Errata and addenda

millimeters should be micrometers in the following:
Page 1, left column, paragraph 1: 50 to 400 μm
Page 1, right column, paragraph 1: 50 to 130 μm
Page 2, right column, paragraph 1: 70 to 400 μm
Page 3, left column, paragraph 1: 20 to 70 μm
Page 3, left column, paragraph 2: 20 to 70 μm
Page 3, right column, paragraph 1: 50 to 75 μm
Page 4, left column, paragraph 2: 40 to 140 μm

Page 3: add to the end of the discussion of *Cooperaria getawayensis* new species: *Hodsia* Moiseev, 1944, from the Upper Triassic of the Caucasus and Pamirs is also similar but has a deep central cloaca.

Page 5: in the discussion of *Polysiphonia flabellata* new species, line 6, change "alignment" to "multiplicity."

Page 7, additional reference:
Moiseev, A. D. 1944. Vodorosli, gubki, gidroidnye polipy i korally verkhnego triasa Kavkazskogo khrebta [Algae, sponges, hydroid polyps, and corals of the Upper Trias of the Caucasus]. Uchemye Zapiski Lenengradskogo Gosaudarstivennogo Universiteta, Series Geologo-Pochvenno-Geografichskaya [Scientific Journal of the Leningrad State University] 11(70):15–28.

Pages 8 & 9, Figure explanations:
Figure 2.1 and Figure 2.3: change "spoecious" to "epoecious."
Figure 2.2: change "meandriforms, cavaedial" to "meandriform cavaedial."
Figure 2.8 and Figure 3.1: delete "(=USNM locality 703)."
Figure 3.2, Figure 4.1, and Figure 5.2: delete "(=USNM locality 703)," change "Road Canyon" to "Cherry Canyon," and change "Glass Mountains" to "Guadalupe Mountains."
Figure 11.4: change "same distance" to "some distance."
Figure 11.6: change "with proximal view directed to left" to "with proximal ray directed to left."

Additional Errata

Page 2, Left column: line 21, delete "the type locality"; line 24, change "which each of" to "each of which localities."

Page 2: under "Type Locality and Stratum" for *Catenispongia agaricus*, change "Road Canyon" to "Cherry Canyon," and change "703c" to "728." Additional locality for this species: USNM 703. [The holotype designation, here and in the Figure Explanations, is correct.]

Page 4: Family Maeandrostiidae and *Polysiphonia* belong in Order Murrayonida.

Page 8, Figure Explanations:
Figure 2.5: change "USNM 128062" to "USNM 128058."
Figure 3.2: change "AMNH locality 585" to "USNM locality 504" delete "(=USNM locality 703)" as indicated in the "Errata and addenda" sheet, but "Road Canyon" and "Glass Mountains" are correct, contrary to the statement in that sheet.

THE UNIVERSITY OF KANSAS

PALEONTOLOGICAL CONTRIBUTIONS

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SOME NEW GENERA OF PALEOZOIC CALCAREOUS SPONGES

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Abstract.—This paper describes six new genera of Paleozoic calcareous sponges: three inozoans, one sclerosponge, one sphinctozoan, and one heteractinid. The first five genera are abundant members of the reef fauna of the west Texas Permian; the sixth is an unusual heteractinid of the Silurian (Niagaran) Henryhouse Formation of Oklahoma. A new family of Inozoa is also established.

SYSTEMATIC PALEONTOLOGY

Class CALCAREA Bowerbank, 1864

Order MURRAYONIDA Vacelet, 1981

Family CATENISPONGIIDAE new family

Type genus.—*Catenispongia* new genus.

Description.—Aspicular skeleton composed of meandriform, anastomosing trabeculae outlining anastomosing tubular spaces of irregular orientation; trabecular microstructure of large (50 to 400 mm) isodiametric spherulites; larger canals and oscules commonly present; imperforate cortex variably developed; no spicules known with certainly.

Other included genera.—*Stratispongia* new genus; *Ossimimus* new genus; *Hartmanina* Dieci, Russo, and Russo, 1974; *Polysiphonella* Russo, 1981; ?*Trinacriella* Parona, 1933.

Genus CATENISPONGIA new genus

Pharetronid new genus A, Finks, 1960, p. 29; Finks, 1990, p. 21, fig. 6a.

Catenispongia Finks, 1971, p. 290, *nomen nudum;* Finks, 1983, p. 61, *nomen nudum.*

Type species.—*Catenispongia agaricus* new species.

Description.—Fungiform; sides invested with finely porous cortex bearing numerous large, circular pores; interior with numerous large, longitudinal, laterally anastomosing canals opening onto top surface as circular to meandriform spaces separated by internally trabecular walls; trabeculae anastomosing curved plates outlining interpenetrating tubular spaces; openings of the tubes on the upper edge of the walls between canals make these edges resemble meandriform chains, whence the generic name. Trabeculae composed of isodiametric spherulites 50 to 130 mm in diameter; spicules absent.

Discussion.—Differs from *Hartmanina* Dieci, Russo, and Russo, 1974, in the presence of two sizes of tubular spaces (canals and tubes in the canal walls) rather than one.

CATENISPONGIA AGARICUS new species

Figure 1; Figure 2; Figure 3.1; Figure 4.1; Figure 5.2–5.3; Figure 6.2

Catenispongia agaricus Finks, 1971, p. 290, *nomen nudum.*

Pharetronid A, Finks, 1960, Finks, 1990, p. 21, fig. 6a.

Description.—Large (up to 122 mm high and 100 mm wide), usually club shaped; top domical, sides irregularly rugose; longitudinal canals typically 0.5 to 1.5 mm in diameter, separated by walls of the same to one-half this thickness; tubular spaces within these walls 0.1 to 0.3 mm in diameter, separated by trabeculae 0.2 mm thick; large circular oscules on top surface 3 mm in diameter, circular pores penetrating cortex on sides approximately half this diameter.

Discussion.—The shape of this sponge is variable in the rate of upward expansion as well as in the development of the annular contractions. Some specimens have incipient branching and develop quite an irregular, lumpy, lateral surface, often rendered the more so by partly overgrown epizoic brachiopods, bryozoans, corals, or other species of sponges. Some silicified specimens have spinose projections on the sides of the trabeculae that outline the larger longitudinal canals (see Fig. 1.2). They are up to 0.25 mm long and 0.05 to 0.13 mm wide (sometimes flattened either vertically or horizontally) and spaced approximately 0.15 mm apart both vertically and horizontally. They might be taken for tufts of echinating monaxons except that in thin sections the skeleton seems entirely spherulitic (see Fig. 6.2). One tangential section, however (Fig. 5.3), has, in off-axis illumination, seemingly monaxonlike bodies with flat ends, some centrally angulate. Moving the focus reveals that they are bladelike; possibly they are crystals produced by silicification. It is not clear how they are related, if at all, to the echinating protrusions. The generally imperforate cortex may have locally fine circular pores 0.05 to 0.10 mm in diameter and approximately 0.025 mm apart; they may sometimes be connected to form short, meandriform openings. This species is most abundant at the type locality (USNM 703c) in the Road Canyon Formation of the Glass Mountains and in the upper part of the Leonard Formation nearby (USNM locality 703a), from which each of approximately 100 specimens have been examined in the collections of the United States National Museum. It has, however, a wide stratigraphic distribution ranging from the base of the Skinner Ranch Formation in the Glass Mountains to the Getaway Limestone Member of the Cherry Canyon Formation in the Guadalupe Mountains, where it is also quite abundant. It is generally associated with a sponge fauna dominated by sphinctozoans and inozoans, characteristic of the reef or shallow-water environments of the Texas Permian.

Holotype.—USNM 128060. Paratypes: USNM 128057, 128058, 128061, 128062; AMNH 44285, 44290, 44291, 44292, 44295, 44296.

Type locality and stratum.—Permian, Road Canyon Formation, USNM locality 703c.

Other localitites.—USNM 702, 702c, 702d, 703a, 703b, 703c, 706c, 707b, 728; USGS 6672 blue; AMNH 497, 503, 504, 512, 520, 585, 600.

Genus STRATISPONGIA new genus

Pharetronid new genus B, Finks, 1960, p. 29; Finks, 1990, p. 21.

Stratispongia Finks, 1971, p. 290, *nomen nudum;* Finks, 1983, p. 61, *nomen nudum.*

Type species.—*Stratispongia cinctuta* new species.

Description.—Conical, sometimes branching; concentrically rugose sides semicorticate with small, meandriform pores and a few large, circular ones; top surface with similar, slightly larger, and more closely spaced meandriform pores as well as numerous larger circular pores; solid trabeculae separating meandriform spaces are dominantly vertical and similarly meandriform; an obscure but pervasive horizontal layering produced by zones of horizontal canals is apparent in longitudinal sections; spherulites 70 to 400 mm in diameter; spicules absent; the dense trabecular skeleton with its basically single size of interior tubular spaces and their pervasively vertical and horizontal orientation distinguish this form from both *Catenispongia* and *Hartmanina.*

STRATISPONGIA CINCTUTA new species

Figure 3.2–3.6; Figure 4.2

Stratispongia cinctuta Finks, 1971, p. 290, *nomen nudum.*

Description.—Conical to flabellate, strongly flaring from 2 mm diameter base to 50 mm or more diameter summit in as much vertical distance; branches arise obliquely from sides, beginning with the same small base; sides smooth, horizontally rugose (rugae 2 mm high, separated by sharp grooves); sides and top finely porous with meandriform pores of 0.1 to 0.3 mm diameter; circular ostia 0.5 to 1.0 mm diameter scattered on both top and sides, those of sides being somewhat larger and sometimes lipped; interior canal spaces of same size and shape as pores, dominantly vertical in orientation, with horizontal connecting canals giving a layered appearance, whence the generic name; trabeculae about the same thickness as the canals they separate; patches of imperforate cortex variously developed on sides.

Discussion.—These sponges and their branches begin with a narrow diameter but expand very rapidly. The strong and approximately uniformly spaced annulation is very characteristic. Epizoans frequently attach to the sides and top of the sponge, especially sphinctozoan sponges, leptodid brachiopods, and various bryozoa. This species is less abundant than *Catenispongia agaricus* but has a similar distribution. It is most abundant in the Road Canyon Formation.

Holotype.—AMNH 44287. Paratypes: AMNH 44286, 44288, 44289, 44294; USNM 128059.

Type locality and stratum.—Permian, Road Canyon Formation, AMNH locality 504.

Other localities.—USNM 702, 703a–c, 706e, 707b, HR, 749a; AMNH 500, 501, 504; PU 53d–e, 53g, 55e.

Genus OSSIMIMUS new genus

Virgola de Laubenfels, 1955, *partim,* Finks, 1960, p. 30; *partim,* Finks, 1971, p. 290.

new genus Finks MS, *partim,* Finks, 1983, p. 61.

Type species.—*Ossimimus robustus* new species.

Description.—Large cylindroid branches bearing scattered, large, circular oscules; surface widely covered with imperforate dermal layer, the remainder showing small meandriform intertrabecular spaces; trabeculae outline uniformly small anastomosing tubes of circular cross section interpenetrating in every direction but frequently subparallel to outer surface; oscules open into canals of the same diameter and perpendicular to the surface, which penetrate some distance into the sponge and communicate with the intertrabecular spaces; trabeculae composed of medium-sized, isodiametric spherulites (diameter approximately 20 to 70 mm); spicules absent.

OSSIMIMUS ROBUSTUS new species

Figure 5.1; Figure 7; Figure 8

Virgola robusta Finks, 1971, p. 290, *nomen nudum.*
"*Virgola*" sp., Finks, 1990, p. 19, fig. 3.
Virgola spp., Finks, 1960, Finks, 1990, p. 21.

Description.—Widely branching, large cylinders, usually flattened except when small, 6 by 6 mm to 50 by 70 mm in diameter; exterior bears numerous circular oscules 0.9 to 1.5 mm in diameter spaced 5 to 12 mm apart; remainder of surface shows circular to meandriform intertrabecular spaces 0.08 to 0.60 mm in diameter, locally covered by more or less extensive imperforate cortex, which forms lips about the oscules; interior intertrabecular spaces meandriform-cylindrical, often subparallel to the outer surface but anastomosing in all directions without the radial or longitudinal tendency seen in some sponges; trabeculae near the surface thickened and locally coalescent to form small, imperforate patches that may be continuous with the overlying cortex proper; spherulites poorly preserved but approximately 20 to 70 mm in diameter. Broken surfaces of this sponge somewhat resemble spongy bone, whence the generic name.

Discussion.—This large and distinctive sponge appears to be confined to the Road Canyon and Cathedral Mountain Formations of the Glass Mountains; most of the specimens are from the Road Canyon Formation. It was used, along with *Polysiphonia flabellata* new species, to define the *flabellata-robusta* sponge zone (Finks, 1971, p. 294). *Ossimimus* shows a superficial similarity to *Cooperaria* new genus but lacks the subparallel, distal-radial divergence of the internal tubes (calicles) of the latter genus.

Holotype.—USNM 128066. Paratypes: USNM 127729, 128063–128065.

Type locality and stratum.—Permian, Road Canyon Formation, USNM locality 703c.

Other localities.—USNM 702, 703a; AMNH 501, 503.

Class SCLEROSPONGIA Hartman and Goreau, 1970

Order CERATOPORELLIDA Hartman and Goreau, 1972

Family ASTROSCLERIDAE Lister, 1900

Genus COOPERARIA new genus

Virgola de Laubenfels, 1955, *partim,* Finks, 1960, p. 30; *partim,* Finks, 1971, p. 290.
new genus Finks MS, *partim,* Finks, 1983, p. 61.

Type species.—*Cooperaria getawayensis* new species.

Description.—Ramose, cylindroid to fungiform; skeleton of trabeculae outlining strongly radial, distally divergent, sometimes laterally confluent, small, and uniform tubular spaces (calicles) with circular cross section or with meandriform cross section where laterally confluent; adjacent tubes are in communication by a single, vertical series of large, circular pores separated by less than their diameter of tube wall; there are no tabulae in the tubes; larger, circular oscules and canals, scattered; cortex lacking or weakly developed; trabeculae built of isodiametric spherulites 50 to 75 mm in diameter; spicules lacking, but foreign spicules frequently incorporated into nonspicular skeleton (see discussion of species below).

COOPERARIA GETAWAYENSIS new species

Figure 6.1; Figure 9

Virgola getawayensis Finks, 1971, p. 290, *nomen nudum.*

Description.—Irregular cylindroid branches, 5 to 30 mm in diameter, often with mushroomlike terminations; branches may anastomose; basal parts may incorporate much shell debris and foreign spicules (oxeas, hexactins); circular to meandroid surface pores and corresponding interior canals or calicles 0.2 to 0.5 mm in diameter; canals or calicles strongly radial, directed distally and peripherally from branch axis, meeting surface at slightly oblique angle; new canals or calicles intercalated peripherally; laterally adjacent canals or calicles connected by a single series of circular, mural pores of similar size and spacing as the canals or calicles themselves; canal or calicle walls (trabeculae) 0.05 to 0.26 mm thick but not exceeding 0.10 mm near branch axis and often thickened to 0.30 mm at branch surface; no tabulae present within canals or calicles; circular oscules of 1.0 to 2.7 mm diameter widely spaced over top and sides (sometimes lipped on sides) opening into short canals of same diameter. These oscular canals have large pores opening into their floors (formed by the confluence, just beneath the floor, of two or more canals or calicles of the usual size); they also have mural pores on their walls; variably developed sparse patches of imperforate cortex on sides, often beneath bulbous overhangs of the top surface.

Discussion.—This species and therefore the genus have been assigned here to the sclerosponges because of the regular, radial, or sheaflike pattern of the tubes, which produces structures resembling the calicles of chaetetid sclerosponges. This pattern contrasts with the irregularly anastomosing arrangement of tubes seen in *Ossimimus.* The closest, previously described genus is the slightly younger *Spherolichaetetes* Gautret and Razgallah, 1987, from the Upper Permian of Jebel Tebaga, Tunisia. The calicles and spherulites of that genus have the same size range as those of *Cooperaria.* Differences include the presence of tabulae and astrorhizae in *Spherolichaetetes,* as well as the presence in *Cooperaria* of meandroid calicles, of large oscules or exhalant canals, and of mural pores (although the species *Spherolichaetetes astrorhizoides* Gautret and Razgallah, 1987, has submeandroid calicles).

This genus and species are very abundant in the Getaway Limestone Member of the Cherry Canyon Formation, to which it appears to be confined. The shape of the sponges is highly variable. Many of them appear to have overgrown the seabottom and to have incorporated shell hash into their bases. In one acid-etched limestone block, a small group of fusulinids has been stuck together by the growth of this sponge between them, which apparently prevented their being oriented by a current that caused all the other fusulinids on the same block to line up at right angles to this small group (see Fig. 9.12). Another specimen has the molds of a sponge root tuft or tufts within it (Fig. 9.13). Many of these sponges contain monaxons several millimeters long incorporated helter skelter in the interior (Fig. 9.4). These are probably not the spicules of the sponge itself, both because of their length and because obviously foreign hexactins are similarly incorporated. Probable spicule-lined, agglutinated worm tubes are also present on some specimens; they are mostly vermiform surface grooves of semicircular cross section, 1 to 2 mm in diameter, that are lined with tangential monaxons uniformly oriented perpendicular to the length of the tube, but some of these tubes penetrate into the sponge (with full circular cross section) and re-emerge. Many of the sponges are also overgrown by bryozoans, in one instance (see Fig. 9.9) probably while the sponge was alive, for the bryozoan avoided the oscules. Other epibionts or postmortem encrusters include productid and richthofeniid brachiopods, favositid and rugose corals, and guadalupiid sponges. The presence of lateral oscules on the conical-fungiform individuals implies that they grew vertically from the seafloor, in contrast to the more irregular, laterally encrusting individuals. Locally on one specimen, small circular pores are present on the surface between the calicles (see Fig. 9.14); they may represent the beginnings of new calicles.

Holotype.—USNM 128067. Paratypes: USNM 128068; AMNH 44297–44308.

Type locality and stratum.—Permian, Getaway Limestone Member of Cherry Canyon Formation, USNM locality 728.

Other localities.—AMNH 512, 519, 547, 585, 600.

Family MAEANDROSTIIDAE Finks, 1971

Family Maeandrostiidae, Finks, 1971, p. 292.

Type genus.—*Maeandrostia* Girty, 1908, p. 284.

Description.—Cylindroidal, cloacate sponges with aspicular skeleton of large, isodiametric spherulites (40 to 140 mm); external cortex with circular, lipped pores, usually large, and, in type genus, meandriform; internal skeleton of meandriform, anastomosing trabeculae outlining radial, upwardly diverging tubular spaces in Carboniferous and Early Permian species, becoming reduced to radially elongate vertical pillars between interwalls with radially elongate interpores in some later forms; endowall present; vesicles present in some genera.

Discussion.—The members of this family differ from such verticillitids as *Verticillites* Defrance, 1829, and the living sphinctozoan *Vaceletia* Pickett, 1982, in having spherulitic microstructure and in having circular pores (lipped, if exopores) spaced their diameter or more apart, instead of nonspherulitic microstructure, and netlike walls with subpolygonal or lobate pores spaced less than their diameter.

Other included genera.—*Preeudea* Termier and Termier in Termier, Termier, and Vachard, 1977; *Protoleucon* Bolkhovitinova, 1923; *Stylopegma* King, 1943; *Polysiphonia* new genus; *Preverticillites* Parona, 1933; *Phragmocoelia* Ott, 1974; *Radiothalamos* Pickett and Rigby, 1983; *Prosiphonella* Dieci, Antonacci, and Zardini, 1970; *Eurysiphonella* Haas, 1909; *Adrianella* Parona, 1933.

Genus POLYSIPHONIA new genus

Amblysiphonellid, new genus Finks, 1960, p. 29.

Polysiphonella Finks, 1971, p. 290, *nomen nudum, non Polysiphonella* Russo, 1981, p. 10.

Stylopegma and new genera, Finks MS, *partim,* Finks, 1983, p. 58.

Permian new genus [with] multiple cloacae, Finks, 1990, p. 20, 22.

Type species.—*Polysiphonia flabellata* new species.

Description.—Cylindrical to flabellate branches, sometimes fusing laterally; branching at acute angles; very subdued external annulation; moderately large, circular labripores in exowall, spaced a bit more than their diameter apart, with very small exopores between them; multiple, narrow, vertical cloacae with small, vertically elongate endopores; cloacae separated by approximately their own diameter and circular in cross section; horizontal interwalls closely spaced with moderately large, closely spaced, circular or subcircular interpores; numerous, closely spaced, often coalescent, vertical pillars connect interwalls across low chambers; trabecular microstructure not known; spicules not known.

POLYSIPHONIA FLABELLATA new species

Figure 10

Polysiphonella flabellata Finks, 1971, p. 290, *nomen nudum.*

Permian new genus [with] multiple cloacae, Finks, 1990, p. 20, 22.

Description.—Erect, branching sponge with conicocylindrical branches that expand laterally, become flabellate past a diameter of 5 mm, and attain sizes of 10 by 25 mm or so; the lateral expansions are approximately in the same plane, and adjacent branches may anastomose; the entire sponge may be 70 mm high and 70 mm wide in the direction of the aligned flabellate branches; interwalls gently convex upward, closely spaced 1 to 2 mm apart; interpores circular or subcircular, separated by approximately their diameter, which varies from 0.1 to 0.5 mm, being larger as the branch grows wider; cloaca absent from smallest branches, appearing first at the periphery of the interwall and becoming multiple as the branch becomes flabellate;

the narrow circular cloacae are 0.5 to 1.5 mm in diameter, separated by their diameter or slightly more; the top surface of the sponge is an interwall with the cloacae forming oscules; endowalls with 0.2 to 0.4 mm, subcircular, somewhat vertically elongate, endopores separated by approximately their diameter; interwalls connected by closely spaced stalactite-stalagmitelike vertical pillars, wider at top and bottom and often centrally incomplete (pillars 0.14 to 0.22 mm in diameter and separated by 0.36 to 0.61 mm); exowall smooth with subtle annulations corresponding to the inner chambers; circular exopores of two kinds: lipped ones 0.2 to 0.6 mm in diameter (most around 0.36 mm), spaced irregularly 0.5 to 1.5 mm apart, but range of size on any one specimen less and varying directly with specimen size; and nonlipped ones 0.07 to 0.20 mm in diameter (most around 0.14 mm), spaced 0.3 to 0.7 mm apart.

Discussion.—This sponge resembles *Stylopegma* King, 1943, which is expanded flabellately and has developed multiple, narrow cloacae. Small, juvenile specimens are cylindrical and often contorted. Multiple cloacae appear after a certain diameter is reached, and the cloacae do not all line up in the direction of lateral expansion; the alignment is therefore not simply a matter of laterally coalesced branches. Expanded branches are not always aligned in the same plane; however, when they are, alignment may be related to a prevailing current in the environment. One specimen from USNM locality 702 may have been overgrown by a bryozoan colony while still alive, for the bryozoan completely covers one of the branches except for a space around the oscule. This genus is restricted to the Road Canyon and Cathedral Mountain Formations in the Glass Mountains, but possible specimens have been found slightly higher in the Brushy Canyon Formation of the Sierra Diablo mountains (USGS 6672 blue). Its span of co-occurrence with *Ossimimus robustus* was used to define the *flabellata-robusta* sponge zone (Finks, 1971, p. 290).

Polysiphonia superficially resembles the Permian genera *Rhabdactinia* Yabe and Sugiyama, 1934, and *Intrasporeocoelia* Fan and Zhang, 1985, which also have scattered, multiple, narrow cloacae and closely spaced interwalls with vertical pillars in the chambers. Their cloacae, however, are vertically discontinuous, passing through a few chambers only, whereas those of *Polysiphonia* are continuous to the top of the sponge once they appear. (In a few specimens of *Polysiphonia* the endowall is missing except at the interwall, but the openings in the interwall remain in line with each other; it is not clear whether this is primary or a matter of preservation.) A peculiarity of some of the cloacae in *Rhabdactinia* is the presence of a series of horizontal diaphragms within them (Yabe and Sugiyama, 1934, pl. 21, fig. 4). More significantly, *Rhabdactinia* and *Intrasporeocoelia* do not have a separately developed exowall. Their interwalls are strongly curved, becoming tangential to the outer surface, and the imbricate succession of these tangential interwalls forms the outer surface. In *Polysiphonia,* on the other hand, the interwalls are gently curved and meet the exowall at a high angle; the separate exowall bears prominent circular labripores with numerous smaller circular pores between them. There is also a difference in the shape, size, and spacing of the interpores: those of the type material of *Rhabdactinia* (Yabe and Sugiyama, 1934, pl. 22, fig. 1 and 2) are widely spaced and of two sizes, the larger ones being polygonal; those of *Polysiphonia* are more nearly circular, closely spaced, and of relatively uniform size. The interpores of the type material of *Intrasporeocoelia* were not illustrated, but those of a referred species (Fan and Zhang, 1985, pl. 7, fig. 3) are subpolygonal, closely spaced, and of variable size. *Intrasporeocoelia* has a quasitrabecular chamber filling of attached spheroidal bodies that was not seen in either *Polysiphonia* or the type material *of Rhabdactinia.* Finally, the external form of both *Rhabdactinia* and *Intrasporeocoelia* is cylindrical and spheroidal, even among large specimens, whereas that of *Polysiphonia* is flabellate except in the small juveniles and lower parts of adults. The most significant of these differences is the exowall with circular labripores, which links *Polysiphonia* to earlier and contemporaneous species of the centrally cloacate and probably ancestral *Stylopegma* King, 1943, in the same Texas Permian basin. It should be noted that the external form and outer surface of *Polysiphonia* are well known from numerous individuals at various ontogenetic stages. Several juveniles are known and two specimens at locality AMNH 504 started their growth from fragments of an *Acanthocladia*-like bryozoan. One of these juveniles (AMNH 44315) immediately splits into two branches. In general the sponge and its branches in this species remain circular in cross section from a beginning of 2 mm until it expands to 5 or 6 mm when it begins to assume a flabellate shape. The largest specimen (the holotype, AMNH 44309) has an overall height of 70 mm and a greatest width of 70 mm. The largest branch at its terminus is about 8 by 23 mm.

Holotype.—AMNH 44309. Paratypes: AMNH 44310–44316; USNM 128069.

Type locality and stratum.—Permian, Road Canyon Formation, AMNH locality 504.

Other localities.—AMNH 500C; USNM 702, 702a, 703a–c; USGS 6672 blue (?).

Class HETERACTINIDA de Laubenfels, 1955

Order OCTACTINELLIDA Hinde, 1887

Family ASTRAEOSPONGIIDAE Miller, 1889

Genus MAGENIA new genus

Type species.—*Magenia davidi* new species.

Description.—Sponge oblately globose, interior containing spicules; spicules of presumed upper surface with six, broad, tangential rays like equilateral triangles, a very short or absent distal ray, and possibly a stout proximal ray; spicules of presumed lower surface with six slender tangential rays, a well-developed short to knoblike distal ray, and a stouter proximal ray about twice the length of tangential rays.

MAGENIA DAVIDI new species

Figure 11

Description.—Oblate spheroidal, about 25 mm in diameter and 12 to 14 mm in height, shaped like a round loaf of bread; one side, possibly the upper surface, flatter than the other. Surface covered with closely spaced, slightly overlapping octactins with six paratangential rays, 60 degrees apart, and a short, knoblike, distal ray. The proximal ray is stout and about twice the length of the tangential rays on several spicules exposed at the surface in side view (see Fig. 11.6). Most octactins 1.0 to 1.5 mm in paratangential diameter; distal ray about 0.1 mm long or less, with flat or slightly rounded end and not tapered; proximal ray about 1.0 mm long, somewhat stouter than the distal ray, slightly tapered with rounded end; paratangential rays tapering slightly to a rounded tip and about as thick as distal ray (0.1 mm) on presumed basal surface and ambitus of sponge, but expanded to form nearly equilateral triangles on flat, presumed upper surface; these spicules with a reduced or absent distal ray, suggesting that expansion of the paratangential rays resulted from additional calcification. The interior may be packed with spicules similar to those of the surface, but the preservation does not allow a clear view of outlines of spicules.

A small, slightly depressed area about 10 mm in diameter lies on presumed lower surface of the sponge in which spicules are obscure or seemingly absent, being lost in a mass of secondary crystals. It is possible that this surface is really the top and that the area is an osculum, or it may be a basal attachment.

Discussion.—The spheroidal shape distinguishes this species from those of *Astraeospongium* C. F. Roemer in Bronn and Roemer, 1852; the absence of very long proximal (or distal) rays distinguishes it from *Ensiferites* Reimann, 1945; the broadly triangular paratangential rays on the spicules of the presumptive top surface distinguishes it from both. The absence of internal canals as well as the spheroidal sponge shape and the broadly triangular paratangential spicule rays distinguish it from *Stellarispongia* Rigby, 1976; *Asteriospongia* Rigby, 1977a; *Constellatospongia* Rigby, 1977b; and *Malluviospongia* Rigby and Goodbody, 1986.

The identification of the upper surface as that with the enlarged spicules is based on the fact that the flat or concave, broader surface of *Astraeospongium* normally contains the coarsest and largest spicules and that this surface is usually considered the top of the sponge.

Holotype.—USNM 127738.

Type locality and stratum.—Silurian (Niagaran), Henryhouse Formation, Oklahoma, see notes at end of references for locality information.

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Notes added in proof:

Type locality and stratum for *Magenia davidi* new species.—Silurian (Niagaran), Henryhouse Formation, 100 to 110 feet below the contact of the Henryhouse and Bois d'Arc, bluff north of Chimneyhill Creek, center of the eastern half of the southeast quarter of section 5, and the northwest quarter of the southwest quarter of section 4, T. 2 N., R. 6 E., 7 miles south of Ada, Pontotoc County, Oklahoma.

Locality information for Figure 11.1–11.6: Silurian (Niagaran), Henryhouse Formation, bluff north of Chimneyhill Creek, 7 miles south of Ada, Pontotoc County, Oklahoma.

Additional locality for *Stratispongia cinctuta*: AMNH 699.

Additional localities for *Polysiphonia flabellata:* USNM 702un, 716x (?); USGS 7157 green.

Addendum to genus *Cooperaria:* this genus is named in honor of Dr. G. Arthur Cooper.

FIGURE 1

Catenispongia agaricus, Permian (Road Canyon), Glass Mountains, Texas, USNM locality 703c. *1,* Top surface, showing large openings of cavaedial spaces separated by trabecular tissue with small anastomosing interspaces, paratype, USNM 128057, ×10.4 (new); *2,* longitudinal section showing vertical cavaedial spaces (large) and intertrabecular spaces (small); note horizontal protrusions from trabeculae into lumen of cavaedia (possibly echinating spicules), paratype, USNM 128058, ×12 (new).

FIGURE 2

Catenispongia agaricus. 1, Side view: note cavaedial spaces forming exhalant systems on top, dense dermal layer with lipped ostia on sides, and spoecious bryozoan near base, holotype, USNM 128060, Permian (Cherry Canyon), Guadalupe Mountains, Texas, USNM locality 728, ×1 (new); *2,* top view, showing circular oscules, meandriforms, cavaedial spaces and fine intertrabecular spaces, holotype, USNM 128060, Permian (Cherry Canyon), Guadalupe Mountains, Texas, USNM locality 728, ×1 (new); *3,* top view (note spoecious bryozoan), paratype, AMNH 44290, Permian (Cherry Canyon), Guadalupe Mountains, Texas, AMNH locality 512, ×1 (new); *4,* top view showing unusually broad intercavaedial spaces, paratype, USNM 128061, Permian (Road Canyon), Glass Mountains, Texas, USNM locality 703c, ×2.3 (new); *5,* longitudinal section showing cavaedial (large) and intertrabecular (small) spaces (see also Fig. 1.2), paratype, USNM 128062, Permian (Road Canyon), Glass Mountains, Texas, USNM locality 703c, ×2.5 (new); *6,* bottom view showing circular, lipped ostia in dermal layer, paratype, AMNH 44290, Permian (Cherry Canyon), Guadalupe Mountains, Texas, AMNH locality 512, ×1 (new); *7,* side view of narrow specimen, paratype, AMMH 44291, Permian (Cherry Canyon), Guadalupe Mountains, Texas, AMNH locality 512, ×1 (new); *8,* side view near base showing anastomosing, tubular, cavaedial spaces, with calcified walls, paratype, AMNH 44292, Permian (Cherry Canyon), Guadalupe Mountains, Texas, AMNH locality 585 (=USNM locality 703), ×2 (new).

FIGURE 3

1, Catenispongia agaricus, side view of ramose specimen, showing oscules and patches of dense cortex, paratype, AMNH 44285, Permian (Cherry Canyon), Guadalupe Mountains, Texas, AMNH locality 585 (=USNM locality 703), ×1 (new). ——*2–6, Stratispongia cinctuta; 2,* side view, showing branching unilateral growth and overgrowing flat bryozoan colony at top, paratype, AMNH 44286, Permian (Road Canyon), Glass Mountains, Texas, AMNH locality 585 (=USNM locality 703), ×1 (new); *3,* side view, showing smooth sides and rough top, holotype, AMNH 44287, Permian (Road Canyon), Glass Mountains, Texas, AMNH locality 504 (=USNM locality 703a), ×1 (new); *4,* underside of specimen which grew unilaterally from basal attachment (slit at bottom), paratype, USNM 128059, Permian (Cathedral Mountain), Glass Mountains, Texas, USNM locality 702, ×1.6 (new); *5,* side view of unbranched specimen, showing dense cortex below top, paratype, AMNH 44288, Permian (Lower Bone Spring=Skinner Ranch), Sierra Diablo, Texas, AMNH locality 699, ×1 (new); *6,* side view, showing oscules, paratype, AMNH 44289, Permian (Road Canyon), Glass Mountains, Texas, AMNH locality 504 (=USNM locality 703a), ×1 (new).

FIGURE 4

1, Catenispongia agaricus, surface showing trabeculae outlining anastomosing tubular spaces between cavaedial openings, paratype, AMNH 44296, Permian (Road Canyon), Glass Mountains, Texas, AMNH locality 585 (=USNM locality 703), ×10 (new).——*2, Stratispongia cinctuta,* trabeculae outlining anastomosing tubular spaces, paratype, AMNH 44294, Permian (Road Canyon), Glass Mountains, Texas, AMNH locality 504 (=USNM locality 703a), ×20 (new).

FIGURE 5

1, Ossimimus robustus, enlarged view of trabeculae outlining anastomosing tubular spaces, paratype, USNM 127729, Permian (Road Canyon), Glass Mountains, Texas, USNM locality 703, ×30 (new).——*2–3, Catenispongia agaricus; 2,* side view of cavaedia, showing openings of intertrabecular spaces (compare Fig. 4.1), paratype, AMNH 44296, Permian (Road Canyon), Glass Mountains, Texas, AMNH locality 585 (=USNM locality 703), ×10 (new); *3,* thin section of trabeculae near exterior of sponge, showing possible monaxons or bladed crystals (note flat ends), off-axis illumination, paratype, AMNH 44295, Slide C, Permian (Road Canyon), Glass Mountains, Texas, USNM locality 703, ×40 (new).

FIGURE 6

1, Cooperaria getawayensis, thin section of trabeculae, showing spherulites, paratype, AMNH 44297, Permian (Cherry Canyon), Guadalupe Mountains, Texas, AMNH locality 512, ×90 (new).——*2, Catenispongia agaricus,* thin section of trabeculae, showing spherulites, paratype, AMNH 44295, Slide B, Permian (Road Canyon), Glass Mountains, Texas, USNM locality 703, ×90 (new).

FIGURE 7

Ossimimus robustus, Permian (Road Canyon), Glass Mountains, Texas, USNM locality 703c. *1,* Side view of small conical specimen, paratype, USNM 128063, ×1.5 (new); *2,* cross section, showing obscure concentric structure, paratype, USNM 128064, ×1.6 (new); *3,* side view of juvenile showing surface canals, i.e., exposed intertrabecular spaces not covered by a dermal layer, paratype, USNM 128065, ×2.6 (new); *4,* side view of large, flattened specimen, showing branching, variation in width, oscules, and dermal layer, holotype, USNM 128066, ×1 (new); *5,* internal net of trabeculae and anastomosing intertrabecular spaces, holotype, USNM 128066, ×12.5 (new).

FIGURE 8

Ossimimus robustus, paratype, USNM 127729, Permian (Road Canyon), Glass Mountains, Texas, USNM locality 703. *1,* Interior skeleton outlining anastomosing tubular spaces; note exhalant pore cluster at lower right, and single oscule at lower center, ×10 (new); *2,* exterior surface, showing patchy cortex, thickened trabeculae, skeletal pores, and two oscules, ×10 (new).

FIGURE 9

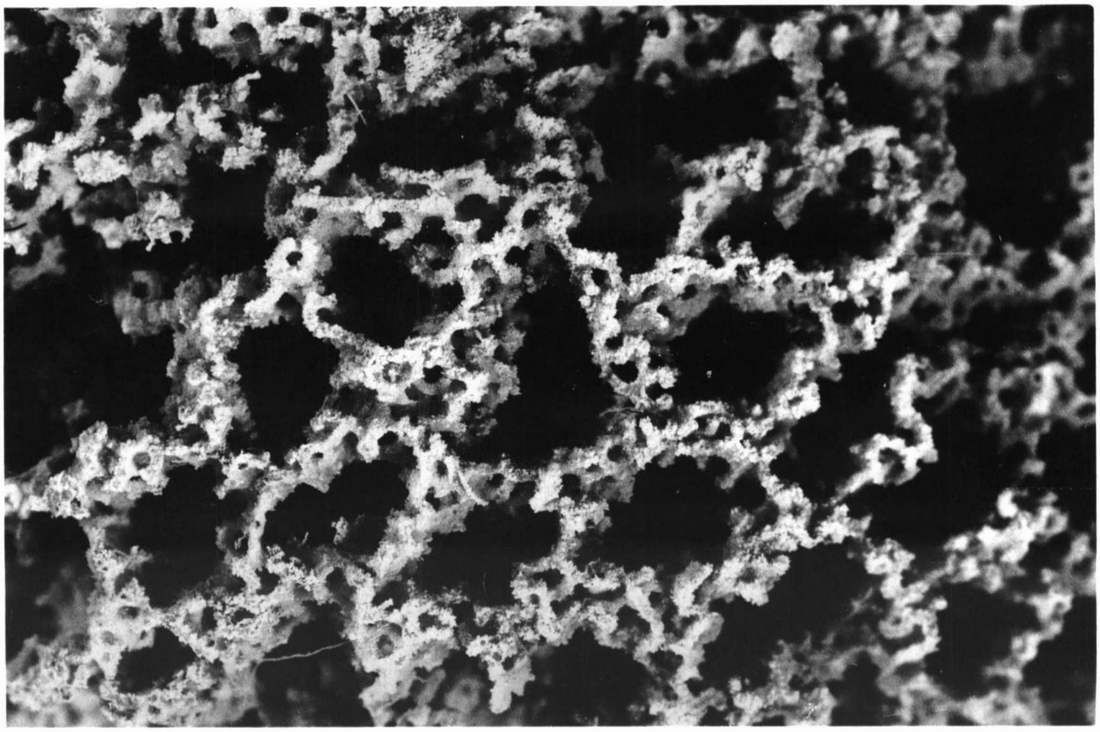
Cooperaria getawayensis, Permian (Cherry Canyon), Guadalupe Mountains, Texas. *1,* Large specimen showing anastomosis of stocks, paratype, AMNH 44298, AMNH locality 512, ×1 (new); *2,* small specimen showing cortex on lower part, paratype, AMNH 44299, Slide B, AMNH locality 512, ×1 (new); *3,* cross section of branch on left showing radially disposed calicles with mural pores, and surface of branch on right showing polygonal to meandroid shape of calicles, paratype, AMNH 44300, AMNH locality 512, ×2 (new); *4,* broken surface showing incorporated monaxons (probably foreign), paratype, AMNH 44301, AMNH locality 512, ×2 (new); *5,* top view of small specimen (see also Fig. 9.6), holotype, USNM 128067, USNM locality 728, ×1.4 (new); *6,* side view of small specimen; note circular oscule (see also Fig. 9.5), holotype, USNM 128067, USNM locality 728, ×1.4 (new); *7,* small ramose specimen showing circular oscules, paratype, AMNH 44302, AMNH locality 512, ×1 (new); *8,* small ramose specimen, paratype, AMNH 44303, AMNH locality 512, ×1 (new); *9,* ramose specimen with encrusting bryozoan that did not overgrow oscules of sponge, suggesting encrustation while sponge was alive, paratype, AMNH 44304, AMNH locality 512, ×1 (new); *10,* small ramose specimen showing circular oscules, paratype, AMNH 44305, AMNH locality 512, ×1 (new); *11,* small ramose specimen, paratype, AMNH 44306, AMNH locality 512, ×1 (new); *12,* partly etched block of limestone showing sponge growing between horizontally aligned fusulines near center, which are at right angles to remaining current-oriented fusulines on block, paratype, AMNH 44307, AMNH locality 512, ×1 (new); *13,* irregular specimen incorporating molds of parallel, vertical monaxons, probably a lyssacine root-tuft, paratype, AMNH 44308, AMNH locality 512, ×1 (new); *14,* surface showing calicles, including small circular openings, which are either intertrabecular spaces or, more probably, nascent calicles (this has not been observed in any other specimen), paratype, USNM 128068, USNM locality 728, ×15 (new).

FIGURE 10

Polysiphonia flabellata. 1, View of interwall from below two cloacae, circular interpores, and longitudinal sections of exopore canals in exowall, paratype, USNM 128069, Permian (Cathedral Mountain), Glass Mountains, Texas, USNM locality 702, ×2.4 (new); *2,* side view of flabellate, branching specimen (see also Fig. 10.4), holotype, AMNH 44309, Permian (Road Canyon), Glass Mountains, Texas, AMNH locality 504 (=USNM locality 703a), ×1 (new); *3,* side view of five fragmental juveniles (see also Fig. 10.5), paratype, AMNH 44310, 44311, 44312, 44313, 44314, Permian (Road Canyon), Glass Mountains, Texas, AMNH locality 504 (=USNM locality 703a), ×1 (new); *4,* top view of flabellate, branching specimen showing multiple cloacae (see also Fig. 10.2), holotype, AMNH 44309, Permian (Road Canyon), Glass Mountains, Texas, AMNH locality 504 (=USNM locality 703a), ×1 (new); *5,* top view of juvenile specimens, with cylindrical branches (see also Fig. 10.3), paratypes, AMNH 44310, 44311, 44312, Permian (Road Canyon), Glass Mountains, Texas, AMNH locality 504 (=USNM locality 703a), ×2 (new); *6,* top view of flabellate specimen, showing anastomosing branches and parallelism of flabellate branches, paratype, AMNH 44316, Permian (Road Canyon), Glass Mountains, Texas, AMNH locality 504 (=USNM locality 703a), ×1 (new).

FIGURE 11

Magenia davidi, holotype, USNM 127738, Silurian (Niagaran), Henryhouse Formation, Oklahoma, see notes at end of references for locality information. *1,* Top (?) surface showing broad-rayed octactins, ×2 (new); *2,* side of sponge, showing octactins with knoblike distal ray, intermediate in enlargement between those of top and basal surfaces, ×10 (new); *3,* side and part of basal surface (above) showing slender-rayed octactins, ×2.5 (new); *4,* radial section showing interior filled with spicules (top surface with enlarged spicules is at bottom of photograph; note that enlarged spicule zone extends same distance into sponge interior), ×5.5 (new); *5,* top (?) surface showing triangular tangential rays and no distal rays, ×5 (new); *6,* basal (?) surface, showing slender octactins with knoblike distal rays and long proximal ray; arrowed spicule at right seen in side view with proximal view directed to left (a remote possibility is that the circular space near top is an oscule and this is the top surface), ×7 (new).



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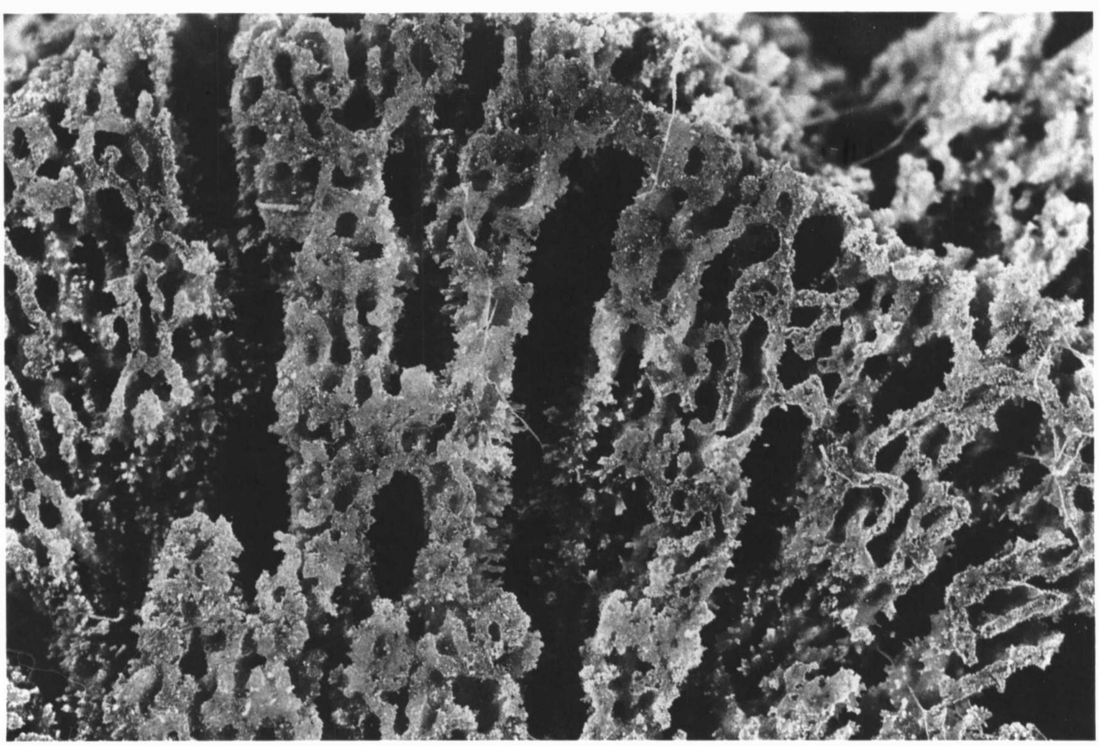

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FIGURE 2

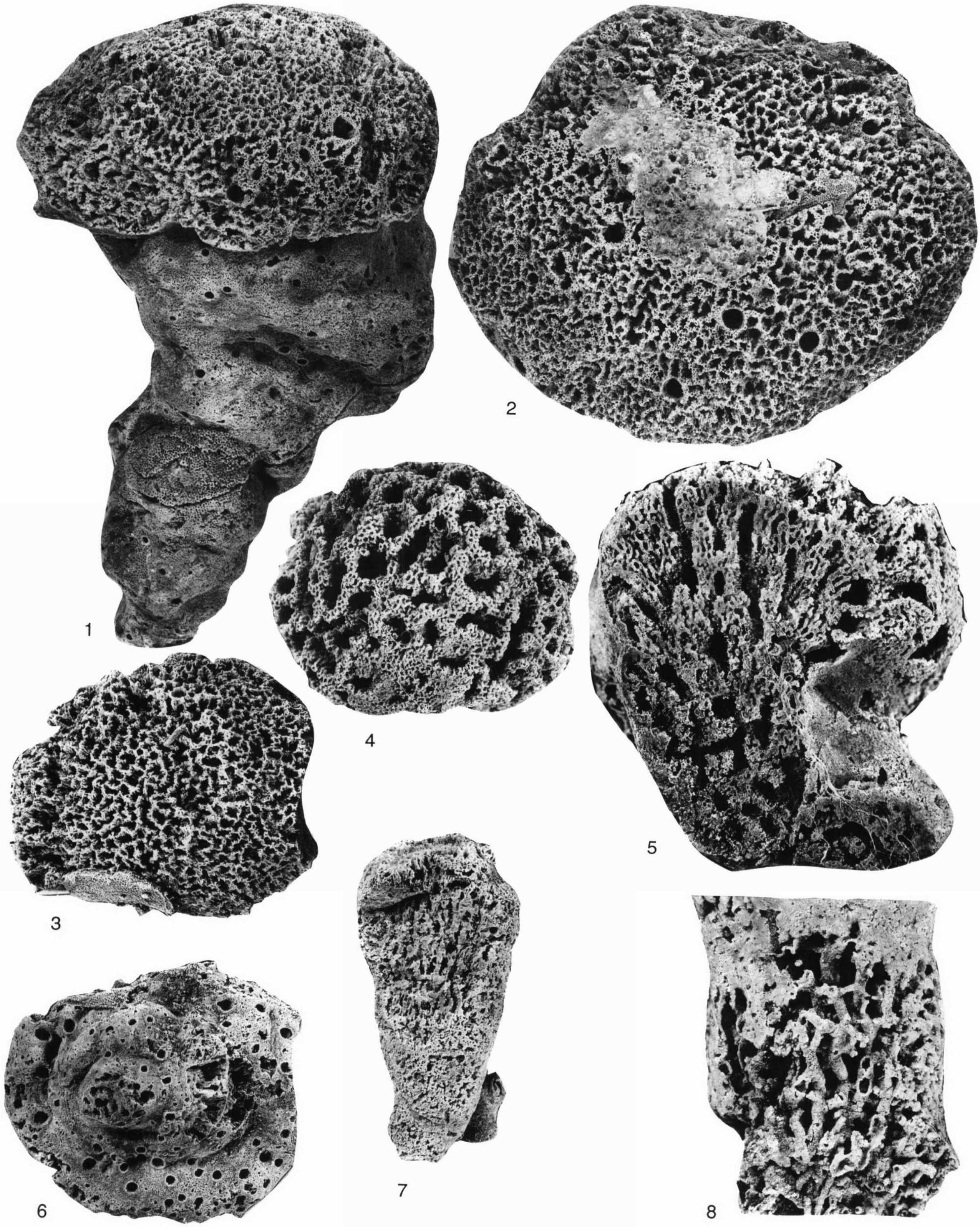


FIGURE 3

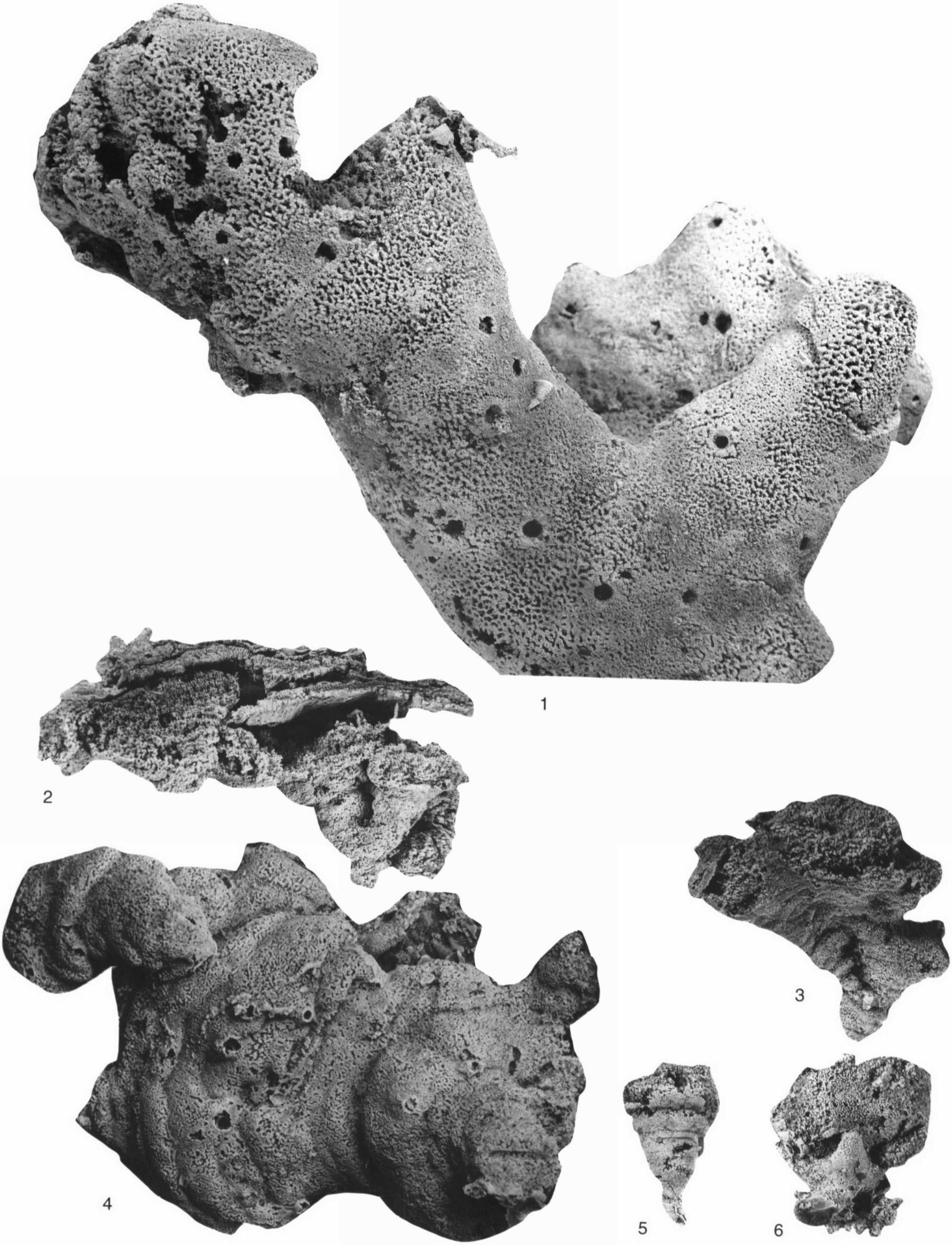
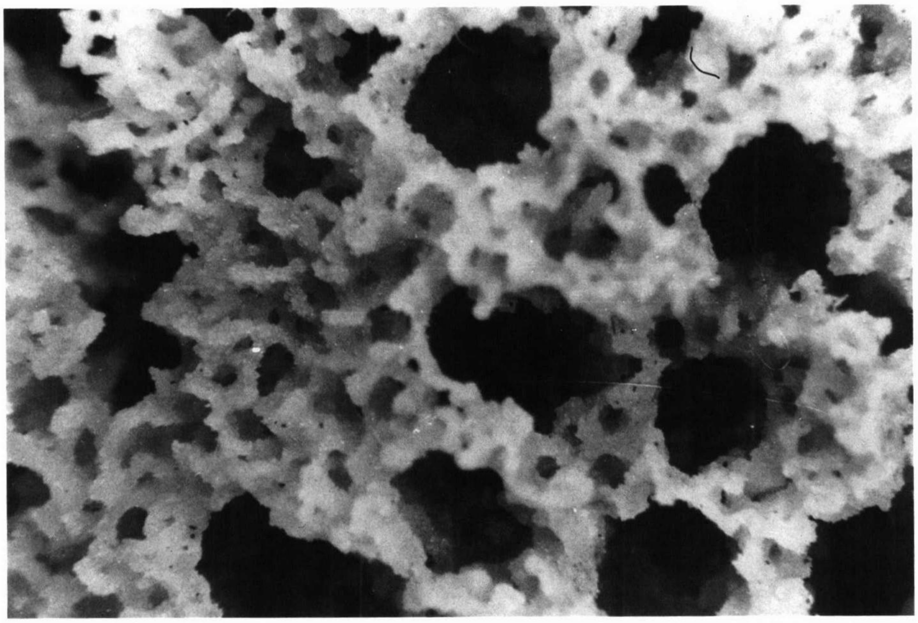


FIGURE 4



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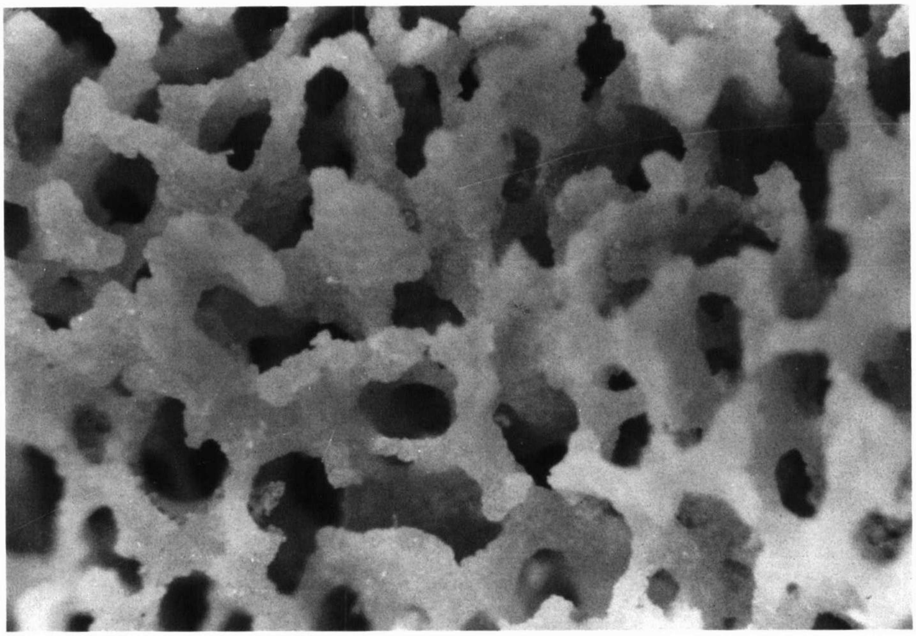

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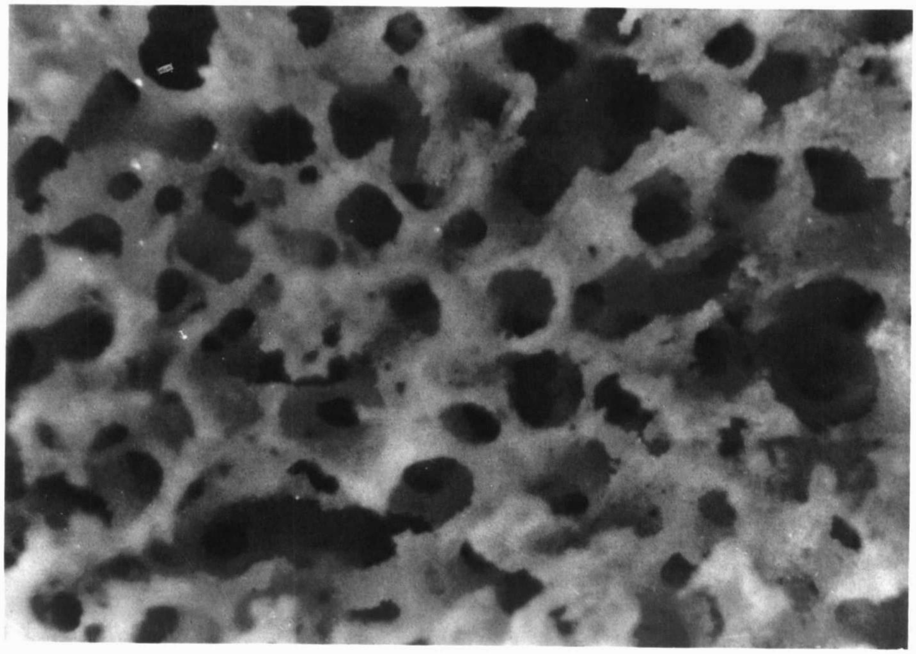
FIGURE 5



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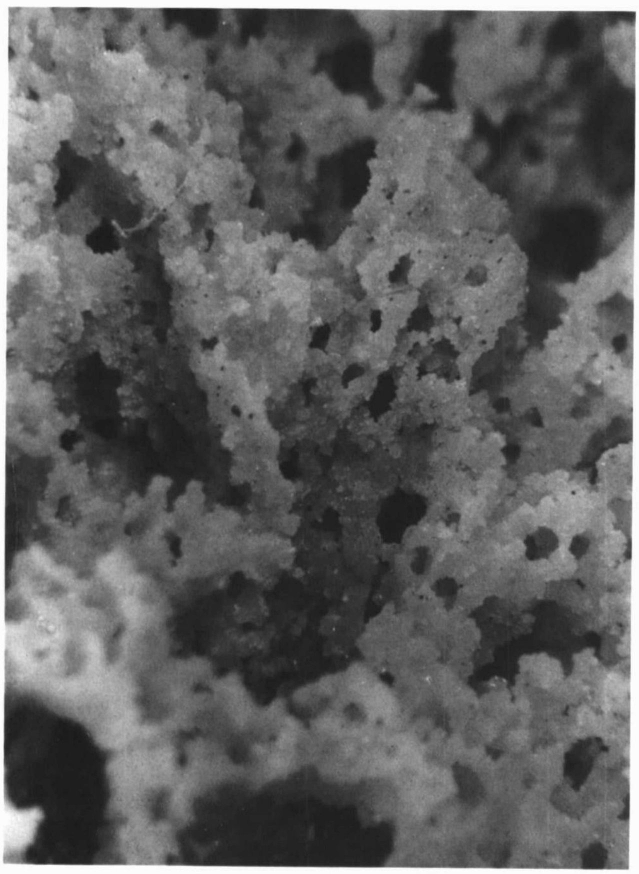

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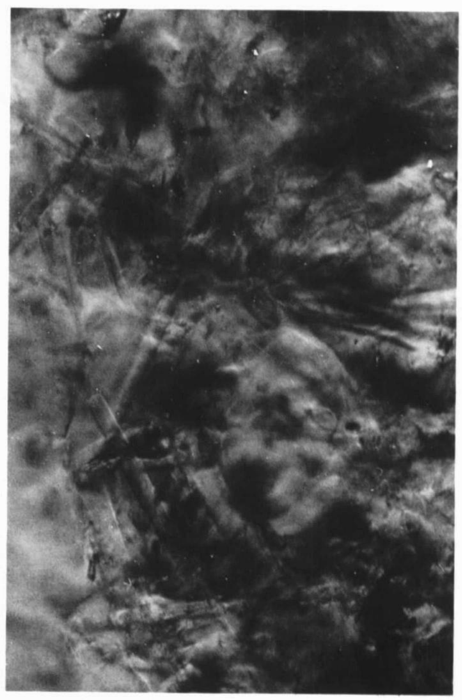

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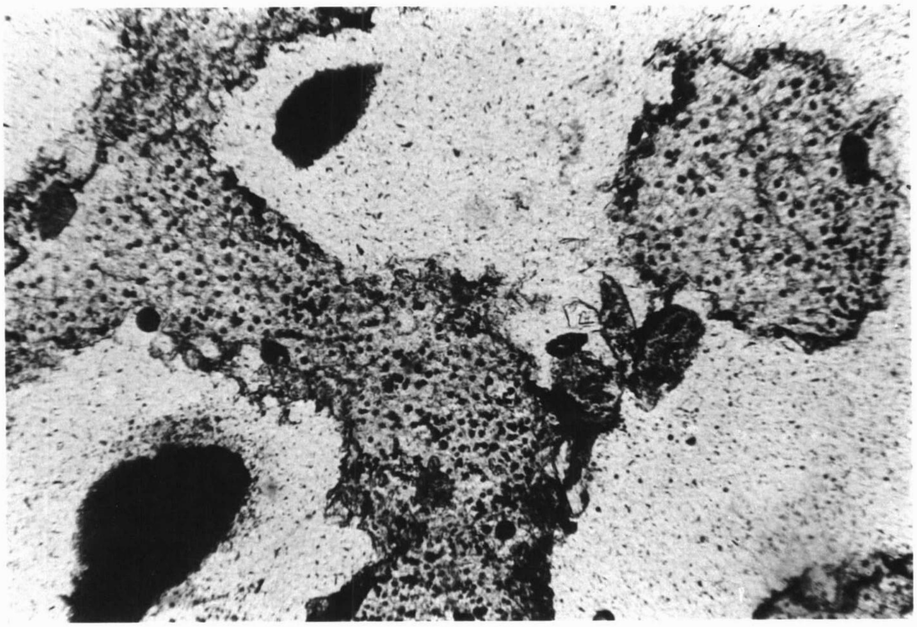
FIGURE 6



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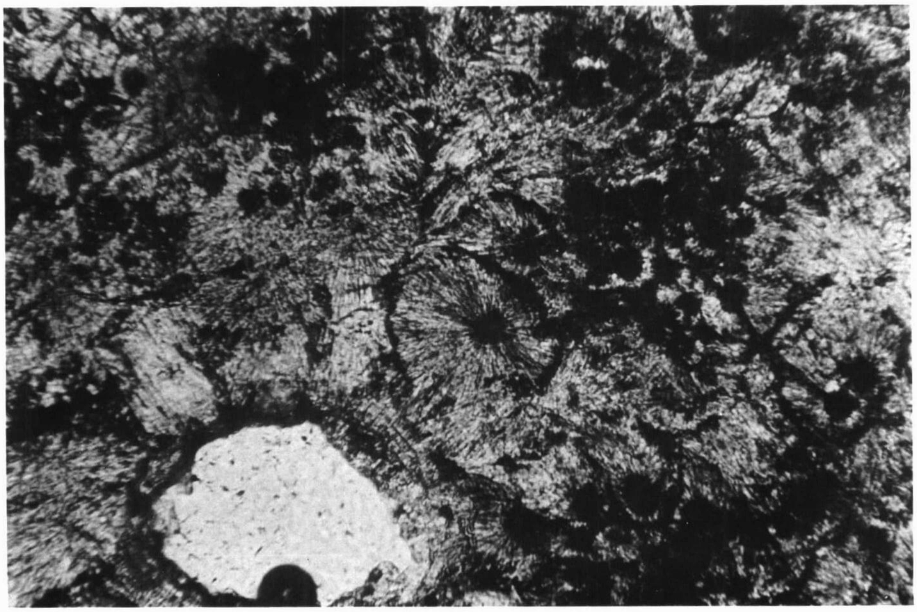

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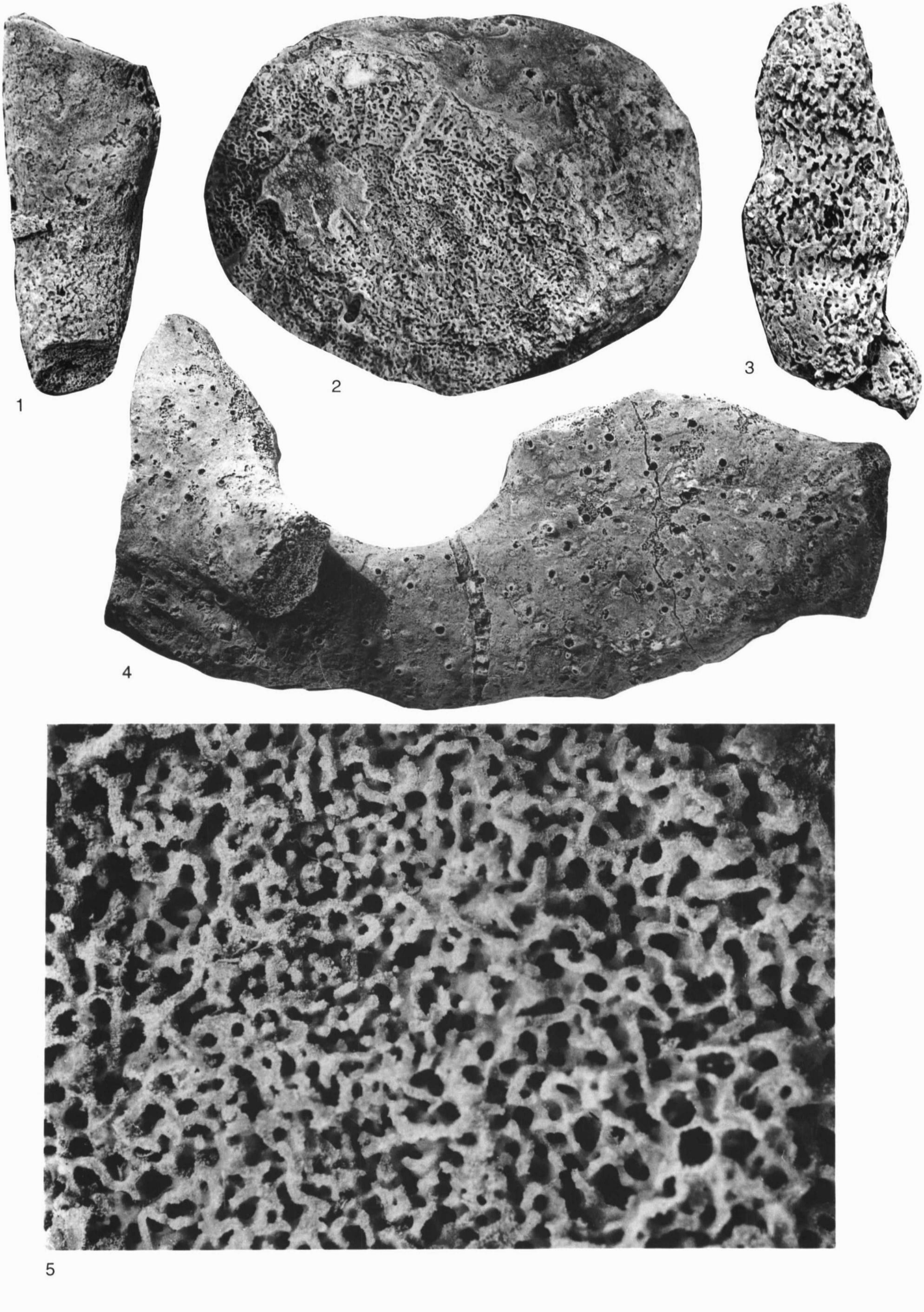
FIGURE 7



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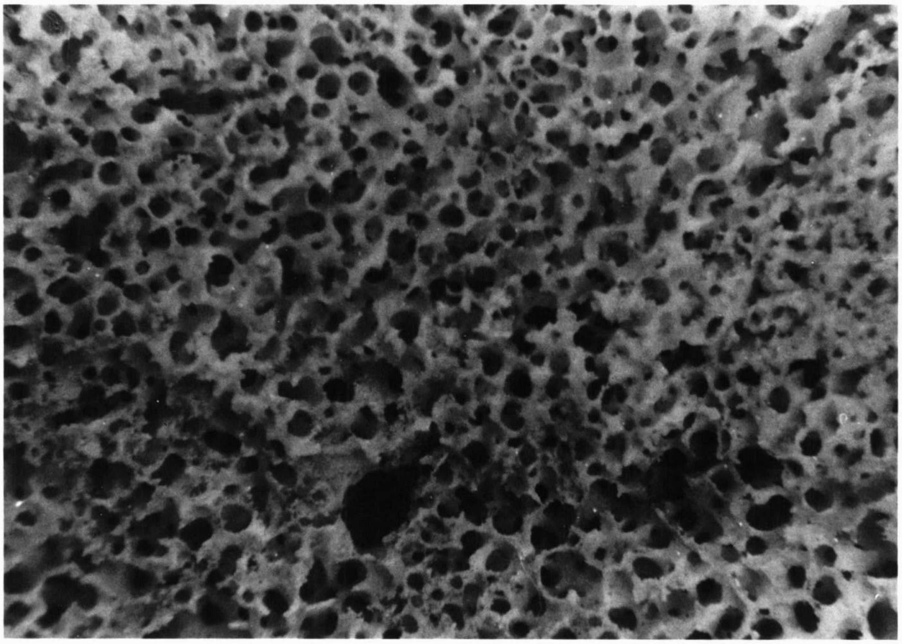

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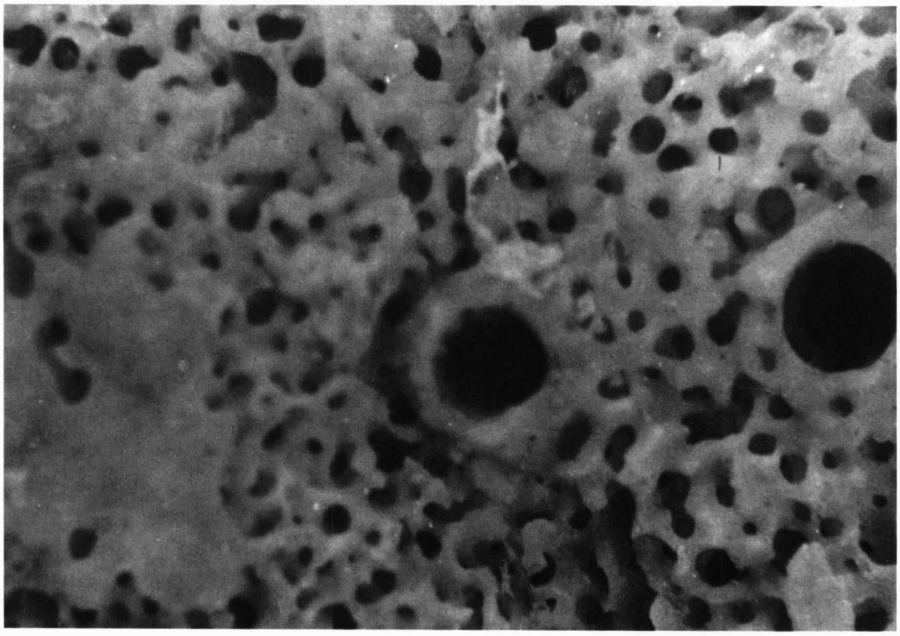

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FIGURE 9

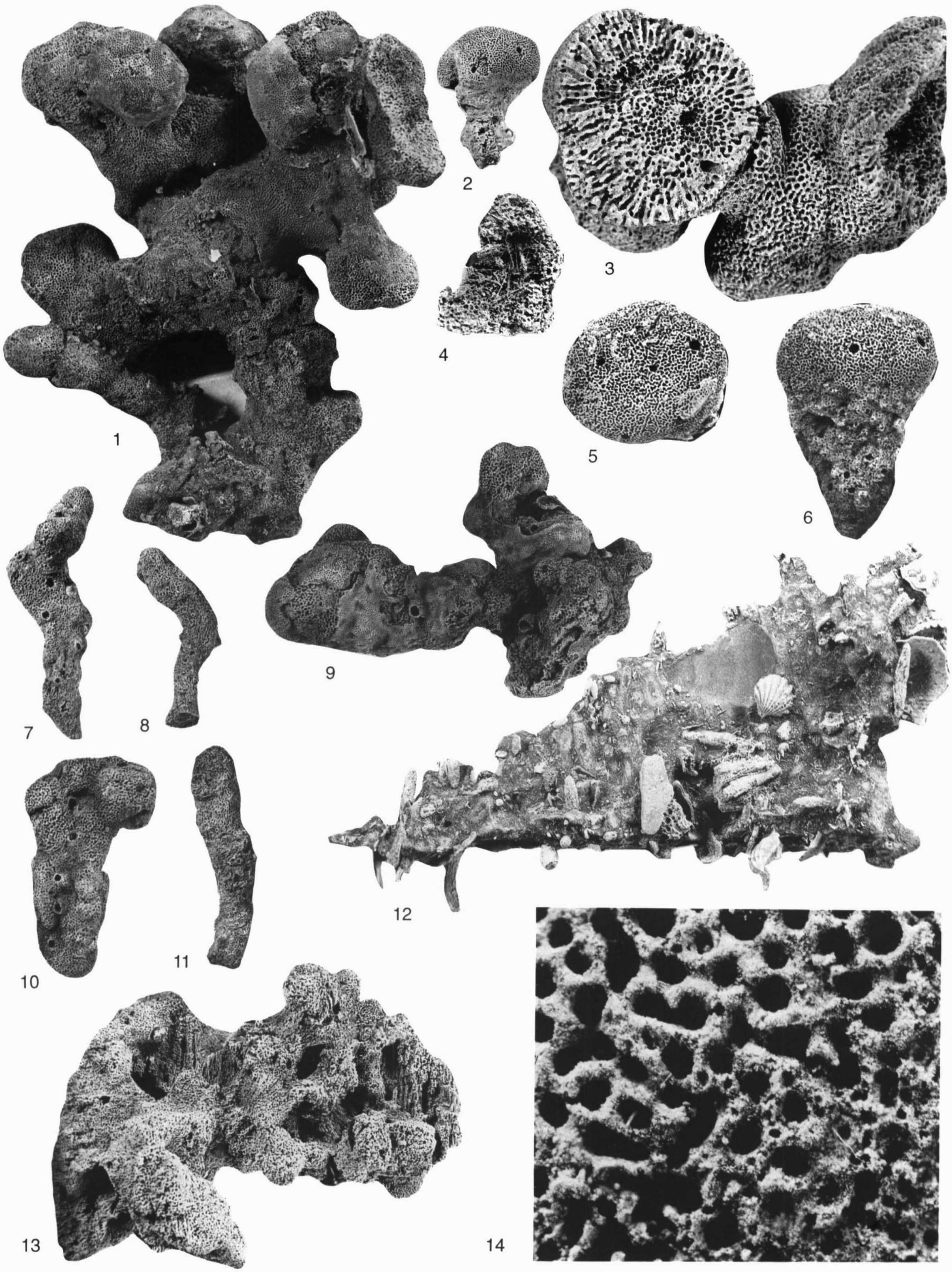

FIGURE 10

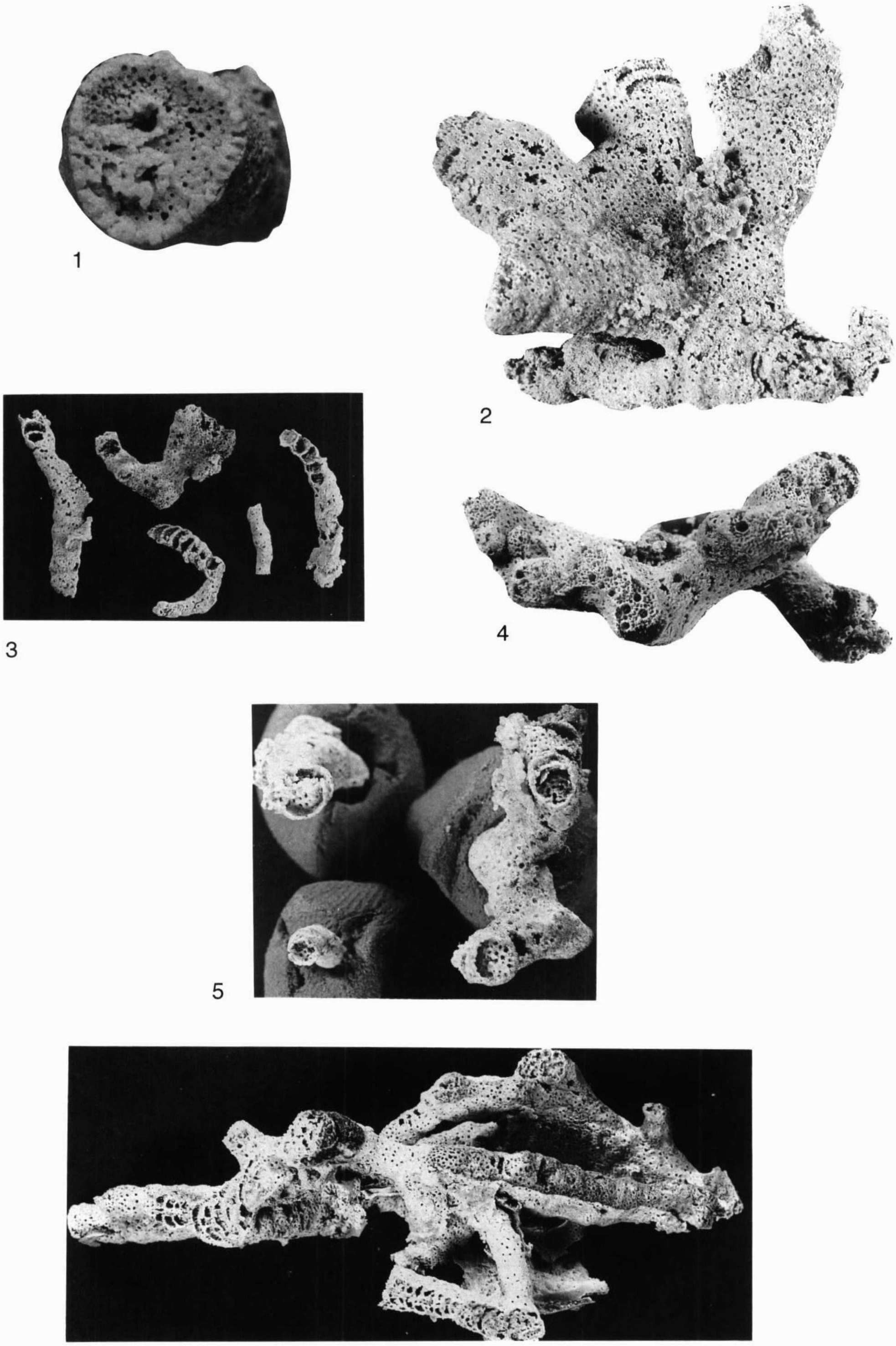

FIGURE 11