Riv. It. Paleont. Strat.	v. 94	n. 1	pp. 3-34	tav. 1-8	Giugno 1988

MICROFACIES AND SPHINCTOZOAN ASSEMBLAGE OF SOME LOWER PERMIAN BRECCIAS FROM THE LERCARA FORMATION (SICILY)

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Key-words: Sphinctozoa, Systematic, Microfacies, Lercara Formation, Lower Permian, Western Sicily.

Riassunto. Alcuni elementi calcarei delle brecce paleozoiche risedimentate nei depositi silico-clastici della Formazione Lercara (Sicilia Occidentale), sono caratterizzati da ricche e ben conservate associazioni fossili mai segnalate e descritte. Questi blocchi si ritrovano nell'area di Cozzo Intronata (Lercara) e lungo il greto del fiume San Filippo (Stazione di Roccapalumba), dove risultano frammisti ai già noti blocchi calcarei con productidi del ?Carbonifero. Essi sono stati probabilmente prodotti dallo smantellamento di un margine di piattaforma carbonatica. Le microfacies presenti negli elementi calcarei studiati sono essenzialmente di due tipi: Boundstone a Spugne calcaree e *Tubiphites* e grainstone/packstone ad Alghe e Foraminiferi. Le Alghe calcaree e le Fusuline consentono di attribuire questi elementi carbonatici al Permiano Inferiore.

Il presente lavoro, oltre alla descrizione delle caratteristiche sedimentologiche e paleontologiche di questi depositi, è principalmente volto allo studio sistematico dei numerosi *Sphinctozoa* presenti nelle associazioni. Sono state riconosciute e descritte 10 specie di *Sphinctozoa*, tra le quali ricorrono con maggiore frequenza *Girtyocoelia beedei* (Girty) e *Sollasia ostiolata* Steinmann. Le altre specie sono piuttosto rare. Viene istituito il nuovo genere *Parauvanella* (specie-tipo *Parauvanella paronai* sp. n.) e una nuova specie del genere *Cystauletes (Cystauletes lercarensis).*

Summary. Some paleozoic calcareous blocks characterized by a rich fossil association, never described before, have been found as elements of the breccias resedimented in the siliciclastic deposits of the Lercara Formation (Western Sicily). These blocks occur in the Cozzo Intronata area (Lercara) and along the River San Filippo (Roccapalumba) mixed with the already known ?Carboniferous calcareous breccias with productid.

The sponge-*Tubiphytes* boundstone and the algal foraminiferal grainstone/packstone are the two main lithofacies types of these new discovered elements. Their Lower Permian age is supported by fusulinids and algae. They probably derived from the dismantling of a carbonate platform margin.

The present paper, besides describing the sedimentological and paleontological features of these deposits, is particularly devoted to the systematic study of the sphinctozoan sponges that played an important role as framebuilder organisms of the reef limestones together with the abundant inozoans.

10 species are here described. *Girtyocoelia beedei* (Girty) and *Sollasia ostiolata* Steinmann are the most frequent species. Other species are rare. A new genus *(Parauvanella)* and a new species *(Cystauletes lercarensis)* are introduced.

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Introduction.

Paleontological and sedimentological analysis carried out in the last two years on the paleozoic breccias of the Middle Triassic Lercara Formation, outcropping in Western Sicily, emphasized the presence, among already known black limestones with productids (see below), of abundant shallow-water carbonate elements characterized by rich and well preserved fossil assemblage of Lower Permian age never described before. They seem to be derived from the dismantling of a carbonate platform characterized by a sponge reef and by a low to medium energy lagoon where algae and foraminifers and, in some places, phylloid algae developed.

The present paper describes the microfacies types and the sphinctozoans recognized among the abundant sponges with a calcareous skeleton, present in these elements.

Geologic and stratigraphic setting.

The Lercara Formation (Schmidt di Friedberg, 1964-65) consists of a complex of siliciclastic deposits first described by Fabiani & Trevisan (1937) outcropping in some areas of Western Sicily. Represented by marls, shales, sandstones, thin bedded resedimented limestones and alkali-basaltic lavas, these deposits are also characterized by the presence of breccias whose elements appear to derive mainly from Paleozoic shallow water limestones.

The main outcrops of the Lercara Formation are located near Cerda (Cozzo Rasolocollo), between Lercara, Roccapalumba and Vicari, and in the Pizzo Colobria area (Fig. 1).

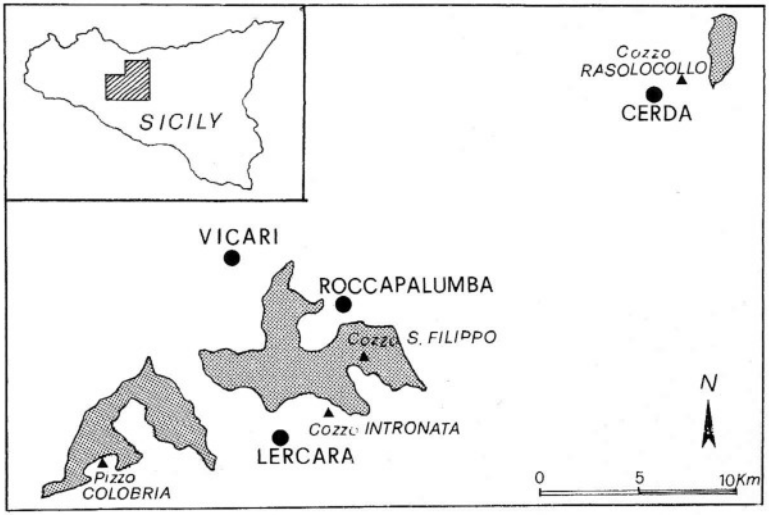

Fig. 1 - Index map of the main outcrops of the Lercara Formation (mod. from Catalano & Montanari, 1979).

Different stratigraphic and paleoenvironmental interpretations of these deposits have been given by several Authors because of their complex paleontological, sedimentological and tectonic features. According to Fabiani & Trevisan (1937) a paleozoic ammonite and some fusulinids present, in places, along the sequence, indicate that the age of the Lercara deposits is Permian.

Castany (1956) comparing these deposits with those of Djebel Tebaga de Medenine (Tunisia) supposed a Lower Permian age for the Lercara rocks.

The French Authors (Broquet, 1968; Mascle, 1979) agree in the whole with the opinion of Fabiani & Trevisan (1937) and consider the Lercara Formation and the overlying Triassic deposits to be the Permo-Triassic basement of the Campofiorito-Cammarata sequence.

Instead, according to Montanari (1967), the Lercara deposits are characterized by the presence of some foraminifers that support a Middle Triassic age. The paleozoic fossils are thus resedimented. Catalano & D'Argenio (1978) agree with this opinion and interpreted the Lercara Formation as deposited in a basin (Lercara basin) originated by a Middle Triassic tensile tectonic phase (1).

The paleozoic breccias.

The paleozoic blocks found in the Lercara Formation are well known among the paleontologists because of their rich and well preserved fossil associations. Besides the very famous Middle Permian white limestones of the Sosio Valley (Gemmellaro, 1887), ?Carboniferous (Visean) black limestones with productid were described by Fabiani & Trevisan (1937). ?Carboniferous rocks are also known from the Roccapalumba oil well (Caflish & Schmidt di Friedberg, 1967). Also Broquet (1968) and Mascle (1979) pointed out the presence of some Carboniferous blocks bearing brachiopods, already mentioned by Fabiani & Trevisan (1937), along the River San Filippo (near Roccapalumba).

Different clastic elements, described in the present paper, have been found in the Cozzo Intronata area (near Lercara) and along the River San Filippo (near the Roccapalumba Railway Station). They appear constituted by grey to brown, very hard limestone blocks which dimensions ranging from a few centimeters to one meter. The most common lithofacies recognized are algal- foraminiferal grainstone/packstone and sponge-*Tubiphytes* boundstone.

It is very difficult to observe the original relationships of these calcareous breccias with the siliciclastic deposits because of the strong deformations affecting these rocks and the scarce natural sections. In the area of Cozzo Intronata (near Lercara) the reef elements prevail. They occur as isolated remnant blocks embedded in the siliciclastic deposits. Along the River San Filippo the elements of algal-foraminiferal grainstone/packstone are common while the reef elements are mostly rare. Here these ele-

(1) Ruggieri & Di Vita (1972) pointed out a Miocenic age for the Lercara Formation considering the permo-triassic deposits to be resedimented in a Miocenic basin.

ments appear reworked by fluvial erosion and mixed with other clastics represented by already known productid black limestones and by *Fusulina* limestones and crinoidal limestones. We did not find along the right bank of this River an outcrop described by Broquet (1968), consisting of several massive clastic bodies of 1 up to 3 m thick interbedded in the varicoloured clays and sandstones.

Microfacies of the Lower Permian elements.

The elements of the algal-foraminiferal limestones appear in thin section as weakly sorted skeletal grainstones. Coated grains as well as intraclasts are commonly observed. In some thin sections a gradation is present. Fusulinids and other foraminifers as well as dasycladacean algae are the most frequent organisms. Bryozoan and echinoid fragments and gastropods are rarely observed in the association. A few well preserved fecal pellets could be observed.

In places in the same samples phylloid algae are present. Their internal structure appears generally replaced by a mosaic of sparry calcite and only in some zones is the original structure observable. Their outer surface is often encrusted by the problematic red alga *Archaeolithoporella*. Fibrous cements and/or foraminiferal grainstones fill up the cavities between the phylloid algae.

According to these sedimentologic and paleontologic features we can interpret these limestones as deposited in a back-reef lagoon characterized by a medium energy.

The most frequent calcareous algae in these deposits are: *Rhodophyceae*: *Ungdarella* sp. *Chlorophyceae*: *Anchycodium* sp., *Atractyliopsis* sp., *Epimastopora* div. sp., *Eugonophyllum johnsonii* Konishi & Wray, *Mizzia* sp., *Neoanchicodium catenoides* Endo. *Cyanophyceae*: *Girvanella* sp.

Among the algae mentioned *Neoanchicodium catenoides* Endo seems to be an index fossil known only from the Lower Permian (Homann, 1972, p. 184; Flügel & Flügel-Kahler, 1980, p. 122). According to Prof. Kahler (pers. com.) also the fusulinids present in these deposits indicate a Lower Permian age.

The reef elements are characterized by sponge-*Tubiphytes* boundstones. Both inozoans and sphinctozoans in nearly the same frequency are the main framebuilding organisms of these deposits. The inozoans are represented by several genera, among which *Meandrostia* Girty (Pl. 6, fig. 4; Pl. 8, fig. 2-4) prevails. The most frequent genera among the sphinctozoans are *Sollasia* and *Girtyocoelia*.

Besides the sponges the *Tubiphytes* are quantitatively important as framebuilders. They are represented by different types (at least morphotypes). The specimen illustrated on Pl. 8, fig. 1 occurs most frequently. It shows a definite shape and is characterized always by an excellent segmentation.

Corals are lacking except for one solitary species with three specimens (thin section S/5/127).

Bryozoans are relatively frequent and are represented by rhabdomesonid, cysto-

porid and fenestrid types. The rhabdomesonid types (*Streblascopora*) are dominant.

The primary framebuilding organisms are nearly always encrusted by *Archaeolithoporella* laminae. The frame cavities are commonly filled by a first generation of fibrous cement (indicating a submarine cementation of these deposits) and by granular cements. In other cases the frame cavities are filled with skeletal grainstone/packstone. The skeletal supply is given by crinoids, echinoids, brachiopods, gastropods and bivalves. The rare foraminifers are represented by sessile *(Hedraites, Tuberitina*) and vagile types (*Lasiodiscus, Lasiotrochus*, lituolid and nodosariid types). The vagile types prevail. The rare fusulinids present support a Lower Permian age for these deposits.

Characteristic for this facies type are small, morphologically different tubes, corresponding in general to the types described by Flügel et al. (1984, pl. 42) from the Permian of Slowenia.

Sphinctozoan assemblage.

The systematic study of the rich fossil assemblages of these deposits was encouraged by the good preservation. In the present paper we described the recognized sphinctozoan (*sensu* Steinmann, 1882) association coming from the Cozzo Intronata area. The study was carried out by numerous thin sections and polished slabs.

The proof material is kept in the Museum of Geology "G.G. Gemmellaro", University of Palermo. Coll. Provv. S. S/D. L. 001- 053.

The following taxa were recognized (classification according to Seilacher, 1962 and Ott, 1967 b):

Superfamily Porata Seilacher, 1962
Family Sebargasiidae Girty, 1908
Genus *Amblysiphonella* Steinmann, 1882
Amblysiphonella barroisi Steinmann, 1882
Amblysiphonella sp.
Genus *Colospongia* Laube, 1865
Colospongia cf. *benjamini* (Girty, 1908)
Genus *Cystauletes* King, 1943
Cystauletes lercarensis sp. n.
Family Guadalupiidae Girty, 1908
Genus *Guadalupia* Girty, 1908
Guadalupia cylindrica Girty, 1908
Family Salzburgiidae Senowbari-Daryan & Schäfer, 1979
Genus *Salzburgia* Senowbari-Daryan & Schäfer, 1979
Salzburgia sp.

Superfamily Aporata Seilacher, 1962
Family Celyphiidae De Laubenfels, 1955
Genus *Girtyocoelia* Cossmann, 1909
Girtyocoelia beedei (Girty, 1908)
Family Thaumastocoeliidae Ott, 1967 b
Genus *Sollasia* Steinmann, 1882

Sollasia ostiolata Steinmann, 1882
Sollasia sp.
Genus *Parauvanella* gen. n.
Parauvanella paronai sp. n.

Comparing the sphinctozoan-fauna of the investigated limestones from Cozzo Intronata with that of other known Carboniferous and Permian localities, we can state:

Some sphinctozoan genera (*Guadalupia, Cystothalamia, Cystauletes*) are missing (*Cystothalamia*) or not common (*Cystauletes, Guadalupia*) in our samples, as opposed to their occurrence in the Upper Permian reef deposits of Texas and Sicily (Girty, 1908; Parona, 1933 and our own observation). The predominant genera/species of the investigated limestones blocks (*Girtyocoelia beedei, Sollasia ostiolata*) occur also in the Upper Permian, but not frequently as in the Carboniferous (Steinmann, 1882; King, 1943; Van De Graaff, 1969; Kügel, 1987). Until now *Amblysiphonella barroisi* Steinmann was not known from the Permian localities.

The sphinctozoan fauna of our samples corresponds in general to that known in the Lower Carboniferous (Carboniferous limestones: Sebargas, Spain; Steinmann, 1882) and in the Upper Carboniferous (Auernig-Beds: Carnic Alps; Lobitzer, 1975; Kügel, 1987). This is also valid for other sponges (*Meandrostia, Coelocladia*) very often occurring in our samples and representing Carboniferous types.

Furthermore almost all the sphinctozoans (and other sponges) which are known from the Upper Permian of the Sosio Valley (Pietra di Salomone, Pietra dei Saraceni) have not been found in our material (Parona, 1933; Aleotti et al., 1986; and our own observation).

Some observations about the evolution of the sphinctozoan fauna during the Lower Permian are suggested by the comparison of the sphinctozoan assemblage of the studied deposits with those of the Upper Permian from the Sosio Valley (Pietra di Salomone, Pietra dei Saraceni). The sphinctozoans of the Lower Permian and the Carboniferous are almost the same taxa, but during the Uppermost Lower Permian a change of three taxa can be recognized. For example *Amblysiphonella barroisi* Steinmann disappears and others (*Sollasia, Girtyocoelia*) become very rare. During the same stage *Guadalupia* (and a lot of other Upper Permian genera) become more important and are the common sphinctozoan during the Upper Permian. Acting as framebuilders the sphinctozoans have almost the same importance as the inozoans.

Systematic description

Phylum **P o r i f e r a** Grant, 1872
Class **Calcispongea** de Blainville, 1834
Order **Pharetronida** Zittel, 1878
Suborder **Sphinctozoa** Steinmann, 1882

Superfamily *P o r a t a* Seilacher, 1962
Family *S e b a r g a s i i d a e* Girty, 1908

Genus *Amblysiphonella* Steinmann, 1882

Type species: *Amblysiphonella barroisi* Steinmann, 1882.

Amblysiphonella barroisi Steinmann, 1882

Pl. 4, fig. 1-6

1882 *Amblysiphonella barroisi* Steinmann, pp. 169 - 170, pl. 6, fig. 1.
1969 *Amblysiphonella barroisi* - Van De Graaff, p. 241, pl. 1, fig. 5, 6, 8-10; pl. 2, fig. 2-4; pl. 3, fig. 1, 4, 6; pl. 4, fig. 9, 10; pl. 5, fig. 4.

Material. All thin sections labeled S/5 with the numbers: 0, 2, 8/1, 32, 215, 302, 303, 307, 308 and 309 from Cozzo Intronata (Lercara).

Description.

The fine and rarely branched stems of our specimens are up to 20 mm long and 3 - 8 mm in diameter. A central channel with a constant diameter of about 2 mm passes through the whole sponge body. Both the chamber walls and the wall of the central channel are pierced by numerous, occasionally ramified, pores (diameter 0.1 - 0.2 mm). The walls are 0.2 - 0.5 mm thick. The height of the chambers is 2 - 5 mm, but it can also differ in one and the same sponge individuum. In the longitudinal sections the shape of the chambers is loaflike. Vesiculae do not occur in our material.

Remarks.

The stem-diameter of 3 - 8 mm measured on our specimens of *A. barroisi* is much smaller than the stem-diameter of Steinmann's (1882) original specimen (13 mm). According to Van De Graaff (1969) the stem-diameter of *A. barroisi* is very variable. By means of about 90 specimens the author indicates a range of variation between 5 and 25 mm for the stem-diameter and between 5 and 200 mm for the length of *A. barroisi.*

Amblysiphonella barroisi Steinmann represents a relatively frequent sponge species in the investigated material. Concerning the frequence, this species seems to come after *Sollasia* and *Girtyocoelia* (within the sphinctozoan-association).

Geographic distribution and age.

A. barroisi Steinmann was only known from Carboniferous of Spain (Steinmann,

- Symbols of the synonymous: *. First description of the species; v. (lat. vidi) = material controlled; non (lat. non) = not, the specimens belong not to this species.

1882; Van De Graaff, 1969). This is the first occurrence of this species in Permian age.

Amblysiphonella sp.

Pl. 7, fig. 3

Material. One specimen in thin section (S/5/211) from Cozzo Intronata.

Description.

We found only one incomplete specimen of this species of *Amblysiphonella*. The fragment, composed of two chambers, is 17 mm long and 12 mm wide. The central channel (diameter 4 mm) can be seen in the lower chamber (Pl. 7, fig. 3). The form of the chambers (in thin section) ranges from round to rectangular. The walls of the chambers are 0.5 - 0.8 mm thick. They are pierced by pores which are funnel-shaped, increasing towards the outside. The pores measure 0.25 mm on the inside and approximately 0.5 mm on the outside of the chamber walls. In the distal zone the pores seem to be repeatedly ramified. More reliable specifications are not possible because of the strong recrystallisation of the specimen.

Genus *Colospongia* Laube, 1865

Type species: *Manon dubium* Münster, 1841.

Colospongia cf. benjamini (Girty, 1908)

Pl. 1, fig. 1

Material. One specimen in thin section (S/5/301) from Cozzo Intronata.

Description.

This sponge is 27 mm long and consists of 10 chambers, the youngest being broken. The diameter of the sponge is 4 mm. The rather homogeneous and symmetrical chambers reach a height of 2.5 - 3 mm and have relatively thick walls (0.4 - 0.8 mm). The walls are pierced by numerous pores approximately 0.15 mm in diameter. Due to the recrystallization of the specimen, the pores cannot be identified everywhere. Vesiculae are present.

Remarks.

Until now about 25 species of the genus *Colospongia* have been described, most of them from the Triassic. Among all known species of *Colospongia*, *C. benjamini* described by Girty (1908 b, p. 286, pl. 15, fig. 8) as *Steinmannia benjamini* shows the most affinities to our specimen. This species (and other species of the genus *Steinmannia*) was

assigned to *Girtyocoelia* by Seilacher (1962, p. 752) and to *Colospongia* by Ott (1967a, p. 50). Due to the smaller stem diameter of our sponge as well as due to untraceable ostia which can occur in the species *Colospongia benjamini* (Girty), we are not sure if our specimen belong to this species.

Colospongia cf. *benjamini* is rare in the investigated limestones. Only one specimen has been found in our material.

According to Kügel (1987, p. 147, pl. 34, fig. 8, 9; pl. 35, fig. 1-3) and our own observation the difference between *C. benjamini* (Girty) and *C. typica* (King) (1932, p. 80, pl. 8, fig. 3 - 5) depends on ecological factors. The feature of one species occurs in the other one too. These two sponges belong to the same species.

Geographic distribution and age.

C. benjamini (Girty) is known from the Carboniferous of Texas (Girty, 1908 b; King, 1932) and of the Alps (Kügel, 1987). The sponge, described as *Girtyocoelia* sp. by Fan & Zhang (1985, p. 10, pl. 2, fig. 3, 8) from Permian of China, belongs most probably to *C. benjamini* (Girty).

Genus *Cystauletes* King, 1943

Type species: *Cystauletes mammilosus* King, 1943.

Cystauletes lercarensis sp. n.

Pl. 2, fig. 1 - 4

Derivatio nominis. From the town of Lercara (Palermo) near the locality of finding.

Holotypus. Pl. 2, fig. 1, 2, 4 (thin sections S/5/34/1, S/5/34/2, S/5/206/1 and one piece), N. inv. provv. S.S/D. L. 008 - 010.

Paratypus. Pl. 2, fig. 3 (thin section S/5/206).

Locus typicus. Cozzo Intronata, near Lercara.

Stratum typicum. Lercara Formation, Lower Permian.

Material. Two specimens in 3 thin sections. Two thin sections (S/5/34/1 and S/5/34/2) were made of the holotype.

Diagnosis. Cylindrical sponge with glomerate chambers arranged in one layer round the central channel. Chamber walls porate; primary pores branching into numerous secondary pores. The chambers are filled by vesiculae.

Description.

The sponge body, reaching a length of 42 mm in the thin section S/5/34/1 (holotype), is 20 mm in diameter. Possibly it is longer and wider than indicated here, because most likely our section does not pass through the middle part of the sponge body.

The glomerate chambers arranged in one layer round the central channel (diameter 3 mm) reach a maximum height of 4 mm and a width of 8 mm. The chamber wall is

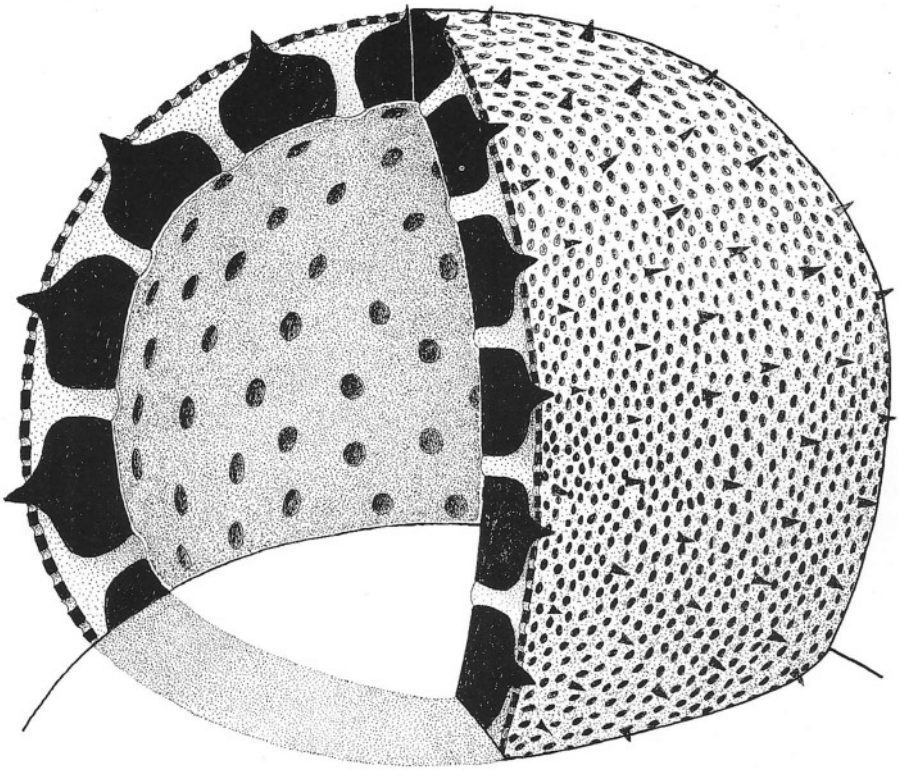

Fig. 2 - Section across a segment of *Cystauletes lercarensis* sp. n. to illustrate the ramified pores and the thorn-like processes. The segment walls are black.

0.4 - 0.6 mm thick and pierced by numerous pores (porate) which are funnel-shaped and increase towards the outside. The primary pores branch out into numerous secondary pores (Pl. 2, fig. 4; Text-fig. 2). In the longitudinal sections 6 - 10 pores were counted. The exact number of all secondary pores coming out from one primary pore could not be determined. The diameter of the secondary pores is 0.05 - 0.08 mm and the wall thickness between them is 0.02 - 0.08 mm. The reconstruction of one chamber (Text-fig. 2) shows the arrangement and the ramification-pattern of the pores.

In the thin section it is often possible to see spine-like elements (up to 0.15 mm long) of the chamber walls in the space between two groups of secondary pores, but is not clear whether these structures are annular elevations of the chamber walls or spines. Since these elements could not be observed everywhere, we have shown them in our reconstruction as spines. We believe that they are the edge of the chamber walls around the secondary pore groups.

Because of the lack of transversal sections we cannot indicate the exact number of the chambers arranged round the central channel. An oblique section (in the lower part of the specimen illustrated on Pl. 2, fig. 3) shows 6 - 8 chambers.

Inside the chambers (particularly the older ones) there are extended multiple vesiculae. In the upper part the normal growth of the specimens (Pl. 2, fig. 1, 2 (Holotype), fig. 3) is disturbed by the presence of a cup-shaped Inozoan.

Cystauletes lercarensis sp. n. is a rare sponge among the sphinctozoan association of the investigated limestones of Cozzo Intronata.

Remarks.

The genus *Cystauletes* was established by King (1943, p. 31) with one species (*C. mammilosus*) from the Carboniferous of Texas. Beside *C. mammilosus*, Van De Graaff (1969) describes another species as *C. major* from the Upper Carboniferous of the Cantabric Mountains in Spain. The author gives clear illustrations and thorough measurements of the two *Cystauletes* species.

Deng (1982a, p. 711) describes another species of the same genus as *C. ribuzuoensis* from the Permian of Maokou-Formation (Sichuan province, SW-China). The chambers of the last mentioned species are not arranged in one layer round the central channel of the sponge (see Deng, 1982 a, pl. 1, fig. 3, 4). As in the genus *Cystothalamia* Girty they are arranged in one or more layers. In the longitudinal section the chambers are more or less tube-like in shape, in transversal section they are polygonal like *Guadalupia* Girty. Considering the shape of the chambers the Deng's species may be placed in the genus *Guadalupia*?.

C. lercarensis sp. n. differs from the above mentioned species in the branching pores on the chamber walls. Besides, *C. major* Van De Graaff with a diameter of 31-45 mm is much larger than *C. mammilosus* King and *C. lercarensis* sp. n.

C. lercarensis falls in the variability range of the stem diameter of *C. mammilosus* King (according to Van De Graaff, 1969, 5 - 28 mm), but it differs from this by the branching pores in the chamber walls. The stem diameter of *C. ? ribuzuoensis* Deng is the smallest of all known species (approximately 8 mm).

From the Permian of Slovenia (Flügel et al., 1984) describes some sphinctozoans as *Amblysiphonella* sp. A, *Amblysiphonella* sp. B and *Colospongia*? sp. The specimen described as *Amblysiphonella* sp. A (p. 201, pl. 36, fig. 1) seems to belong to *Guadalupia*, because of the glomerate chamber arrangement (*Amblysiphonella* has ring chambers). This can be seen in the lower part of the sponge, where the chamber sections appear as circles.

Considering the arrangement of the chambers around the channel, the sponge described as *Amblysiphonella* sp. B (pl. 36, fig. 2-4) must be assigned to *Cystauletes* King which, according to the dimensions indicated on page 201, represents in all probability a new species of this genus. Also the sponge illustrated as *Colospongia*? sp. (pl. 36, fig. 8, 9) must be placed in the genus *Cystauletes* because of the glomerate arrangement of its chambers.

The sponge described by Zankl (1969, pl. 2, fig. 4a, b) from the Upper Triassic Dachstein reef limestones as *Cystauletes* may belong to this genus, but its diameter of about 27 mm, the relatively thin chamber walls and the homogeneous pores in the

chamber walls hardly allow comparison with *C. lercarensis* sp. n.

C. lercarensis is known only from the Lower Permian of Lercara Formation (Cozzo Intronata).

Geographic distribution and age.

The genus *Cystauletes* occurs from Carboniferous to Upper Triassic age.

Family *Guadalupiidae* Girty, 1908

Genus *Guadalupia* Girty, 1908

Types species: *Guadalupia zitteliana* Girty, 1908.

Guadalupia cylindrica Girty, 1908

Pl. 6, fig. 1

*1908a *Guadalupia cylindrica* Girty, pp. 81 - 82, pl. 6, fig. 3 a - c.
v. 1933 *Guadalupia cylindrica* - Parona, p. 47, pl. 9, fig. 10 - 12.
1962 *Guadalupia cylindrica* - Zhuravleva, p. 76, fig. 19 a, b.
1977 *Guadalupia cylindrica* - Termier & Termier (in Termier et al.), p. 45, pl. 10, fig. 10.
1977 *Guadalupia cylindrica* - Termier & Termier, p. 72, pl. 9, fig. 3, 4; text-fig. 16.
v. 1984 *Guadalupia cylindrica* - Flügel (in Flügel et al.), p. 202, pl. 37, fig. 2.
1986 *Guadalupia cylindrica* - Aleotti, Dieci & Russo, p. 11, pl. 2, fig. 1 - 4; text-fig. 1 b.

Material. One specimen from the locality of Cozzo Intronata (thin section S/5/212).

Description.

There is only one specimen of this sponge, half of which has been destroyed by weathering; only an oblique section could be made.

The sponge measures 20 mm in length (although it was originally longer) and at least 9 mm in diameter. The chambers are glomerately arranged in one layer round the central channel (diameter approximately 2 mm) and are about 3 mm long with a diameter of 0.4 - 0.6 mm. The chamber walls are 0.5 - 1.2 mm thick. In the cross-section the chambers are almost circular, while the outline of the chamber wall (due to the thickening of the walls in the corners) has a polygonal shape. The "perforation" of the chamber walls is not homogeneous; it appears porate in some parts and aporate in others.

Geographic distribution and age.

G. cylindrica Girty is described from the Permian age of Texas (Girty, 1908 b), Tunisia (Termier, Termier & Vachard, 1977), Sicily (Parona, 1933; own material), Jugoslavia (Flügel et al., 1984). The genus *Guadalupia* is very common within the Permian rocks of the Guadalupe Mountains in Texas and in the Upper Permian rocks in Sicily (Pietra di Salomone, Pietra dei Saraceni, own material).

Family *Salzburgiidae* Senowbari - Daryan & Schäfer, 1979

Genus *Salzburgia* Senowbari - Daryan & Schäfer, 1979

Type species: *Salzburgia variabilis* Senowbari - Daryan & Schäfer, 1979.

Salzburgia sp.

Pl. 1, fig. 4, 5a

Material. One specimen in two thin sections (S/5/126/1 and S/5/126/2) from the locality of Cozzo Intronata.

Description.

The sponge body is composed of glomerate chambers and reaches a length of 55 mm and a diameter of 20 mm. The chambers are up to 10 mm in width and heigth and contain only a few vesiculae. The two-layered chamber wall is typical of this sponge and very similar to that of *Salzburgia variabilis* Senowbari - Daryan & Schäfer: on the outer layer there is a complicated and irregularly ramified pore system; on the innerside a relatively thick layer not showing pores but pierced by ostia. At the contact of two chambers the wall consists of three layers (the inner and outer layers of the old one and only the inner layer of new one) (Pl. 1, fig. 5a: arrow; Text-fig. 3). The existence of a central channel penetrating the whole sponge is not certain.

Remarks.

This sponge looks very similar to *Cystauletes* King, but it differs from this in the very complicated double development of the chamber walls. Because of the two-layered wall structure the sponge may be placed in the genus *Salzburgia*, of which only the type species is known from the Upper Triassic (Rhaetian, Northern Calcareous Alps). The genus is also present in the Upper Triassic reefs of the Wallowa Mountains (USA) and Canada (Stanley & Senowbari - Daryan, 1986; Senowbari - Daryan & Reid, 1987).

This sponge differs from *Salzburgia variabilis* in its thinner chamber walls, its rough surface and its irregular shape of the chambers. Because of the scarce material we can not assign this specimen to a new species.

Geographic distribution and age.

This sponge occurs only in the Lower Permian of Lercara Formation of Cozzo Intronata.

Superfamily *Aporata* Seilacher, 1962

Family *Celyphiidae* De Laubenfels, 1955

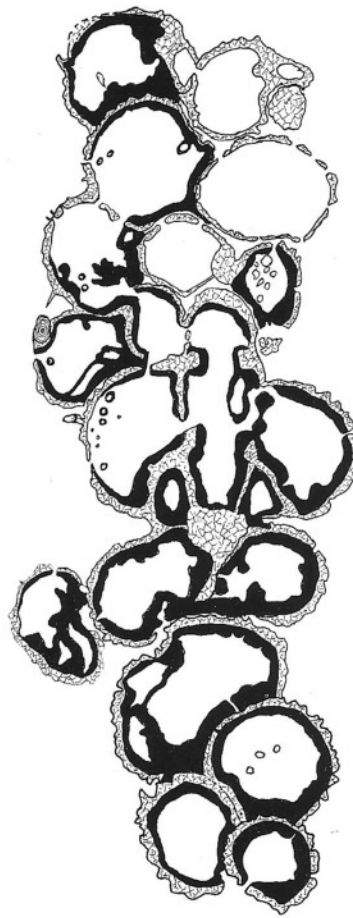

Fig. 3 - *Salzburgia* sp. Copied from fig. 4 in Pl. 1 to illustrate the two-layered

Genus *Girtyocoelia* Cossmann, 1909

(pro *Heterocoelia* Girty, 1908)

Type species: *Heterocoelia beedei* Girty, 1908.

Girtyocoelia beedei (Girty, 1908)

Pl. 1, fig. 2, 3, 5b; Pl. 3, fig. 1-4; Pl. 7, fig. 7

*1908a *Heterocoelia beedei* Girty, p. 248, pl. 14, fig. 1 - 8.
1932 *Heterocoelia beedei* - King, p. 78, pl. 7, fig. 5, 6.
1932 *Heterocoelia sphaerica* King, p. 79, pl. 7, fig. 7, 8.
v. non 1933 *Heterocoelia beedei* - Parona, p. 42, pl. 8, fig. 1.
1943 *Girtyocoelia dunbari* King, pp. 33 - 34, pl. 3, fig. 6.

1962 *Girtyocoelia dunbari* - Zhuravleva, p. 76, fig. 111 (from King, 1943).
? 1962 *Girtyocoelia beedei* - Zhuravleva, p. 76, fig. 110 (compare Zhuravleva, 1979).
1975 *Girtyocoelia* cf. *G. beedei* Toomey, p. 248, fig. 4b.
? 1977 *Girtyocoelia* sp. Termier & Termier (Termier et al.), pl. 10, fig. 8.
1977 *Girtyocoelia* sp. Termier & Termier, pl. 9, fig. 1, 2; text-fig. 20.
v. 1987 *Girtyocoelia beedei* - Kügel, p. 144, pl. 33, fig. 4 - 8.

Material. All thin sections labeled S/5 with the number: 10/3, 47, 48, 52, 63, 77, 78, 90, 96, 121/1, 126/1/2, 131, 169, 177 and 206 from Cozzo Intronata (Lercara, Sicily).

Description.

The sponge body consists of globular to barrel-shaped chambers and reaches a length of more than 40 mm and a diameter of 6 - 8 mm. A central channel (diameter 1 - 2 mm) crosses the whole sponge. The central channel is in communication with the inside of the chambers by several pores (diameter 0.2 - 0.5 mm). The perforate walls are pierced only by isolated ostia (diameter approximately 0.5 mm). The ostia show a typical projecting wall which is lengthened and widened on the outer side, adopting a beak-like shape (pl. 1, fig. 2, 3; pl. 3, fig. 3, 4). The wall of the central channel (approximately 0.2 mm) is normally thinner than the outer wall of the chambers (about 0.4 mm). The walls between two chambers have the greatest thickness (1 - 2 mm), because of the duplication of the walls at the contact between two chambers. The height of the chambers is normally 5 mm. Vesiculae do not occur.

In several specimens it could be observed that the chamber wall shows a two-layered structure (Pl. 3, fig. 3, 4): inside the inner layer consists of lamellae, the outer layer is granular (similar to *Sollasia ostiolata* Steinmann). Thus we cannot exclude a primary two-layered structure and consequently the attribution of this genus to the family of *Thaumastocoeliidae* Ott. Also the microstructure of *Girtyocoelia* as well as *Sollasia* is sphaerolitic.

Remarks.

Until now the following species of *Girtyocoelia* have been described:

Girtyocoelia beedei (Girty, 1908). Upper Carboniferous, Texas.
Girtyocoelia dunbari (King, 1943). Permian, Texas.
Girtyocoelia sphaerica (King, 1932). Upper Carboniferous, Texas.
Girtyocoelia oenipontana Ott, 1967b. Middle Triassic (Ladinian), Alps.
Girtyocoelia carnica Senowbari - Daryan, 1981. Upper Triassic (Carnian), Karawanken/Slovenia.

The specimen illustrated as *Girtyocoelia markanensis* by Deng (1982b, pl. 6, fig. 5) seems to be porate and therefore it cannot be assigned to the genus *Girtyocoelia*. Unfortunately the original description of *G. markanensis* from Upper Triassic age of China was not available to us. So we can not decide the exact taxonomic position of this species.

The species *Girtyocoelia dunbari* King and *G. sphaerica* King show the same charac-

teristics as *G. beedei* and are identical to it (Kügel, 1987).

Girtyocoelia beedei (Girty) represents a frequent sphinctozoan species within the investigated limestones. Regarding frequence it comes second after *Sollasia ostiolata* Steinmann among the sphinctozoan assemblage.

Geographic distribution and age.

G. beedei (Girty) is known from the Carboniferous of Texas (Girty, 1908 b; King, 1932, 1943) and the Carnic Alps (Lobitzer, 1975; Kügel, 1987), in the Upper Permian of Sicily (Pietra di Salomone, own material), and in Southern Tunisia (Termier, Termier & Vachard, 1977, and own material).

Genus *Parauvanella* gen. n.

Diagnosis.

Nodular aggregates consisting of numerous small and irregular chambers. Central channel missing. Chamber walls sparitic to microsparitic (most probably primary aragonite?); imperforate to coarsely perforate without filling tissue and vesiculae.

Remarks.

The external morphology of this sponge is very similar to *Uvanella* Ott (1967 b, p. 38), but it differs in the constitution and the structure of the chamber walls. While the chamber wall of *Uvanella* shows a micritic (high-Mg-calcite) and "schlierigen Feinbau mit eingeschlossenen Hohlräumen und agglutinierten Sedimentpartikeln" (a streaky fine structure with enclosed cavities and agglutinated sedimentary particles, Ott, 1967 b, p. 38), the wall structure of the new genus is sparitic to microsparitic (aragonite); it is similar to that of the *Colospongia* or the *Amblysiphonella* (aragonite). Unlike the wall of *Uvanella* which appears dark in transmitted light and bright to milky in reflected light, the wall of our sponge is bright and transparent in transmitted light.

Because of the imperforate chamber walls we attributed the new genus to the family *Celyphiidae* De Laubenfels, although *Uvanella* Ott is placed in the porate sphinctozoans (see Ott, 1967 b, p. 38).

Type species: *Parauvanella paronai* sp. n.

Parauvanella paronai sp. n.

Pl. 5, fig. 1 - 5; Pl. 7, fig. 4.

Derivatio nominis. In honour of Prof. Dr. C. F. Parona who worked in detail on the sponges of the Sosio Valley.

Holotypus. The specimen on Pl. 5, fig. 4 (thin section S/5/207).

Paratypi. Pl. 5, fig. 1 - 3, 5; Pl. 7, fig. 4 (thin sections S/5/149, S/5/86, S/5/122, S/5/163, S/5/49) besides the following sections not figured: S/5/13/2, S/5/145, S/5/207. (N. inv. provv. S.S/D.L. 031).

Locus typicus. Cozzo Intronata, near Lercara.

Stratum typicum. Breccias in the Lercara Formation, Lower Permian.

Diagnosis.

Nodular aggregates consisting of numerous small and irregular chambers. Asiphonate. Glomerate chamber arrangement. Without filling tissue or vesiculae. The primary composition of the skeleton was most probably aragonite.

Description.

The encrusting sponge body, consisting of numerous glomerately arranged chambers, reaches a width of 14 mm and a length of 10 mm. The holotype is 9 mm wide and 11 mm long. The chambers are in connection with one another and with the exterior by simple ostia whose number and distribution on the chamber walls are very variable. One can see up to 4 ostia in the space stretch of 1.5 mm, but in other cases there are none in the stretch of 2.5 mm. Generally the chambers are broader than long, their maximum width is 4 mm and their maximum length 2 mm. The thickness of the chamber walls varies from 0.1 to 0.3 mm.

Geographic distribution and age.

Lower Permian carbonate breccias of Lercara Formation (Cozzo Intronata). The genus occurs also in the Permian reefs of Guadalupe Mountains/Texas (own material).

Family *Thaumastocoeliidae* Ott, 1967

Genus *Sollasia* Steinmann, 1882

Type species: *Sollasia ostiolata* Steinmann, 1882.

Sollasia ostiolata Steinmann, 1882

Pl. 2, fig. 5; Pl. 3, fig. 6, 8, 9; Pl. 5, fig. 7; Pl. 7, fig. 1, 5, 6; Pl. 8, fig. 4 d

*1882 *Sollasia ostiolata* Steinmann, pp. 151 - 152, pl. 7, fig. 3.
v. 1933 *Heterocoelia beedei* - Parona, p. 42, pl. 8, fig. 1.
1962 *Sollasia ostiolata* - Zhuravleva, p. 76, fig. 115 a, b.
1969 *Sollasia ostiolata* - Van De Graaff, p. 240, pl. 1, fig. 2; pl. 2, fig. 5 - 7; pl. 4, fig. 4.
? 1982 *Sollasia* aff. *ostiolata* Deng, p. 710, pl. 1, fig. 1.
1985 *Sollasia* n. sp. Fan & Zhang, pl. 8, fig. 7, 9.
v. 1987 *Sollasia ostiolata* - Kügel, p. 144, pl. 33, fig. 1 - 3.

Material. All thin sections labeled S/5 with the numbers: 5, 8/2, 37, 47, 48, 52, 68, 74, 76, 80, 86, 87, 90, 98, 99, 101, 107, 110, 112, 115, 117, 118, 123, 127, 128, 135, 152, 163, 167, 170, 205, 213, 306 and 412 from Cozzo Intronata (Lercara, Sicily).

mm in diameter). The chambers are globular to barrel shaped. They are connected to each other by a single aperture (osculum, diameter up to 0.8 mm). The height of the chambers ranges from 3 to 6 mm. The chambers come into contact with the exterior through coarser apertures (ostia, diameter 0.2 - 0.5 mm). Generally only one ostium of each chamber is cut. Two ostia in one chamber have rarely been observed. The thickness of the chamber walls varies extremely in one and the same specimen. It measures between 0.3 and 0.6 mm. The wall between the chambers has the greatest thickness (duplication of the walls by chamber nappes and chamber grounds up to 1.5 mm). The granular development of the outer side of the chamber walls is very typical. Towards the interior, this granular structure continually reduces until it disappears completely. The two- layered structure of the chamber walls - described by Steinmann in the original description of the species - cannot be proven in our material, although there are hints in some specimens. The SCAN investigations of the chamber walls of *Sollasia ostio -lata* show that these granular structures consist of sphaerolites (Pl. 7, fig. 1). The size of the single sphaerolite is approximately 50 µm. It is particularly interesting that fine pores could be observed in the chamber walls of some specimens (Pl. 5, fig. 7).

Remarks.

Until now the following species of the genus *Sollasia* have been described:
Sollasia ostiolata Steinmann, 1882. Upper Carboniferous, Spain.
Sollasia dussaulti Mansuy, 1914. Permian, Kambodia.
Sollasia ostiolata permica Parona, 1933. Upper Permian, Sosio (Sicily).
Sollasia? baloghi Kovacs, 1978. Triassic, Hungary.

Geographic distribution and age.

S. ostiolata Steinmann is described from the Carboniferous of Spain (Steinmann, 1882; Van De Graaff, 1969) and from the Carnic Alps (Lobitzer, 1975; Kügel, 1987), from the Permian of China (Fan & Zhang, 1985), Sicily (Pietra di Salomone, own material), Tunisia (own material), and from Texas (own material).

Sollasia sp.

Pl. 3, fig. 5, 7; Pl. 4, fig. 4 b, 6 b; Pl. 6, fig. 3

Material. All thin sections labeled S/5 with the numbers: 50, 72, 93, 103, 119, 165, 302, 306, 307 and 309.

Description.

This species differs from the preceding one in its bigger stem diameter (8 - 10 mm) and its globular chambers. Apart from this, the chambers of this species are filled with multiple tissues much thicker than vesiculae and representing, unlike these, a primary inter-chamber secretion of the chamber wall (Pl. 3, fig. 7; Pl. 4, fig. 4 b). All the other characteristics correspond to the preceding species.

Acknowledgement.

The research has been carried out by B. Senowbari - Daryan within the scientific program "Evolution of fossil reefs, revision of sphinctozoans, Fl 42/49-1" and "Permo-Triassic sphinctozoans, Se 416-1", with the generous financial support of the Deutsche Forschungsgemeinschaft (DFG) and by P. Di Stefano in the frame of stratigraphic investigations in Western Sicily supported by M.P.I. 40% 1982/ 83/ 84 and 60% 1982/ 83/ 84.

We would like to thank Dipl. Geol. S. Kraus for typing of the manuscript.

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PLATE 1

Fig. 1 - *Colospongia* cf. *benjamini* (Girty). Longitudinal section across several, homogeneous chambers. The perforation of the chamber walls can be seen in parts. Only a few vesicles are developed in the interiors. Cozzo Intronata, thin section S/5/301; 4,5 x.

Fig. 2, 3 - *Girtyocoelia beedei* (Girty).
2) Longitudinal section. In the upper part of the sponge the central channel is cut. Cozzo Intronata, thin section S/5/206; 3 x.
3) Longitudinal section. In the middle part of the sponge the perforation of the wall of the central channel can be clearly seen. The arrows show the lengthened beaklike ostia. Cozzo Intronata, thin section S/5/177; 2,7 x.

Fig. 4, 5 - *Salzburgia* sp.
4) Longitudinal section. In the middle part of the specimen the central channel is cut. The chamber walls develop in two layers (see Text-fig. 3). Cozzo Intronata, thin section S/5/126/2; 1,3 x.
5) a) *Salzburgia* sp. Parallel section to fig. 4.
b) *Girtyocoelia beedei* (Girty). Cozzo Intronata, thin section S/5/126/1; 3 x.

PLATE 2

Fig. 1-4 - *Cystauletes lercarensis* sp. n.
1) Holotype. Marginal section across the glomerate chambers. The chamber interiors are filled with vesiculae. Cozzo Intronata, thin section S/5/34/2; 2,6 x.
2) Holotype. Longitudinal section. In its upper part (on the left side) the sponge is disturbed in its normal growth by the presence of a cup-shaped sponge (Inozoa). Parallel section to fig. 1. Cozzo Intronata, thin section S/5/206/1; 2 x.
3) Paratype. Marginal section across glomerate chambers. Cozzo Intronata, thin section S/5/206; 4 x.
4) Magnification of the top chamber of fig. 2. The ramified pores of the chamber walls are very clear; 13 x.

Fig. 5 - *Sollasia ostiolata* Steinmann. Longitudinal section across numerous chambers. The arrows show the ostia. Cozzo Intronata, thin section S/5/37; 3 x.

PLATE 3

Fig. 1-4 - *Girtyocoelia beedei* (Girty).
1) Marginal section. The central channel is cut in the lower and the upper part of the sponge. Cozzo Intronata, thin section S/5/10/3; 6 x.
2) Marginal section. Cozzo Intronata, thin section S/5/169; 3,5 x.
3) Section across three chambers. The arrows show the lengthened beaklike ostia. Cozzo Intronata, thin section S/5/126/2; 4 x.
4) Marginal longitudinal section. The arrows indicate ostia. There is a bryozoa on the ostium of the top chamber. Cozzo Intronata, thin section S/5/52; 5 x.

Fig. 6, 8, 9 - *Sollasia ostiolata* Steinmann.
6) Longitudinal section across several chambers. The arrows show ostia. Cozzo Intronata, thin section S/5/306; 4 x.
8) Longitudinal section across several chambers. The osculum is cut in the lower part. Cozzo Intronata, thin section S/5/152; 3 x.
9) Longitudinal sections across three specimens. Cozzo Intronata, thin section S/5/110; 1,5 x.

Fig. 5, 7 - *Sollasia* sp.
5) Longitudinal section across three chambers. The arrow indicates the ostia. Cozzo Intronata, thin section S/5/306; 4 x.
7) Longitudinal section across chambers filled with tissue similar to vesiculae. Cozzo Intronata, thin section S/5/307; 2,2 x.

PLATE 4

Amblysiphonella barroisi Steinmann

Fig. 1 - Marginal longitudinal section. The central channel is cut in the middle part of the sponge. Cozzo Intronata, thin section S/5/32; 3,6 x.

Fig. 2 - Longitudinal section. Cozzo Intronata, thin section S/5/303; 4 x.

Fig. 3 - Marginal longitudinal section. Cozzo Intronata, thin section S/5/309; 2,3 x.

Fig. 4 - a) *A. barroisi* Steinmann growing on b) *Sollasia* sp. Cozzo Intronata, thin section S/5/309; 3 x.

Fig. 5 - Marginal longitudinal section. Cozzo Intronata, thin section S/5/308; 6 x.

Fig. 6 - a) Two specimens of *A. barroisi* Steinmann growing on b) *Sollasia* sp. c) *Peronidella* sp. Cozzo Intronata, thin section S/5/302; 3 x.

PLATE 5

Fig. 1-5 - *Parauvanella paronai* gen. n. sp. n.
1) The encrusting sponge is growing on an inozoan very frequently found in the investigated limestones (*Meandrostia* sp.). Cozzo Intronata, thin section S/5/149; 6 x.
2) Longitudinal section across numerous glomerate chambers. Cozzo Intronata, thin section S/5/86; 5,6 x.
3) a) Specimen encrusting an inozoan (*Meandrostia* sp.); b) *Tubiphytes*; c) a brachiopod-shell; d) bryozoans ?. Cozzo Intronata, thin section S/5/122; 4 x.
4) Holotype. Longitudinal section. Specimen growing on an inozoan. Cozzo Intronata, thin section S/5/207; 3 x.
5) *Parauvanella paronai* gen. n. sp. n. and *Tubiphytes* (black spots) which have grown together. Cozzo Intronata, thin section S/5/163; 10 x.

Fig. 6 - Inozoa or *Guadalupia*? sp. The central channel of the sponge is provided with cross elements. Cozzo Intronata, thin section S/5/106; 5 x.

Fig. 7 - Granular wall structure of *Sollasia ostiolata* Steinmann. Fine pores are indicated inside the wall. Cozzo Intronata, thin section S/5/106; 10 x.

PLATE 6

Fig. 1 - *Guadalupia cylindrica* Girty. Longitudinal section. The lengthened tube-like chambers are arranged in one-layered position round the central channel. Cozzo Intronata, thin section S/5/212; 4 x.

Fig. 2 - Inozoan or *Guadalupia*? sp. Same sponge as Pl. 5, fig. 6. Cozzo Intronata, thin section S/5/182; 7 x.

Fig. 3 - *Sollasia* sp. Section across three chambers. Extended vesiculae in the chamber interiors. Cozzo Intronata, thin section S/5/165; 4 x.

Fig. 4 - Longitudinal and cross sections of *Meandrostia* sp. Cozzo Intronata, thin section S/5/115; 6 x.

Fig. 5 - Cross and diagonal section of *Peronelella* sp. Cozzo Intronata, thin section S/5/?; 6 x.

Fig. 6 - Longitudinal section of *Coelocladia* sp. (Inozoa). The lengthened beaklike ostia are typical of this sponge (arrows). Cozzo Intronata, thin section S/5/?; 2 x.

PLATE 7

Fig. 1 - The sphaerolithic wall structure of *Sollasia ostiolata* Steinmann. SCAN-photography.

Fig. 2 - *Parauvanella paronai* gen. n. sp. n. growing on a problematic fossil. Cozzo Intronata, thin section S/5/13/2; 4 x.

Fig. 3 - *Amblysiphonella* sp. Section across two chambers. Towards the outside the wall pores are ramified (arrows). Cozzo Intronata, thin section S/5/211; 4 x.

Fig. 4 - *Parauvanella paronai* gen. n. sp. n. Longitudinal section across glomerate chambers with *Tubiphytes* (arrows). Cozzo Intronata, thin section S/5/49; 7 x.

Fig. 5 - *Sollasia ostiolata* Steinmann. Longitudinal section across several chambers. Cozzo Intronata, thin section S/5/210; 1,5 x.

Fig. 6 - The incompletely developed wall of *Sollasia ostiolata* Steinmann with granular structure (Sphaerolites). Cozzo Intronata, thin section S/5/90; 10 x.

Fig. 7 - The incompletely developed chamber wall and the central channel wall (partly) of *Girtyocoelia beedei* (Girty) with lengthened beaklike ostia. Cozzo Intronata, thin section S/5/90; 7 x.

PLATE 8

Fig. 1 - *Tubiphytes* sp. Besides cylindric types there are also well defined and segmented types whose calcispongian nature is not excluded. The organism is encrusted by *Archaeolithoporella* in great quantities. Cozzo Intronata, thin section S/5/86; 5 x.

Fig. 2 - *Meandrostia* sp. (Inozoa). The sponge is characterized by ramification and beaklike ostia (arrows). Cozzo Intronata, thin section S/5/116; 2 x.

Fig. 3 - *Meandrostia* sp. and Inozoa? gen. et sp. indet. Cozzo Intronata, thin section S/5/52; 2,5 x.

Fig. 4 - Different Inozoans of the investigated limestones. a) *Meandrostia* sp.; b) cup-shaped Inozoan; c) Inozoan gen. et sp. indet. d) *Sollasia ostiolata* Steinmann. Cozzo Intronata, thin section S/5/115; 2 x.


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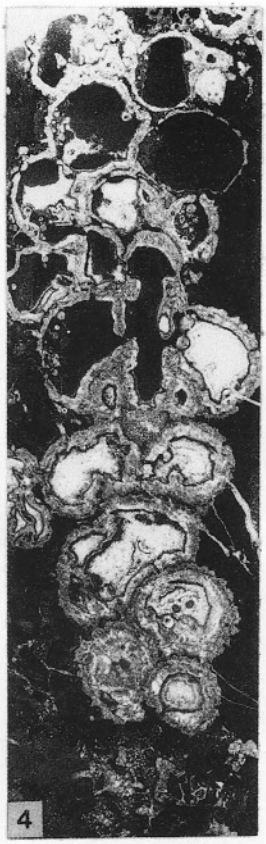
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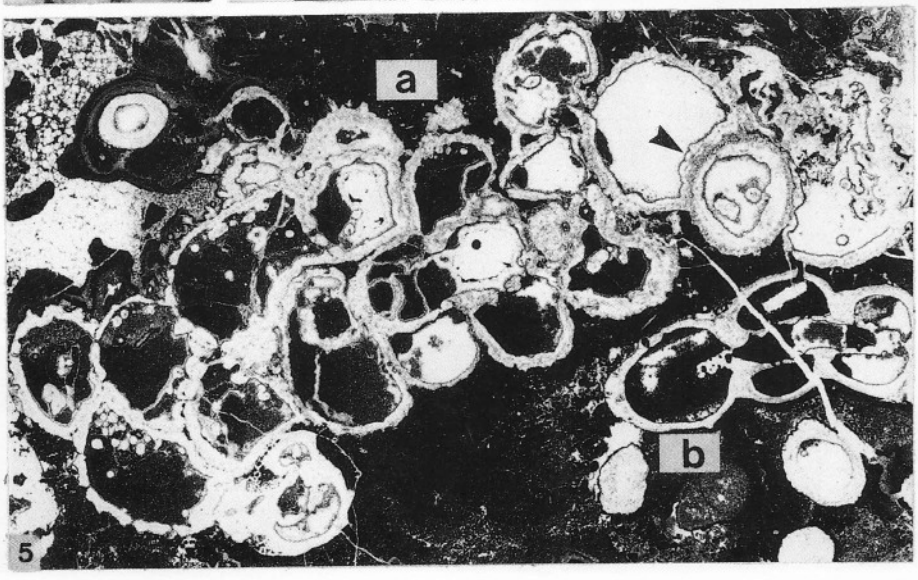

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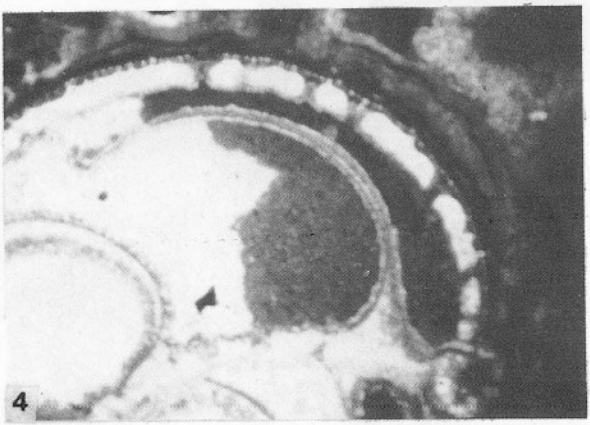
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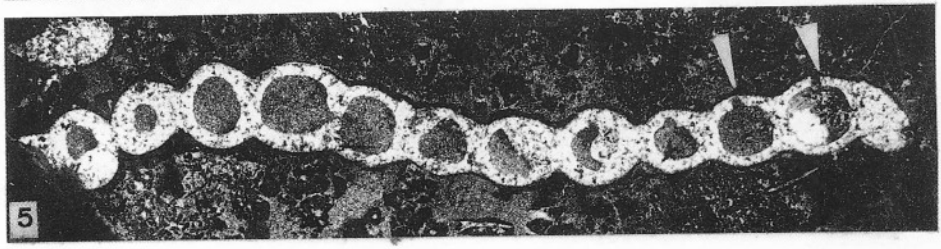
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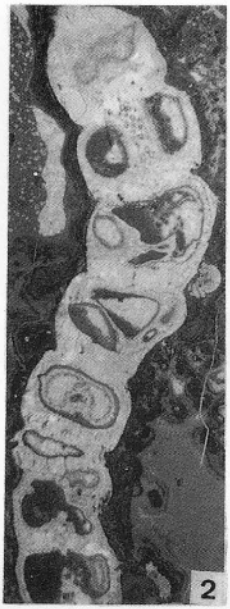
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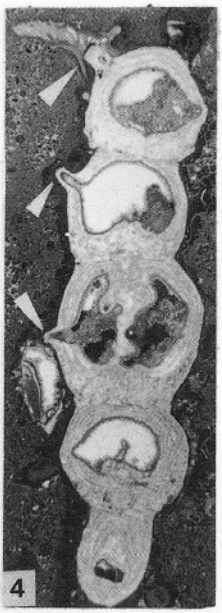
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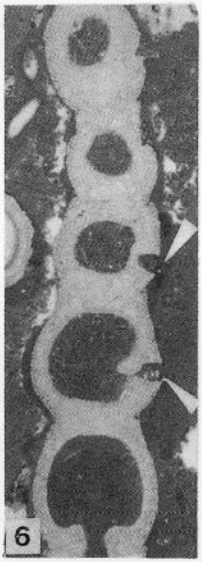
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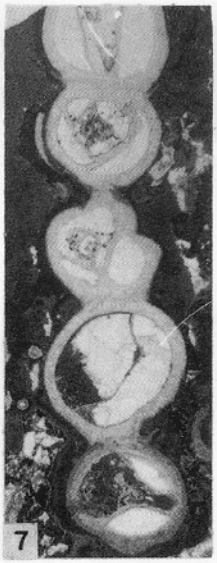
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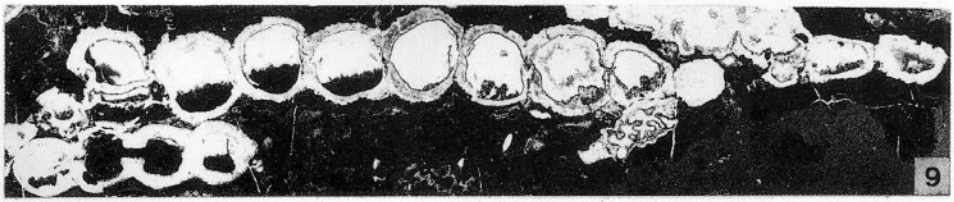
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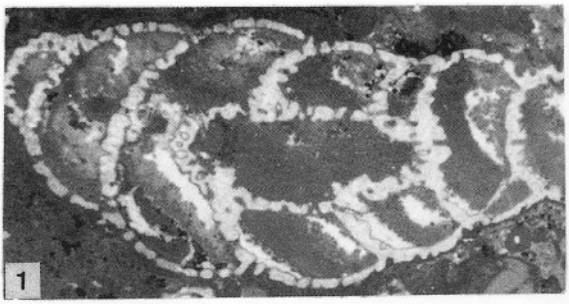
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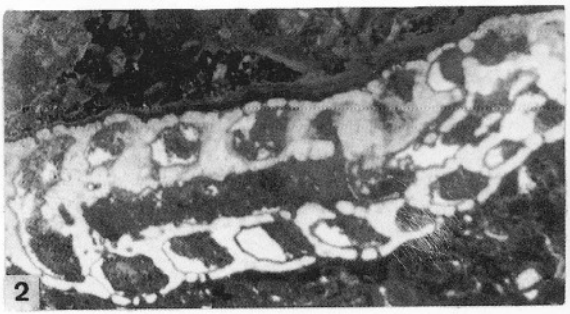
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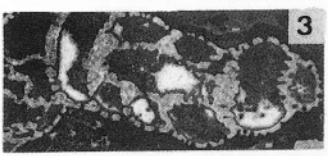
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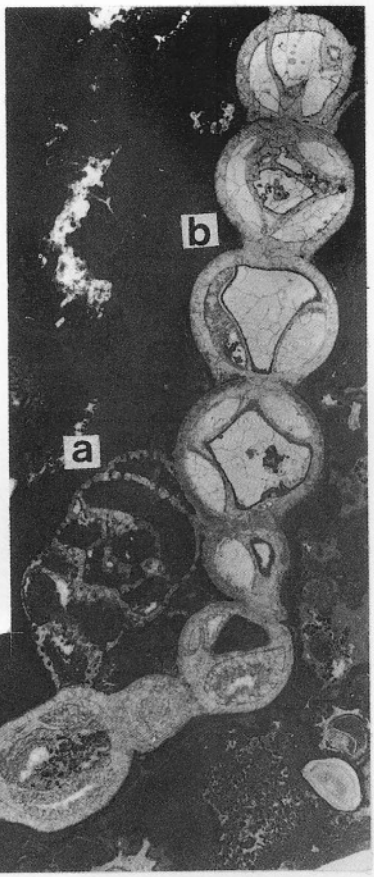
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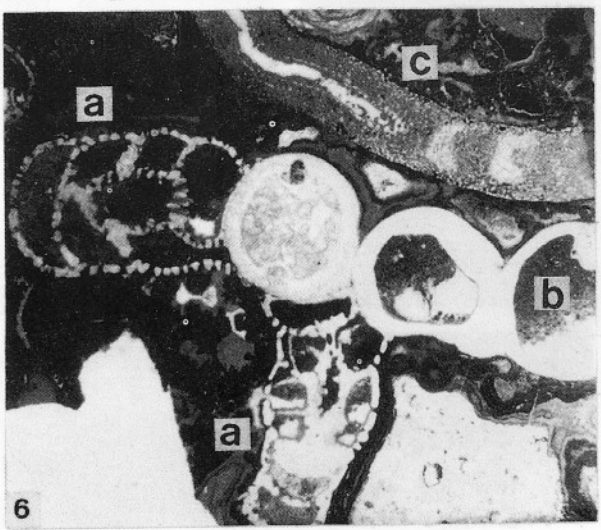
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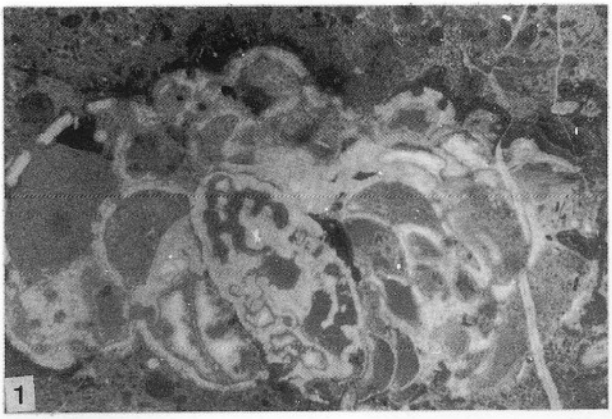
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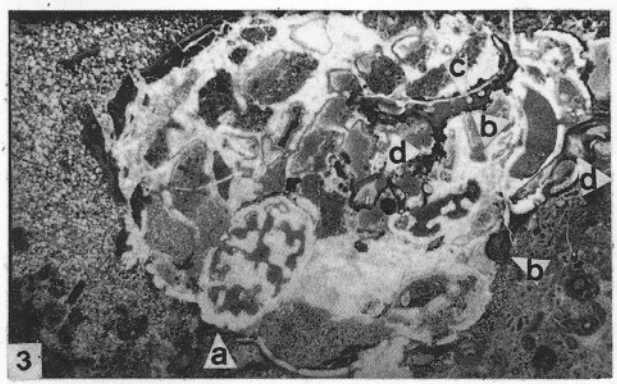

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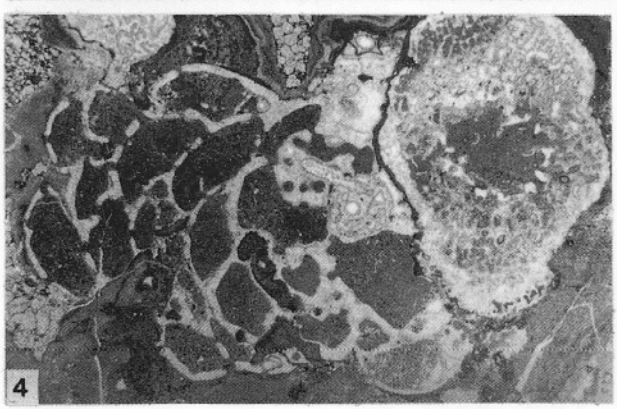
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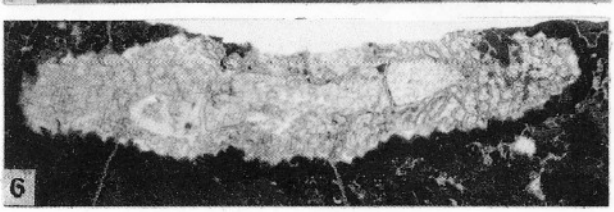
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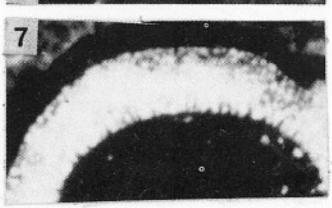
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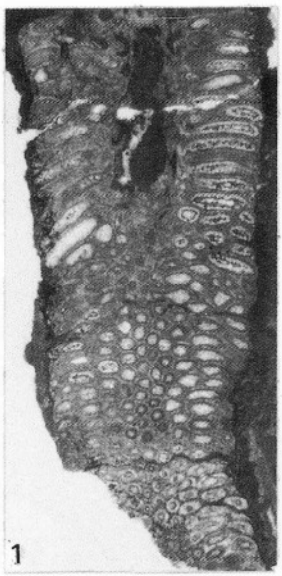
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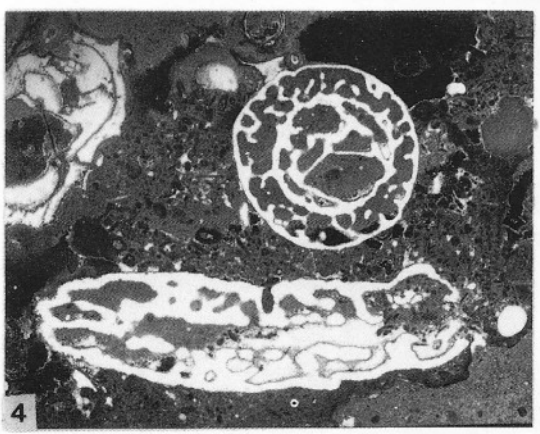
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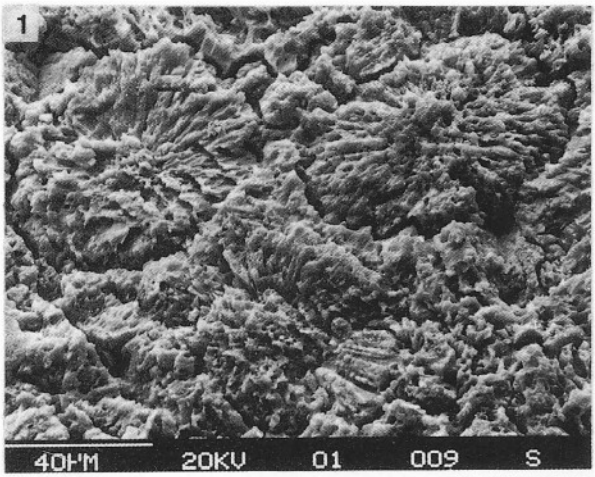
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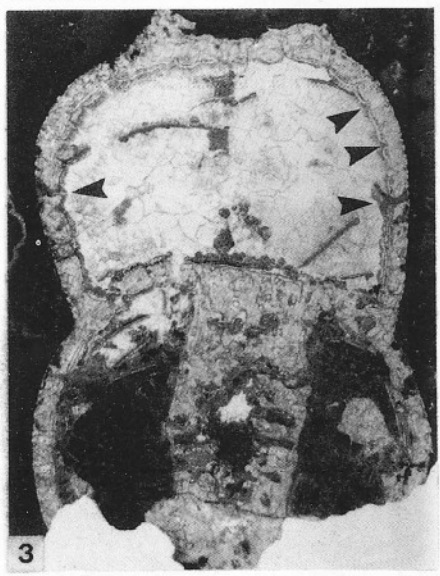
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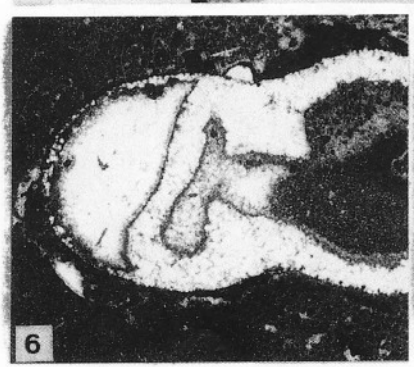
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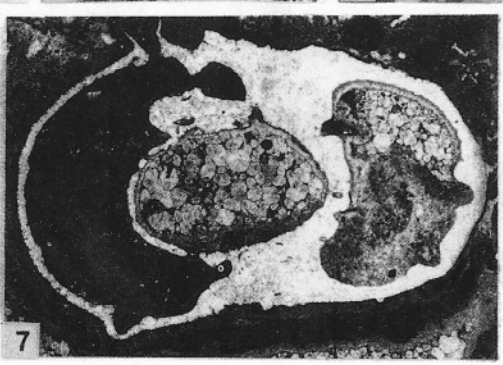
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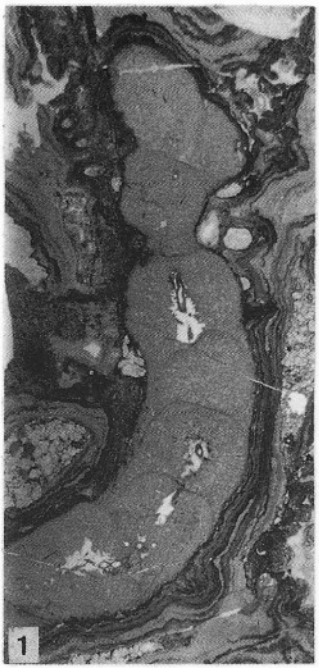
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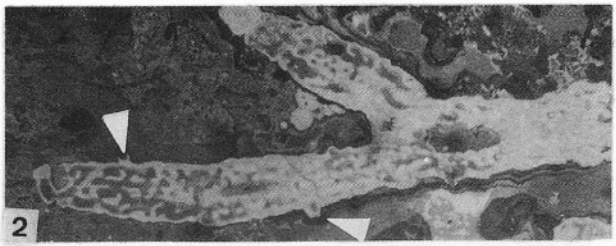
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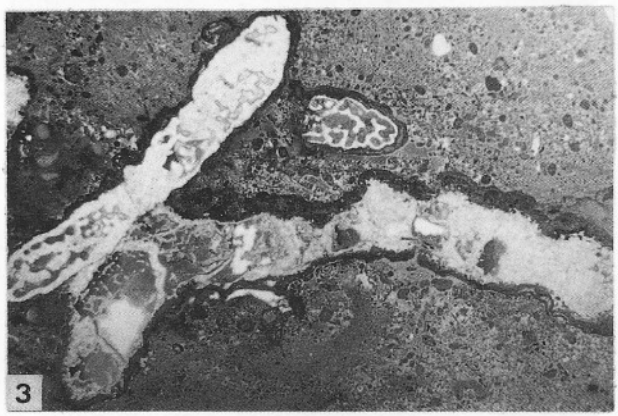
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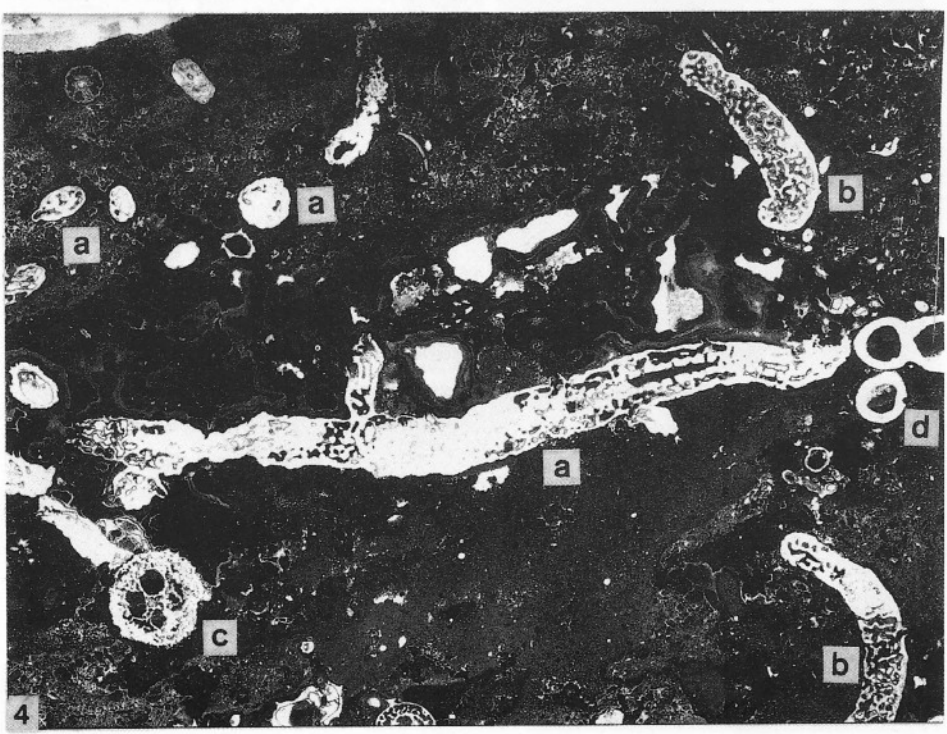
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