEL, 1872]. *Trias.-Jur.*, ?*Cret.*, Eu.-Peru.—FIG. 81, 6. *S. glomerata* (QUENST.), U. Jur., Ger.; side $\times 1$ (94). **Endostoma** RÖMER, 1864 [**Scyphia foraminosum* GOLDF., 1833; SD DELAUB., herein]. Resembles *Stellispongia*. ?*Cret.*, Eu.

Enaulofungia FROM., 1861 [**E. corallina*] [= *Holcospongia* HINDE, 1893]. Pores in vertical rows on sides (7). *Jur.-Cret.*, Eu.

Inobolia HINDE, 1884 [**I. inclusa*]. Like *Stellispongia* but oscules not evident (12). *M. Jur.*, Eng. **Synopella** ZITTEL, 1878 [**Lymnorea sphaerica* MICH., 1847; SD DELAUB., herein]. Rounded, may be compound, warty, with coarse spicular strands (49). *Cret.*, Eu.



FIG. 82. *Pharetrospongia strahani* SOLLAS, Cret., Eng. (p. E98).

- Blastinia** ZITTEL, 1878 [**Achilleum costatum* GOLDF., 1833; SD DELAUB., herein]. Budlike, cloaca elaborate, stalked; skeletal strands very crooked (49). *Jur.*, Eu.
- Euzittelia** ZEISE, 1897 [**E. magnifica*]. Like *Blastinia* but cloaca more simple. *Jur.-Cret.*, Eu.
- Limnorea** GOLDF., 1833 [*pro Lymnorea* LAMX., 1821 (non PERON & LESUEUR, 1810)] [**Lymnorea mammillosa* LAMX., 1821] [= *Lymnorotheles* FROM., 1860; *Lymnorella* RICHARDSON & THACKER, 1920]. Cylindrical branching sponges with naked porous tops (9). *M.Jur.*, Eu.—FIG. 81,2. **L. michelini* (ORB.); side, $\times 1$ (59).
- Epitheles** FROM., 1860 [**Myrmecium hemisphaericum* GOLDF., 1833]. Probably congeneric with *Limnorea* but not branched (7). *U.Jur.*, Fr.
- Diasterofungia** FROM., 1861 [**D. insignis*]. Like *Limnorea*. *M.Jur.*, Fr.
- Blastinoidea** RICHARDSON & THACKER, 1920 [**B. frithica*]. Like *Blastinia* but without surface furrows. *M.Jur.*, Eng.

Family ELASMOSTOMATIDAE de Laubenfels, nov.

Primarily lamellate or leaf-shaped but may form somewhat pronounced concavo-convex growths distinguishable from typical bowl-shaped sponges in occurrence of oscules on the convex side about as commonly as on the concave surface. *Jur.-Cret.*

- Elasmostoma** FROM., 1860 [**Tragos acutimargo* RÖMER, 1839]. Irregular shallow saucer or fan with abundant prosopores on one side and groups of 3 to 6 oscules on the other (7). *Jur.-Cret.*, Eu.—FIG. 81,3. **E. acutimargo* RÖMER, L.Cret., Ger.; concave side, $\times 1$ (94).

Steinmanella WELTER, 1910 [**S. latidorsa*]. Like *Elasmostoma*; layered walls suggest growth sequence (46). *Cret.*, Ger.

Diaplectia HINDE, 1884 [**D. auricula*; SD DELAUB., herein]. Cup-, fan-, or platter-shaped (12). *M.Jur.*, Eng.-Fr.

Family PHARETROSPONGIIDAE de Laubenfels, nov.

Pharetronids characterized by hard skeletal strands composed of linearly arranged, laterally joined diacts (oxeas), resembling the spongin-cemented fibers of modern demosponges such as *Haliclona*. *L.Cret.-U.Cret.*

Pharetrospongia SOLLAS, 1877 [**P. strahani*]. Various convoluted plates. Eng.—FIG. 82. **P. strahani*, U.Cret., Kent; $\times 0.5$ (63*).

Family LELAPIIDAE Dendy & Row, 1913

Erect cylinders or inverted cones with one or more deep cloacas opening on the rather flat top. *Perm.-Rec.*

Lelapia GRAY, 1867 [**L. australis*]. Stemlike, with cloacal layer of tetracts. *Rec.*, Austral.

Corynella ZITTEL, 1878 [**Scyphia foraminosa* GOLDF., 1833; SD HINDE, 1884]. Variably cylindrical, knobby, or top-shaped, with one or more oscules; canals evident or not; normal rhagon

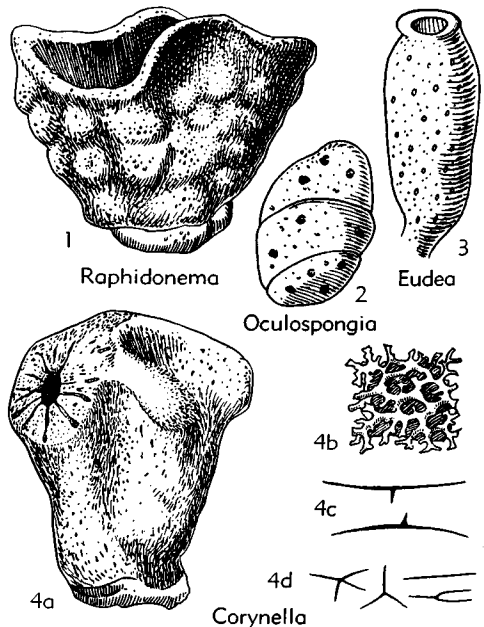


FIG. 83. Pharetronida (Chalarina): Lelapiidae (p. E99).

architecture with prosocletes and apocletes (49). *Trias.-Cret.*, Eu., ?E.Indies.—FIG. 83,4. *C. quenstedtii* ZITTEL, U.Jur., Ger.; 4a, side $\times 1$; 4b, part of skeleton, $\times 4$; 4c, spicules of strand, $\times 75$; 4d, near-surface spicules, $\times 25$ (4a,b, 94; 4c,d, 63).

Conocoelia FROM., 1860 [**Siphonocoelia crassa* FROM., 1861; SD DELAUB., herein]. Like *Corynella* but very coarse meshes of skeletal network serve as canals (49). *L.Cret.*, Fr.-Ger.

Oculospongia FROM., 1860 [**O. neocomiensis*]. Cushion-shaped (7). *L.Cret.*, Fr., ?Ger.—FIG. 83,2. **O. neocomiensis*, side, $\times 1$ (59).

Virmula GREGORIO, 1930 [**V. notans*]. Resembles *Corynella* and *Conocoelia*. *Perm.*, Sicily.

Eudea LAMX., 1821 [**E. clavata*; SD DELAUB., herein]. Tube- or club-shaped, with smooth porous surface and single large oscule at summit (21). *Trias.-Jur.*, Eu.—FIG. 83,3. *E. gracilis* (MÜNSTER), *Trias.*, Ger.; $\times 1$ (59).

Raphidonema HINDE, 1884 [**R. contortum*; SD DELAUB., herein]. Vase- or funnel-shaped, exterior rough and lumpy, cloacal surface smooth, with small apopores (12). *Trias.-Cret.*, Eu.—FIG. 83,1. *R. farringtonense* (SHARPE), *L.Cret.*, Eng.; side, $\times 0.7$ (94).

?**Tretocalia** HINDE, 1900 [**T. pezica*]. Small, possibly juvenile. *Eoc.*, Austral.

Pachytilodia ZITTEL, 1878 [**Scyphia infundibuliformis* GOLDF., 1833] [= *Pachytilodia* ZITTEL-E., 1900]. Thick-walled funnel with coarse skeletal network, prosopores very numerous, separated by thin walls (49). *L.Cret.-U.Cret.*, Eu.

Pachymura WELTER, 1910 [**P. goldfussi*]. Like *Pachytilodia* in nature of pores but with skeleton as in *Raphidonema* (46). *L.Cret.*, Ger.

Himatella ZITTEL, 1878 [**Tragos milleporata* MÜNSTER, 1841]. Inverted cone with large oscule, dermis smooth, pores minute (49). *Trias.*, Switz.

Family DISCOCOELIIDAE de Laubenfels, nov.

Bushlike pharetronids with oscules at or near tips of branches. *Trias.-Cret.*

Discocoelia FROM., 1861 [**Scyphia cymosa* MICH., 1847; SD RAUFF, 1893] [pro *Polycoelia* FROM., 1860 (non KING, 1849)] [= *Discoelia* FROM., 1861; *Phicoelia* POMEL, 1872 (**Scyphia cymosa* MICH., 1847; SD DELAUB., herein); *Dendrocoelia* LAMBE, 1864]. Digitate extensions from a common base, each with moderately large oscule at its rounded extremity (7). *M.Jur.*, Eu.

Peronidella HINDE, 1893 [pro *Peronella* ZITTEL, 1878 (non GRAY, 1855)] [**Spongia pistilliformis* LAMX., 1821; SD DELAUB., herein]. Like *Dendrocoelia* but with several small oscules on each column. *Trias.-Cret.*, Eu., ?E.Indies.—FIG. 84,1. *P. dumosa* (FROM.), U.Jur., Ger.; side, $\times 1$ (94).

Eusiphonella ZITTEL, 1878 [**Scyphia bronni* GOLDF., 1833; SD DELAUB., herein]. Like *Peron-*

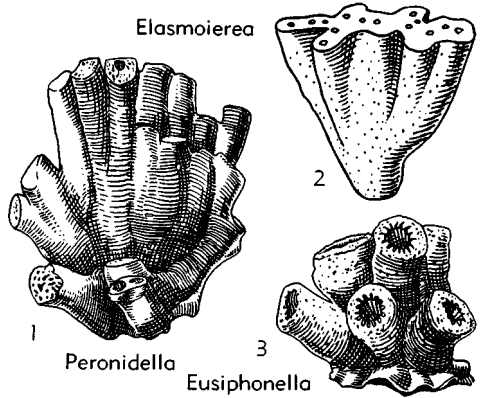


FIG. 84. Pharetronida (Chalarina): Discocoeliidae, Elasmocoeliidae (p. E99).

idella but with conspicuous grooves (mainly longitudinal) in cloacal wall, apopores large (49). *Jur.*, Eu.—FIG. 84,3. **E. bronni* (GOLDF.), Ger.; side, $\times 1$ (94).

Family ELASMOCOELIIDAE de Laubenfels, nov.

Vaselike or tubular, with walls formed by laterally joined erect small tubes. *Jur.-Cret.*

Elasmocoelia RÖMER, 1864 [**E. orbiculata*; SD DELAUB., herein] (35). *Cret.*, Ger.

Elasmoierea FROM., 1860 [**E. sequana*] [= *Elasmoierea* ZITTEL, 1878]. Not certainly vase-shaped (7). *Jur.-L.Cret.*, Ger.-Fr.—FIG. 84,2. **E. sequana*, *L.Cret.*, Fr.; side, $\times 0.7$ (59).

Suborder STEREINA de Laubenfels, nov.

Pharetronids with rigid skeleton formed by union of spicules at ray tips as in tetraclad lithistids (Demospongea) and dictyids (Hyalospongea) (*sterea*, firm). *Jur.-Rec.*

Family POROSPHERIDAE de Laubenfels, nov.

Globular, with pores and oscules distributed over all or nearly all of the spiny surface. *Cret.-Rec.*

Porosphaera STEINM., 1878 [**Millepora globularis* PHILL., 1829]. Spiny globes less than 1 cm. in diameter. *Cret.*, Czech.—FIG. 85,1. **P. globularis* (PHILL.); $\times 35$ (63).

Porosphaerella WELTER, 1910 [**P. subglobosa*]. Like *Porosphaera* but skeletal network more reg-

ular (46). *L.Cret.*, Ger.—FIG. 85,3. **P. subglobosa*; part of skeleton, $\times 50$ (90).
Sagittularia WELTER, 1910 [**S. adfixa*]. Like *Porosphaera* but less regular in form and structure and less firmly cemented (46). *L.Cret.*, Ger.
Petrostroma DÖD., 1892 [**P. schulzei*]. Massive, with digitate processes or coarse spines. *Cret.-Rec.*, Ger.-Japan.
Electronia HINDE, 1900 [**P. halli*]. Top-shaped, with relatively smooth surface; skeleton formed of cemented spiny tetracts. *L.Cret.-Rec.*, Ger.-Austral.-S.Pac.

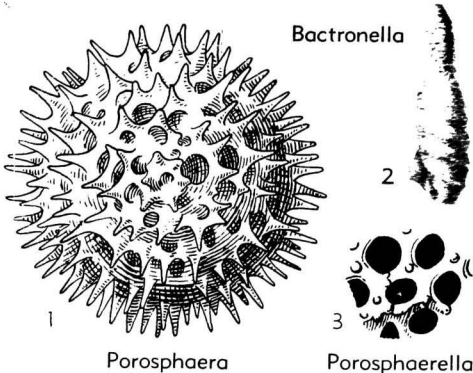


FIG. 85. Pharetronida (Stereina): Porosphaeridae, Bactronellidae (p. E99-E100).

Family BACTRONELLIDAE de Laubenfels, nov.

Subcylindrical to massive. *Jur.-Eoc.*

Bactronella HINDE, 1884 [**B. pusillum*]. Rod- or club-shaped, small; lower half smooth with transverse wrinkles or annular swellings, upper half porous; without evident oscule (12). *Jur.-Eoc.*, Ger.-Austral.—FIG. 85,2. **B. pusillum*, U.Jur., Ger.; $\times 1.3$ (63*).

Suborder UNCERTAIN

Leiospongia ORB., 1849 [**Achilleum milleporatum* MÜNSTER, 1841; SD DELAUB., herein] [=Leiofungia FROM., 1860] (29). *Trias.*, Eu.
Tremospongia ORB., 1849 [**Lymnorea sphaerica* MICH., 1847; SD RAUFF, 1893] (29). *U.Cret.*, Fr.
Colospongia LAUBE, 1865 [**Manon dubium* MÜNSTER, 1841]. *Trias.*, Eu.
Conispongia ÉTAL., 1859 [**C. thurmanni*; SD RAUFF, 1893]. *U.Jur.*, Fr.
Diplostoma FROM., 1860 [**D. neocomiense*] (7). *Cret.*, Fr.
Polycnemiseudea FROM., 1860 [**Cnemidium gregarium* ORB., 1849] (7). *U.Cret.*, Fr.
Polyendostoma F. A. RÖMER, 1864 [**P. sociale*; SD DELAUB., herein] (35). ?*Cret.*, ?Ger.

Aplosphacion POMEL, 1872 [**A. radiceforme*] (31). *Tert.*, Alg.
Cnemicopanion POMEL, 1872 [**Monotheles punctata* RÖMER, 1864; SD DELAUB., herein] (31). *Cret.*, Ger.
Coeloconia POMEL, 1872 [**Scyphia cylindrica* GOLDF., 1833] (31). *Tert.*, Alg.
Dyoconia POMEL, 1872 [**D. pomeli* DELAUB., nov. (=Scyphia cylindrica GOLDF., 1833, pars)] (31). *Tert.*, Alg.
Coniatopenia POMEL, 1872 [**Elasmostoma peziza* RÖMER, 1864] (31). *Cret.*, Ger.
Diostosphacion POMEL, 1872 [**Tremospongia grandis* RÖMER, 1864] (31). *Cret.*, Ger.
Dycopanon POMEL, 1872 [**Scyphia monilifera* RÖMER, 1864] (31). *Cret.*, Ger.
Trachyphlyctia POMEL, 1872 [**Spongia helvelloides* LAMX., 1821; SD RAUFF, 1893] (31). *Cret.*, Ger.
Trachysphacion POMEL, 1872 [**Spongia stellata* LAMX., 1821; SD RAUFF, 1893] (31). *Cret.*, Ger.
Crispispongia QUENST., 1878 [**C. expansa*; SD DELAUB., herein] (32). *Jur.*, Ger.
Astrofungia GREGORIO, 1883 [**A. cidariformis*; SD DELAUB., herein]. ?Age, Italy.
Rauffia ZEISE, 1897 [**R. clavata*]. *Mesoz.*, Eu.
Strambergia ZEISE, 1897 [no species]. *Mesoz.*, Eu.
Plectinia POČTA, 1903 [**P. minuta*; SD DELAUB., herein]. *Cret.*, Czech.
Myrmecidium VINASSA, 1920 [pro *Myrmecium* GOLDF., 1833 (non LATREILLE, 1825)] [**Myrmecium hemisphaericum* GOLDF., 1833; SD DELAUB., herein]. *Jur.*, Ger.
Molengraafia VINASSA, 1920 [**M. regularis*]. ?*Trias.*, E.Indies.
Alasonia SIRKOVA, 1938 [**A. remesi*]. *Jur.*, Czech.
Aphlebospongia SIRKOVA, 1938 [**A. remesi*]. *Jur.*, Czech.

Order THALAMIDA de Laubenfels, nov.

[=Sphinctozoa STEINM., 1882 (partim)]

Calcisponges with skeleton consisting of straight, curved, or branched series of hollow spheroidal bodies, commonly about 1 cm. in diameter, some with a tubular cloaca or inhalant siphon in axial position (*thalamos*, chamber). *U.Carb.-Cret.*

The hollow chambers of fossils belonging to the Thalamida do not prove that corresponding open cavities existed in these sponges when living. Many modern species of the Porifera are characterized by ectosome that is notably denser than the endosome, and some, like *Geodia*, possess an armored exterior associated with flimsy endosome full of small cavities. Accordingly, it is reasonable to suggest that in living Thalamida the spheroidal rooms may have

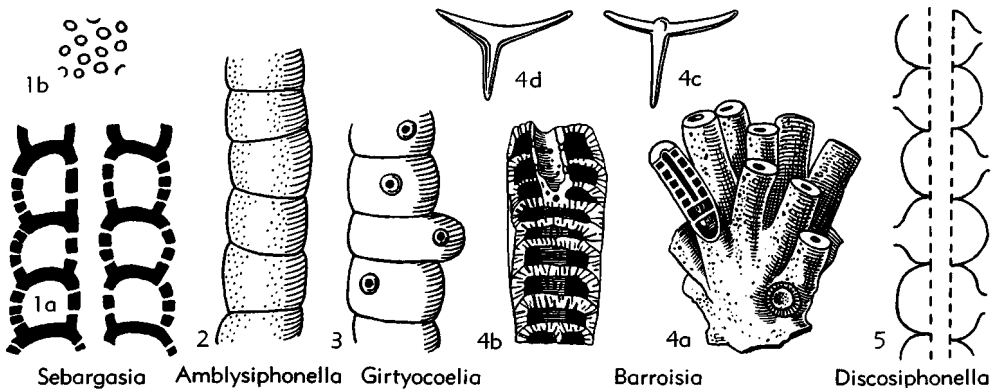


FIG. 86. Thalamida: Sebargasiidae, Barroisiidae (p. E101).

been filled with endosomal tissue containing numerous canals and minute flagellate chambers. Such tissue probably would contain loose spicules which almost invariably would be scattered and lost in fossilization. Sponges belonging to the Thalamida generally have been classed in the group here termed Lebetida, despite evidence that they have a distinctly more elaborate chamber system than that of the lebetids.

MORET (1952) in the *Traité de Paléontologie* (Masson) designates as sphinctozoarians ("sphinctozoaires") some sponges of the type here termed Thalamida. STEINMANN'S (1882) "Sphinctozoa," defined as a suborder of calcisponges, comprises only part of the division named Thalamida.

Family SEBARGASIIDAE Girty, 1908

Linear series of hollow subglobular bodies pierced by an axial tube which may be a cloaca but more probably served an inhalant function. *U.Carb.-Cret.*

Sebargasia STEINM., 1882 [**S. carbonaria*]. *Carb.*, Spain.—FIG. 86,1. **S. carbonaria*; 1a, long. sec., $\times 1$; 1b, surface pores, $\times 7$ (86).

Amblysiphonella STEINM., 1882 [**A. barroisi*] [= *Tetraproctosia* RAUFF, 1938]. Differs slightly from *Sebargasia* in pore structure (43). *U.Carb.-Perm.*, Eu.-N.Am.-Japan-Peru-E.Ind.—FIG. 86,2. **A. barroisi*, *Carb.*, Sp.; side, $\times 1$ (86).

Girtyocoelia COSS., 1909 [pro *Heterocoelia* GIRTY, 1908 (non DAHLBOM, 1854)] [**Heterocoelia beedei* GIRTY, 1908]. Like *Sebargasia* but with some pores in outer wall much larger than others and surrounded by a raised rim, resembling oscules; if these openings were exhalant, the axial tube probably was an inhalant passageway.

Penn., Kan.-Okla.-Tex.—FIG. 86,3. **G. beedei* (GIRTY); side, $\times 2$ (84).

Discosiphonella INAE, 1936 [**D. manchuriensis*]. Like *Girtyocoelia* but oscule-like openings on alternate sides. *Carb.*, Manch.—FIG. 86,5. **D. manchuriensis*; diagrammatic long. sec., $\times 1.5$ (65). *Thalamopora* F. A. RÖMER, 1840 [**T. cribosea*; SD DE LAUB., herein]. *Cret.*, Ger.-Fr.

Family BARROISIIDAE de Laubenfels, nov.

Like Sebargasiidae but colonial in growth, composed of a number of chamber-series joined together. *Trias.-Cret.*

Barroisia CHALMAS, 1882 [**Tubipora anastomosans* MANTELL, 1822]. Axial tubes may not reach to base of colony. *Cret.*, Eng.—FIG. 86,4. **B. anastomosans* (MANTELL), L.Cret.(Apt.), Berksh.; 4a, colony with a branch cut longitudinally, $\times 1$; 4b, column of chambers cut obliquely, $\times 2.5$; 4c, tetract, $\times 36$; 4d, triact, $\times 72$ (94).

Tremacystia HINDE, 1884 [**Verticillites d'orbigny*; SD DE LAUB., herein]. Resembles *Barroisia* (12). *Jur.-Cret.*, Eng.-Fr.-Ger.

Welteria VINASSA, 1920 [**W. repleta*]. Like *Barroisia*. *Trias.*, E.Indies.

Family CYSTOTHALAMIIDAE Girty, 1908

Differs from Sebargasiidae in that axial tube is surrounded by adherent hollow spheroidal chambers instead of piercing a linear series of such chambers. *Penn.-Perm.*

Cystothalamia GIRTY, 1908 [**C. nodulifera*]. Globular chambers irregularly disposed, each bearing one or more oscule-like openings (8). *Perm.*, Tex.

Cystauletes R. H. KING, 1943 [**C. mammilosus*]. Hollow globes spirally arranged around axial tube,

each with many coarse pores (?apopores) (19). *M.Penn.*, Okla.—FIG. 87,1. **C. mammilosus*; side, $\times 1$ (19).

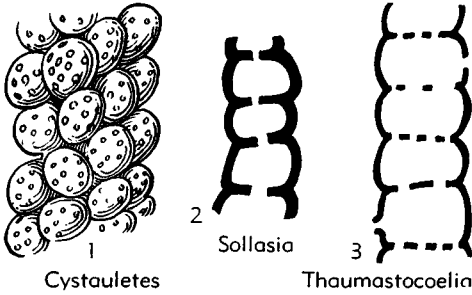


FIG. 87. Thalamida: Cystothalamiidae, Celyphiidae (p. E102).

Family CELYPHIIDAE de Laubenfels, nov.

Thalamid calcisponges consisting of a row of rounded appressed chambers not pierced by an axial tube but with openings in side walls which seem to be true oscules. *U.Carb.-Trias.*

Celyphia POMEL, 1872 [**Manon submarginata* MÜNSTER, 1841] (31). *Trias.*, Eu.

Thaumastocoelia STEINM., 1882 [**T. cassiana*]. Like *Celyphia* but walls between adjacent chambers perforated (43). *Perm.-Trias.*, Eu.—FIG. 87,3. **T. cassiana*, *Trias.*, Italy; long. sec., $\times 1$ (86).

Enoplocoelia STEINM., 1882 [**Scyphia armata* KLIPSTEIN, 1845]. Each globe with several apertures that seem to be oscules (43). *Perm.-Trias.*, Eu.

Henricellum WILCKENS, 1937 [**H. insigne*]. *Trias.*, E.Indies.

Girtycoelia R. H. KING, 1933 [**G. typica*]. Like *Celyphia* but rows of globes may branch (18). *Penn.*, Kan.-Tex.

?**Imperatoria** GREGORIO, 1930 [**I. marconi*]. Individuals shaped like inverted cone. *Perm.*, Eu.

Sollasia STEINM., 1882 [**S. ostiolata*]. Like *Celyphia* but with a single large aperture in wall between chambers (43). *Penn.-Perm.*, Eu.—FIG. 87,2. **S. ostiolata*, *Carb.*, Sp.; diagrammatic long. sec., $\times 3$ (86).

Family CRYPTOCEOELIIDAE Steinmann, 1882

Resembling Celyphiidae in growth form but the successive rounded chambers contain internal structures such as longitudinal pillars or vesicles. *Perm.-Cret.*

Cryptocoelia STEINM., 1882 [**C. zitteli*]. Chambers

containing longitudinal pillars (43). *Trias.-Cret.*, Eu.—FIG. 88,1. **C. zitteli*, *Trias.*, Aus.; 1a, side, $\times 1$; 1b, long. sec., $\times 1$ (86).

Waagenella DE LAUB., nom. nov. [pro *Steinmannia* WAAG.-W., 1888¹ (non FISCHER, 1886)] [**Steinmannia salinaria* WAAG.-W., 1888]. Chambers filled with vesicles which are larger than normal flagellate chambers. *Perm.-Trias.*, India-E.Indies.

Seranella WILCKENS, 1937 [**S. tenuissima*]. Like *Waagenella* but some chambers penetrated halfway by a cloaca. *Trias.*, E.Indies.

Cryptocoeliopsis WILCKENS, 1937 [**C. gracilis*]. Like *Waagenella* but chamber walls paper-thin. *Trias.*, E.Indies.

Deningeria WILCKENS, 1937 [**D. camerata*]. Chamber walls thicker (1 mm.) than in *Waagenella*, with dense vesicular tissue just inside walls becoming attenuated and open toward interior open space that simulates a cloaca. *Trias.*, E.Indies.

Family SPHAEROCOELIIDAE Steinmann, 1882

Like Celyphiidae but with walls formed by rigid skeletal strands composed of many overlapping rows of monactinal spicules, as in the common spongin-cemented fibers of Demospongea. *U.Cret.*

Sphaerocoelia STEINM., 1882 [**Thalamopora michelini* SIMONOWITSCH, 1871] (43). Eu.—FIG. 88,2. **S. michelini* (SIMONOWITSCH); side, $\times 2.5$ (86).

Family UNCERTAIN

Polyphymaspongia R. H. KING, 1943 [**P. explanata*] (22). *Perm.*, Tex.—FIG. 88,6. **P. explanata*; section of peripheral part of sponge, $\times 1$ (66).

Polytholosis RAUFF, 1938 [**P. complicata*]. Complex aggregation of chambers varying in size, shape, and position. *Trias.*, Peru.

Order UNCERTAIN

Ascospylegma RAUFF, 1938 [**A. torosum*]. Rounded fossils attaining height of 15 cm. composed of tubes 4 to 7 mm. diameter piled one on another, with pharetronid-type walls but no spicules known. *Trias.*, Peru.

Epeudea FROM., 1860 [**Eudea cribraria* MICH., 1847] (7). *M.Jur.*, Fr.

Polysiphon GIRTY, 1908 [**P. mirabilis*] (11). *Perm.*, Tex.

Holocoelia STEINM., 1913 [**H. toulai*; SD DE LAUB., herein]. ?Age, ?loc.

Gaspongia PARKS, 1933 [**G. basalis*]. *Sil.*, Can.

Scribroporella SPRIEST., 1935 [**S. socialis*]. *M.Dev.*, Ger.

Oligoplagia HERAK, 1944 [**O. carnica*]. *Trias.*, Aus.

¹ WAAGEN, W., & WENTZEL, J. (1888) *Salt Range fossils: India Geol. Survey, Mem.*, ser. 13, pt. 6, p. 979.

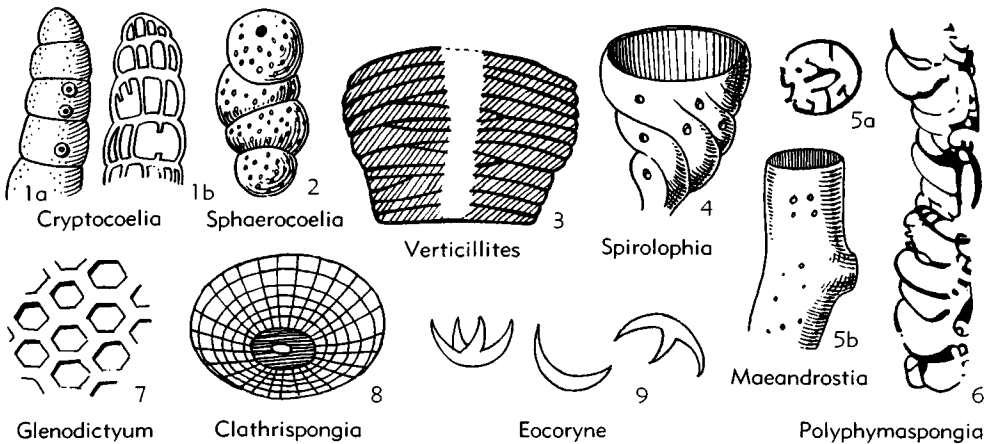


FIG. 88. Thalamida: Cryptocoeliidae, Sphaero-coeliidae, Incertae Sedis (p. E102-E103).

Class UNCERTAIN

Atikokania WALC., 1912 [**A. lawsoni*]. Cylindrical or elongate conical, with cloaca-like central cavity surrounded by radiating and concentric skeletal strands. *Precam.*, Can.

Eocoryne MATTHEW, 1886 [**E. geminum*]. Relatively large peculiarly shaped spicules (1.5-2 mm.). *M.Cam.*, Can.—FIG. 88,9. **E. geminum*; 9a-c, spicules enlarged (70).

Cyathophycus WALC., 1879 [**C. subsphaericus*]. Lacking spicules or reticulate structure. *Ord.*, N.Y.

Caliculospongia FOERSTE, 1916 [**C. pauper*]. Cylindrical, with deep cloaca, walls with many round canals but no spicules or fibers. *Ord.*, Ky.

Cotyliscus R. H. KING, 1943 [**C. ewersi*]. Cuplike, with canals penetrating walls (19). *Miss.*, Tex.

Maeandrostia GIRTY, 1908 [**M. kansasensis*]. Cylindrical, with scattered small oscules, walls penetrated by irregular canals (19). *Penn.*, Kan.-Tex.—FIG. 88,5. **M. kansasensis*; 5a, transv. sec., $\times 1$; 5b, side, $\times 1$ (66).

Guadalupia GIRTY, 1908 [**G. zitteliana*]. Stalked fronds and branches (8). *Perm.*, Tex.

Fissispongia R. H. KING, 1938 [**F. jacksboroensis*]. Resembles *Maeandrostia*. *Penn.*, Tex.

Verticillites DEF., 1829 [**V. cretaceus*] [= *Verticillipora* BLAINV., 1834; *Verticillocoelia* FROM., 1860]. Tubes surrounded by chambers, somewhat resembling Thalamida. *Trias.-Cret.*, Eu.—FIG. 88,3. **V. cretaceus*, *Cret.*; long. sec., $\times 1$ (86).

Preverticillites PARONA, 1933 [**P. columella*]. Like *Verticillites* but lacking cloaca. *Perm.*, Italy.

Clathrispongia QUENST., 1878 [**C. orbica*]. Shallow saucer-shaped, with rectangular skeletal network next to surface (32). *Jur.*, Ger.—FIG. 88,8. **C. orbica*; side, $\times 0.5$ (77).

Spirolophia POMEL, 1872 [**Pleurostoma tortuosa* RÖMER, 1864]. Cup-shaped, spirally convoluted (31). *Cret.*, Ger.—FIG. 88,4. **S. tortuosa* (RÖMER); side, $\times 0.3$ (76).

Glenodictyum VON DER MARCK, 1873 [**G. hexagonum*]. Skeleton with conspicuous hexagonal network. *Cret.*, Eu.—FIG. 88,7. **G. hexagonum*; part of skeleton, $\times 0.2$, (69).

Megalelasma POČTA, 1903 [**M. dispansum*]. Inverted cone-shaped, 17 cm. high and 41 cm. in diameter, with walls 1 cm. thick. *Cret.*, Czech.

UNRECOGNIZABLE SUPPOSED SPONGES

Many authors writing before 1889 had inadequate methods for ascertaining the fine structure of sponge fossils, and for this or other reasons they gave unrecognizable descriptions even though their specimens might today prove to be recognizable. Exploration in museums may eventually permit transferring some of their generic names from the uncertain group to a definite place in the taxonomic arrangement of sponges.

It is embarrassingly true that numerous fossils, especially of sponges, have been so altered during fossilization that little information can be gleaned from them, regardless of method or zeal. In the following tabulation, many names refer to fossils that are not known certainly to be sponges. The names are arranged alphabetically because too little is known to warrant effort in grouping them.

- Achilleum* OKEN, 1814 [**A. manus*; SD DE LAUB., herein]. *Cret.-Rec.*, Eu.
- Adelphocoelia* ÉTAL., 1860 [**Scyphia propinqua* GOLDF., 1833]. *Jur.*, Eu.
- Alcyonolithes* BLUM., 1815 [**A. stadensis*]. ?*Age*, ?loc.
- Amorphocoelia* ÉTAL., 1860 [**A. incrustans*]. *Jur.*, Eu.
- Amorphospongia* ORB., 1848 (non FROM., 1860) [**Achilleum tuberosum* GOLDF., 1833; SD DE LAUB., herein]. *Jur.*, Eu.
- Angidia* POMEL, 1872 [**A. cribrosa*; SD DE LAUB., herein]. *Cenoz.*, Alg.
- Aplorytis* POMEL, 1872 [**Lymnorea bajocensis* ORB., 1849]. *Jur.*, Eu.
- Araeoplocia* POMEL, 1872 [**Maeandrospongia annulata* RÖMER, 1864; SD DE LAUB., herein]. *Cret.*, Eu.
- Arthrocyphella* POMEL, 1872 [**Scyphia articulata* GOLDF., 1833]. *Cret.*, Eu.
- Asteriscosella* CHRIST, 1925 [**A. nassovica*]. *Dev.*, Ger.
- Asteropagia* POMEL, 1872 [**Asterospongia globosa* RÖMER, 1864; SD DE LAUB., herein]. *Cret.*, Eu.
- Astrolmia* POMEL, 1872 [**Cnemidium astrophorum* GOLDF., 1833]. *Cret.*, Eu.
- Astrospongia* ÉTAL., 1859 [**A. subcostata*]. *Jur.*, Fr.
- Ateloraia* POMEL, 1872 [**Cnemidium manon* MÜNSTER, 1841]. *Cret.*, Eu.
- Atelosphacion* POMEL, 1872 [**A. commutatum*]. *Cenoz.*, Alg.
- Aulocopagia* POMEL, 1872 [**Leiospongia meandrina* ORB., 1849]. *Cret.*, Eu.
- Aulacospongia* GERTH, 1927 [**A. hanieli*]. *Perm.*, Timor.
- Badinskia* POMEL, 1872 [**B. lobata*]. *Cenoz.*, Alg.
- Batalleria* HÉRENGER, 1946 [**B. cylindrata*]. *Cret.*, Sp.
- Batospongia* MILLER, 1889 [**B. spicata*]. *Carb.*, U.S.A.
- Bicupula* COURT., 1861 [**B. gratioza*; SD DE LAUB., herein]. *U.Cret.*, Fr.
- Biopalla* WALLACE, 1878 [**B. keokuki*]. *Carb.*, Iowa.
- Blumenbachium* KOENIG, 1825 [**B. globosum*]. ?*Age*, ?loc.
- Bonneyia* SOLLAS, 1873 [no species]. *L.Cret.*, Eu.
- Bothriopeltia* POMEL, 1872 [**Cribrispongia baugieri* ORB.; SD RAUFF, 1893]. *Cret.*, Eu.
- Broseocnemis* POMEL, 1872 [**B. asperata* POMEL]. *Jur.*, Alg.
- Bursispongia* QUENST. 1877 [**B. bursata*]. *Jur.*, Ger.
- Calpia* POMEL, 1872 [**Cribrispongia cariosa* RÖMER, 1864]. *Cret.*, Eu.
- Calymmospongia* STRAND, 1928 [**Cystispongia subglobosa* RÖMER, 1864; SD RAUFF, 1893] [= *Calymma* POMEL, 1872 (non HUEBNER, 1823)]. *Cret.*, Eu.
- Camerocoelia* ÉTAL., 1858 [* ?type]. ?*Age*, ?loc.
- Catalopia* POMEL, 1872 [**C. gemmans*]. *Cret.*, Alg.
- Cephalocoelia* ÉTAL., 1859 [**C. gresslyi*]. ?*Age*, ?loc.
- Ceriopelta* POMEL, 1872 [no species]. ?*Age*, ?loc.
- Chenendrosphyia* FROM., 1860 [**Chenendopora marginata* MICH., 1847]. ?*Age*, ?loc.
- Chitoracia* POMEL, 1872 [**C. roemeri*; SD RAUFF, 1893]. *Cret.*, Eu.
- Cladocalpia* POMEL, 1872 [**Tubulospongia dendroides* COURT., 1861; SD DE LAUB., herein]. *U.Cret.*, Eu.
- Cladocinclis* POMEL, 1872 [**Tubulospongia dendumosa* ORB., 1849]. *Cret.*, Eu.
- Cladopagia* POMEL, 1872 [no species]. ?*Age*, ?loc.
- Cladomilia* POMEL, 1872 [**Ceriopora(?) prolifera* GOLDF., 1833]. ?*Age*, ?loc.
- Clionothes* LEE & THOMAS, 1919 [**C. lizardensis*]. ?*Age*, ?loc.
- Cnemaulax* POMEL, 1872 [**C. verrucosus*]. *Cenoz.*, Alg.
- Cnemicoelia* ÉTAL., 1858 [* ?Type]. ?*Age*, ?loc.
- Cnemidium* GOLDF., 1853 [**C. lamellosum* GOLDF., 1833; SD MILLER, 1889]. *U.Cret.*, Eu.
- Cnemipsechia* POMEL, 1872 [**C. fungiaeformis*]. *Cenoz.*, Alg.
- Cnemiracia* POMEL, 1872 [**Stellispongia aperta*; SD DE LAUB., herein]. *Cret.*, Eu.
- Cnemiscudea* FROM., 1860 [**Scyphia costata* GOLDF., 1833]. *U.Jur.*, Ger.
- Cnemopeltia* POMEL, 1872 [**Cnemidium rimulosum* GOLDF., 1833]. *Cret.*, Eu.
- Coelosphacridium* C. F. RÖMER, 1885 [**C. cyclocrinophilum*]. ?*Age*, ?loc.
- Coelomilia* POMEL, 1872 [**Ceriopora favosa* GOLDF., 1833; SD DE LAUB., herein]. *Cret.*, Eu.
- Collojera* POMEL, 1872 [**Siphonia ramosa* MICH., 1847]. *Cret.*, Eu.
- Colpoclocia* POMEL, 1872 [**Plocoscyphia michelini* ORB., 1849; SD RAUFF, 1893]. *U.Jur.*, Eu.
- Confervites* BRONGN., 1828 [**C. fasciculata*; SD DE LAUB., herein]. *Jur.*, Eu.
- Corthya* POMEL, 1872 [no species]. ?*Age*, ?loc.
- Cribrocoelia* ÉTAL., 1859 [**C. striata*; SD DE LAUB., herein]. *Jur.*, Eu.
- Cribrrosphyia* FROM., 1860 [**Scyphia polyommata* GOLDF., 1833]. *U.Jur.*, Eu.
- Cribrrospongia* ORB., 1849 [**Scyphia reticulata* GOLDF., 1833]. *U.Jur.*, Eu.
- Cryptodesma* SCHRAM., 1924 [**Asterospongia globosa* RÖMER, 1864; SD DE LAUB., herein]. *Cret.*, Eu.
- Cupulospongia* ORB., 1849 [**Tragos patella* GOLDF., 1833; SD DE LAUB., herein]. [= *Cupulochonia* FROM., 1861]. *U.Jur.*, Fr.
- Cyathoplocia* POMEL, 1872 [**Scyphia texata* GOLDF., 1833]. ?*Age*, ?loc.
- Cyclosporgia* MILLER, 1892 [**C. discus*]. *Dev.*, U.S.A.
- Cylindrocoelia* ULR., 1889 [**C. endoceroidea* ULR.; SD MILLER, 1889]. *Ord.*, U.S.A.
- Cylindrospongia* F. A. RÖMER, 1864 [**C. abbreviata*; SD DE LAUB., herein]. *Cret.*, Eu.

- Cyronella** BEEDE, 1899 [?Type]. ?Age, ?loc.
- Cystoloena** POMEL, 1872 [**Cystospongia undulata* RÖMER, 1848; SD RAUFF, 1893]. *Cret.*, Eu.
- Cystopora** POMEL, 1872 [**Verticillites truncatus* ORB., 1848; SD DELAUB., herein]. *Cret.*, Eu.
- Dendrospongia** F. A. RÖMER, 1864 [**D. clathrata*; SD DELAUB., herein]. *Cret.*, Eu.
- Dercites** CARTER, 1871 [**D. haldonensis*] [= *Dercitites* SOLLAS, 1880]. *L.Cret.*, Eu.
- Desmoscinia** POMEL, 1872 [**Scyphia procumbens* GOLDF., 1833]. ?Age, ?loc.
- Desmospongia** ÉTAL., 1863 [**Spongites semicinctus* QUENST., 1878]. *Jur.*, Fr.
- Dichoplectella** MATTHEW, 1891 [**D. irregularis*]. ?Age, ?loc.
- Dichorea** POMEL, 1872 [**Lymnorea michelini* ORB., 1849]. *Cret.*, Eu.
- Dictyocladia** POMEL, 1872 [**D. ramosa*]. *U.Jur.*, Alg.
- Dictyonocoelia** ÉTAL., 1855 [**D. schveiggeri*]. *Jur.*, Eu.
- Dictyomila** POMEL, 1872 [**D. reteporiformis*]. *Cret.*, Eu.
- Didesmospongia** ÉTAL., 1864 [no species]. *Jur.*, Eu.
- Diseudea** FROM., 1860 [**Siphonia lagenaria* MICH., 1847] [= *Copanon* POMEL, 1872]. *M.Jur.*, Eu.
- Distheles** FROM., 1860 [**D. depressa*]. *Jur.*, Eu.
- Dolispurgia** QUENST., 1877 [**Scyphia meandrina* GOLDF., 1833; SD DELAUB., herein]. *Jur.*, Ger.
- Donatispongia** MALFATTI, 1901 [**D. patellaris*]. *Cenoz.*, Eu.
- Dulmius** GREGORIO, 1930 [**D. innovatus*]. *Perm.*, Sicily.
- Elasmeudea** POMEL, 1872 [**Eudea cribraria* MICH., 1847; SD RAUFF, 1893]. *Cret.*, Eu.
- Elasmopagia** POMEL, 1872 [**E. anomala*; SD RAUFF, 1893]. *Cret.*, Alg.
- Eligma** REGNARD, 1927 [**E. douvilli*]. *Cret.*, Fr.
- Emplocia** POMEL, 1872 [**Brachiolites foliaceus* T. SMITH]. *Cret.*, Eu.
- Enteropycnus** DELAUB., *nom. nov.* [pro *Pycnogaster* SCHRAM., 1924 (ref. 39, p. 30) (*non* GRAELL, 1851)] [**Pycnogaster texturatus* SCHRAM., 1924]. *Cret.*, Ger.
- Erythrospurgia** HUDSON, 1929 [**E. lithodes*]. *Carb.*, Eng.
- Eucoscina** POMEL, 1872 [**Scyphia cancellata* GOLDF., 1833; SD DELAUB., herein]. *Cret.*, Eu.
- Eulespongia** QUENST., 1878 [**Siphonocoelia texta* RÖMER, 1864]. *Cret.*, Eu.
- Evinospongia** STOPPANI, 1860 [**E. cerea*; SD DELAUB., herein]. *Trias.*, Italy.
- Exosinion** POMEL, 1872 [**Ventriculites gracilis* RÖMER, 1864]. *Cret.*, Eu.
- Favispongia** QUENST., 1878 [**Scyphia obliqua* GOLDF., 1833]. *Jur.*, Eu.
- Favospongia** HINDE, 1888 [**F. ruthveni*]. *U.Sil.*, Eu.
- Floria** GREGORIO, 1930 [**F. permiana*]. *Perm.*, Sicily.
- Forospongia** ORB., 1849 [**Tragos acetabulum* GOLDF., 1833]. *Jur.*, Eu.
- Fungispongia** RINGUEBERG, 1884 [**F. irregularis*]. *Sil.*, U.S.A.
- Gelasinophorus** SCHRAM., 1924 [**G. reitmeyeri* SCHRAM.; SD DELAUB., herein]. *Cret.*, Eu.
- Gemmellarella** PARONA, 1933 [**G. permica*]. *Perm.*, Eu.
- Gigantodesma** SCHRAM., 1924 [**Pachypoterion auritum* SCHRAM.; SD DELAUB., herein]. *Cret.*, Ger.
- Goniocoelia** ÉTAL., 1858 [?Type]. ?Age, ?loc.
- Gonioscyphia** FROM., 1860 [**Scyphia striata* GOLDF., 1833]. *U.Jur.*, Fr.
- Goniospongia** ORB., 1849 [**G. schlotheimii*]; SD RAUFF, 1893]. *U.Jur.*, Fr.
- Gymnomyrmecium** POMEL, 1872 [**Myrmecium gracile* MÜNSTER, 1841]. *Cret.*, Eu.
- Gymnorea** POMEL, 1872 [**Polycoelia gemmans* FROM., 1864; SD RAUFF, 1893]. *Cret.*, Eu.
- Hallisida** POMEL, 1872 [**Hallirhoa lycoperdites* LAM., 1821]. *Cret.*, Eu.
- Hemicoetis** POMEL, 1872 [**Scyphia tenue* RÖMER, 1841]. *Cret.*, Eu.
- Hemipenia** POMEL, 1872 [**Oculispongia polymorpha* RÖMER, 1864; SD DELAUB., herein]. *Cret.*, Eu.
- Hemispongia** ORB., 1849 [**H. rouyana* ORB.; SD DELAUB., herein]. [= *Strobocoelia* POMEL, 1872]. *Cret.*, Eu.
- Herpophlyctia** POMEL, 1872 [**H. subregularis*]. *Cenoz.*, Alg.
- Herpothis** POMEL, 1872 [**H. sahelensis*]. *Cenoz.*, Alg.
- Heteropenia** POMEL, 1872 [**Manon peziza* GOLDF., 1833] [= *Trachypenia* POMEL, 1872; *Catagma* SOLLAS, 1878 (**Manon peziza* GOLDF., 1833; SD DELAUB., herein)]. *Cret.*, Eu.
- Heteromila** POMEL, 1872 [**H. diastoporiformis*]. *Cenoz.*, Alg.
- Holcosinion** POMEL, 1872 [**Ocellaria laticostata* RÖMER, 1864; SD DELAUB., herein]. *Cret.*, Eu.
- Holoracia** POMEL, 1872 [**Cnemidium turbinatum* MÜNSTER, 1841; SD RAUFF, 1891]. *Cret.*, Eu.
- Holosphecion** POMEL, 1872 [**H. tuberosum*]. *Cenoz.*, Alg.
- Homalorea** POMEL, 1872 [**Tremospongia dilatata* RÖMER, 1864]. *Cret.*, Eu.
- Homolpia** POMEL, 1872 [**Spongius townsendi* MANTZELL, 1822]. *Cret.*, Eu.
- Homoptychium** POMEL, 1872 [**Coeloptychium decimum* RÖMER, 1864]. *Cret.*, Eu.
- Hylospongia** SOLLAS, 1872 [no species]. ?Age, ?loc.
- Hystriospurgia** MILLER, 1889 [= *Hystriospurgia* ULR., 1890]. *Carb.*, U.S.A.
- Isophyllum** DELAUB., *nom. nov.* [pro *Coelophyllum* SCHRAM., 1924 (ref. 39, p. 150) (*non* *Coelophyllum* SCUDDER, 1875)] [**Coelophyllum marginatum* SCHRAM., 1924]. *Cret.*, Ger.
- Kazania** STUCK., 1895 [**K. elegantissima* STUCK.; SD DELAUB., herein]. *Carb.*, Eu.

- Labyrintholithes** SINTZOV, 1879 [**L. varians*; SD DE LAUB., herein]. *Cret.*, U.S.S.R.
- Leiohyphes** SCHRAM., 1924 [**L. solitaria*; SD DE LAUB., herein]. *Cret.*, Eu.
- Leptomitosis** BÖHM, 1928 [**L. dubia*]. *Cret.*, Eu.
- Lithosia** POMEL, 1872 [**Turonina radiata* COURT., 1861; SD DE LAUB., herein]. *Cret.*, Eu.
- Lithospongites** CARTER, 1873 [**L. kittoni*; SD DE LAUB., herein]. *Carb.*, Eu.
- Loboptychium** SCHRAM., 1924 [**L. convarrum*; SD DE LAUB., herein]. *Cret.*, Eu.
- Loczia** VINASSA, 1901 [**L. cryptocoelioides* VINASSA; SD DE LAUB., herein]. ?*Age*, loc.
- Lodanella** KAYSER, 1885 [**L. mira*]. *L.Dev.*, Eu.
- Loenocoelia** POMEL, 1872 [**L. ramosa*; SD RAUFF, 1893]. *Cret.*, Alg.
- Loenopagia** POMEL, 1872 [**Tragos ramosum* KLIPSTEIN, 1845]. *Cret.*, Eu.
- Madrespongia** QUENST., 1878 [**M. trichotomoides* QUENST.; SD DE LAUB., herein]. *U.Jur.*, Ger.
- Maecandroptychium** SINTZOV, 1879 [**M. polymorphum*; SD DE LAUB., herein]. *Cret.*, U.S.S.R.
- Mammillopora** BROWN, 1825 [**M. paucissimae*; SD DE LAUB., herein]. ?*Cret.*, *Rec.*, Eu.
- Manon** OKEN, 1814 [**Spongia dichotoma* LINNÉ, 1767; SD DE LAUB., herein]. ?*Cret.*, *Rec.*, Eu.
- Mantellia** PARKINSON, 1822 [no species]. ?*Age*, ?loc.
- Mastoscina** POMEL, 1872 [**Scyphia verrucosa* GOLDF., 1833; SD DE LAUB., herein]. *Cret.*, Eu.
- Mastospongia** QUENST., 1878 [**M. coniformis*; SD DE LAUB., herein]. *Jur.*, Ger.
- Megalodictyon** OPPL., 1926 [**M. fretreulensis*]. *Jur.*, Eu.
- Megaspongia** QUENST., 1878 [**M. tessellata*; SD DE LAUB., herein]. *Jur.*, Ger.
- Megastroma** DAWSON, 1883 [**M. laminosum*]. ?*Age*, ?loc.
- Monamona** DE LAUB., *nom nov.* [pro *Mona* SMITH, 1911¹ (non HULST, 1888)]. [**Mona monensis* SMITH, 1911]. *Carb.*, Isle of Man.
- Monilites** CARTER, 1871 [**M. haldonensis*; SD DE LAUB., herein]. *Cret.*, Eu.
- Monotheles** FROM., 1860 [**M. neocomiensis*]. *L.Cret.*, Eu.
- Nanodiscites** SOLLAS, 1880 [**N. parvus*]. *Cret.*, Eu.
- Nelumbosium** GREGORIO, 1930 [**N. primum*]. *Perm.*, Sicily.
- Nexispongia** QUENST., 1878 [**N. libera*]. *Jur.*, Ger.
- Nudispongia** QUENST., 1878 [**N. cribrata*; SD DE LAUB., herein]. *Jur.*, Ger.
- Ocellarioscyphia** FROM., 1860 [**Ventriculites radiatus* MANTELL, 1822; SD DE LAUB., herein]. *Cret.*, Eng.
- Oegophymia** POMEL, 1872 [?type species]. ?*Age*, ?loc.
- Oligocoelia** VINASSA, 1901 [**O. zitteli*; SD DE LAUB., herein]. ?*Age*, ?loc.
- Olynthia** POMEL, 1872 [**Manon marginatum* MÜNSTER, 1841; SD RAUFF, 1893]. *Cret.*, Eu.
- Oncolopia** POMEL, 1872 [**Brachiolites elegans* T. SMITH, 1848]. *Cret.*, Eu.
- Orthodiscus** SCHRAM., 1924 [**O. fragilis* SCHRAM.; SD DE LAUB., herein]. *Cret.*, Ger.
- Operytis** POMEL, 1872 [**Tragos stellatum* GOLDF., 1833] [= *Actinopagia* POMEL, 1872]. *Cret.*, Eu.
- Orispongia** QUENST., 1878 [**Spongites perforatus* QUENST.; SD DE LAUB., herein]. *Jur.*, Ger.
- Pachaena** SOLLAS, 1880 [**P. hindi*]. *Cret.*, Eu.
- Pachastrellites** SOLLAS, 1880 [**P. fusifer*]. *Cret.*, Eu.
- Pachychlaenia** POMEL, 1872 [**Manon megastoma* REUSS]. *Cret.*, Eu.
- Pachycinclis** POMEL, 1872 [**Amorphospongia carantonensis* ORB., 1849]. *Cret.*, Eu.
- Pachyegma** SCHRAM., 1924 [**P. macrostoma*]. *Cret.*, Eu.
- Pachyselis** SCHRAM., 1924 [**Chonella auriformis*]. *Cret.*, Eu.
- Pachytechia** POMEL, 1872 [**Cnemidium parva* ÉTAL., 1859]. *Cret.*, Eu.
- Palaeoderma** GERTH, 1927 [**P. tubulosa*]. *Perm.*, U.S.A.
- Palaeoicerea** LAUBE, 1864 [**Manon(?) gracilis* MÜNSTER, 1841]. ?*Age*, Eu.
- Palaeospongia** ORB., 1849 [**Porites cyathiformis* HALL, 1847; SD MILLER, 1889] [= *Palaeochonia* FROM., 1860]. *Sil.*, N.Y.
- Paracinclis** POMEL, 1872 [**Amorphospongia digitata* ORB., 1849]. *Cret.*, Eu.
- Paramoudra** BUCKLAND, 1817 [no species]. ?*Age*, ?loc.
- Paraplocia** POMEL, 1872 [**Spongia labyrinthica* MANTELL, 1822; SD DE LAUB., herein]. *Cret.*, Eu.
- Parenia** POČTA, 1885 [?type]. ?*Age*, ?loc.
- Pareudea** ÉTAL., 1859 [**P. bronni*; SD DE LAUB., herein] [= *Pareudea* ÉTAL., 1863]. *Jur.*, Fr.
- Peregrinus** KRASMOPEEVA, 1940 [?type]. ?*Age*, ?loc.
- Periphora** REGNARD, 1927 [**P. robusta*]. *Cret.*, Eu.
- Perispongia** ORB., 1849 [**P. reflexa*]. ?*Age*, ?loc.
- Phragmoscina** POMEL, 1872 [**Scyphia decorata* GOLDF., 1833]. *Cret.*, Eu.
- Phymatocoelia** POMEL, 1872 [**Scyphia uvaeformis* GIEBEL]. *Cret.*, Eu.
- Phymatolopia** POMEL, 1872 [**Brachiolites tuberosus* T. SMITH, 1848]. *Cret.*, Eu.
- Phymocoetis** POMEL, 1872 [**Ocellaria interrupta* RÖMER, 1864]. *Cret.*, Eu.
- Phymoracia** POMEL, 1872 [**Stellispongia verrucosa* RÖMER, 1864]. *Cret.*, Eu.
- Phymosinion** POMEL, 1872 [**Coeloptychium muricatum* RÖMER, 1841]. *Cret.*, Eu.
- Pilosphcion** POMEL, 1872 [**Tragos acutemarginatum* KLIPSTEIN, 1845; SD RAUFF, 1893]. *Cret.*, Eu.
- Placorea** POMEL, 1872 [**Limnorea mammillaris* RÖMER, 1864]. *Cret.*, Eu.

¹ SMITH, J., (1911) *Carboniferous limestone rocks of the Isle of Man*: Geol. Soc. Glasgow, Trans., v. 14, p. 149.

- Planispongia** QUENST., 1877 [**P. auriformis* QUENST.; SD DELAUB., herein]. *Jur.*, Eu.
- Plectodocis** POMEL, 1872 [**Brachiolites fenestratus* T. SMITH, 1848]. *Cret.*, Eu.
- Plesiocnemis** POMEL, 1872 [**P. siphonioides*; SD RAUFF, 1893]. *U.Jur.*, Alg.
- Plethocoetis** POMEL, 1872 [**Laocoetis irregularis*; SD DELAUB., herein]. *Cenoz.*, Alg.
- Plococoelia** ÉTAL., 1864 [**P. obscura*]. *Jur.*, Fr.
- Polycantha** SOLLAS, 1873 [**P. etheridgii*]. *L.Cret.*, Eu.
- Polyozia** POMEL, 1872 [**P. ropalina*]. *Cenoz.*, Alg.
- Polyproctus** SCHRAM., 1924 [**P. tuberosus*; SD DELAUB., herein]. *Cret.*, Eu.
- Polyscyphia** SINTZOV, 1879 [**P. pseudocoeloptychium*]. *Cret.*, U.S.S.R.
- Porosmila** FROM., 1860 [**P. martini*]. *L.Jur.*, Eu.
- Pseudosphonia** COURT., 1861 [**P. tuberculata*]. *Cret.*, Eu.
- Psilobolia** POMEL, 1872 [**P. metaeformis*]. *Cenoz.*, Alg.
- Pterosmila** POMEL, 1872 [**Ceriopora alata* GOLDF., 1833; SD DELAUB., herein]. *Cret.*, Eu.
- Ptychocoetis** POMEL, 1872 [**Pleurostoma trilobatum* RÖMER, 1864]. *Cret.*, Eu.
- Pulvillus** CARTER, 1878 [**P. thomsoni*]; SD DELAUB., herein]. *Carb.*, Eu.
- Puppispongia** GREGORIO, 1930 [**P. prostrema*]. *Perm.*, Sicily.
- Queenstedtella** DELAUB., *nom. nov.* [**Vermispongia hamiltonensis* WHITF., 1905] [*pro Vermispongia* WHITF., 1905¹ (*non* QUENST., 1878)]. *Dev.*, Ind.
- Radicipongia** QUENST., 1878 [**R. radiciiformis*]. *Jur.*, Eu.
- Rauffella** ULR., 1889 [**R. filosa* ULR.; SD MILLER, 1889]. *Ord.*, U.S.A.
- Reteporiten** WALCH, 1776? [**?*type]. *?Age, ?loc.*
- Retia** SOLLAS, 1872 [*no species*]. *L.Cret.*, Eu.
- Retispinopora** BRYDONE, 1912 [**R. arbusculum*]; SD DELAUB., herein]. *?Age, ?loc.*
- Rhabdaria** BILL., 1865 [**R. fragilis* BILL.; SD MILLER, 1889]. *Cam.-Ord.*, U.S.A.
- Rhabdocnemis** POMEL, 1872 [**Scyphia costata* GOLDF., 1833; SD RAUFF, 1893]. *Cret.*, Ger.
- Rhabdocoetis** POMEL, 1872 [**Ocellaria cancellata* RÖMER, 1864]. *Cret.*, Ger.
- Rhiposinion** POMEL, 1872 [**Ventriculites decurrens* T. SMITH, 1848]. *Cret.*, Eu.
- Rhizogonima** POMEL, 1872 [**Rhizospongia digitata* COURT., 1861]. *Cret.*, Eu.
- Rhytidolpia** POMEL, 1872 [**Ventriculites striatus* T. SMITH, 1848]. *Cret.*, Eu.
- Rhyzospongia** ORB., 1849 [**Polypotecia pictonica* MICH., 1847] [= *Rhyzospongia* ORB., 1850; *Rhizospongia* ORB., 1852 (*non* CHARLESWORTH, 1848); *Risospongia* FROM., 1860; *Rizoscyphia* FROM., 1860]. *U.Cret.*, Fr.
- Saccotragos** OPPL., 1926 [**S. acuminata*]. *Jur.*, Eu.
- Satratus** SEELEY, 1902 [**S. brainerdi*]; SD DELAUB., herein]. *M.Ord.*, Vt.
- Scheia** TSCHERNYCHEV & STEPANOV, 1926 [**S. tuberosa*]. *?Age, U.S.S.R.*
- Schizorhabdus** ZITTEL, 1878 [**S. libycus, nom. nud.*] (49). *Cret.*, *?Afr.*
- Sciadosinion** POMEL, 1872 [**Coeloptychium plicatellum* RÖMER, 1841]. *Cret.*, Eu.
- Scythia** ORB., 1850 [**?*type]. *?Age, ?loc.*
- Sestrimia** POMEL, 1872 [**Manon impressum* GOLDF., 1833]. *Cret.*, Eu.
- Siderospongia** TRAUT., 1870 [**S. sirenis*]. *?Age, ?loc.*
- Silurispongia** MARTIN, 1878 [**S. conus*]. *Sil.*, Eu.
- Solenomia** POMEL, 1872 [**Scyphia manon* MÜNSTER, 1841] [= *Solenopsechia* POMEL, 1872]. *Cret.*, Eu.
- Solenothyia** POMEL, 1872 [**Camerospongia schlönbachii* RÖMER, 1864]. *Cret.*, Eu.
- Sparsispongia** ORB., 1850 [**Stromatopora polymorpha* GOLDF., 1833]. *Jur.*, Eu.
- Sphecidion** POMEL, 1872 [**Manon tubuliferum* GOLDF., 1833]. *Cret.*, Eu.
- Spheciopsis** POMEL, 1872 [**Achilleum poraceum* KLIPSTEIN, 1845]. *Cret.*, Eu.
- Sphenodictya** HERZER, 1901 [**S. cornigera*]; SD DELAUB., herein]. *?Age, ?loc.*
- Sphenopterium** MEEK-W., 1860 [**Palaeacis compressus*]; SD DELAUB., herein]. *Carb.*, U.S.A.
- Spongarium** MURCH., 1839 [**S. edwardsii*] [= *Spongium* BROWN, 1848 (*obj.*)]. *Sil.*, Eu.
- Spongillopsis** GEINITZ, 1864 [**S. dyadica*]; SD DELAUB., herein]. *?Age, ?loc.*
- Spongoconia** POMEL, 1872 [**S. angulosa*]; SD DELAUB., herein]. *Cenoz.*, Alg.
- Spongopagia** POMEL, 1872 [**Spongia informis* MICH., 1847]. *Cret.*, Eu.
- Spongospira** STOEHR, 1880 [**S. florealis*]. *?Age, ?loc.*
- Sporocalpia** POMEL, 1872 [**Plocoscyphia morchella*]; SD DELAUB., herein]. *Cret.*, Eu.
- Sporosinion** POMEL, 1872 [**Ventriculites impressus* T. SMITH, 1848; SD RAUFF, 1893]. *Cret.*, Eu.
- Spumispongia** QUENST., 1877 [**S. punctata* QUENST.; SD DELAUB., herein]. *Jur.*, Eu.
- Stamnia** POMEL, 1872 [**Cephalites alternana* T. SMITH, 1848; SD DELAUB., herein] [= *Phymostamnia*, *Oncostamnia*, *Sestrostamnia*, *Rhytistamnia*, *Tretostamnia*, *Xystrostamnia* POMEL, 1872]. *Cret.*, Eu.
- Stannocnemis** POMEL, 1872 [**Cnemidium rouyana* ORB., 1850]. *Cret.*, Eu.
- Stegendea** FROM., 1864 [= *Stegeudea* FROM., 1864]. *Mesoz.*, Eu.
- Stelgis** POMEL, 1872 [**Ventriculites radiatus* MANTSELL, 1822] [= *Cladostelgis* POMEL, *Pleurostelgis* POMEL, 1872]. *Cret.*, Eu.
- Stenocoelia** FROM., 1864 [**?*type]. *?Age, ?loc.*
- Streblia** POMEL, 1872 [**S. tuberiformis*]; SD DELAUB., herein]. *Cenoz.*, Alg.

¹ WHITFIELD, R. P. (1905) *Descriptions of new fossil sponges from the Hamilton group of Indiana*: Bull. Am. Mus. Nat. Hist., v. 21, p. 298.

- Strophochetus* SEELEY, 1885 [**S. ocellatus*; SD MILLER, 1889] [= *Strophochetus* VOSMAER, 1887]. *M.Ord.*, Vt.
- Stromatopagia* POMEL, 1872 [**S. radiosa* (ORB.), 1849]. *Cret.*, Eu.
- Sulcispongia* QUENST., 1876 [**S. incisa* QUENST.; SD DE LAUB., herein]. *Jur.*, Ger.
- Syncalpia* POMEL, 1872 [**Cnemidium astrophorum* GOLDF., 1833; SD RAUFF, 1893]. *Cret.*, Eu.
- Synlynthia* POMEL, 1872 [**Choanites subrotunda* MANTELL, 1822]. *Cret.*, Eu.
- Taseconia* POMEL, 1872 [**T. obovata*]. *Cenoz.*, Alg.
- Taothis* POMEL, 1872 [**Polytrema pavonia* ORB., 1849]. *Mesoz.*, Eu.
- Testaspongia* QUENST., 1878 [**T. craniolaris* QUENST.; SD DE LAUB., herein]. *Mesoz.*, Eu.
- Tethylites* SOLLAS, 1880 [**T. cretaceus*]. *Cret.*, Eu.
- Tetrasmila* FROM., 1860 [**T. corallina*]. *U.Jur.*, Eu.
- Thalamospongia* ORB., 1849 [**T. cottaldina*] [= *Thalamosmila* FROM., 1860]. *Mesoz.*, Eu.
- Thecospongia* ÉTAL., 1859 [**T. gresslyi*]. *Jur.*, Fr.
- Tholothis* POMEL, 1872 [**Polytrema convexa* ORB., 1849; SD DE LAUB., herein]. *Mesoz.*, Eu.
- Thryonia* POMEL, 1872 [**Cephalites seriatoporus* RÖMER, 1864]. *Mesoz.*, Eu.
- Thyia* POMEL, 1872 [**Cephalites capitata* T. SMITH, 1848] [= *Trachythyia* POMEL, 1872]. *Cret.*, Eu.
- Trachysinion* POMEL, 1872 [**Ventriculites tuberculatum* RÖMER, 1864; SD DE LAUB., herein]. *Cret.*, Ger.
- Tretolmia* POMEL, 1872 [**Scyphia psilopora* GOLDF., 1833]. *Cret.*, Eu.
- Tretolopia* POMEL, 1872 [**T. sparsa* POMEL, SD DE LAUB., herein]. ?*Cenoz.*, ?Alg.
- Trinacriella* PARONA, 1833 [**T. retusa*]. *Perm.*, Italy.
- Trioxites* RAF., 1839 [**Achilleum dubium* GOLDF., 1833]. ?*Age*, ?loc.
- Triphyllactis* SOLLAS, 1880 [**T. elegans* SOLLAS]. ?*Age*, ?loc.
- Triposphaerilla* WISNIOWSKI, 1889 [**T. poctae*]. *Jur.*, Eu.
- Trochospongia* C. F. RÖMER, 1887 [**T. cyathophylloides*]. *Sil.*, Eu.
- Ttachycnemus* POMEL, 1872 [**T. rugosa* POMEL] [= *Trachycnemus* RAUFF, 1893]. *Cret.*, Eu.
- Tubispongia* QUENST., 1878 [**T. caeca* QUENST.; SD DE LAUB., herein]. *Jur.*, Ger.
- Tubulospongia* COURT., 1861 [**T. insignis* COURT.; SD DE LAUB., herein]. *Cret.*, Fr.
- Vermispongia* QUENST., 1878 [**V. wittingensis*]. *Mesoz.*, Ger.
- Vomacispongites* DE LAUB., *nom. nov.* [pro *Spongites* SCHLOTH., 1820¹ (*non* OKEN, 1814)] [**Spongites pertusus* SCHLOTH., 1820]. *Cret.*, Eu.

¹ SCHLOTHEIM, E. F. VON (1820) *Die Petrefaktenkunde auf ihren jetzigen Standpunkte*: (Gotha), ed. 2, p. 369.

GENERIC NAMES INCORRECTLY APPLIED TO PORIFERA BUT BELONGING TO OTHER ORGANISMS

- Alcyonium* LINNÉ, 1758 (ascidian).
- Alveolites* LAM., 1801 (coelenterate).
- Anthelia* LAM., 1816 (coelenterate).
- Anthophyllum* SCHWEIGER, 1820 (coelenterate).
- Bebryce* PHILIPPI, 1842 (coelenterate).
- Cellepora* GMELIN, 1789 (bryozoan).
- Cerriopora* GOLDF., 1833 (bryozoan).
- Chaetetes* FISCHER, 1810 (coelenterate).
- Choanites* MANTELL, 1822 (ascidian).
- Cylindrites* GOEPPERT, 1842 (alga).
- Eschara* LAM., 1801 (bryozoan).
- Fibularia* LAM., 1816 (echinoderm).
- Fungites* MARTINI, 1762 (coelenterate).
- Heliolites* DANA, 1846 (coelenterate).
- Hydnopora* PHILL., 1836 (bryozoan).
- Isis* LINNÉ, 1758 (coelenterate).
- Lichenopora* DEFR., 1823 (coelenterate).
- Millepora* LINNÉ, 1758 (coelenterate).
- Palaeacis* MEEK-W., 1860 (coelenterate).
- Retepora* LAM., 1801 (bryozoan).
- Somphospongia* BEEDE, 1899 (alga).
- Theonaa* LAMX., 1821 (bryozoan).

Kingdom, Phylum, Class, Order UNCERTAIN

Family RECEPTACULITIDAE Eichwald, 1860

The name of this family is based on retention of *Receptaculites* BLAINV., 1830, established by nearly universal long usage, instead of its senior synonym *Receptacules* DEFR., 1827.

Ovoid, globose, or discoid fossils with calcareous hard parts consisting of closely

joined ossicles with smooth or excavate, rhomboid or hexagonal outer faces from which generally a pillar-like process (rhabd) bearing 4 laterally directed branches (clads) extend inward. Bowl-shaped fossils may be derived from collapse of originally globular forms. The ossicles commonly are arranged very regularly, forming wall that incloses a central cavity, but the existence of pores, canals, or open-

ings comparable to oscules is debatable. *Ord.-Dev., ?Carb.*

This important assemblage of early and middle Paleozoic fossils, here treated as a family of unknown affinities, has been interpreted by various authors as belonging with calcareous algae, foraminifers, sponges, corals, or echinoderms, or as representing an independent extinct phylum. They lack any marks of attachment, but most of them seem to be much too ponderous to warrant interpretation of them as floating organisms. Presumably, they lived on the sea bottom, and, judged by the nature of associated invertebrates and physical characters of formations containing them, they were able to thrive in moderately shallow waters.

Well-preserved specimens show that the components of the skeleton consist of microgranular nearly clear calcite; the ossicles are not crystalline and possess no fine honeycomb structure, as in echinoderms. Many receptaculitid fossils, especially those collected from dolomitic rocks, are molds and thus constitute only impressions of the original hard parts; some paleontologists have misconstrued them as actual remains of the organisms, interpreting the impressions of spicules as canals, like those of sponges.

Distinctive features of the skeletal elements are their form, arrangement, and gradation in size. Each ossicle or spicule typically comprises an expanded platelike "head" that forms part of the exterior of the fossil, a shaft perpendicular to the head extending inward, and raylike lateral prominences (generally 4) joined to the shaft. The generally hexagonal heads fit together as a pavement, and are arranged in a quincunxial pattern of intersecting double spirals that extend outward from a center; the heads increase regularly in size so that the largest are those farthest from the center. Such an arrangement of skeletal elements is never found in undoubted sponges. Although characters of the ossicles bear some resemblance to sponge spicules, most features of these fossils are not spongelike. The fact that nearly all receptaculitids in which the hard parts are preserved are calcareous strongly indicates that the original skeleton consisted of calcium carbonate,

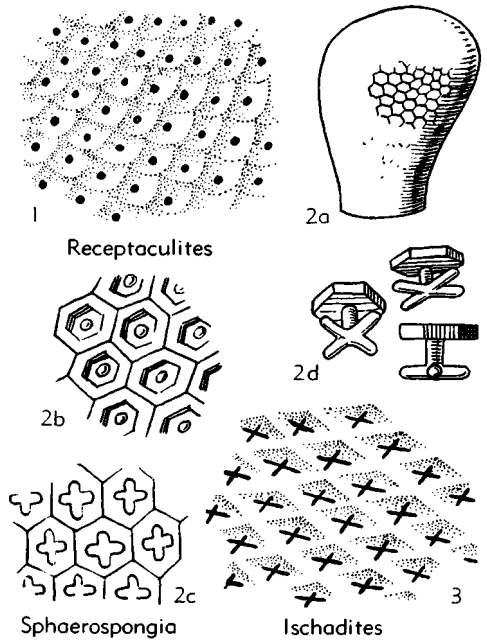


FIG. 89. Receptaculitidae (p. E110).

but this is not conclusive evidence, since it is well known that siliceous spicules may be altered to calcite in the course of fossilization. GÜMBEL has reported evidence of organic layers both on the outer and inner sides of the skeleton.

Many fossils of this family, such as specimens of *Ischadites*, reveal an apical opening that may have been an oscule. No unquestioned pores are reported. On the other hand, the present close juxtaposition of the dermal discs may be post-mortem. Many sponges shrink after dying. Some Recent sponges have pores in surface grooves between skeletal elements. Therefore, the possibility exists that the Receptaculitidae may have been aberrant Porifera.

Receptaculites BLAINV., 1830 [ICZN pend.] [**Receptacules* DEFR., 1827]. Cup- or saucer-shaped, expanded exterior parts of spicules hexagonal or rhombic to somewhat rounded, closely adjoined so as to form an even pavement, rhabds relatively stout, with 4 laterally directed clads just below expanded platelike head and seemingly with platelike expansion at inner extremity that forms part of a continuous inner well. In fossils preserved as molds, the skeletal parts are represented by cavities. *M.Ord.-Dev., ?Carb., cos-*

mop.—FIG. 89,1. **R. neptuni* (DEFR.), Ord., Wis.; part of outer surface of a mold, showing form of expanded exterior portions of spicules and position of rhabds, $\times 2$.

Acanthochonia HINDE, 1884 [**A. barrandei*]. Like *Receptaculites* in form but with surface as in *Ischadites* (14). *Sil.*, Czech.

Ischadites MURCH., 1839 [**I. koenigii*] [= *Tetragonis* EICHW., 1842; *Tetragonis* LONSD., 1845]. Globular, ovoid, hollow, with apical aperture (?oscule); rhomboidal dermal plates of spicules arranged concentrically, inner rhabds so reduced that clads are appressed on inner face, resembling stauracts (14). *Ord.-Dev.*, Eu.-N.Am.—FIG. 89,3. **I. koenigii*, *Sil.*, Br.I.; part of surface, $\times 2$ (73).

Sphaerosporgia PENGELLY, 1861 [*pro Sphaeromites* PHILL., 1841 (non HIS., 1828)] [= *Polygonosphaerites* F. A. RÖMER, 1880]. External parts of spicules hexagonal, rhabds very short (11, 13).

Ord.-Dev., Eu.—FIG. 89,2. **S. tessellata* (PHILL.), Dev., Eng.; 2a, side, $\times 0.5$; 2b,c, outer and inner views of spicules, $\times 2$; 2d, reconstructions of ossicles, $\times 1$ (68n based on 63).

Cerionites MEEK-W., 1868 [**C. dactyloides*]. Like *Sphaerosporgia*. *U.Sil.*, Ill.

Cyclocrinites EICHW., 1842 [**C. sparkii*]. *Ord.*, Eu. **Dictyocrinus** HALL, 1859 [**D. squamifer*] [= *Dictyocrinites* HALL, 1859]. Like *Sphaerosporgia* in shape but surface resembling that of *Receptaculites*. ?*Ord.*, U.S.A.

Lepidolites ULR., 1889 [**L. dickhantii*; SD MILLER, 1889]. Like *Dictyocrinus*. *Ord.*, U.S.A.

Nidulites SALTER, 1851 [**N. fauus*]. Pear-shaped, with outer faces of ossicles deeply concave, forming honeycomb pattern. *Ord.*, N.Am.-Eng.

Anomaloides ULR., 1878 [**A. reticulatus*]. Conical, with spines perpendicular to surface. *Ord.*, N.Am.

Pasceolus BILL., 1857 [**P. halli*; SD HINDE, 1884]. *Ord.*, N.Am.

REFERENCES

Some 500 articles containing significant data in regard to fossil sponges have been published and about 300 of these have been studied in the preparation of this portion of the *Treatise*; those not consulted being almost entirely of such nature that study of them was not required.

Of 50 selected papers here cited, numbers 17, 22, and 44 contain general information about the Porifera, Recent as well as fossil. Numbers 41 and 50 cover the whole range of invertebrate fossils appropriately, but discuss few genera of sponges. Numbers 5, 7, 9, 21, 31, 32, and 35 are antiquated, but have historical interest and initiate many new names. The following numbers contain main sources of generic names and therefore have descriptions of greatest value: 12, 13, 25, 26, 28, 30, 36-40, 43, 45, 49.

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