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CONTRIBUTION TO THE SYSTEMATICS AND PHYLOGENY OF AMPHIASTRAEINA (SCLERACTINIA)

Abstract. — Amphiastraeina are connected with their presumed ancestors, Permian Polycoeliidae, by a transitional link — Triassic corals of the family Pachythecalidae Cuif, 1975. During the early Jurassic they differendiated into a few phylogenetic lines and developed certain structural patterns of corallites homeomorphic with those of Rugosa, which had not been, however, recognized in their ancestral group (lonsdaleoid septa/dissepiments, gemmation). Four families are recognized: Amphiastraeidae Ogilvie, Donacosmiliidae Krasnov emend. Roniewicz, Carolastraeidae Eliášová, and Intersmiliidae Melnikova & Roniewicz, fam.n. The earliest Amphiastraeina are described from the ?Hettangian-Sinemurian through the Bajocian and the Callovian of South-East Pamir. One new genus, *Prodonacosmilia* Melnikova is distinguished.

INTRODUCTION

The present paper is an attempt to fill in the gap in the knowledge on Amphiastraeina, a diverse group of Mesozoic corals. Until recently amphiastraeinas were known, chiefly, from the Upper Jurassic of Europe. The palaeontological investigations carried out in the Pamir Mts contributed to the discovery of numerous findings of amphiastraeinas in the deposits of Sinemurian to Kimmeridgian age inclusively.

Peculiar characters of amphiastraeinas had been recognized already by Ogilvie (1897) who distinguished them as a separate family, while Alloiteau (1952) ranked them as a suborder. It should be mentioned, however, that at first the numerous group of amphiastraeinas included genera of remote phylogenetic relations. This was the reason for a great number of revisions (Alloiteau, 1957; Beauvais, 1970, 1974; Eliášová, 1974; Roniewicz, 1976).

The present knowledge on Mesozoic Scleractinians allows to introduce corrections into the noting of the suborder and to make an attempt of a new classification of its representatives as well as to define the main features of their phylogeny.

The present authors base their conclusions on their own studies including description of Jurassic amphiastraeinas of Central Asia (Melnikova,

present paper, the Sinemurian-Kimmeridgian of the Pamir), Europe (Roniewicz, 1966, 1976, the Oxfordian-Kimmeridgian of Poland and Rumania), as well as on new data obtained by other authors (Eliášová, 1974, 1975, 1976, the Tithonian of Czechoslovakia).

The palaeontological work on Jurassic amphiastraeinas of the Pamir published here has been done by G. K. Melnikova, while theoretical considerations were formulated as a result of the authors co-operation. Photographs of the Carpathian specimens of *Donacosmilia corallina* and *Prodonacosmilia* sp., as well as measurements and remarks on these specimens were contributed by dr. H. Eliášová (Ústředni Ústav Geologický, Prague).

The collections from the Pamir are housed in the Institute of Geology of the Academy of Sciences of the Tadzhikaya SSR, Dushanbe (abbrev. as IGD), the specimens from the Tithonian of the Carpathians — in the Ústředni Ústav Geologický, Prague (UUG), specimens of *Intersmilia irregularis* — at the University of Bucharest (UB), specimens of *Pleurophyllia trichotoma* and *Mitrodendron ogilviae* in the Palaeozoological Institute, Polish Academy of Sciences, Warsaw (ZPAL).

This paper owes much to discussions conducted in Dushanbe during the stay there of the second author. E. Roniewicz would like to express her sincere gratitude to the Institute of Geology of the Academy of Sciences of the Tadzhikskaya SSR for their hospitality and co-operation. Her special thanks are due to G. K. Melnikova for showing numerous collections of the Mesozoic Scleractinians of the Pamir, Afghanistan and Iran. Sincere thanks go to dr. J. Fedorowski (Laboratory of Palaeozology, University in Poznań) for the discussion concerning microstructure of the Polycoeliidae.

CHARACTERISTICS AND CLASSIFICATION OF AMPHIASTRAEINA

Among the Mesozoic Scleractinia amphiastraeinas are distinguished by a number of ancestral features. First of all, their septal apparatus is made of nonexsert septa often of lonsdaleoid or amplexoid type. The septal apparatus displays radial and/or bilateral symmetry. The endotheca is built, as a rule, of tabuloid dissepiments which peripherally often pass into a dissepimental zone. Traces of microstructure seem wall to indicate that the is composed of fascicles of fibers.

As the microstructure of the Jurassic Amphiastraeina is not preserved, the interpretation is accepted after the microstructure of the Triassic corals (see Cuif, 1975), which seems to have much in common with that of the Amphiastraeina. Wall and septal microstructure of Amphiastraeina are exemplified by *Mitrodendron ogilviae* Geyer and *Pleurophyllia trichotoma* de Fromentel from the Polish Kimmeridgian:

1. The wall is primary when compared to septa and in the distal part of the corallite is developed as thin tube (Roniewicz, 1966, text-fig. 13).

2. The wall develops in result of successive actions of skeletal secretion (pl. XXVIII, figs 1, 2), it is "multilamellar" as was assumed by Beauvais (1974).

3. Basic skeletal elements of the wall are subhorizontal or slightly downward oriented spines (pl. XXVIII, fig. 1b) which are also marked on the surface of lonsdaleoid dissepiments. They probably correspond to fascicles of fibers in representatives of Pachythecalidae Cuif, 1975. They were regarded as abortif septa in previous interpretation of wall structure (Eliášová, 1974, Roniewicz, 1976).

4. The size of fascicles of fibers in the examined representatives of the mentioned genera seems to be similar (pl. XXIX, figs 1, 4).

5. The corallite surface is covered with very thin pellicula (epitheca) which is rarely preserved (pl. XXIX, figs 2, 3).

6. Septa show strongly marked growth lines observable in longitudinal sections which are similar to those noted in *Pachythecalis major* Cuif (pl. XXVIII, figs 1b, 3).

7. A thin line, light or dark in colour, runs throught the middle of septum.

8. The wall to septa relation is not traceable but taking into consideration the above facts and analogies to Pachythecalidae Cuif, one may suppose that these two elements are independent. Thus, the sofar interpretations of the wall structure of Amphiastraeina (Alloiteau, 1957 — archeotheca; Eliášová, 1974 and Roniewicz, 1976 — septotheca) are erroneous.

Gemmation mainly of Taschenknospung-type (text-figs 1, 2) or lateral; the parricidal gemmation occurs. The colonies are distinguished by a low degree of individual integration. They are phaceloid (*Pleurophyllia*, *Mitrodendron*, etc.), cerioid (*Pleurostylina*) and pseudocerioid, with each individual having its own wall and the colony being divided into separate polygonal corallites (*Amphiastraea*).

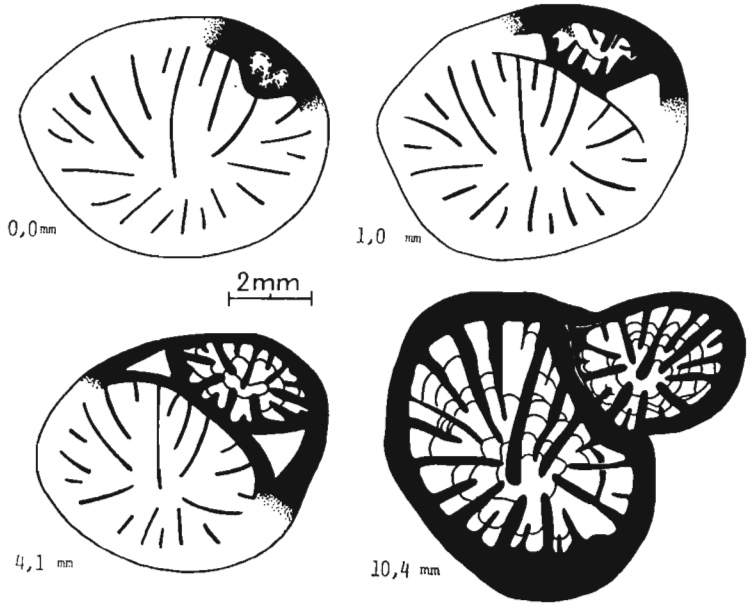

Fig. 1. *Pleurophyllia trichotoma* de Fromentel (ZPAL H. III). Blastogeny of the Taschenknospung-type demonstrated by a series of sections: interrelationships between parent and daughter corallite are visible. Septal apparatus of the parent corallite is marked schematically on the left and upper drawings.

In the Jurassic certain other scleractinians display some primitive characters (parricidal gemmation, formation of phaceloid colonies, etc.) but it is only in Amphiastraeina that these characters form an integrated ancestral complex.

Eliášová (1975) has limited the scope of the suborder of Amphiastraeina to the single family, Amphiastraeidae Ogilvie, 1897, emend. Eliášová 1975. Roniewicz (1976) has recognized among Amphiastraeina two families:

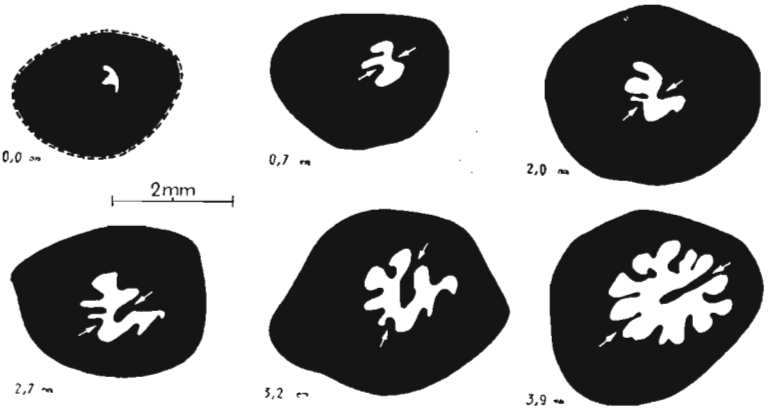

Fig. 2. *Pleurophyllia trichotoma* de Fromentel (ZPAL H. III). Organisation of the septal apparatus during the blastogeny of the Taschenknospung-type. All stages are shown in a series of slightly oblique sections of an individual; arrows mark the position of the cardinal-counter septa. Compare with the initial stages of the blastogeny in Carnian and Norian forms illustrated by Cuif (1974, text-fig. on p. 1754).

Amphiastraeidae Ogilvie emend. Eliášová (with genera: *Amphiastraea* Etallon, *Pleurostylina* de Fromentel, *Pleurophyllia* de Fromentel, *Cheilosmilia* Koby, *Mitrodendron* Quenstedt, *Aulastraea* Ogilvie, *Pseudopisthophyllum* Geyer, *Amphiaulastraea* Geyer, *Hykeliphyllum* Eliášová) and Donacosmiliidae Krasnov, 1970, emend. Roniewicz (with genera: *Donacosmilia* de Fromentel, *Parepismilia* Beauvais and *Cylindrosmilia* Roniewicz), characterized by the type of symmetry of the septal apparatus and the pattern of gemmation. The first of the above families is distinguished by a bilateral symmetry expressed in a stronger development of one major septum or a group of septa — as well as in a parricidal gemmation. Indicative of the second family are the radial symmetry of the septal apparatus and a lateral gemmation. Both families are related by the presence of lonsdaleoid septa and by a certain tendency of endotheca towards a two-zonal structure with its central part filled with large tabuloid dissepiments and the marginal one crowded by vesicular dissepiments. Eliášová (1976) has recognized a third family, Carolastraeidae, embracing the genera characterized by a bilateral symmetry, tabular endotheca and lateral gemmation. The family comprises one genus, *Carolastraea* Eliášová, 1976.

The present authors believe it necessary to distinguish still another new family, Intersmiliidae, with a single genus *Intersmilia* Eliášová, 1974. The family in question has the septal apparatus with a radial symmetry, a subtabular endotheca and a gemmation of lateral and parricidal types. All these features as well as character of microstructure of septa (fine medial line) and wall allow to class the family Intersmiliidae nov. within the suborder Amphiastraeina Alloiteau, 1952. It is most closely related to Donacosmiliidae Roniewicz, 1976 and Carolastraeidae Eliášová, 1976, differing from the former in the lack of lonsdaleoid septa/dissepiments and from the latter — in having exclusively a radial symmetry.

OUTLINE OF PHYLOGENY OF AMPHIASTRAEINA

Amphiastraeina occupy a specific position among Scleractinia by their morphology and phylogeny. They stand out from all known Jurassic and younger scleractinians thanks to a number of features, such as formation of amplexoid and lonsdaleoid septa or peculiar bilateral arrangement of septa, combined with a cyclic appearance of metasepta. These latter are in certain cases reduced in the zones of arrested growth (Roniewicz, 1966). All the above characters make Amphiastraeina similar to Rugosa.

These resemblances tempted various authors to include Amphiastraeina directly into Rugosa (Koby, 1882—1889), or to look for a more distant relation between the former and Zaphrentidae (Ogilvie, 1897) or Lonsdaleidae (Alloiteau, 1957). Another opinion was postulated by Beauvais (1970) who believes that the above resemblances are due to convergence only. The present authors have a similar point of view but not without limitations. They consider that the resemblance between Amphiastraeina and the above mentioned groups of Rugosa actually have the nature of convergence which does not exclude, however, a phylogenetic relationship between the former and some other families of Rugosa. Polycoelids are such a group of Rugosa which attracted the attention of Schindewolf (1942) and later Iljina (1965) by their stratigraphic position and morphological features, in many ways, transient to scleractinians. They are undoubtedly related to Amphiastraeina, no matter what their relation to the other Scleractinia may be.

The new data, obtained from the vast territory extending from the Alps to Pamir (Cuif, 1974, 1975; Montanaro-Gallitelli, 1975; Melnikova, 1975) indicate that in the Upper Triassic of the Tethys basin there exists a group of corals with many characters resembling Polycoeliidae as well as some Amphiastraeina. These corals ("*Protoheterastraea leonhardi*" described by Montanaro-Gallitelli *op.c.*, *Pachydendron microthallos* Cuif, 1975 and *Quenstedtiphyllia* Melnikova, 1975) have a tabular endotheca, bilateral septal apparatus with protosepta formed in a similar way to those in Rugosa and a peculiar fibrose structure of the wall (Cuif, *op.c.*). As compared to Polycoeliidae the above corals are distinguished by a new trait, namely,

the ability for gemmation which is of a mural, extracalicinal type. Thus, the group of corals in question, Pachythecalidae Cuif, 1975 can be reasonably recognized as transient between Polycoeliidae and Amphiastraeina.

The similarities displayed by these three groups in their microstructure of septa and wall are still a matter of debate. Judging from the vestiges, the microstructure in the Amphiastraeina resembles that in the Pachythecaliidae (see p. 99). Furthermore, the Pachythecaliidae and the Polycoeliidae are similar in this aspect as it is shown on Schindewolf's (1924) and Iljina's (1965) illustrations representing the microstructure in the Polycoeliidae and that of Cuif (1975) refering to the Pachythecaliidae. These authors, however, presented contadictory interpretations of the microstructure: Schindewolf and Cuif considered it as nontrabecular, while Iljina advocates the trabecular character of this structure.

In Fedorowski's (1974) opinion Schindewolf erroneously based his interpretation of "diffus- trabecular" type of microstructure on thin sections parallet to medial line and not on the medial section, which is the only one considered to be valuable criterion in the matter of microstructure. Thus the differences in conclusions might have been the result of a misunderstanding.

According to the data presented here by the first of authors, at least three phylogenetic lines branched off this pre-amphiastraeid group within the Lower Lias. The first of them were Carolastraeidae, a group recorded actually not before the Callovian, but related closely to the pre-amphiastraeid Triassic forms and suspected already in the Lias. Their similarities with the Triassic forms in their septal arrangement, structure of endotheca, and to a great extent, in the pattern of gemmation persist without major changes until the uppermost Jurassic (see Eliášová, 1975). The Jurassic genus is little known sofar but it cannot be excluded that it is a relict of the Triassic family Pachythecalidae. Representatives of the two remaining phylogenetic lines, Intersmiliidae and Donacosmiliidae, appear simultaneously in the Sinemurian. Throughout the Jurassic the intersmiliids undergo no changes. The Donacosmiliidae, in their turn, developed from the ancestral type with amplexoidal septa (*Prodonacosmilia* Melnikova gen.n., Sinemurian-Tithonian) into an advanced one having vertically continuous septa (*Cylindrosmilia* Roniewicz, 1976, Callovian-Kimmeridgian; *Donacosmilia* de Fromentel, 1861, Oxfordian-Tithonian) (text-fig. 3).

The youngest line seems to be that of Amphiastraeidae, which is known from the Oxfordian to the Lower Cretaceous. In early stages of its phylogeny corresponding, probably, to the Doggerian, this line must have been represented by the forms resembling *Pleurophyllia* de Fromentel, which in the arrangement of the septal apparatus are similar to the pre-amphiastraeidal phase. Amphiastraeidae were the only to acquire the ability of gemmation of Taschenknospung-type. Since the Oxfordian a strong differentiation at the generic level begins within this line to attain a peak in the Tithonian (see Eliášová, 1975). In Amphiastraeidae (*Pleurophyllia trichotoma*, text-fig. 1, 2; *Amphiastraea basaltiformis* — Koby, 1888, pl. 115, fig. 1) a certain resemblance is observed in the mode of the protosepta formation to that of the Triassic pachythecalids (see Cuif, 1975).

Similarities in the development of septal apparatus in *Intersmilia* and the young stage of *Prodonacosmilia* as well as the radial arrangement of septa and the lateral budding are indicative of a close affinity between the intersmiliids and donacosmiliids. A transient link connecting the latter with Amphiastraeidae are carolastreids. They combine certain characters of

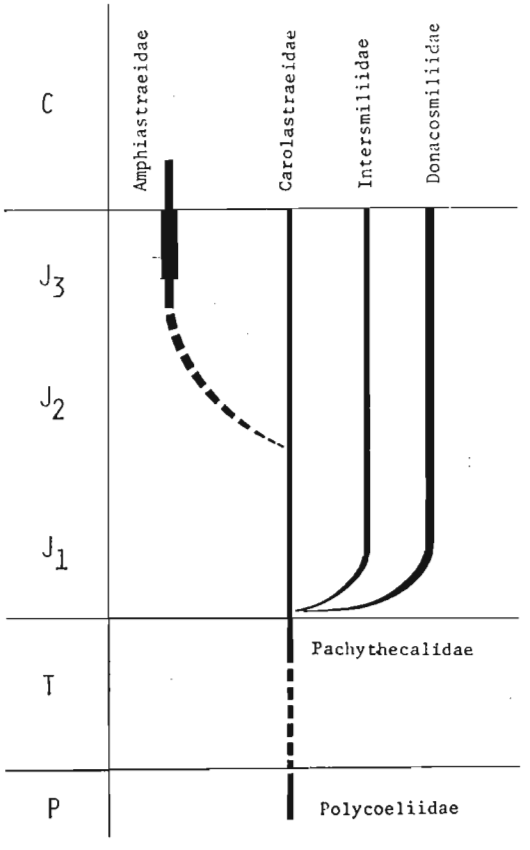

Fig. 3. Phylogeny of Amphiastraeina.

intersmiliids (endotheca and gemmation) on the one hand, and those of Amphiastraeidae (septal arrangement) on the other. This intermediate position of carolastreids with their relation to the Triassic forms allow to place them in the centre of the family tree of Amphiastraeina.

It is worth mentioning that both Intersmiliidae and Carolastraeidae, of a most primitive structure, display only a very small adaptive radiation each being represented throughout the Jurassic by one genus. Much more differentiated were Donacosmiliidae (three genera), the most variable being Amphiastraeidae distinguished by an equally strong generic (seven genera) and specific differentiation and occuring as a common and abundant component of coral assemblages.

The data presented indicate that Amphiastraeina have some conservative features, not all of them, however, being inherited from their tetracoral ancestors. They are the only corals which transferred unaltered through the Permian/Triassic boundary some features of late Rugosa (septal arrangement and tabular endotheca in some genera). During the Jurassic they subsequently developed certain structural patterns of corallites, homeomorphic with those in Rugosa, which had not been, however, recognized in their presumed ancestral group, Polycoeliidae (lonsdaleoid septa/dissepiments, gemmation).

The structural changes in this group are negligible as compared to the majority of Scleractinia. They are comparable with those attained by Stylophyllidae or Conophyllidae. These groups underwent evolutionary changes on quite a different level than in the majority of Scleractinia. In the latter case the structural patterns were basically reorganized during the early stages of phylogeny.

An interesting point for discussion is the ability of Amphiastraeina to compete with other scleractinians representing a modern structural pattern of corallites. The differentiation of Amphiastraeina is chiefly due to various modes of extratentacular gemmation (the intratentacular gemmation, here represented as the parricidal one, plays no part in the colony formation, being though, when present, quite a common case in the colony). Such a type of gemmation produces, first of all, the colonies of phaceloid type, this being a basic form of colonies in the suborder in question.

It seems quite probable that a certain coincidence between an easy formation of such colonies and a selective superiority of this type of colonies in the Upper Jurassic environment (Roniewicz, 1976) resulted in a high compatibility of Amphiastraeina in respect to modern scleractinians.

SYSTEMATIC DESCRIPTIONS

Family **Intersmiliidae** Melnikova & Roniewicz fam.n.

Diagnosis. — Radial elements of septal type, septal arrangement radial, microstructure (?) non-trabecular, endotheca tabuloid, wall septothecal; gemmation lateral and parricidal with the septa of mother individual continued into the daughter one.

Scope of family. — *Intersmilia* Eliášová, 1974.

Distribution. — Lias-Tithonian, Eurasia.

Genus *Intersmilia* Eliášová, 1974

Type species: *I. malevola* Eliášová, 1974.

Intersmilia Eliášová, 1974 is characterized besides a lateral gemmation by a multiple parricidal one, like in *Mitrodendron* (Amphiastraeidae). In contrast to the latter

the septal apparatus of daughter corallites in *Intersmilia* appears on the extension of the radial elements of the parent individual (text-fig. 4).

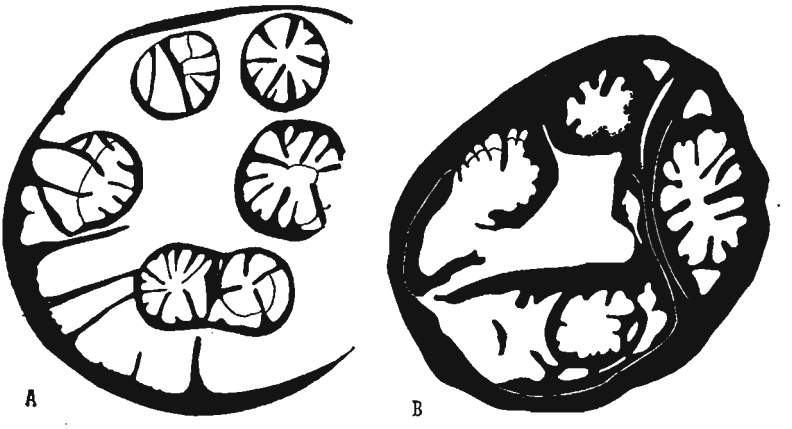

Fig. 4. Parricidal budding observed in the distal part of corallites in *A. Intersmilia irregularis* Roniewicz (Lower Kimmeridgian, UB 334 m) and *B. Mitrodendron ogilviae* Geyer (Lower Kimmeridgian, ZPAL H. III/110). In *I. irregularis* septal apparatus of the daughter corallite is based on the septal apparatus of the parent individual. In *M. ogilviae* septal apparatus in the distal part of an adult corallite is lacking, parricidal individuals being based on the endothecal elements (the right individual is formed by Taschenknospung).

Intersmilia djartyrabatica Melnikova, sp.n.
(pl. XXIV, figs 2—4)

Type specimen: IGD 510/3586; Pl. XXIV, fig. 2.
Type horizon: Sinemurian, Ghurumdinskaya member.
Type locality: SE Pamir, Djarty-Rabat Mt.
Derivation of the name: from the type-locality.
Diagnosis. — Diameter reaching up to 12 mm, number of septa — up to 24.
Material. — Ten fragments of colonies.

Dimensions (in mm):

d	s	e [1]
10—12	18—22	4—7/10

Description. — Colonies phaceloid, gemmation lateral. Septa smooth, wedge-like, differentiated in 3 incomplete cycles. In young individuals there are 5—6 septa at a diameter of 3—5 mm and 9—14 septa at 6—7 mm. Endotheca composed of complete tabulae in young individuals and of large, tabuloid, concave dissepiments in adult. Wall is 0.5 mm — 1.0 mm thick.

Remarks. — This species, resembling *I. primitiva* in diameter of corallites, differs from it in a greater number of septa and in its heterogenous endotheca.

Occurrence. — SE Pamir, Alitshurskaya Dolina, Djarty-Rabat Mt.: ?Hettangian-Sinemurian.

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1) d — diameter of corallite, s — number of septa, e — number of endothecal elements on 10 mm, in longitudinal section.

Intersmilia primitiva Melnikova, sp.n.
(pl. XXIV, fig. 1)

Type specimen: IGD 510/I—XIII; Pl. XXIV, fig. 1.
Type horizon: Middle Callovian, Koltshakskaya member.
Type locality: SE Pamir, Koltshak Mt.
Derivation of the name: from the simple morphology of corallite.
Diagnosis. — Diameter reaching up to 13 mm, number of septa — up to 14; endotheca tabular.
Material. — Three fragments of colonies.

Dimensions (in mm):

d	s	e
10—13	12—14	6—7/10

Description. — Colonies branching, budding lateral. In young individuals there are 6—9 septa at the diameter of 3—7 mm. Septa smooth, thin, wedge-like, differentiated in 2—3 cycles, the longest reaching up to half the radius in length. Endotheca composed of complete subhorizontal tabulae. Wall is 0.5 mm thick.

Remarks. — Adult individuals resemble immature corallites of the Sinemurian *I. djartyrabatica* sp.n. (see p. 105). From the other Callovian species it differs in a low number of septa and in tabular endotheca.

Occurrence. — SE Pamir, Kuntej saj, Koltshak Mt.: Middle Callovian.

Intersmilia kunteica Melnikova, sp.n.
(pl. XXV, fig. 4)

Type specimen: IGD 510/XLIV; Pl. XXV, fig. 4.
Type horizon: Middle Callovian, Koltshakskaya member.
Type locality: SE Pamjr, Kuntej saj, Koltshak Mt.
Derivation of the name: from the type-locality.

Diagnosis. — Diameter reaching up to 13 mm, number of septa — up to 40.
Material. — Fifteen fragments of colonies.

Dimensions (in mm):

d	s	e
10—13	32—40	7—10/10

Description. — Colonies phaceloid, gemmation lateral. Immature, just individualised corallites are 5—6 mm in diameter. Septa differentiated in 4 incomplete cycles; 12 are long, rhopaloid, 12 of the 3rd cycle attain 1/3 to 1/2 of the longest septa in length; septa of the 4th cycle are very short. Endotheca composed of large, subhorizontal dissepiments. Wall is 0.5 mm — 0.7 mm thick.

Remarks. — The species differs from *I. djartyrabatica* sp.n. in a greater number of septa and in denser endotheca.

Occurrence. — SE Pamir, Kuntej saj: Middle Callovian.

?*Intersmilia* sp.
(pl. XXV, fig. 3)

Material. — One specimen.

Dimensions (in mm):

d	s	d
15	36	5/10

Description. — Corallite cylindrical. Septa developed in 4 incomplete cycles, arranged in 7 systems. The longest septa meet in the axial area, septa of the 2nd cycle are slightly shorter, septa of the 3rd cycle reaching up to half and septa of the 4th cycle up to 1/4 of the 1st cycle septa in length. Endotheca composed of large, mostly vesicular dissepiments, slightly sloping downwards axially. Wall is 0.3—0.5 mm thick.

Remarks. — This long corallite is supposed to be a fragment of a phaceloid colony. This form differs from *I. kunteica* in vesicular elements occurring in endotheca.

Occurrence. — SE Pamir, Kuntej saj, Koltshak Mt: Middle Callovian, Koltshakskaya member.

Family **Donacosmiliidae** Krasnov, 1970 emend. Roniewicz, 1976
Genus *Prodonacosmilia* Melnikowa, gen. n.

Type species: *P. dronovi* sp.n.

Derivation of the name: Gr. *pro* — before and *Donacosmilia* — a genus which appeared before the genus *Donacosmilia* de Fromentel.

Diagnosis. — Colony phaceloid, gemmation lateral. Symmetry radial. Septa vertically discontinuous. Endotheca composed of large dissepiments in the peripheral part lonsdaleoid in caracter, tabuloid in axial part. Parietal columella.

Species assigned: *P. dronovi* sp.n., *Prodonacosmilia* sp.

Remarks. — This genus differs from the genus *Donacosmilia* de Fromentel in its septa continuous axially and peripherally, but periaxially amplexoid.

Occurrence. — Eurasia, Sinemurian-Tithonian.

Prodonacosmilia dronovi Melnikova, sp.n.
(pl. XXVI, fig. 1, text-fig. 5)

Type specimen: IGD 510/22154; Pl. XXVI, fig. 1.

Type horizon: Sinemurian, Churumdinskaya member.

Type locality: SE Pamir, mouth of Djangi-davan saj.

Derivation of the name: in honour of geologist W. I. Dronov, who conducted research work in the Pamir, and who collected the first specimens of this species.

Diagnosis. — Diameter of corallites reaching up to 12 mm; septal apparatus composed of about 30 well developed septa; density of endotheca in axial part is 6—7/10 mm.

Material. — Three fragments of colonies.

Dimensions (in mm):

d	s	e
8—12	28—30	6—7/10

Description. — Colony phaceloid, corallites subparallel, gemmation lateral. In mature corallites, septa are developed in form of low ridges on the upper surface of the endothecal elements, only in the mural and axial parts they are vertically continuous. The longest septa meet axially to form a parietal columella. In young individuals, there are 6—14 vertically continuous septa at the diameter of 3—5 mm, and endotheca tabular. With the growth of individual, at diameter of 6—7 mm, a peripheral zone of lonsdaleoid dissepiments develops. It occupies about one-third of diameter in adult corallites. Dissepiments, tabuloid and subhorizontal in the axial part, are mostly vesicular and steeply sloping downwards in the peripheral part. Wall very thin.

Occurrence. — SE Pamir, mouth of Djangi-davan saj: ?Hettangian-Sinemurian.

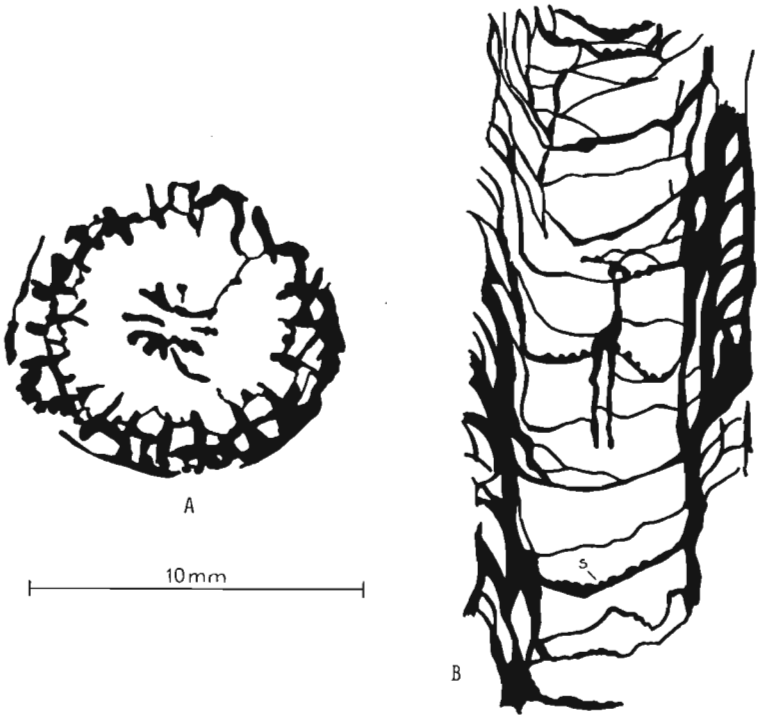

Fig. 5. *Prodonacosmilia dronovi* Melnikova, gen.n., sp.n. Holotype, IGD 510/22154. *A* cross and *B* longitudinal sections. Discontinued vertically septa, developed on the upper surface of endothecal elements are visible (*s*).

Prodonacosmilia sp.
(pl. XXVI, fig. 2, 3)

Material. — One fragmentary colony.

Dimensions (in mm):

d	s (in centrum)
4—14	18

Description. — Colony phaceloid. Lonsdaleoid dissepiments are large. Septa are very thin in their axial part. Wall often thickened.

Occurrence. — West Carpathians, Štramberk: Tithonian.

Genus *Donacosmilia* de Fromentel, 1861

Type species: *D. corallina* de Fromentel, 1861

Donacosmilia corallina de Fromentel, 1861
(pl. XXVII, figs 1—3; text-fig. 6)

1851. *Donacosmilia corallina* de Fromentel: p. 146.
1957. *Donacosmilia corallina* de Fromentel; Alloiteau, p. 366, pl. 14, fig. 4; pl. 15, fig. 8; pl. 17, fig. 2.
1964. *Donacosmilia corallina* de Fromentel; Beauvais, p. 203.
1974. *Donacosmilia coralina* de Fromentel; Beauvais, pl. 2, fig. 4; pl. 3, fig. 2; pl. 4, fig. 1.

Material. — 27 fragments of colonies from the Pamir and a few colonies from the West Carpathians.

Fig. 6. *Donacosmilia corallina* de Fromentel. UUG 18895, Štramberk, Tithonian, ×4,5. Cross section showing specimens without lonsdaleoid dissepiments (compare pl. XXVII, fig. 1)

Dimensions (in mm):

d	s	e
10—14	26—36	4—6/10

Remarks. — Holotype (Alloiteau, 1957, pl. 17, fig. 2) and specimens from the Pamir and from the Carpathians do not show any bilaterality in arrangement of septa. Septal apparatus ir radial, not bilateral as estimated by Alloiteau (*op.c.*).

About 30 septa (1st, 2nd and incomplete 3rd cycles) extend to the axial cavity, the longest meet in centrum. Gemmation lateral.

Occurrence. — SE Pamir, Najza-Tash Pass: Kimmeridgian. France: Oxfordian. West Carpathians: Tithonian.

Genus *Cylindrosmilia* Roniewicz, 1976

Type species: *C. cylindrata* Roniewicz, 1976

Cylindrosmilia bulini Melnikova sp.n.
(pl. XXV, fig. 1, 2)

Type specimen: IGD 510/1562; Pl. XXV, fig. 2.
Type horizon: Bajocian.
Type locality: SE Pamir, Alitshurskaya Dolina.
Derivation of the name: in honour of W.P. Bulin, who has collected specimens of this species.
Diagnosis. — Simple short corallites of d:h near 1; symmetry hexameral, calice of 20 mm in diameter; number of septa about 35.
Material. — Three specimens.

Dimensions (in mm):

h	d	s
15—20	20	30—36

Description. — Corallites almost spherical. Septa in 4 incomplete cycles. Septa of the 1st and 2nd cycle, 12 in number, thick and extended to the axis, septa of the 3rd and 4th cycles are often vertically discontinuous in the perimural zone, developed as lonsdaleoid septa. Endothecal elements, tabuloid in the central part and large lonsdaleoid in the peripheral part. Wall thin.
Occurrence. — SE Pamir, Alitchurskaya Dolina: Bajocian.

Family **Carolastraeidae** Eliášová, 1976
Genus *Carolastraea* Eliášová, 1976

Type species: *C. fraji* Eliášová, 1976.

Carolastraea sp.
(pl. XXVII, fig. 4)

Material. — One fragment.

Dimensions (in mm):

2,5—3,5	14—18
d	s

Description. — Colony branching, gemmation lateral. Septal apparatus bilateral, cardinal septum the longest of all. Endotheca composed of scarce, horizontal tabulae.
Remarks. — This species resembles in diameter the Tithonian species, *C. fraji* Eliášová, from the West Carpathians.
Occurrence. — SE Pamir, Kuntej saj, Koltshak Mt: Middle Callovian, Koltshakskaya member.

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UWAGI O SYSTEMATYCE I FILOGENEZIE AMPHIASTRAEINA (SCLERACTINIA)

Streszczenie

Amphiastraeina są połączone ze swymi przypuszczalnymi przodkami, permskimi Polycoeliidae, za pośrednictwem ogniwa pośredniego, jakim są triasowe korale z rodziny Pachythecalidae Cuif, 1975. Podczas wczesnej jury Amphiastraeina uległy zróżnicowaniu na kilka linii filogenetycznych i wytworzyły pewne struktury, homomorficzne z Rugosa, lecz nieswoiste dla grupy wyjściowej (lonsdaleoidalne septa/dysepimenta, pączkowanie). Wyróżniono 4 rodziny: Amphiastraeidae Ogilvie, 1897, Donacosmiliidae Krasnov, 1970 emend. Roniewicz, 1976, Carolastraeidae Eliášová, 1976 i Intersmillidae Melnikova i Ronjewicz, fam.n., z których Carolastraeidae wydają się zajmować wyjściowe położenie wobec pozostałych. Opisano z SE Pamiru najwcześniejsze znane Amphiastraeina, poczynając od form z ?hettangu-sinemuru, przez bajoskie i kelowejskie. Wyróżniono nowy rodzaj, *Prodonacosmilia* Melnikova.

ГАЛИНА К. МЕЛЬНИКОВА & ЭВА РОНЕВИЧ

ПРИМЕЧАНИЯ НА ТЕМУ СИСТЕМАТИКИ И ФИЛОГЕНЕЗА AMPHIASTRAEINA (SCLERACTINIA)

Резюме

Amphiastraeina соединяются со своими предполагаемыми предками — пермскими Polycoeliidae посредством промежуточного звена, которым являются триасовые кораллы из семейства Pachythecalidae Cuif, 1975. В ранней юре Amphiastraeina подверглись дифференциации на несколько филогенетических линий и развили некоторые структуры, гомоморфные с Rugosa однако не свойственные исходной группе (лонсдалеоидные септы/диссепименты, почкование). Выделены четыре семейства: Amphiastraeidae Ogilvie, 1897, Donacosmiliidae Krasnov, 1970 emend. Roniewicz, 1976, Carolastraeidae Eliášová, 1976 и Intersmiliidae Melnikova & Roniewicz, fam. n., среди которых Carolostraeidae занимают очевидно исходное положение по отношению к остальным. Описаны по юго-восточной части Памира самые ранние известные Amphiastraeina начиная с форм ?геттанжа-синемюра, по байосские и келловейские формы. Определен новый род *Prodonacosmilia* Melnikova.

EXPLANATION OF PLATES

Plate XXIV

Intersmilia primitiva Melnikova, sp.n.
Middle Callovian, SE Pamir, Koltshak Mt.

Fig. 1. *a* cross section; *b* longitudinal section; ×3. Holotype, IGD 510/I—XIII.

Intersmilia djartyrabatica Melnikova sp.n.
?Hettangian-Sinemurian, SE Pamir, Djarty-Rabat Mt.

Fig. 2. Cross section, ×3. Holotype, IGD 510/3586.
Fig. 3. Cross section, ×3. IGD 510/3585.
Fig. 4. Longitudinal section, ×5. IGD 510/3592.

Plate XXV

Cylindrosmilia bulini Melnikova sp.n.
Bajocian, SE Pamir, Alitshurskaya Dolina

Fig. 1. Cross section, ×3. IGD 510/1649/g.
Fig. 2. Coss section, ×3. Holotype, IGD 510/1562.

?*Intersmilia* sp.
Middle Callovian, SE Pamir, Koltshak Mt.

Fig. 3. *a* cross section; *b* longitudinal section; ×3. IGD 510/Iф—XIII.

Intersmilia kunteica Melnikova sp.n.
Middle Callovian, SE Pamir, Koltshak Mt.

Fig. 4. *a* cross section, ×3; *b* cross section, ×5; *c* longitudinal section, ×5. Holotype. IGD 510/XLIV.

Plate XXVI

Prodonacosmilia dronovi Melnikova, gen.n. sp.n.
?Hettangian-Sinemurian, SE Pamir, Djanghi-Davan saj

Fig. 1. *a* cross section; *b* longitudinal section; ×3. Holotype, IGD 510/22154.

Prodonacosmilia sp.
Tithonian, W Carpatians, Štramberk

Fig. 2. Cross section, ×6. UUG 65133.
Fig. 3. Cross section, ×5. UUG 18885.

Plate XXVII

Donacosmilia corallina de Fromentel, 1861

Figs 1, 2. Cross- and longitudinal sections, ×3. IGD 500/51, 52. Kimmeridgian, SE Pamir, Najza-Tash Pass.
Fig. 3. Longitudinal section, ×3. UUG 18896. Tithonian, W Carpathians, Štramberk.

Carolastraea sp.
Middle Callovian, SE Pamir, Koltshak Mt.

Fig. 4. *a* cross section, ×5; *b* longitudinal section, ×10. IGD 510/I—XIII m.

Plate XXVIII

Mitrodendron ogilviae Geyer, 1955
Świętokrzyskie Mts, Poland, Lower Kimmeridgian

Fig. 1. *a* longitudinal section showing the successive growth zones of wall, ×3, *b* fragment magnified ×14. ZPAL H. III/110. *bc* rudiments of calicular border, *ff* fascicles of fibers.

Pleurophyllia trichotoma de Fromentel, 1856
Świętokrzyskie Mts, Poland, Lower Kimmeridgian, all corallites of the colony No. ZPAL H. III/102.

Fig. 2. Longitudinal section showing the growth lines in the wall, ×14.
Fig. 3. Tangential section of septum, ×8.

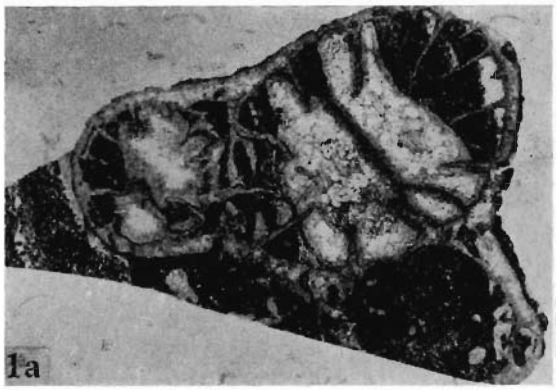
Plate XXIX

Pleurophyllia cara Eliášová, 1974
Dobrogea, Rumania, Lower Kimmeridgian

Fig. 1. Cross section showing micritised centers of fascicles of fibers (*cff*), ×15 (compare with Cuif, 1975, text-fig. 6*b*). UB 279.

Mitrodendron ogilviae Geyer, 1955
Świętokrzyskie Mts, Poland, Lower Kimmeridgian, all corallites of the colony No. ZPAL H. III/110

Figs 2, 3. Thin pellicula (*pe*) preserved between the corallites which touch each other, ×15.
Fig. 4. Fascicles of fibers (*ff*) in the corallite wall, ×20.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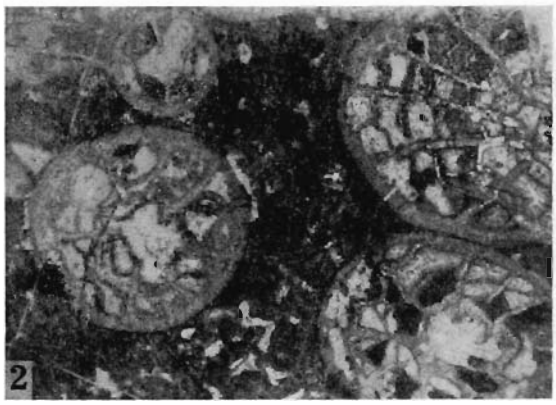
1b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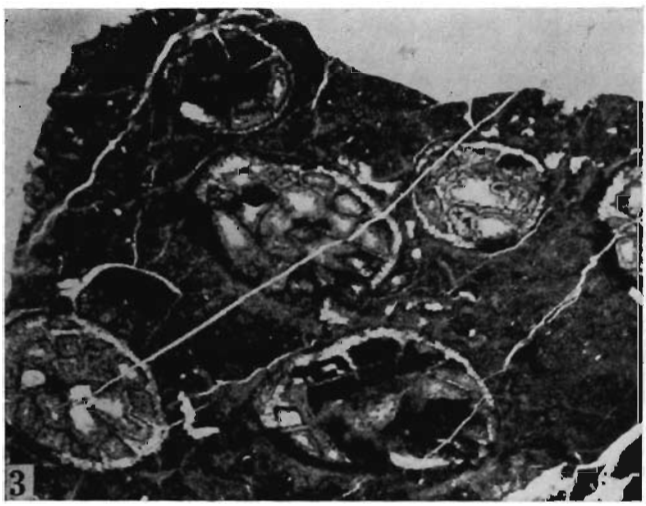
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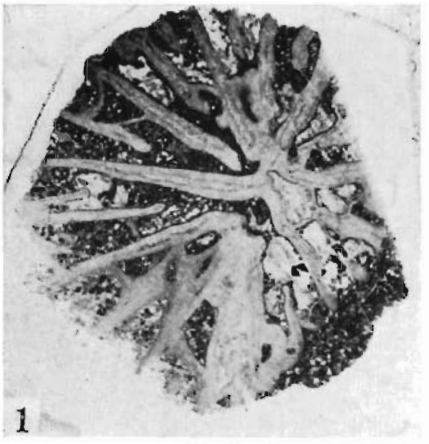
4

Phot. E. Mulawa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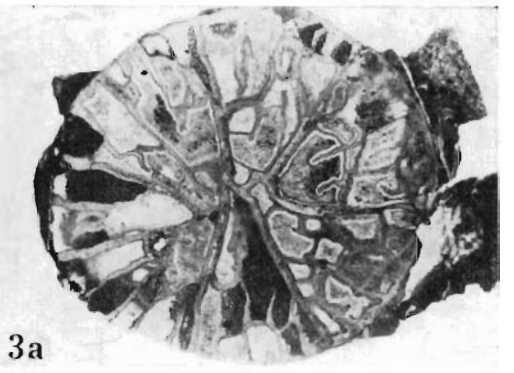
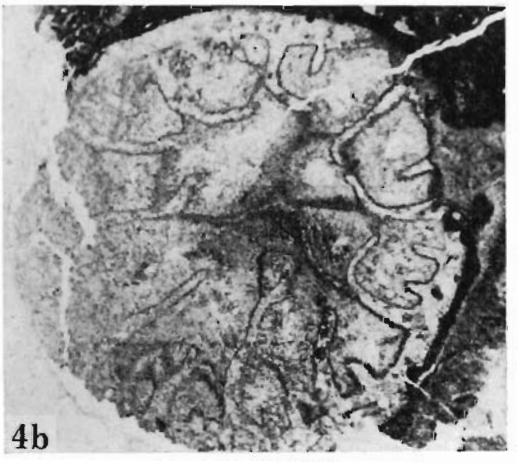

3a


3b


2


4a


4c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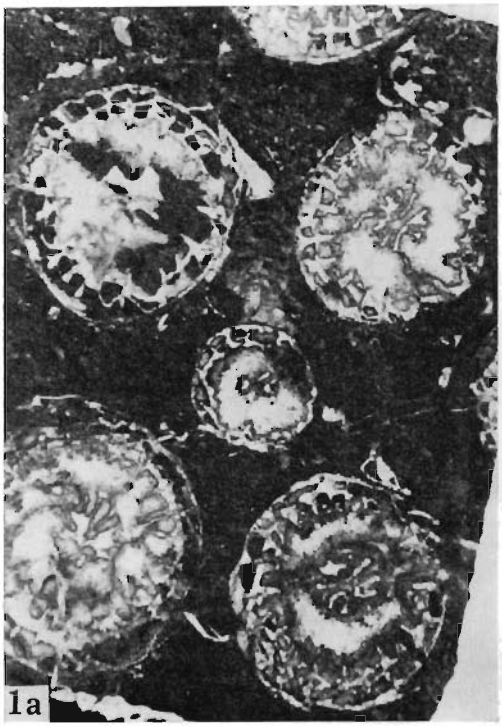
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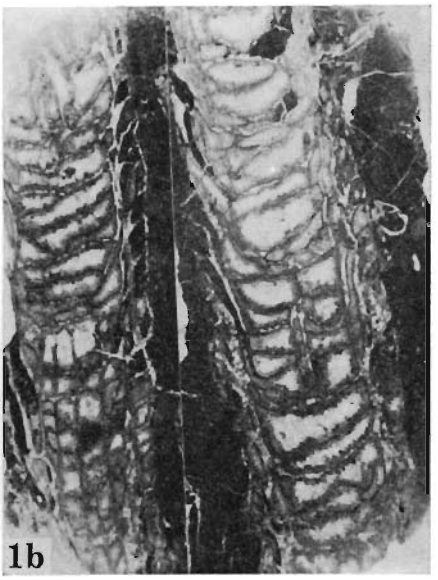
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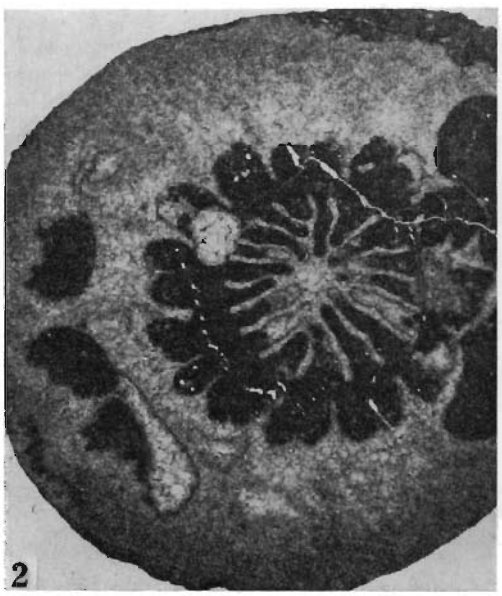
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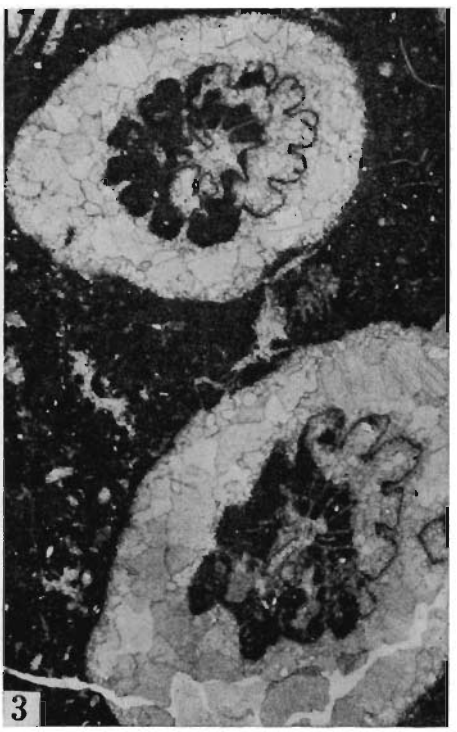
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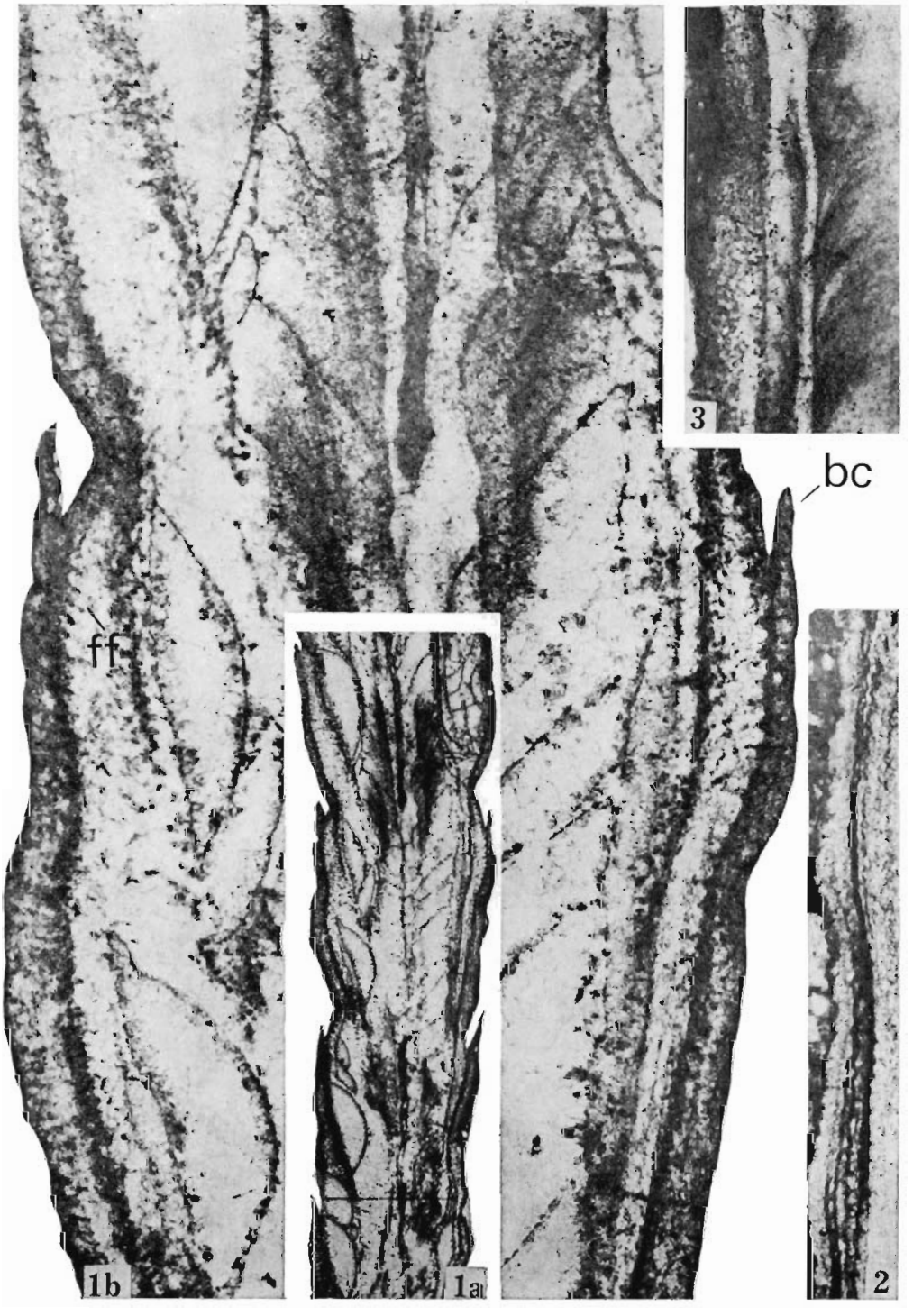

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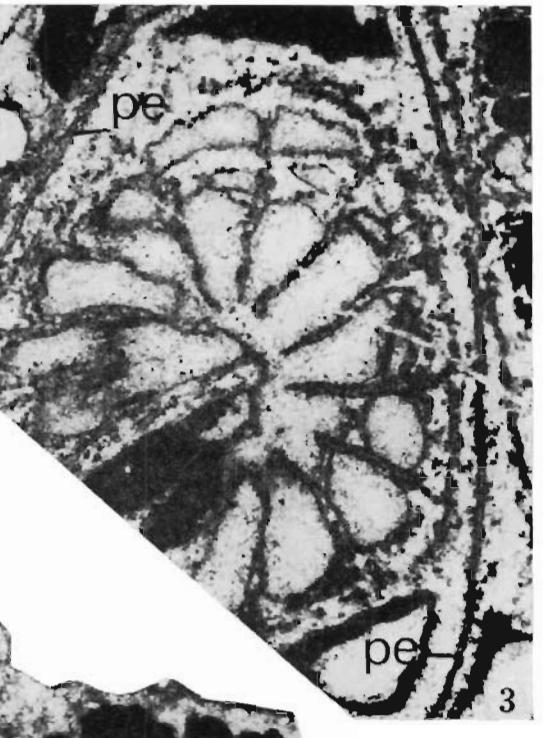

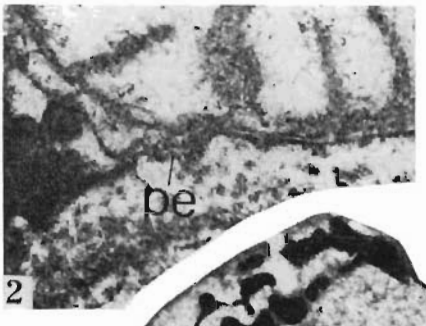

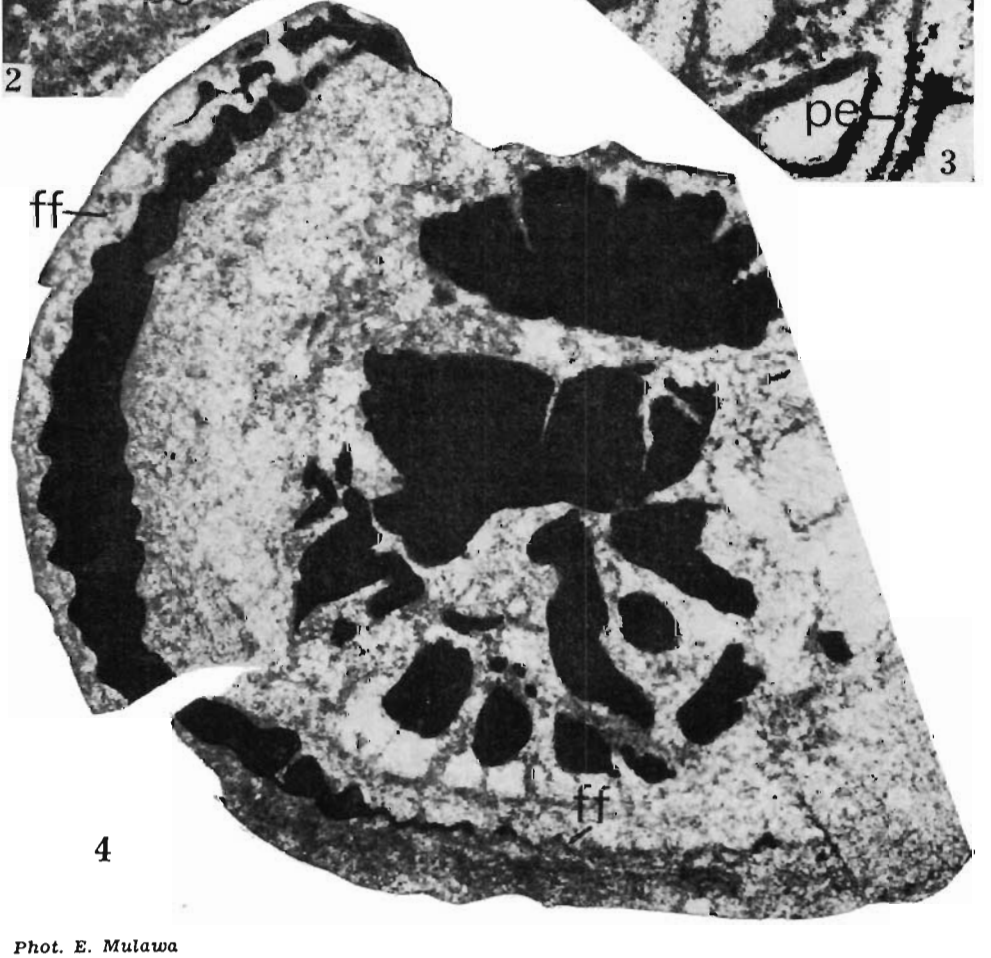

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