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Rugose corals Polycoelaceae and Tachylasmatina subord. n. from Dalnia in the Holy Cross Mts

ABSTRACT: Fourteen new species of tetracorals have been described from the neptunian dykes on Dalnia Hill (Wocklumeria or Gattendorfia Stage) in the Holy Cross Mts, and assigned to nine genera (three new ones) and four families (one new family and one new subfamily). Corals with the pentaphylloid type of septal insertion have been separated to form a new suborder Tachylasmatina, their separation from the superfamily Polycoelaceae being based on their different ontogeny.

INTRODUCTION

The present paper includes only a small part of the coral materials from the new faunal locality at Dalnia near Karczówka on the outskirts of Kielce in the Holy Cross Mts (*cf.* Szulczewski 1971, 1973). They have been chosen for a separate elaboration since they might provide a basis for proving the taxonomic separateness of corals with differentiated protosepta that developed in two different ways. All data on stratigraphy and sedimentary environment of the coral-bearing deposits are the subject of M. Szulczewski's papers (1971, 1973).

If the ontogeny of corals is considered as a character not very significant taxonomically, the conclusions presented in this paper may seem debatable. However, the writer considers that ontogeny is very important in paleontological studies, in particular when there is a possibility of not only comparing the development of various individuals and species from distinct areas and geological epochs, but also of tracing the entire development process in one and the same individual.

In this paper, the writer does not present a review of all works in which tetracorals with differentiated protosepta are described. Likewise,

he does not assign particular genera to the families Polycoeliidae and Plerophyllidae. For, the aim of the present paper is not a revision of this group of corals, which, as a matter of fact, could not be done only on the basis of the material here described. Hence, there are numerous references to the papers of other authors given in the remarks and the works in which only the ephebic stages are described are omitted. Unfortunately, most descriptions are in the latter category. The writer's only intention is to suggest that relating corals with ontogeny so different from each other as the pentaphylloid and zaphrentoid ones is erroneous. The new taxons of Tachylasmatina subord. n., described in the present paper, indicate that this is a much more differentiated group than believed previously. It is not unlikely that the studies on the ontogeny of various species seemingly distant from each other systematically will allow one to include here further taxons. *Commutia* gen. n., whose ephebic stage does not quite resemble the classic structure of the tachylasmatids, may serve as a good example in this respect.

Acknowledgements. The writer's thanks are extended to Professor M. Różkowska for her discussion of the morphology, onto- and phylogeny of the corals described and to Docent M. Szulczewski (Institute of Geology, Warsaw University) for entrusting the writer with the material necessary for the present paper and for giving information on the stratigraphy of the deposits on Dalnia Hill. The writer's gratitude is also due to Dr. W. A. Oliver, Jr., U. S. Geological Survey, Washington, for reading the manuscript and discussing English terminology. He also feels indebted to Miss J. Konieczna from the Institute of Paleozoology of the Polish Academy of Sciences (Poznań Branch) for taking the photographs presented.

THE ONTOGENY AND SYSTEMATIC POSITION OF THE "POLYCOELIDS"

The ontogeny of this group of corals has not previously been completely described. Since no one has hitherto succeeded in studying the youngest, postlarval stages of the growth of these corals, many doubts are aroused in particular by ontogeny of the pentaphylloid type. There are only a few descriptions of younger phases of the neanic stage (Carruthers 1919, Hudson 1936, Schindewolf 1942, Kullmann 1965 and the present paper). The other, zaphrentoid type of ontogeny has been accurately studied and frequently described. At present, it seems possible to determine on the basis of these descriptions not only the "classical" forms of both types of ontogeny, but also a certain range of departures consisting of either generic characters, or simplifications presumably caused by phylogeny (*e.g.* the Upper Permian *Plerophyllum dzulfense* Ilina, 1965), or else purely pathological anomalies (*e.g.* development of *Bradyphyllum differentiatum* sp. n. in the present paper).

In the present paper, the writer omits the discussion on the correctness of the generic name *Pentaphyllum,* as such a discussion would be quite irrelevant and

concern the name only. Recently, opinions on this subject have been expressed by Ilina (1965) and Flügel (1968). Both holotypes, that is, *Pentaphyllum caryophyllatum* de Koninck, 1872, and *P. armatum* de Koninck, 1872, are damaged, incomplete and not investigated. Even if topotypes would be found, this also would not solve the problem without at least fragmentary neanic stages of the preserved holotypes, since only such stages may be compared and be of any importance in determining the separateness of *Pentaphyllum* and *Plerophyllum*. Under such circumstances, all suppositions in this respect are unnecessary and the problem may be solved only by the International Commission on Zoological Nomenclature. This does not, however, affect the essence of the matter: a large group of corals develops in a quite different way and, at the same time, displays astoundingly permanent and durable characters in its ontogenetically younger stages, with a considerable variability of adult forms. The development of this type is observed from the Lower Devonian (Kullmann 1965) and even maybe from the Upper Silurian (Sutherland 1965) up to the Uppermost Permian without essential changes in the proximal part of corallites. This is an amply long period to consider the development of this type as completely fixed genetically and valid taxonomically.

Another group of corals with differentiated protosepta — the Polycoelaceae sensu stricto — developed simultaneously with and parallel to those discussed above. They also have an almost invariable ontogeny in the nepionic and neanic stages. In this group, a complete ontogeny of the holotypes of the oldest genera *Calophyllum* and *Plerophyllum*, from which the names of families have been derived, is also unknown. Unlike in the Tachylasmatina subord. n., this fact does not arouse any major discussions or objections, possibly because the youngest hitherto studied development stages of these specimens have a typically zaphrentoid arrangement (Schindewolf 1942). A complete development of this group of corals has been studied with the use of other materials (*i.a.*, Hudson 1936, Schindewolf 1942, Ilina 1965, Fedorowski 1968).

Ilina (*l.c.*, Text-fig. 17) presents a complete development series of a specimen of the species *Plerophyllum dzulfense* Ilina. On the basis of this development she considers *Pentaphyllum* (= *Cryptophyllum*) as a synonym of *Plerophyllum* and the ontogeny of the two groups as being identical. The writer does not agree with Ilina's (*l.c.*) standpoint or with her interpretation of particular development stages of *P. dzulfense* and comparing them with those of the pentaphylloid type. Fundamental differences are displayed even by the first skeleton secretions, such as the classical ones of the cardinal and counter protoseptum dividing a corallite into two parts in *P. dzulfense* and the presence of an aseptal tube in all the Tachylasmatina subord. n. The writer does not preclude a possibility of the existence in the Tachylasmatina subord. n. of septal grooves, occurring on the surface of a corallite as early as this development stage. Their existence will, however, remain unknown until a complete and excellently preserved specimen is found. As a matter of fact, the existence of these grooves alone does not entitle one to identify with each other the two types of developing protosepta. It is quite obvious that all Tetracoralla secrete septa in four quadrants. This is at least what results from hitherto conducted studies and the present understanding of the taxonomic rank of this character, typical of an order. It also seems obvious to the writer that in the case of suborders, durable development lineages, fitting within Kunth's (1869) canon, should be identified.

The atrophy of the counter septum is, according to Ilina (*l.c.*), a main evidence of the identity of *Pentaphyllum* and *Plerophyllum*. Since finding a completely preserved specimen is very uncommon the writer disregards this phenomenon as being observed in probably one only specimen. More important seem to be the following facts: (*a*) it is unknown whether or not the counter septum is present in

the microstructure of the wall, which is quite probable; (*b*) whether or not it is a pathologically deformed development; (*c*) it is stated that the counter septum atrophies when all protosepta and at least one pair of metasepta are already well-developed. Such a stage cannot be compared with the pentaseptal, late nepionic stage of tachylasmatids, but it should be compared with their neanic stage, marked by a delayed development of the counter septum. The similarity in structure in this development stage may be expressed as an intersection point of the lines of a regressive (in *P. dzulfense*) and progressive (in Tachylasmatina subord. n.) development and not as a proof of the identity of their ontogenetic development. Provided that it is not pathological in character, the development presented by Ilina (*l.c.*) displays certain character transitional between the Tachylasmatina subord. n. and Polycoelaceae. Obviously, for chronological reasons, it cannot be any connecting link between the two groups of corals, but it makes a good example of a far advanced simplification of a zaphrentoid ontogeny.

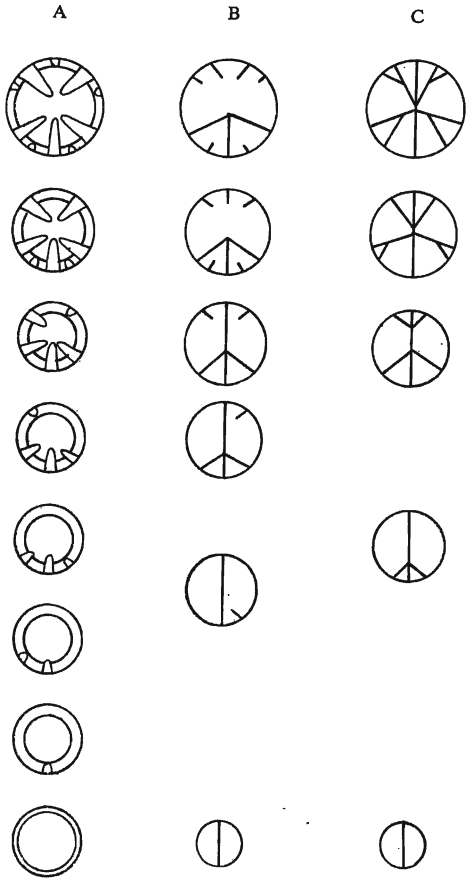

Fig. 1

Schematic diagram showing septal increase in: *A* — Tachylasmatina subordo n. (the septa appear singularly; counter septum as the last of protosepta), *B* — *Plerophyllum dzulfense* Ilina, 1965 (primary axial septum appears at the beginning of ontogeny; counter septum is lost only after increasing of a first pair of metasepta), *C* — Streptelasmatina Wedekind, 1927; typical plan of septa (schematized)

In the present paper, the writer does not discuss the ontogeny of Tachylasmatina subord. n. and the Polycoelaceae since the material under study does not allow him to form any new conclusions. Particular stages of the development of these corals (Text-fig. 1) are presented graphically and compared with each other. Table 1

gives the most important differences beween the development of the Streptelasmatina and Tachylasmatina subord. n. The remarks given below only supplement the tabular data and make an attempt to reconstruct the process of septal development.

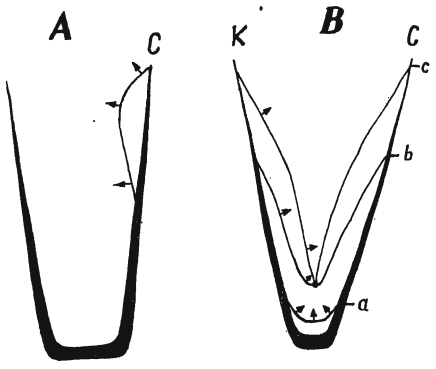

Fig. 2

Schematic cuts by postlarval parts of calices

A — Tachylasmatina subordo n.; only cardinal septum is visible (mark *C*) which was increased one some distance beyond the basal disc; the direction of growth is indicated by arrows
B — Streptelasmatina; cardinal (mark *C*) and counter (mark *K*) protosepta increase contemporary, firstly in common ectodermal pocket on the basal disc (mark *a*); mark *b* indicates the final stage of primary axial septum; cardinal and counter protosepta become free starting from the point indicated by a dot; the direction of growth is indicated by arrows

The mechanics of protosepta development in corals, which is of the zaphrentoid type, is in principle the same in all so far studied Streptelasmatina *sensu stricto* beginning with the Ordovician (Neuman 1967, 1969). In the writer's opinion, this type of ontogeny should be considered as a fundamental criterion of belonging to the suborder Streptelasmatina and the revision of families and genera assigned to it should be conducted from this viewpoint. Clearly, then, the question is not here of a system of septa strictly corresponding to the genus ***Zaphrentis*** or ***Zaphrentites,*** but of a paired development of six protosepta, of which at least the cardinal and counter ones are directly connected with each other above the basal plate and are inserted more or less contemporary. The investigated Ordovician genera (Neuman, *l.c.*) have all protosepta connected, which may indicate that ontogeny of this type is an initial form in the phylogenetic development of the Streptelasmatina. The writer assumes that in this suborder the basal disc is the base for the formation of the first protosepta. Also basal is the first secretion of the septal type, that is, the primary cardinal and counter septa (Text-fig. 2*A*) which are formed as one unit, commonly as a convexity on the bottom of the calice. A septal pocket in the ectoderm probably from the beginning gets onto the previously developed outer wall. The growth of septum everywhere takes place perpendicularly to its margin (arrows in Text-fig. 2*A*) and probably slightly earlier at the highermost point of the septal pocket near the wall. Division of the primary axial septum into cardinal and counter protosepta is effected as a result of a set-back in the growth in the axial part of the pocket (*a* point in Text-fig. 2*B*). Clearly, the reconstruction presented above is purely theoretical. Its reality might be only proven by longitudinal section of the basal disc and axial septum with a well preserved microstructure, in which the direction of the growth of particular calcite fibres might be traced. The writer has had at his disposal neither an appropriate specimen, not technical means for conducting such detailed studies.

TABLE 1

STREPTELASMATINA	TACHYLASMATINA
(1) Cardinal and counter septa equally participating in forming the primary axial septum. It is probably formed in one, common concavity on the bottom of polype. Even if they are formed separately and only fuse with each other, there is no indication of the underdevelopment of either of them.	(1) No primary axial septum is formed. Cardinal septum is formed in an ectoderm convexity near the wall and is completely separated from counter septum. Counter septum is formed as the last of protosepta, as a rule after the formation of one to two pairs of metasepta.
(2) Alar and counter-lateral septa are formed in pairs with the support of the external wall and in direct contact with the base of cardinal or counter septum to the fusion of medial lines (Carruthers 1906). This may suggest their formation in a secondarily folded, septal pocket in common with the primary axial septum (Text-fig. 3).	(2) Alar and counter-lateral septa are formed in succession in completely separated septal pockets. In principle, alar septa develop first. At the beginning, they distinguish themselves only in the microstructure of the marginal part of external wall.
(3) A development trend of the septal apparatus (including metasepta) observed from the closest connection of septa at the moment of formation, through a loose combination, up to the separation. Such a development may be called an excentric development of septa.	(3) A development trend of the septal apparatus (including metasepta) observed from a complete separation of septa to a possible contact, sporadically also to a fusion of 5 protosepta in the axial part of corallite. Such a development may be called a concentric development of septa.
(4) A corallite in the phase of four to six protosepta is usually less than 1 mm in diameter, which rapidly increases. We may suppose that the free swimming larva was not large.	(4) A corallite in the pre-pentaseptal development phase is usually about 2 mm in diameter, which in the initial stage of growth remains almost unchanged at all. A free swimming larva was probably relatively large.

Theoretically, there is also a possibility of forming septal pockets of the cardinal and counter septum separately near the external wall (D. Weyer's oral information) and, afterwards, of connecting them along the axis of corallite. This does not, however, change a fundamental assumption of the formation of this type of protosepta, that is, a formation of primary axial septum according to principle of an equal participation of the cardinal and counter protosepta. Thus, the similarity of this principle to that observed in the Tachylasmatina subord. n. is rather general in character. In the present writer's opinion, it is not particularly important where the incipient first septum did appear (on the basal disc or on the wall), but it is important how the first protosepta — cardinal and counter ones — did develop and what were the effects of this development (Table 1, par. *1—3*).

As yet the first development stages of septa above the basal disc in Tachylasmatina subord. n. remains unknown, but we can hardly suppose that a primary axial septum was formed in this place and then almost immediately reduced and atrophied without any trace. Likewise, it is not yet known whether or not there exist any septal grooves, corresponding to the protosepta still invisible in the microstructure of the wall. In the writer's opinion, this is not important in examining the development of Tachylasmatina subord. n. within the range of the order Tetracoralla (Rugosa). Even in the case of finding a marked groove of counter septum and other septal grooves in the stage of a seemingly aseptal tube above the basal disc, this will only confirm the unquestionable assignment of Tachylasmatina subord. n. to this order. As a matter of fact, it is also in this case that the problem of the succession of appearance of particular grooves may be of a fundamental importance to taxonomy.

A tentative reconstruction of the development of the Tachylasmatina subord. n. may be proposed on the basis of the observations made so far (*i.a.*, Carruthers 1919, Schindewolf 1942, and the present paper). The septal pockets are formed in this group of corals only with the use of the external wall as a base and with a complete separation from each other (Table 1, par. *1—3*). The growth of a septum begins at the initial, lowermost point of the septal pocket close to the epitheca. The principal accretion of calcite fibres — towards the inside of corallite and upwards — may be subject to minor modifications (Text-fig. 2*b*). Of fundamental importance is a generally observed fact of a delayed development (and probably also of a delayed foundation) of counter septum in the initial phase of the growth of corallite. As shown above, the calling in question of this fact by Ilina (1965) is incorrect and results from her comparison of inadequate development stages of corallites. No true primary axial septum is formed in the Tachylasmatina subord. n. Even if the counter septum elongates, this takes place only in a later stage of growth. New septa appear completely separated from those preceding them in development and, therefore, the secondary folding of septal pockets, suggested above by the writer for the development of the Streptelasmatina (Table 1, par. *2*; Text-fig. 3) is in this case out of the

Fig. 3

Reconstruction of alar protosepta increase in Streptelasmatina; it could take place in common ectodermal pocket together with the cardinal protoseptum

A, B — Successive stages of growth

question. In the completely separated pockets there are formed, or, in the case of a very improbable simultaneous formation, developed in succession protosepta which tend to contact each other along the axis of corallite. In the nepionic stage and frequently also in the early phase of the neanic stage, the counter septum does not take part in the development, contrary to the Streptelasmatina, in which it is an equal partner of the cardinal septum in forming the primary axial septum. The arrangement described, and the development tendency of septa are, as mentioned above, a rule in this group of corals from the Lower Devonian (?Upper Silurian) to the Upper Permian inclusively, occurring regardless of the structure of corallite in the ephebic stage. It does not display any major deviations and even, on the contrary, it is more precisely defined than the development of the Streptelasmatina.

The ontogeny of the Tachylasmatina subord. n. may be easily compared with and distinguished from that of the Polycoelaceae, even without the knowledge of the youngest development stages. The polycoelids display a permanent tendency to form a zaphrentoid phase in the neanic stage. It occurs in classical form in the Carboniferous representatives of the superfamily. Quite opposite is the case of the tachylasmatids, in which, even if the metasepta shorten uniformly in particular quadrants, they remain free.

The facts and considerations presented above seem to the writer to be a sufficient basis for the following findings:

(*1*) What are known as the "Polycoelaceae", as understood so far, are not a phylogenetically homogenous group. For, one cannot assume that in one superfamily there occur two, completely different ways of the ontogenetic development, which are stabilized from the youngest developmental stages.

(*2*) The development of the zaphrentoid type in a general sense is characteristic not only of many Polycoelaceae sensu stricto, but also of other typical representatives of the Streptelasmatina from the Ordovician through the Permian and, therefore, it should be considered as a fundamental diagnostic character of this suborder.

(*3*) The development of the pentaphylloid type is a genetically fixed model of development, whose fundamental characters do not change during a very long (geologically) period. The taxonomic rank of these characters, determined by comparison with various stages of the Streptelasmatina (Table 1), cannot be lower than suborder.

(*4*) If the Polycoelaceae can be linealy derived from the Ordovician Streptelasmatina, the origin of Tachylasmatina subord. n. remains yet unclear and not based on reliable proofs. It may be supposed that they separated from the Streptelasmatina or related forms by remodelling their system of founding protosepta.

(*5*) Tachylasmatina subord. n. occurs in the same ecological niches and mostly together with the Polycoelaceae. They developed similar structures and adaptative characters. It is only the ontogeny in their young stage, most strongly determined genetically, that remains as a fundamental diagnostic character, indicating their phylogenetic separateness.

SYSTEMATIC PART

Order **Rugosa** Milne-Edwards & Haime, 1850
Suborder **Streptelasmatina** Wedekind, 1927
Superfamily **Polycoelaceae** Roemer, 1883

Families assigned: Polycoelidae Roemer, 1883; Plerophyllidae Koker, 1924; ?Endothecidae Schindewolf, 1942; ?Adamanophyllidae Vassiljuk, 1959.

Diagnosis. — Solitary corallites with a zaphrentoid ontogeny; protosepta varying in length; columella not developed; dissepimentarium may be developed(?).

Remarks. — Of the families, which may be assigned to this group of corals, only the first two have their ontogeny studied to such an extent that their relationship and assignment to the superfamily seem to the writer to be quite unquestionable. This group of corals was many times critically reviewed (recently by Flügel, 1968), but the views on their taxonomy were never agreed upon. Almost all of the divergences

result from the subjective understanding of the rank of ontogeny as a diagnostic character. Some investigators (*e.g.* Ilina 1965, Ivanovsky 1967) combine the forms with the pentaphylloid and zaphrentoid ontogeny, giving them common generic names. Most authors assign them, however, to separate subfamilies or families (*e.g.* Schindewolf 1942, Kullmann 1965, Flügel 1968). As mentioned above, the present writer considers the difference in ontogeny to be a character of a rank of suborder. In the present paper, the names of families are, therefore, considered with an exact reference to a primary definition of the genera and holotypes of their type species. All species with the pentaphylloid ontogeny, subsequently assigned to genera are not included.

The families Endotheciidae and Adamanophyllidae have tentatively been included in the superfamily Polycoelaceae but it is rather doubtful that it will be possible to keep them within its range. The ontogeny of the two families has not been studied to such an extent that it would be possible now to make this decision with a higher certainty. The Adamanophyllidae seem to be much closer to the plerophyllids and polycoelids.

Family **Polycoeliidae** Roemer, 1883
(Type genus: *Calophyllum* Dana, 1846)

Synonym: Soshkineophyllinae Grabau, 1928.

Diagnosis. — Polycoelaceae without dissepiments having predominant alar protosepta and counter protoseptum; cardinal protoseptum may be subject to shortening in the ephebic stage.

Remarks. — Fundamental data on the ontogeny of many genera being unavailable, it is impossible to list the complete generic composition of this family. In the writer's opinion, only the genera with a zaphrentoid ontogeny should be assigned here.

Genus *CALOPHYLLUM* Dana, 1846
(Type species: *Cyathophyllum profundum* Geinitz, 1842)

Synonyms: see Hill, 1956, p. F. 260.

Calophyllum diffusum sp. n.
(Text-fig. 4; Pl. 1, Figs 1—2)

Holotype: Specimen No. Z. Pal. P. Tc-6/1, figured in Pl. 1, Fig. 1*a*—*c*.
Type horizon: Wocklumeria or *Gattendorfia* Stage.
Type locality: Dalnia Hill near Kielce, Holy Cross Mts.
Derivation of the name: Lat. *diffusus* — irregular, after an irregular arrangement of septa.

Material. — Four solitary corallites preserved fragmentarily. The holotype with its proximal end deformed by a parasite or a commensal.

Dimensions (in *mm*):

Specimen No. Z. Pal. P.	Diameter	Number of septa	Spacing of thin sections
Tc-6/1	4.3×4.8	20	
,,	3.7×3.9	18	3.6
,,	3.1×3.3	12	2.2
Tc-6/2	4.2×4.4	16	
,,	4.2×4.4	16	2.8
,,	4.6×4.6	16	2.2
Tc-6/3	4.2×4.4	20	
,,	4.2×4.6	20	2.2

Diagnosis. — A *Calophyllum* with 16 to 20 thin major septa and about 4.5 mm in diameter; cardinal, counter and alar protosepta connected axially; the arrangement and length of metasepta irregular; minor septa lacking.

Description. — Transverse section (Text-fig. $4_{1h,\ 1i;\ 2;\ 3a,\ 3b}$; Pl. 1, Figs 1c, 2). Septa thin, irregularly bent, usually pointed, slightly thickened near the external wall. In addition to the protosepta, mentioned in the diagnosis, one counter-lateral protoseptum and some metasepta may reach the axis. The length of metasepta in quadrants considerably varying and irregular. Counter quadrants are predominant. Minor septa lacking.

Ontogeny (cf. Text-fig. $4_{1a\text{-}1g}$). — The youngest thin section available 1.3 × 2.5 mm in diameter (Text-fig. 4_{1a}) has been cut obliquely in the plane of cardinal and counter septum. This has caused an apparent excessive elongation of the cardinal septum and has made the first metaseptum seem to first appear in the counter quadrants. It is already in this stage that part of the holotype is damaged by a commensal (or parasite?) and due to this damage we can only find that ontogeny has characters which are zaphrentoid sensu lato, that is, that the primary degradation of the counter septum does not occur here.

Individual variability. — Assuming the irregular arrangement and irregularly differentiated length of septa as diagnostic characters, we find that individual variation is not large. Changes may occur in the *n/d* ratio (by one to two septa) or in the formula in particular quadrants, but fundamental diagnostic characters remain constant.

Remarks. — The species described is similar morphologically to two Permian species, *C. gracilis* (Schindewolf, 1942) and *C. weberi* (Gerth, 1921) which have four rather thin protosepta fused axially. *C. gracilis* differs in having twice as large dimensions with a lower number of septa and in a regular arrangement of septa in

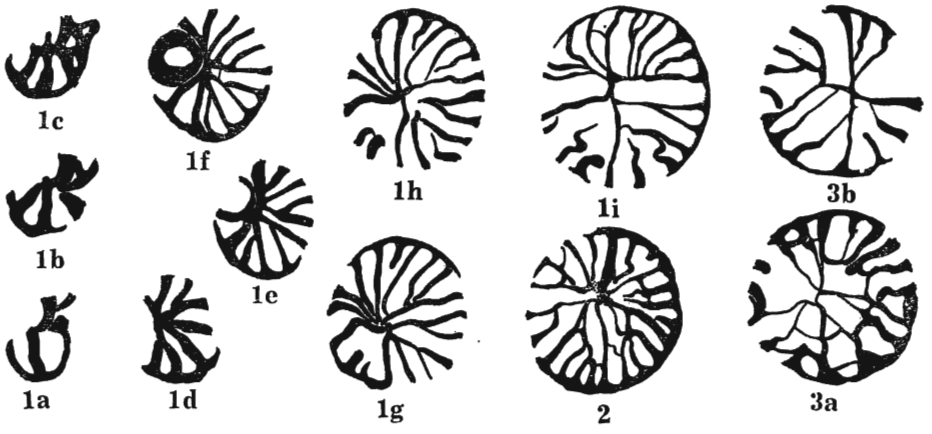

Fig. 4

Calophyllum diffusum sp. n.; × 5

1a-1i — Specimen No. Z. Pal. P. Tc-6/1 (holotype): *1a—1e* successive transverse sections of the neanic stage, *1f—1h* successive transverse sections of the early ephebic stage, *1i* transverse section of the ephebic stage.

2 — Specimen No. Z. Pal. P. Tc-6/3; transverse section of the ephebic stage.

3a-3b — Specimen No. Z. Pal. P. Tc-6/2; transverse sections of the ephebic stage.

quadrants. *C. weberi* is nearly three times larger, has more septa and strongly developed minor septa.

Occurrence. — Dalnia near Karczówka Monastery, Holy Cross Mts, *Wocklumeria* or *Gattendorfia* Stage.

Calophyllum(?) bipartitum sp. n.
(Text-fig. 5; Pl. 1, Fig. 3)

Holotype: specimen No. Z. Pal. P. Tc-6/5, figured in Pl. 1, Fig. 3*a*—*e*.
Type horizon: Wocklumeria or *Gattendorfia* Stage.
Type locality: Dalnia Hill near Kielce, Holy Cross Mts.
Derivation of the name: Lat. bipartitus — bipartite, after the arrangement of major septa.

Material. — A corallite without the calice.
Dimensions (in *mm*):

Diameter	Number of septa
7.8	24
10.6	26
11.0	29

Diagnosis. — *A Calophyllum*(?) with 29 septa and 11 mm in diameter; formula: $\frac{5}{6}\left|\frac{5}{7}\right.$; septa of cardinal quadrants thickened and arranged in a tentlike manner above cardinal septum; counter septum indiscernible in the ephebic stage.

Description. — In the ephebic stage (Text-fig. 5*e*; Pl. 1, Fig. 3*e*) cardinal quadrants, more distinctly separated from counter quadrants, occupy about one-third of corallite. Major septa in cardinal more thickened than in counter quadrants, arranged parallel to each other and in a tentlike manner in relation to cardinal septum. Alar septa and the first two pairs of metasepta are longer than cardinal septum, which is conspicuous by its thickness and reaches a length equal to that of metasepta of the third pair. Counter quadrants asymmetric. Only the last four pairs of metasepta become regularly shortened towards alar septa. The remaining septa of these quadrants, including counter and counter-lateral ones, have axial ends rhopaloid and slightly spirally curved behind the axial part of corallite, filled with stereoplasma. Counter septum does not differ from counter-lateral ones and from adjoining metasepta. It may be even shorter than some of them. Minor septa occur only in the wall.

Ontogeny. — The youngest section (Text-fig. 5*a*) which could be examined, with 19 septa and 4.5 mm in diameter, represents a fairly advanced neanic stage. Here, predominant are six protosepta joining each other in the axis of corallite, but not connected by median lines. Cardinal septum, developed most strongly, is shaped like a big mace. The remaining protosepta almost equalling each other. Metasepta in quadrants arranged regularly but varying in number. Formula: $\frac{2}{3}\left|\frac{3}{6}\right.$. In cardinal quadrants all metasepta are short.

The ephebic stage starts probably with the development of the arrangement of septa in cardinal quadrants characteristic of the species (Text-fig. 5*b*). Septa are still thickened, most of all the cardinal septum, which continues to contact the elongate counter septum and alar septa. Counter-lateral septa are already slightly

shortened. In a farther development (Text-fig. 5*c*, *d*), there occurs a gradual differentiation of the thickeness of septa in quadrants and a decrease in the length of cardinal septum. Minor septa are still indistinguishable in the structure of wall.

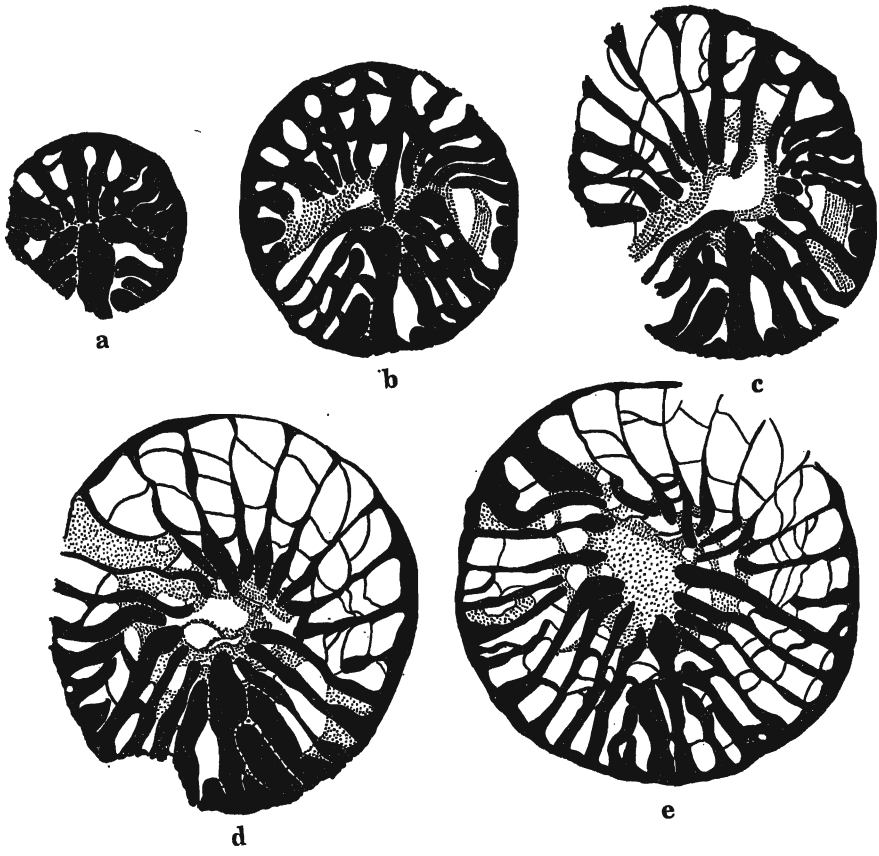

Fig. 5

Calophyllum? bipartitum sp. n.; specimen No. Z. Pal. P. Tc-6/5 (holotype), × 5
a transverse section of the late neanic stage, *b*—*d* successive transverse sections of the early ephebic stage, *e* transverse section of the ephebic stage

Remarks. — The specimen described differs in some particulars from typical representatives of *Calophyllum*, the most important of these differences being: a quite different structure of cardinal and counter quadrants, the arrangement of septa in cardinal quadrants, the equalization of the length of counter septum with that of adjoining septa and the neanic stage with six protosepta predominating. These are qualitative characters whose rank is probably sufficient for erecting a new subgenus. The writer gave up doing so, since the specimen was deprived of its ontogenetically oldest part, the lack of which made the description incomplete. At the same time, the characters named above differ the specimen from all known species of *Calophyllum*.

Occurrence. — Dalnia near Karczówka Monastery, Holy Cross Mts, *Wocklumeria* or *Gattendorfia* Stage.

Calophyllum(?) sp.
(Text-fig. 6)

Material. — A corallite without the proximal part of calice.

Description. — The ephebic stage (Text-fig. 6*c*). A corallite 5 mm in diameter and with 15 major septa varying in length, irregularly twisted and with rhopaloid axial ends. The longest are alar septa curled around cardinal septum somewhat shorter than they. Only two metasepta are developed in cardinal quadrants. Counter septum markedly longer than counter-lateral septa inclined towards it. Three and four metasepta of counter quadrants strongly varying in length, the first pair being longer than counter septum and one septum of the second pair strongly shortened. Minor septa are visible only in the form of grooves on the external wall. Sections of a few basal elements are visible between some septa. Judging from their arrangement, these are peripheral parts of tabulae rather, than dissepiments.

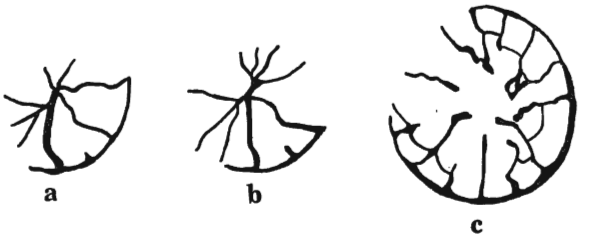

Fig. 6

?Calophyllum sp.; specimen No. Z. Pal. P. Tc-6/6, × 5
a, b successive transverse sections of the neanic stage, *c* transverse section of the ephebic stage

The neanic stage (Text-fig. 6*a, b*). With a diameter 3.7 × 4.0 mm, ten septa may be distinguished inside the corallite, with additional two in the wall. Particularly distinguishable is cardinal septum, less so alar septa, while counter septum, together with counter-lateral ones form a sort of triad. Even in this section they are relatively short. All proto- and two metasepta are connected with each other axially or near the axis. The arrangement of septa is not, however, zaphrentoid as in typically developing representatives of the genus *Calophyllum*.

Remarks. — The specimen described has tentatively been assigned to *Calophyllum*. Although in its hypothetical ephebic stage it has four predominating protosepta, the arrangement of its septa and development of corallite are not typical. Counter septum is too poorly developed, cardinal quadrants reduced and alar septa inclined over cardinal septum. These characters make the specimen described slightly similar to *C.(?) bipartitum* sp. n. The connection of counter with counter-lateral septa gives an impression of a triad known in other families and superfamilies of the tetracorals. This is not, however, a triad sensu stricto, since the occurrence of a groove of minor septum between counter and one of the counter-lateral septa was discovered in a better preserved fragment of specimen.

Occurrence. — Dalnia near Karczówka Monastery, Holy Cross Mts, *Wocklumeria* or *Gattendorfia* Stage.

Genus *SOSHKINEOPHYLLUM* Grabau, 1928
(Type species: *Plerophyllum artiense* Soshkina, 1925)

Synonyms: *Plerophyllum* Hinde, 1890, e. p.
Tachylasma Grabau, 1922, e. p.
Soshkineophyllum Grabau, 1928, e. p.
Empodesma Moore & Jeffords, 1945.

Diagnosis. — Polycoeliidae with only counter and alar protosepta predominating in the mature stage; cardinal septum shortened.

Remarks. — Considerations about genus *Soshkineophyllum* given by Schindewolf (1942, p. 94) are mostly parallel to the present writer's opinion, except that he considers *Soshkineophyllum* to be a genus, not a subgenus, as Schindewolf proposed. The writer intends only to add some remarks about genus *Empodesma* Moore & Jeffords, 1945 obtainable by him on the type material. Ontogeny of *Empodesma imulum* Moore & Jeffords is zaphrentoid in the neanic stage and becomes *Calophyllum*-like in the late neanic and early ephebic stages. The *Calophyllum*-like structure is especially well visible in the holotype (compare Moore & Jeffords' *l.c.*, Text-figs 10*a*, 10*b*) where four protosepta (cardinal, counter and two alars) are rhopaloid and reached each other at the corallite axis, but without connecting its median lines. In the ephebic stage cardinal septum is shortened and counter septum predominates together with alar septa. Neither type specimen nor paratypes appear to have any structure distinguishing them from *Soshkineophyllum*.

Geographical and stratigraphic range. — Eurasia, North America; *Wocklumeria* or *Gattendorfia* Stage to Lower Permian.

Soshkineophyllum internectum sp. n.
(Text-fig. 7; Pl. 2, Fig. 1)

Holotype: specimen No. Z. Pal. P. Tc-6/7, figured in Pl. 2, Fig. 1*a—e*.
Type horizon: Wocklumeria or *Gattendorfia* Stage.
Type locality: Dalnia Hill near Kielce, Holy Cross Mts.
Derivation of the name: Lat. *internectere* to connect, to combine.

Material. — A corallite with the proximal end and the bottom of the calice preserved and provided with a strongly developed talon.

Dimensions (in *mm*):

Diameter	Number of septa	Note
8.3×9.0	24 × 2	Bottom of calice
7.6×8.0	24 × 2	Under calice
6.2×6.5	23 × 2	Early-ephebic stage
5.6×7.5	22 (× 2 ?)	Incipient talon
1.2×1.2	6	Nepionic stage
1.0×1.0	6	Nepionic stage

Diagnosis. — A *Soshkineophyllum* with 24 × 2 septa and 9 mm in diameter; arrangement of septa similar to that in *Claviphyllum* s. lato.

Description. — The bottom of calice such as presented in Pl. 2, Fig. 1*b*. Lateral walls of the upper part of calice not preserved. At the end of development the corallite is asymmetric — one of the cardinal quadrants has better developed septa than the other. It may be found in both of them, however, that the first pair of metasepta is somewhat shorter as compared with one or two pairs of next metasepta. Alar protosepta are slightly or even considerably longer than the adjoining metasepta. Septa of counter quadrants are relatively thin and grow shorter towards counter

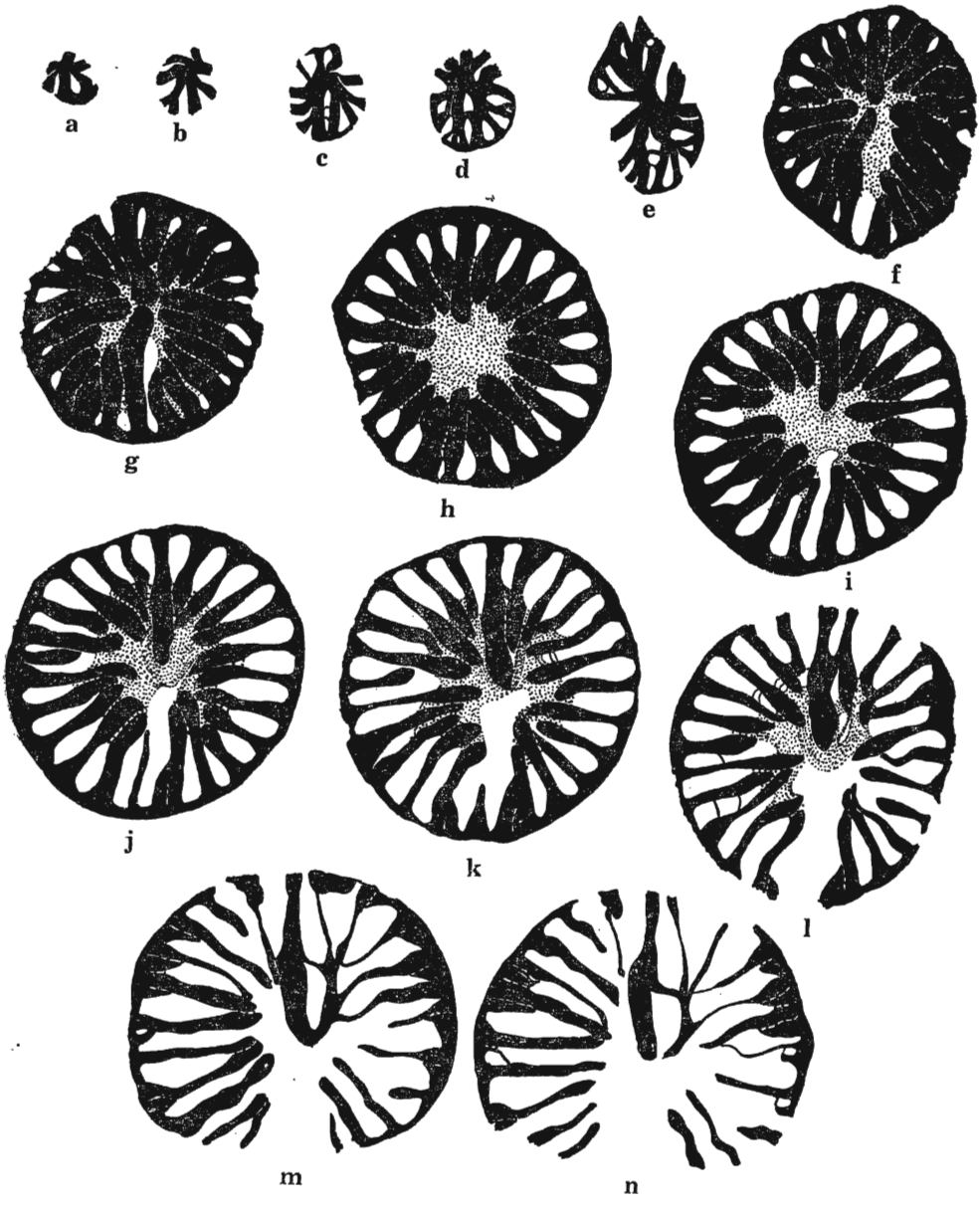

Fig. 7

Soshkineophyllum intermectum sp. n.; specimen No. Z. Pal. P. Tc-6/7 (holotype), × 5

a transverse section of the late nepionic stage, *b—e* successive transverse sections of the neanic stage, *f, g* successive transverse sections of the late neanic stage showing *Calophyllum*-type of septal development, *h—k* successive transverse sections of the ephebic stage, *l* transverse section of the calice bottom, *m, n* successive transverse sections of the calice

septum reaching outside the axis of corallite. Counter-lateral septa are slightly longer than the first pair of metasepta. Cardinal septum very strongly shortened, is situated on the convex side of corallite in a deep cardinal (tabular) fossula. Minor septa are mostly embedded only in the wall or only their grooves are visible. They may, however, occur near major septa, in the region of their bases and may be inclined towards them. They are not contratingent and their axial ends are distinctly separated, even in the case when they contact major septa. A similar structure has been found in several sections made with a thickness of calice of 2.5 mm (Text--fig. 7*m, n*). It is still in the calice, close to its bottom, that major septa gradually grow thicker and start to join each other with their rhopaloid ends to form groups. At the bottom of calice, all septa are already connected with each other either directly or by a deposit of stereoplasma (Text-fig. 7*k*).

Under calice (Text-fig. 7*i, j*), major septa are more strongly thickened rhopaloidally and get nearer the axis of corallite than in calice itself. Cardinal septum remains shortened and thin, but it is considerably longer then in calice. A thick, rhopaloid counter septum predominates here. In addition, the septa of the last but one pair of counter quadrants are conspicuously thick and long. One of the alar septa becomes shortened and does not differ from the adjoining metasepta. Consequently, the corallite continues to be asymmetric. The bases of major septa are thickened. Minor septa either enter the interior of the corallite, or are restricted to the wall.

Ontogeny. — The development has been studied from the nepionic stage having six protosepta (Text-fig. 7*a*). It does not differ in any esential detail from the zaphrentoid development characteristic of the Polycoelaceae. For this reason the illustrations of only the most typical sections (Text-fig. 7*a—e*) are given by the writer, who omits detailed descriptions of younger development phases. It is only worth emphasizing that in this case no protosepta are distinguished. In the older part of the neanic stage, the corallite's structure is most similar to that of *Calophyllum* (Text-fig. 7*f—h*). Continuously predominant is the cardinal septum, but the counter septum is distinctly longer than the counter-lateral septa and the alar septa are longer than the adjoining metasepta. Minor septa may already distinguish themselves in some of the interloculi in the form of nodes on the epitheca. The ephebic stage probably starts at the moment when the cardinal septum equals the last pair of metasepta and when minor septa appear as if stuck to the bases of major septa. From this moment up to the end of development, the cardinal septum shortens and the remaining septa undergo the modifications described above.

Remarks. — The species has been described on the basis of one specimen, which was possible owing to an excellent state of preservation of the corallite used for nearly all the observations necessary. As many others in the material described, this specimen is one of the geologically oldest representatives of the genus. Apart from *Soshkineophyllum* sp. (*in* Schindewolf 1942) from the *Gattendorfia* Zone of the Rhine Slate Mountains, all the remaining species come from the Permian. In addition, *S. internectum* sp. n. is marked by a certain instability of structure characteristic of transitional forms: (*1*) The following two phases should be underscored in ontogeny: (*a*) a paired insertion of protosepta and a normal development of counter septum in the nepionic stage, and (*b*) a structure of the type of *Calophyllum* in the late--neanic stage; a new generic character, that is, the shortening of cardinal septum appears in the ontogeny of this species later than in all other so far studied species. (*2*) The situation of cardinal septum on the convex side and the development and arrangement of major septa in the ephebic stage suggest the similarity or relationship to some species of the genus *Claviphyllum* s. lato (e.g., *C. hillae*). Even though alar septa are not shortened, one of them in some sections may not differ from

the adjoining metasepta. The last but one pair of metasepta is predominant in counter quadrants, in which, except for the last pair, the length of metasepta increases towards alar septa. In fact, this character also occurs in some of the Permian *Soshkineophyllum*. It is not unlikely, therefore, that the species described is on the boundary between *Calophyllum* and some species so far assigned to *Claviphyllum*. The latter genus requires, in the writer's opinion, a thorough revision and demonstration that the occurrence of contratingent minor septa in its specimens is an individual, or at most, specific character. Otherwise, species not having contratingent minor septa should be separated to form a new genus. The writer believes *S. internectum* sp. n. to be related only to the *C. hillae* group.

Occurrence. — Dalnia near Karczówka Monastery, Holy Cross Mts, *Wocklumeria* or *Gattendorfia* Stage.

Genus *BRADYPHYLLUM* Grabau, 1928
(Type species: *B. bellicostatum* Grabau, 1928)

Synonyme Pseudobradyphyllum Dobroljubova, 1940.

Diagnosis. — Polycoeliidae with cardinal septum shortened in the ephebic stage and with major septa shortened and arranged radially; alar septa and counter septum generally longer than major ones, vary slightly in length; minor septa strongly developed, non-contratingent; tabulae convex.

Remarks. — In the present paper, despite his previous opinion (Fedorowski 1968), the writer includes the genus *Bradyphyllum* in the Polycoeliidae and not in the Hapsiphyllidae. The new approach seems more correct for the reason that the stage of *Calophyllum* is marked in the geologically oldest species described below (Text-fig. 8*e, f*), while alar septa and counter septum longer than other major septa may easily by distinguished in most species that are geologically younger.

A possible series or a development trend within the *Bradyphyllum*, beginning with *B. differentiatum* sp. n. is now possible to state. In addition to the alar septa and counter septum, which are longer during the entire ephebic stage, here also predominates the cardinal septum, which is not subject to a major shortening even in the bottom of calice. Such species, younger geologically, as *B. bojkowskii* or *B. bellicostatum* have not so distinctly differentiated protosepta, although alar septa and counter septum, as well as a shorter cardinal septum may be still distinguished in them. This is a development trend slightly related to *Soshkineoplyllum*, except for the fact that in *Bradyphyllum* the shortening of mentioned protosepta took place considerably earlier in ontogeny and more radically than in *Soshkineophyllum*.

It seems to be beyond any doubt that the *Pseudobradyphyllum* Dobroljubova, 1940, is a younger synonym of *Bradyphyllum*. It was as early as 1940 that Dobroljubova (p. 12) finding the occurrence of tabulae and lack of dissepiments in *Bradyphyllum*, considered these genera as identical to each other. As is known, both these conditions are met.

Bradyphyllum differentiatum sp. n.
(Text-fig. 8; Pl. 3, Figs 1—2)

Holotype: specimen No. Z. Pal. P. Tc-8/8, figured in Pl. 3, Fig. 2*a—d*.
Type horizon: Wocklumeria or *Gattendorfia* Stage.
Type locality: Dalnia Hill near Kielce, Holy Cross Mts.
Derivation of the name: Lat. *differentia* — variety, difference.

Material. — Three fragmentarily preserved corallites. A holotype with the bottom of calice preserved, but without the proximal end.

Dimensions (in *mm*):

Specimen No. Z. Pal. P.	Diameter	Number of septa	Note
Tc-6/8	12.2×12.5	25×2	Bottom of calice
,,	9.0×9.2	23×2	Ephebic stage
,,	7.2×7.2	23×2	,, ,,
,,	5.5×5.5	21×2	,, ,,
Tc-6/9	13.0×12.5	24×2	,, ,,

Diagnosis. — A *Bradyphyllum* with 25 × 2 septa and 12.5 mm in diameter; cardinal, counter and alar protosepta well- distinguishable in the early-ephebic stage; counter-minor septa better developed than the remaining minor septa.

Description. — In a transverse section through the bottom of calice (Text-fig. 8*h*) major septa are thickened, particularly so near the bases and axial ends; counter septum markedly thick and slightly longer than counter-lateral septa. Cardinal

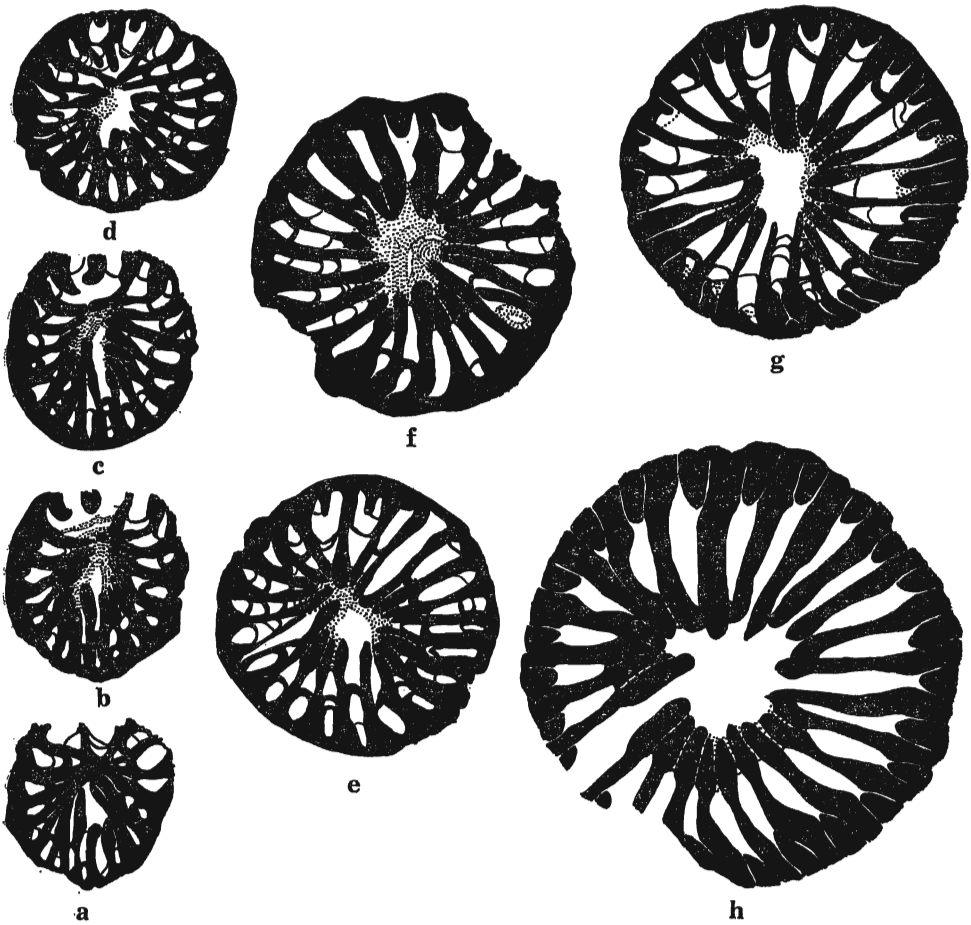

Fig. 8

Bradyphyllum differentiatum sp. n.; specimen No. Z. Pal. P. Tc-6/8 (holotype), × 5
a—c successive transverse sections of the neanic stage, *d—g* successive transverse sections of the ephebic stage (*f* shows *Calophyllum*-type of septal development), *h* transverse section of the calice near its bottom

septum does not differ from the adjoining metasepta. The section has been cut above the last tabula and, therefore, there is no tabular fossula visible and the septal fossula is not formed at all. Minor septa thick, closely adhering to major septa, but not contratingent. Counter-lateral minor septa longer than the remaining septa, not forming a triad.

In section under the calice (Text-fig. 8*g*) cardinal septum longer than the last pair of metasepta and situated in a narrow tabular fossula. Counter septum slightly thicker and longer than counter-lateral septa. Alar septa not particularly distinguishable. All septa in counter quadrants and most of them in cardinal quadrants are connected with rhopaloid axial ends to form a cyathotheca, which is open only near the cardinal septum. Minor septa varying in length, closely adhering to major septa. In ontogenetically younger sections of the ephebic stage, only counter-lateral minor septa are visible inside the corallite.

Ontogeny. — The proximal end of the specimen under study has mechanically damaged counter quadrants. In cardinal quadrants, septa are arranged zaphrentoidally; cardinal septum strongly developed. This septum is separated early from other major septa converging in the axis of corallite. Counter quadrants are also deformed pathologically in the process of the development of a corallite, which is indicated by an unnatural bend of the peripheral parts of septa. In the younger part of the neanic stage, counter septum reaches the axis of corallite (Text-fig. 8*a, b*), which is revealed by its preserved fragment. The shortening of this septum in a further development was probably caused by a life time damage of the polyp and it is not its diagnostic character. At the end of the neanic stage, the arrangement of septa becomes more and more radial. Minor septa project inside the corallite and counter septum begins to predominate.

Individual variability. — Paratype No. Tc-6/9 differs from the holotype in slightly larger dimensions with the same number of septa, in shorter major septa in the ephebic stage and in the variable length of cardinal septum, which considerably shortens as it may be observed on one of the sections through the ephebic stage (Pl. 3, Fig. 1*b*). These fairly large differences have, however, been treated here as characters of the individual variability, since they are unstable and are subject to various changes with the growth of corallite. The third, not illustrated and considerably smaller specimen, is probably only a fragment of the neanic development stage of a corallite.

Remarks. — In its dimensions and number of septa, this species is related to *B. oppositum* Fomitshev, 1953, and *B. bojkowskii* Fedorowski, 1968, from which it differs in thick, rhopaloid major septa in the ephebic stage, in only a somewhat shortened or not shortened cardinal septum and in a development of thick and relatively long minor septa adhering to major septa. Counter-lateral minor septa are particularly strongly developed, which may be also observed in, i.a., *B. obscurum* Grabau, 1928, *B. caninoideum* Huang, 1932, and other species.

Occurrence. — Dalnia near Karczówka Monastery, Holy Cross Mts, *Wocklumeria* or *Gattendorfia* Stage.

Family **Plerophyllidae** Koker, 1924
(Type genus: *Plerophyllum* Hinde, 1890)

Synonyms: cf. Schindewolf, 1942, p. 102.

Geographical and stratigraphic range: Lower Devonian to Upper Permian, Eurasia, Australia, ?N. America.

Diagnosis. — Polycoelaceae with predominating alar and counter-lateral protosepta; counter septum shortened; cardinal septum may be subject to shortening in the ephebic stage.

Remarks. — Schindewolf's (1942, p. 102) characteristics of the subfamily (= family in the present paper) seem to be quite sufficient. The writer agrees with them, but does not accept the systematics suggested by Ilina (1965), which has already been discussed above.

Genus *PLEROPHYLLUM* Hinde, 1890
(Type species: *P. australe* Hinde, 1890)

Synonym: Timorosmilia Koker, 1924.
Geographical and stratigraphic range: Wocklumeria or *Gattendorfia* Stage to the Upper Permian, Eurasia, Australia.

Diagnosis. — See Schindewolf, *l.c.*, p. 111 (subgenus).

Remarks. — Since the youngest phases of the neanic stage could not be studied, the generic assignment of the species described is not quite certain. The here adopted classification has been based on a comparison of corresponding development stages of *Plerophyllum* and *Pentaphyllum*. Particular doubts are aroused by the assignment of *P. penetrale* sp. n., in which the phase with a long counter septum could not be observed. The species described below are based on an insufficient material. Despite this fact, the writer decided to describe them since they are the oldest representatives of the genus, previously known only from the Permain and Upper Carboniferous.

Plerophyllum regulare sp. n.
(Text-fig. 9; Pl. 1, Figs 4—5)

Holotype: specimen No. Z. Pal. P. Tc-6/11, figured in Pl. 1, Fig. 4.
Type horizon: Wocklumeria or *Gattendorfia* Stage.
Type locality: Dalnia Hill near Kielce, Holy Cross Mts.
Derivation of the name: Lat. *regularis* — even, regular.

Material. — Four specimens without proximal ends and one with a well preserved calice.

Dimensions (in *mm*):

Specimen No. Z. Pal. P.	Diameter	Number of septa
Tc-6/11	5.0×5.5	18
„	3.5×3.7	14
Tc-6/12	4.1×4.8	18
„	3.6×3.6	18
Tc-6/13	6.3×6.3	19
„	4.6×4.6	18
Tc-6/14	4.0×4.0	16

Diagnosis. — A *Plerophyllum* with 18—19 septa and 5.0—6.5 mm in diameter; an equal number and symmetric arrangement of septa are observed in all quadrants; no minor septa inside the corallite.

Description. — Septa arranged symmetrically and regularly, pinnate in all quadrants. Cardinal septum, reaching nearly the axis of corallite, is predominating in the ephebic stage (Text-fig. 9^{1b}). Alar septa long, arranged nearly perpendicularly to cardinal septum. Metasepta in cardinal quadrants subparallel to alar septa and shortening towards cardinal septum. Counter septum may reach counter-lateral septa, connected above it. The first pair of metasepta almost equalling counter-lateral septa and the last one in the form of nodes on the external wall. In the early ephebic stage (Text-fig. 9_{1a}), counter septum predominates in thickness, as well

as slightly in length, over counter-lateral septa. As compared with the remaining septa, cardinal septum is shorter than in the wholly mature stage. Thus, the shortening of counter and lengthening of cardinal septum is observed in the development process.

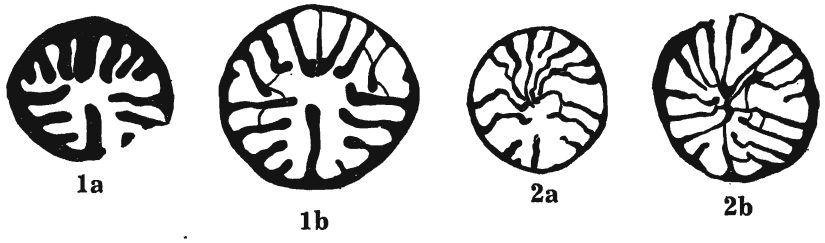

Fig. 9

Plerophyllum regulare sp. n.; × 5

1a, b — Specimen No. Z. Pal. P. Tc-6/11 (holotype): *1a* transverse section of the late neanic stage, *1b* transverse section of the ephebic stage.
2a, b — Specimen No. Z. Pal. P. Tc-6/12; successive transverse sections of the ephebic stage.

Individual variability. — The holotype is the most symmetrically formed corallite and the paratype No. Tc-6/12 (Text-fig. $9_{2a, b}$) the less so. It seems likely that this paratype specimen should already be excluded from *P. regulare* sp. n. It has been included in this species by the writer who considers that the slightly developed, tortuous and in a way tangled septa are its pathological character, while the number of septa, identical with that in the holotype and their similar arrangement are diagnostic characters. These characters are also permanent in the remaining paratypes, which also have slightly twisted and not so regularly tortuous septa and cardinal septum shorter than that in the holotype.

Remarks. — The species described is marked by very small dimensions and by a simple and, in normally developed specimens, regular structure. These characters, together with its stratigraphic position, allow one to consider it as a form related to the initial form of this genus. At any rate, it is one of the geologically oldest representatives of the genus (next to *P. penetrale* sp. n., described below). The characters named above differ it from Permian representatives of the genus. From *P. penetrale* sp. n. it differs in smaller dimensions, lower number of septa and the structure of septal apparatus.

Occurrence. — Dalnia near Karczówka Monastery, Holy Cross Mts, *Wocklumeria* or *Gattendorfia* Stage.

Plerophyllum penetrale sp. n.
(Text-fig. 10; Pl. 1, Fig. 6)

Holotype: specimen No. Z. Pal. P. Tc-6/15, figured in Pl. 1, Fig. 6*a*—*c*.
Type horizon: *Wocklumeria* or *Gattendorfia* Stage.
Type locality: Dalnia Hill near Kielce, Holy Cross Mts.
Derivation of the name: Lat. *penetralis* — internal, after septa filling the inside of the corallite.

Material. — A corallite with a partly preserved calice and without the proximal end.

Diagnosis. — A *Plerophyllum* with 23 septa and a calice 8 mm in diameter; cardinal septum and counter quadrants are predominant; no minor septa occur inside the corallite.

Description. — In the neanic stage (Text-fig. 10*a, b*), 4.0 and 4.2 mm in diameter, there occur 11 and 13 very thick septa which almost completely fill the inside of corallite. Even in this stage, cardinal septum, reaching as far as outside the axis of corallite, is conspicuously long. Also very strongly developed are counter-lateral septa; the counter septum, if also thick, is shortened and compressed between them.

In the early-ephebic stage (Text-fig. 10*c, d*), corallite has a somewhat asymmetrical arrangement of septa according to the formulae $\frac{1}{3}\frac{1}{4}$ and $\frac{2}{3}\frac{3}{4}$. All septa rhopaloid, thick. Cardinal septum thicker than the remaining ones, irregular in outline, reaching the axis of corallite. Counter quadrants differ from each other in number and arrangement of septa, as well as in a space they fill in the corallite. Counter septum remains shortened. Counter-lateral septa inclined to it, contacting each other and cardinal septum with their axial ends. Metasepta of counter quadrants are on the whole shortened towards alar septa, some of them may, however, be conspicuously long.

In the late-ephebic stage (Text-fig. 10*e, f*), the arrangement of septa and a mutual ratio of the volume of particular quadrants are similar as the above described development stage. Septa are, however, considerably thinner and the cardinal septum and counter-lateral septa are more clearly predominant. Cardinal septum irregularly macelike in outline. This outline does not result from the microstructure of septum, but it reflects the effects of pressure exerted on cardinal septum by proto- and metasepta contacting it. In one of the quadrants, cardinal septum is

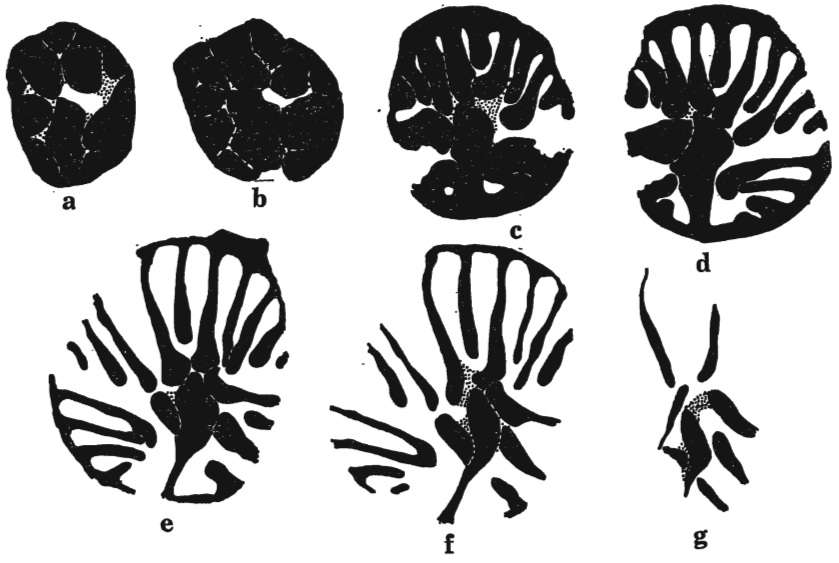

Fig. 10

Plerophyllum penetrale sp. n.; specimen No. Z. Pal. P. Tc-6/15 (holotype), × 5
a, b successive transverse sections of the neanic stage, *c—f* successive transverse sections of the ephebic stage, *g* transverse section of the calice

joined — up to the end of the individual development — by a separated end of a septum. A similar structure has been found in calice (Text-fig. 10*g*), in which protosepta, except for the counter one, formed a convex structure in the axis, as indicated by the fact that none of them occurred in the marginal part of the section illustrated.

Remarks. — Differences in relation to *P. regulare* sp. n. have been mentioned in the remarks concerning this species. *P. penetrale* sp. n. differs from the Permian representatives of the genus in the development of its macelike cardinal septum and in its measurable characters. Since it is not known whether or not the primary axial septum is formed, its assignment to this genus is not quite certain. It is possible that this species develops pentaphylloidally and that the necessity will arise of transfering it to the tachylasmatids, but the development phases studied so far seem to the writer to be more closely related to the polycoelids.

Occurrence. — Dalnia near Karczówka Monastery, Holy Cross Mts, *Wocklumeria* or *Gattendorfia* Stage.

Genus *UFIMIA* Stuckenberg, 1895
(Type species: *U. carbonaria* Stuckenberg, 1895)

Synonyms: ?*Tachylasma* Grabau, 1922, e.p.
Rhopalolasma Hudson, 1936

Geographical and stratigraphic range: Eurasia, North America, Lower Devonian to Upper Permian.

Diagnosis. — See Hill, 1956, p. F262.

Remarks. — Grabau (1922, p. 35) expresses the following remarks on the development of the *Tachylasma:* "Unfortunately we have not enough material to permit the making of serial sections from which the progress of septal development might be ascertained, but there seems no reason to suppose that it was other than that known in *Stereolasma rectum.*" If it is so in fact, the genus *Tachylasma* is a younger synonym of *Ufimia.* However, it is beyond any doubt that part of the species which in the ephebic stage have their structure identical with that of the *Ufimia* develop pentaphylloidally. They belong to the *Tachylasma* sensu Schindewolf, 1942. The writer was absolutely unable to study Grabau's (*l.c.*) originals and, therefore, in this paper he includes part of the genus *Tachylasma* to the synonymy of *Ufimia* with a reservation only. A revision of Grabau's (*l.c.*) originals and settling the names in this group of corals are indispensable.

In 1968, during his stay in the U.S.S.R., the writer succeeded in studying the development of the syntypes of *Ufimia carbonaria* Stuckenberg, 1895. Admittedly, none of them had the nepionic and early neanic stage, but the zaphrentoid arrangement of septa in the neanic stage is sufficiently characteristic to enable the assignment of this genus to Polycoelaceae. The illustrated specimen (Stuckenberg 1895, Pl. 2, Fig. 2), which should be considered as a lectotype of *U. carbonaria* is cut in two or three parts. The ontogenetically oldest part (Stuckenberg, *l.c.*, Pl. 2, Fig. 2*b* and Text-fig. 11_3 in the present paper) is unnumbered and is housed at the University of Kazan. The central part (Stuckenberg, *l.c.*, Pl. 2, Fig 2*c* and Text-fig. 11_2 in the present paper) is designated No. 21/45 and housed at the Museum of the Gorny Institute in Leningrad. A specimen housed at the same museum under No. 23/45 is most likely to be part of the same corallite, as indicated by its diameter, arrangement and number of septa, ribbing and character of changes resulting from fossilization. This specimen is, however, longer than the proximal end of the lectotype indicated by Stuckenberg, *l.c.*, Pl. 2, Fig. 2, below the line. Also different is the internal structure of this fragment of corallite drawn by Stuckenberg (*l.c.*, Pl. 2, Fig. 2*d*) and by the writer (Text-fig. 11_{1b}). This may result from the fact

that Stuckenberg did not make thin sections and in this development stage septa are arranged fairly closely to each other and do not stand out distinctly against the cristalline background. It is also very likely that Stuckenberg's above mentioned drawing corresponds to Text-fig. 11_{1a} of the present paper. At any rate, three fragments of corallite discussed make up, in the present writer's opinion, a whole and may be considered as a lectotype of *U. carbonaria*.

The present writer does not give a complete synonymy of the genus (*e.g.*, some species assigned to the *Plerophyllum*), and does not contain a list of species belonging to *Ufimia*. It will be possible to do so only after studying their ontogeny.

Ufimia makowskii Różkowska, 1969
(Text-fig. 11; Pl. 2, Fig. 2)

1969. *Ufimia makowskii* Różkowska; M. Różkowska, pp. 129 and 130, Text-fig. 51*A*.

Material. — Three fragmentarily preserved corallites.
Diagnosis. — See Różkowska, 1969, p. 129.

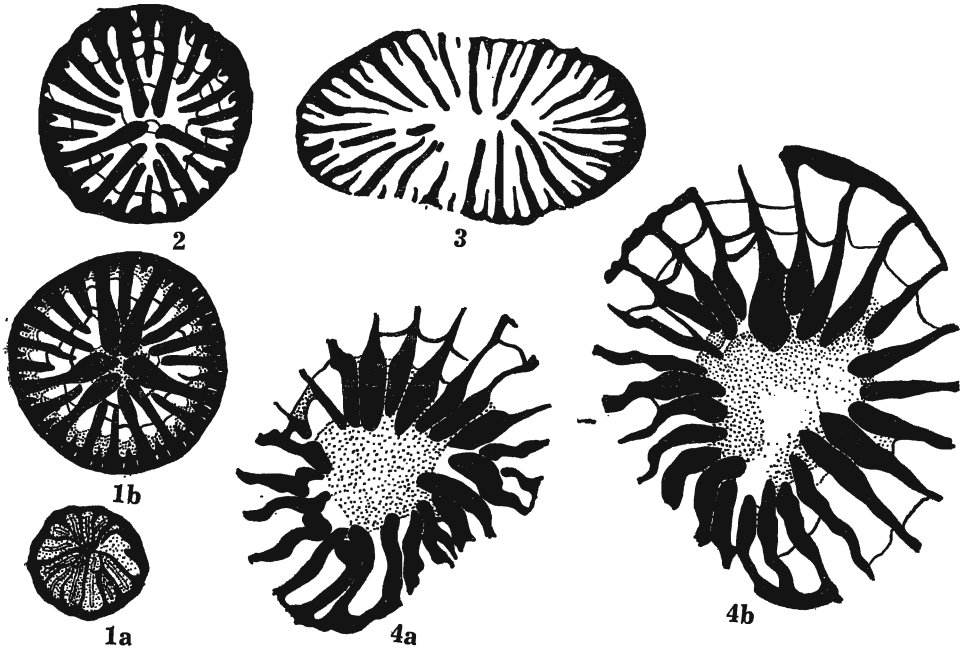

Fig. 11

1a, b, 2 and 3 — *Ufimia carbonaria* Stuckenberg, 1895

1a, b — Specimen No. 23/45 (housed in the Museum of the Institute of Mining in Leningrad), probably the youngest part of the lectotype: *1a* transverse section of the neanic stage (× 5), *1b* transverse section of the early ephebic stage (× 3).

2 — Specimen No. 21/45 (housed in the same Museum; lectotype drawing by Stuckenberg, 1895, Pl. 2, Fig. 2*c*: transverse section of the ephebic stage (× 3).

3 — Unnumbered specimen (housed in the Museum of the University of Kazan; lectotype drawing by Stuckenberg, 1895, Pl. 2, Fig. 2*b*: transverse section of the calice, slightly destroyed (× 3).

4a, b — *Ufimia makowskii* Różkowska, 1969; specimen No. Z. Pal. P. Tc-6/16 — transverse sections of the early (*4a*) and late (*4b*) ephebic stage, × 5.

Remarks. — One of the specimens assigned to this species (No. Tc-6/16) completely corresponds to numerical data of the holotype, two others being smaller. No differences which might be considered as specific have been found in morphology. Specimens from Dalnia have a slightly more shortened cardinal septum and a more distinctly rhopaloid major septa in the ephebic stage.

Occurrence. — Dalnia near Karczówka Monastery, Holy Cross Mts, *Wocklumeria* or *Gattendorfia* Stage.

Suborder **Tachylasmatina** subord. n.

Families assigned: Tachylasmatidae Grabau, 1928
Dalnilidae fam. n.

Geographical and stratigraphic range: Eurasia, North America, Australia, Lower Devonian (?Upper Silurian) to Upper Permian.

Diagnosis. — Tetracoralla (Rugosa) with a pentaphylloid development.

Remarks. — The necessity of separating this suborder has been discussed by the writer above. Since it seems possible to find related forms with dissepiments and maybe also colonial ones, the diagnosis is on purpose so very general in character. Through such a diagnosis, the writer intends to emphasize that ontogeny should be of a decisive importance in assigning such forms to the Tachylasmatina subord. n.

Family **Tachylasmatidae** Grabau, 1928

Subfamilies assigned: Tachylasmatinae Grabau, 1928
Commutinae subfam. n.

Geographical and stratigraphic range: as for the suborder.

Diagnosis. — Solitary Tachylasmatina without dissepiments and with a lamellar microstructure; counter septum delayed in development.

Subfamily **Tachylasmatinae** Grabau, 1928
(Type genus: *Pentaphyllum* de Koninck, 1872)

Genera assigned: Pentaphyllum de Koninck, 1872; *Pentamplexus* Schindewolf, 1942; *?Tachylasma* Grabau, 1928 (or *Prionophyllum* Schindewolf, 1942); *Antikinkaidia* gen. n.

Diagnosis. — Tachylasmatidae with major septa not forming a phyllotheca.

Genus *PENTAPHYLLUM* de Koninck, 1872
(Type species: *P. armatum* de Koninck, 1872 chosen by Schindewolf, 1942, p. 180)

Synonyms: Plerophyllum Hinde, 1890 e.p.
?Oligophyllum Počta, 1902
Cryptophyllum Carruthers, 1919

Diagnosis. Tachylasmatinae with five predominating protosepta which do not fuse with each other and with an underdeveloped counter protoseptum.

Remarks. — The writer was unable to study the holotypes of type species of *Pentaphyllum, "Oligophyllum"* and *"Cryptophyllum"*. In the present paper these genera have been connected only on the basis of the results of so far published studies (Carruthers 1919, Hudson 1936, Schindewolf 1942).

As underscored in the general remarks, the discussion on the essence of the genus *Pentaphyllum* de Koninck cannot be fruitful at present. The species and specimens developing and built similarly a *"Cryptophyllum" hibernicum* Carruthers are considered by the writer as representatives of this genus. On the other hand, the

formal aspect of nomenclature has unequivocally been determined by the International Code of Zoological Nomenclature, par. 56a: the principle of a single letter. The name given by Dejean, 1821 to the Coleoptera was *Pentaphyllus* and thus the name *Pentaphyllum* is correct.

The genus *Oligophyllum* Počta, 1902 does not differ in qualitative characters from *Pentaphyllum*. At least such a conclusion may be drawn on the basis of published studies (Počta 1902, Schindewolf 1942, Kullmann 1965) and the present writer's study of photographs of two transverse thin sections of the holotype of the type species. In both genera, the same protosepta predominate and probably identically develope, as indicate the thin sections of the holotype, mentioned above. The main difference — the lack of tabulae in *Oligophyllum* — strongly emphasized by Kullmann (*l.c.*) has not been proven. Not one of the longitudinal sections of this genus has ever been studied and it is a well known fact that in most Tachylasmatina tabulae are very widely spaced and may escape observation in transverse and even serial sections. Also likely is the existence of a very deep calice. If such would be the case, tabulae would occur only at the proximal end, which so far also remains unstudied.

The subgenus *Oligophyllum (Pentelasma)* Kullmann, 1965 introduced on the basis of a single specimen, does not display larger than specific differences as compared with *Pentaphyllum*. The diagnostic characters of the subgenus, given by Kullmann (*l. c.*), are quantitative only.

Specimens described by Soshkina (1951) and Spassky (1960) as *Oligophyllum quinqueseptatum* Počta have a very long counter septum and are related rather to *Hexalasma* (or *Pseudocryptophyllum*). Unfortunately, their ontogeny is unknown. In his description, Spassky (*l. c.*) mentions the occurrence of tabulae.

Pentaphyllum pauperum sp. n.
(Tex-fig. 12; Pl. 4, Figs 1—2)

Holotype: specimen No. Z. Pal. P. Tc-6/19, figured in Pl. 4, Fig. 1*a—b*.
Type horizon: Wocklumeria or *Gattendorfia* Stage.
Type locality: Dalnia Hill near Kielce, Holy Cross Mts.
Derivation of the name: Lat. *pauper* — poor, after its simplified structure.

Material. — Three solitary corallites without proximal ends. Specimen No. Z. Pal. P. Tc-6/20 with preserved calice.

Dimensions (in *mm*):

Specimen Z. Pal. P.	Diameter	Number of septa	Note
Tc-6/19	3.3	8	Cross beneath calice
Tc-6/20	4.3	6	„ „ „
„	5.0	6	„ by calice
Tc-6/21	3.4	5 (?)	Recrystallized

Diagnosis. — A *Pentaphyllum* with six to eight short major septa and 3.5 to 5 mm in diameter; minor septa absent from the inside and wall of corallite.

Description. — Transverse section (Text-fig. $12_{1c, d; 2b, c}$). Only counter-lateral septa occur in counter quadrants, no counter septum and metasepta. Six relatively long septa develop in cardinal quadrants in the late-ephebic stage. Alar septa are connected throughout the entire ontogeny by a thin structureless plate. Minor septa do not occur.

Ontogeny. — In the neanic stage corallites are about 2.5 mm in diameter and have five thick, short protosepta (the earliest stage has not been found in the material under study). Counter septum marked neither in the microstructure of the external

wall, nor in the form of a groove in epitheca. This pentaseptal stage persists in the holotype over most part of the development and in the paratypes almost up to the end of ontogeny. At the end of development, the holotype very rapidly (over a space

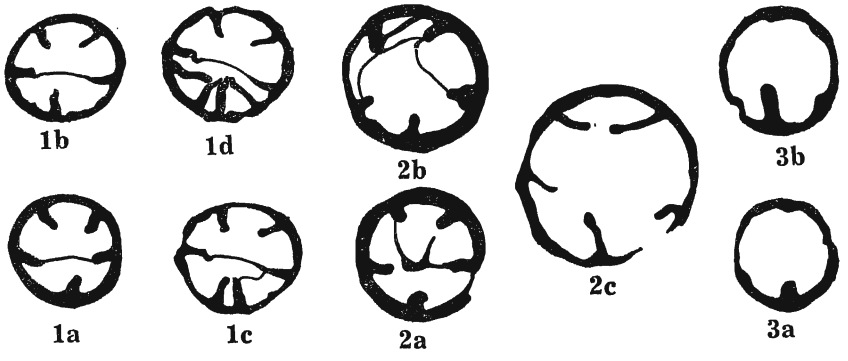

Fig. 12

Pentaphyllum pauperum sp. n.; × 5

1a-d — Specimen No. Z. Pal. P. Tc-6/19 (holotype): *1a, b* successive transverse sections of the neanic stage, *1c, d* successive transverse sections of the ephebic stage.
2a-c — Specimen No. Z. Pal. P. Tc-6/20: *2a* transverse section of the neanic stage, *2b* transverse section of the ephebic stage, *2c* transverse section of the calice.
3a, b — Specimen No. Z. Pal. P. Tc-6/21; successive transverse sections of the neanic stage.

of 0.4 mm of its growth) produces three fairly long metasepta in cardinal quadrants (Text-fig. $12_{1c, d}$). They may exceed the length of protosepta.

Individual variability. — In the neanic stage, corallites are strongly variable in diameter (from 2.3 mm in the holotype to 3.5 mm in one of the paratypes). Differences are also observed in structure: specimen No. Tc-6/21 has a long and thick cardinal septum, while the remaining protosepta hardly project from the external wall. Metasepta not always developed. Specimen No. Tc-6/21 is probably devoid of them at all and No. Tc-6/20 displays a single metaseptum in the form of a node as late as at the end of the development.

Remarks. — The most closely related species is *P. bulbosum* Schindewolf, 1942, from which *P. pauperum* sp. n. differs in more than two times smaller dimensions and in the number of septa, in the lack of metasepta in counter quadrants, in the lack of counter septum, as well as in shorter and considerably thinner protosepta in the neanic stage.

Occurrence. — Dalnia near Karczówka Monastery, Holy Cross Mts, *Wocklumeria* or *Gattendorfia* Stage.

Genus *ANTIKINKAIDIA* gen. n.
(Type species: *A. triseptata* sp. n.)

Derivation of the name: with septa arranged in an opposite way than in *Kinkaidia* Easton, 1945.

Species assigned: by monotypy.

Stratigraphic and geographical range: Holy Cross Mts, Poland, *Wocklumeria* or *Gattendorfia* Stage.

Diagnosis. — Tachylasmatinae with cardinal quadrants reduced in volume; cardinal septum and alar septa fused with it nearly to the end of development are predominant; metasepta of counter quadrants variable in length; counter-lateral septa not distinguished.

Remarks. — The genus *Antikinkaidia*, introduced by the writer on the basis on one corallite only, is not sufficiently determined. As compared with so far described tetracorals with pentaphylloid ontogeny the structure of this corallite displays qualitative differences. The lack of counter septum (or its underdevelopment) in the relatively early phase of its development indicates that it should be assigned to Tachylasmatina subord. n.

Antikinkaidia triseptata sp. n.
(Text-fig. 13; Pl. 4, Fig. 3)

Holotype: Specimen No. Z. Pal. P. Tc-6/22, figured in Pl. 4, Fig. 3*a—e*.
Type horizon: Wocklumeria or *Gattendorfia* Stage.
Type locality: Dalnia Hill near Kielce, Holy Cross Mts.
Derivation of the name: Lat. *triseptata* — after three predominant protosepta.

Material. — A specimen with partly preserved proximal end and the bottom of the calice.

Dimensions (in *mm*):

Diameter	Number of septa	Notice
8.5	25 (?)	Bottom of calice, incomplete
8.0	25	Beneath the bottom of calice
7.0	25	Ephebic stage.

Diagnosis. — *Antikinkaidia* with 25 septa and 8 mm in diameter; formula: $\frac{3 \mid 3}{7 \mid 6}$.

Description. — Cardinal septum and alar septa very distinctly predominate in the bottom of calice (Text-fig. 13*d*). They reach nearly the axis of corallite and have axial ends strongly thickened rhopaloidally. Alar septa inclined to cardinal septum and connected with its axial end. Three metasepta strongly varying in length occur in each of the cardinal quadrants. Counter septum does not occur in the section available, but the corallite is slightly damaged in this place. Counter-lateral septa and three to four adjoining metasepta are more or less equal in length and somewhat rhopaloid. The last two to three pairs of metasepta in counter quadrants are shortened. Cardinal tabular fossula is still visible. Not unlikely is also the presence of tabular fossula near counter septum, which might be indicated by the arrangement of tabulae. Unfortunately, no transverse section could be made for the lack of material.

Beneath the botom of calice and in younger section of the ephebic stage (Text-fig. 13*b, c;* Pl. 4, Fig. 3*a—d*) the fundamental arrangement of septa remains the same as that described above. A complete fusion — the connection of the median lines included — of alar septa with cardinal septum makes up a principal difference. Such a structure has been observed in all the sections of the ephebic stage prepared. In addition these septa are somewhat thinner than the remaining major septa and have not rhopaloid axial ends. Counter-lateral septa are longer than metasepta and the counter septum may reach 1.3 mm in length.

The neanic stage (Text-fig. 13*a*) is marked by similar proportions as the ephebic stage, counter quadrants being predominant in volume and numbers. Counter-lateral septa, the longest of all septa, gradually shorten themselves in a further ontogeny. Metasepta of counter quadrants are arranged in a pinnate manner in relation to counter-lateral septa and regularly shortened towards alar septa. In the section illustrated no counter septum is visible, but the specimen was damaged in this place. In another, not illustrated section, this septum is visible somewhat higher up. A long and thick cardinal septum even in this stage joins one of the alar

septa, while another alar septum remains free. The arrangement of septa described above slightly differs from a typicaly pentaphylloid system. First of all, with such a small diameter of corallite (about 4.5 mm), there are relatively many septa, whose

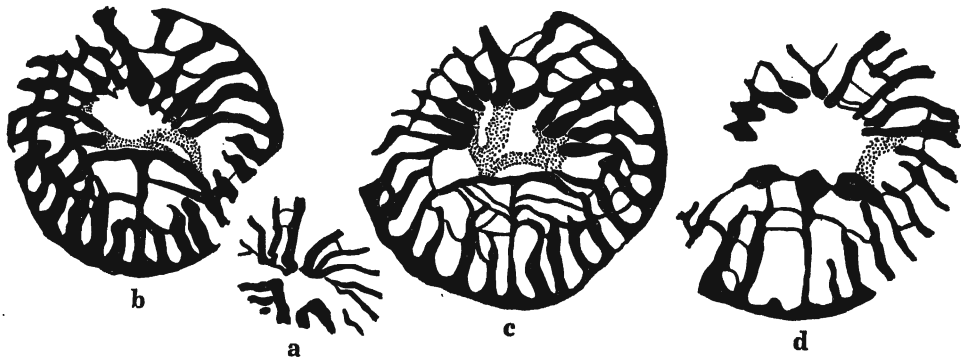

Fig. 13

Antikinkaidia triseptata sp. n.; specimen No. Z. Pal. P. Tc-6/22 (holotype), × 5
a transverse section of the neanic stage, *b, c* successive transverse sections of the ephebic stage, *d* transverse section near the bottom of the calice

arrangement is, in addition, more regular and similar to zaphrentoid in counter quadrants, except the shortening of counter septum.

Occurrence. — Dalnia near Karczówka Monastery, Holy Cross Mts, *Wocklumeria* or *Gattendorfia* Stage.

Subfamily **Commutiinae** subfam. n.
(Type genus: *Commutia* gen. n.)

Genera assigned: by monotypy.
Geographical and stratigraphic range: Holy Cross Mts, Poland, *Wocklumeria* or *Gattendorfia* Stage.

Diagnosis. — Tachylasmatidae developing phyllothecae in the ephebic stage.

Remarks. — Since only one genus belongs to the subfamily Commutiinae, the remarks given below include at the same time this genus. Of so far described genera, only *Endothecium* and *Pentaphyllum* may be compared with *Commutia* gen. n. The former has phyllothecae in its neanic stage. The development of these Upper Permian corals has never been studied in full, but it seems that it is different than that in the *Commutia* gen. n., at least in the neanic and ephebic stages. On the whole, the genus *Endothecium* considerably differs from all Polycoelaceae and Tachylasmatina subord. n. and requires a repeated, accurate definition and studies.

The genus *Pentaphyllum* is incomparably closer to the *Commutia*. Ontogeny and microstructure give evidence for a close relationship of these genera and subfamilies. Young development stages of the *Commutia* and *Pentaphyllum* are indistinguishable in practice. *Pentaphyllum* seems to be older phylogenetically, as primarily indicated by the fact that the *Commutia* usually acquires its new generic character, that is, phyllotheca late in ontogeny. The moment at which the phyllotheca is formed is, at the same time, so variable that it may be considered as an individual character of corallites. Such a lack of stabilization is mostly observed in the appe-

aring, not yet fully established structural elements. Also remarkable is the fact that the *Commutia* gen. n. does not repeat in its development the mature stage of *Pentaphyllum*, but directly passes from the stage with five protosepta connected axially, to the formation of the phyllotheca.

At the same time, it should be emphasized that the close ontogenetic bond and a nearly completely identical development in the nepionic and neanic stages are the characters of the entire family Tachylasmatidae. The division into lower taxons may here be conducted only on the basis of the ephebic stages. The formation of phyllotheca and a particularly strong development of some metasepta, which also participate in its construction are quite sufficient characters enabling the separation of the subfamily.

According to Dr. D. Weyer (in litt.) *Plerophyllum (Ufimia) tricyclicum* Schindewolf, 1942, has also a real phyllotheca but (in contrast to *Commutia* gen. n.), only in the neanic stage. The full development of that species and its real relationship and taxonomic position remains unknown.

Genus *COMMUTIA* gen. n.
(Type species: *C. szulczewskii* sp. n.)

Derivation of the name: Lat. *commutare* — to change, after a variable structure.
Geographical and stratigraphic range, diagnosis and remarks: as for the subfamily.
Species assigned: ?*Pentaphyllum (P.) irregulare* Kullmann, 1965; *C. szulczewskii* sp. n.; *C. longiseptata* sp. n.; *C. miranda* sp. n.; *C. multitabulata* sp. n.

Commutia szulczewskii sp. n.
(Text-fig. 14; Pl. 5, Figs 4—9)

Holotype: Specimen No. Z. Pal. P. Tc-6/33, figured in Pl. 5, Fig. 7.
Type horizon: Wocklumeria or *Gattendorfia* Stage.
Type locality: Dalnia Hill near Kielce, Holy Cross Mts.
Derivation of the name: in honor of Docent M. Szulczewski who found this fossiliferous locality.

Material. — Twenty nine corallites, some of them with calices, many with preserved proximal ends having five protosepta. Maximum length of a corallite found 22 mm, most specimens being 12 to 15 mm long.

Dimensions (in *mm*):

Specimen No. Z. Pal. P.	Number of septa	Diameter	Note
Tc-6/23	20	9.1 × 10.1	Calice
„	16	6.2 × 6.4	Ephebic stage
„	14	4.3 × 4.6	Neanic stage
Tc-6/24	14	3.7 × 3.7	Late-neanic st.
Tc-6/25	20	5.0 × 6.1	Ephebic stage
„	22	5.8 × 6.8	Calice
Tc-6/26	12	3.3 × 3.3	Neanic stage
„	19	5.8 × 6.3	Ephebic stage
„	19	6.4 × 6.8	Calice's bottom
Tc-6/27	18	4.2 × 4.6	Ephebic stage
Tc-6/28	5	2.0 × 2.4	Nepionic stage
„	6 (?)	2.8 × 3.0	Early-neanic st.
Tc-6/29	17	6.6 × 7.2	Calice
„	17	5.6 × 5.6	Ephebic stage
„	13	4.5 × 4.5	Late-neanic st.
Tc-6/31	16	3.4 × 3.6	Early-ephebic

Tc-6/32	11	2.7 × 2.7	Early-ephebic
Tc-6/33	18	5.7 × 7.0	Calice
,,	15	4.9 × 5.7	Late-neanic st.
,,	8 (?)	2.7 × 3.0	Neanic stage
Tc-6/35	14	3.5 × 4.3	Neanic stage
Tc-6/36	20	4.4 × 4.6	Calice
,,	16	3.1 × 3.5	Ephebic stage
,,	13	2.2 × 2.5	Neanic stage

Diagnosis. — A *Commutia* with very widely spaced tabulae; phyllotheca formed by at least nine septa, preserved until the end of the ontogenetic development.

Description. — Corallites funnel-like, with a long, slender part corresponding to the neanic stage and a very strongly extended upper part, which includes the late-neanic or early-ephebic stage (Pl. 5, Figs 5 and 7*a*). The holotype develops its phyllotheca only in the extended part. It is formed by nine axial ends of septa and is 2.0 × 2.3 mm in diameter. Counter septum equalling in length eight underdeveloped metasepta. The remaining protosepta do not differ from the four ontogenetically oldest metasepta with which they form phyllotheca.

In longitudinal section (Text-fig. $14_{8b;\ 10a,\ b}$) the phyllotheca extends more or less regularly from the position at which the axial ends of septa separate, up to the calice. Tabulae very widely spaced (less than one per 5 mm), in the marginal part of corallite directed obliquely from the external wall upwards to the phyllotheca; they are concave inside the phyllotheca.

Ontogeny. — It is difficult to separate the nepionic from the neanic stage. The growth of septa and increase in the diameter of corallite are very slow. The part of growth in which only five protosepta occur is considered by the writer to be the nepionic stage. Counter septum does not distinguish itself either in the microstructure of the external wall, or in the form of a groove on epitheca. Obviously, this groove may not occur on such a thick wall. Counter septum is formed in some specimens very late. One of the specimens (Text-fig. 14_7) probably does not develop it at all. Only few specimens have this septum strongly developed and produce it early in the ontogeny (Text-fig. $14_{1,\ 3,\ 9}$). In the writer's opinion, the sector of the corallite's growth between the appearance of the first pair of metasepta and counter protoseptum, if only in the microstructure of wall, and the development of phyllotheca, should be considered as the neanic stage of this species, regardless of the length of this sector. In most corallites, counter septum appears in the neanic stage, but the moment at which it is formed is their individual character. Usually, the acceleration of the growth of metasepta is observed in counter quadrants. In some specimens, it is as early as this development stage that an incipient paired arrangement may be observed of alar and counter-lateral protosepta with adjoining pairs of metasepta (Text-fig. 14_{1c}).

Individual variability. — Corallites assigned to this species may be divided into several groups, which differ from each other distinctly, but not as strongly as to be considered separate species.

(*a*) Fine, multiseptal corallites (Text-fig. $14_{5,\ 6}$), very early reaching their ephebic stages (early development of phyllotheca). The arrangement and length of septa are in this group so variable that they may be considered individual characters. Counter septum appearing very late. Specimen No. Tc-6/30 (Text-fig. 14_8) having, however, slightly larger dimensions, is approaching this group.

(*b*) Corallites with a very distinctly paired septa forming phyllotheca, with few short metasepta and with very late appearing counter septum or even without it (Text-fig. $14_{7,\ 10}$).

(*c*) Corallites with a fairly well developed and early appearing counter septum and which form phyllotheca approximately halfway their growth. At first, phyllotheca is open near cardinal septum, which is only slightly bent in its axial part (Text--fig. 14_{9c}; Pl. 5, Figs 5 and 6*b*, *c*). In the bottom of calice phyllotheca is already completely closed.

(*d*) Specimens similar to or only slightly different from the holotype in their particular characters, *e.g.*, specimen No. Tc-6/25 (Text-fig. 14_3; Pl. 5, Fig. 9) or No. Tc-6/23 (Text-fig. 14_1), which do not display acceleration in the growth of their septa.

Remarks. — Remarks will be submitted with the description of following species.

Occurrence. — Dalnia near Karczówka Monastery, Holy Cross Mts, *Wocklumeria* or *Gattendorfia* Stage.

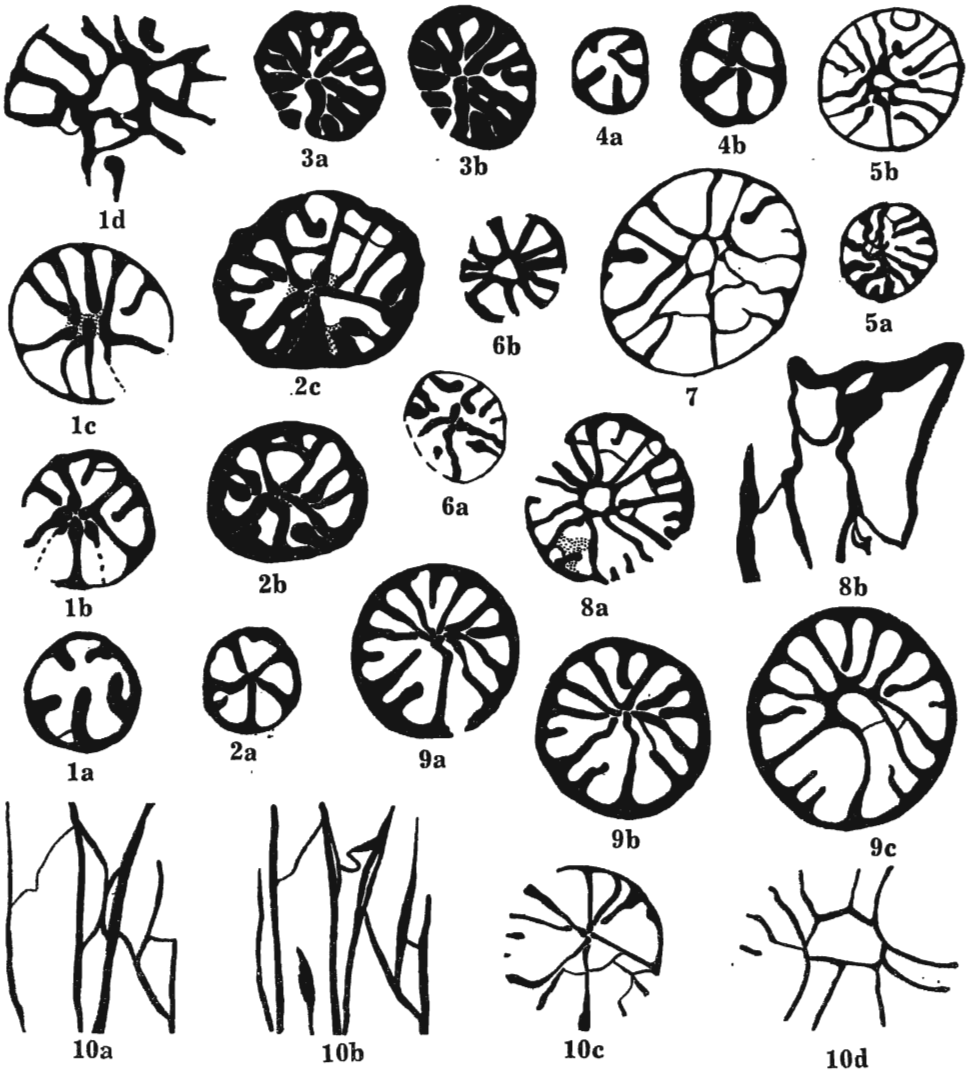

Fig. 14

Commutia longiseptata sp. n.
(Text-fig. 15*a*—*e*; Pl. 4, Figs 4—5)

Holotype: Specimen No. Z. Pal. P. Tc-6/55. figured in Pl. 4, Fig. 5*a*—*b*.
Type horizon: Wocklumeria or *Gattendorfia* Stage.
Type locality: Dalnia Hill near Kielce, Holy Cross Mts.
Derivation of the name: longiseptata — after five, very long protosepta.

Material. — Seven solitary corallites without proximal ends, some of them having calices preserved.

Dimensions (in *mm*):

Specimen No. Z. Pal. P.	Number of septa	Diameter	Note
Tc-6/53	12	4.7 × 5.5	Ephebic stage
,,	8	3.0 × 3.4	Neanic stage
Tc-6/54	8	2.8 × 4.1	Neanic stage
Tc-6/55	10	5.1	Calice
,,	5	2.1 × 3.1	Nepionic stage
Tc-6/56	7	4.1 × 4.1	Ephebic stage
Tc-6/57	9	4.0 × 4.0	Calice
,,	7	3.6 × 3.8	Ephebic stage

Diagnosis. — A *Commutia* with a very narrow phyllotheca formed at the end of the individual development by only five protosepta; counter septum in the external wall or lacking at all.

Description. — Corallites similar in shape to *C. szulczewskii* sp. n. Holotype (Pl. 4, Fig. 5*a*, *b*) has in its strongly widened calice ten septa five of which form phyllothecae about 0.5 mm in diameter (thickness included). Counter septum probably lacking. It has not been found either in the microstructure of wall or in a corresponding groove on the surface of the external wall. Metasepta very short, only the first pair near counter-lateral septa somewhat longer. In addition to metasepta entering the lumen of corallite, there have been found four septal grooves which have not their counterparts in the nodes inside the corallite.

Fig. 14

Commutia szulczewskii sp. n.; × 5

1a-1d — Specimen No. Z. Pal. P. Tc-6/34: *1a* transverse section of the nepionic stage, *1b*, *1c* successive transverse sections of the neanic stage, *1d* transverse section of the ephebic stage.
2a-2c — Specimen No. Z. Pal. P. Tc-6/33 (holotype); successive transverse sections of the neanic stage.
3a, 3b — Specimen No. Z. Pal. P. Tc-6/35; successive transverse sections of the neanic stage.
4a, 4b — Specimen No. Z. Pal. P. Tc-6/28; successive transverse sections of the nepionic stage (the distance between figures = 7.2 mm).
5a, 5b — Specimen No. Z. Pal. P. Tc-6/36; *5a* transverse section of the neanic stage, *5b* transverse section of the ephebic stage.
6a, 6b — Specimen No. Z. Pal. P. Tc-6/32; *6a* transverse section of the neanic stage, *6b* transverse section of the ephebic stage.
7 — Specimen No. Z. Pal. P. Tc-6/37; transverse section of the ephebic stage.
8a, 8b — Specimen No. Z. Pal. P. Tc-6/27; *8a* transverse section of the neanic stage, *8b* longitudinal section beneath calice bottom.
9a-c — Specimen No. Z. Pal. P. Tc-6/29; *9a*, *b* successive transverse sections of the neanic stage, *9c* transverse section of the ephebic stage with not fully closed phyllotheca.
10a-d — Specimen No. Z. Pal. P. Tc-6/30; *10a*, *b* successive longitudinal sections, *10c* transverse section of the neanic stage, *10d* transverse section of the ephebic stage.

Ontogeny. — Typical of this genus. The increase of septa and growth of the diameter of corallite are very slow in the neanic stage, in which counter septum may not appear at all.

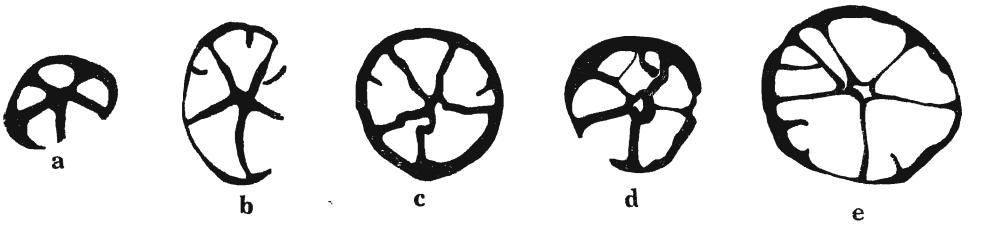

Fig. 15

Commutia longiseptata sp. n.; × 5

a — Specimen No. Z. Pal. P. Tc-6/55 (holotype); transverse section of the late nepionic stage.
b — Specimen No. Z. Pal. P. Tc-6/54; transverse section of the late neanic stage.
c — Specimen No. Z. Pal. P. Tc-6/57; transverse section of the late neanic stage.
d — Specimen No. Z. Pal. P. Tc-6/56; transverse section of the ephebic stage.
e — Specimen No. Z. Pal. P. Tc-6/53; transverse section of the ephebic stage.

Individual variability. — So far, the writer has not had at his disposal a sufficiently abundant material as to be able to ascertain a full range of variability. The species seems, however, to belong to less variable ones. The main variability trends are expressed by the development of long metasepta (Text-fig. 15*e*) and the possibility of a relatively early formation of phyllotheca (Text-fig. 15*d*).

Remarks. — The species differs from the type species primarily in the structure of phyllotheca and its very small dimensions. Less important differences are the underdevelopment of the first metasepta in quadrants and the resulting lack of characteristic pairs of proto- and metasepta, as well as a small number of septa developing in the cavity of the corallite.

Occurrence. — Dalnia near Karczówka Monastery, Holy Cross Mts, *Wocklumeria* or *Gattendorfia* Stage.

Commutia miranda sp. n.
(Text-fig. 16; Pl. 4, Fig. 6)

Holotype: specimen No. Z. Pal. P. Tc-6/60, figured in Pl. 4, Fig. 6*a—d*.
Type horizon: Wocklumeria or *Gattendorfia* Stage.
Type locality: Dalnia Hill near Kielce, Holy Cross Mts.
Derivation of the name: Lat. *mirandus* — strange.

Material. — A corallite without its proximal end and with the lower part of calice preserved.

Diagnosis. — A *Commutia* with 17 major septa and 7.5 mm. in diameter; phyllotheca formed in the early-ephebic stage of development disappears at the end of ontogeny.

Description. — Corallite in the form of a short, rapidly extending horn, 7.3 × 9.1 mm in diameter at the bottom of calice. Arrangement of septa excentric. Cardinal quadrants occupying about two-thirds of the bottom of calice and include two-thirds of all septa arranged in a pinnate manner in relation to a long cardinal septum. Particularly extended is the second or third metaseptum, while the last

pair is shortened and arranged parallel to cardinal septum. Counter quadrants slightly deformed and, in the place where counter septum should occur, destroyed. Four protosepta (except for the counter ones and one of the counter-lateral ones) are connected with each other at a point excentric toward counter quadrants. Minor septa lacking.

Ontogeny. — The youngest section studied has a similar structure as the neanic stage of other species of *Commutia* gen. n. (Text-fig. 16*a*). The paired system of septa in cardinal quadrants is marked on one side only, since one of the first metasepta is underdeveloped. Counter septum not marked in the microstructure of wall, but there exists a corresponding, delicate groove on the external surface. The paired system of septa in counter quadrants is also deformed — one of the counter--lateral septa bends at a right angle and reaching another septum forms a sort of a pseudo-fossula over an incipient counter septum. This arrangement of counter--lateral protosepta persists nearly to the end of the individual development.

The next section (Text-fig. 16*b*) presents the most regularly built phyllotheca, joined by 12 septa. Cardinal septum enters deeper into the wall of phyllotheca and is longer than other ones. In this place, there also occurs a very short counter septum. In the process of further development, phyllotheca becomes gradually transformed. First, it is penetrated by the axial end of cardinal septum (Text-fig. 16*c*), but its largest part remains at first unchanged. Also in the next sections phyllothecal fragments are visible, although in this place there predominate axial tabellae very strongly thickened by stereoplasma (Text-fig. 16*c*, *d*). Under the bottom of calice phyllotheca disappears in practice (Text-fig. 16*e*). Alar protosepta and one of the counter-lateral ones join cardinal septum forming a system similar to that described at the beginning of the present species description. In a way this is a sort of a

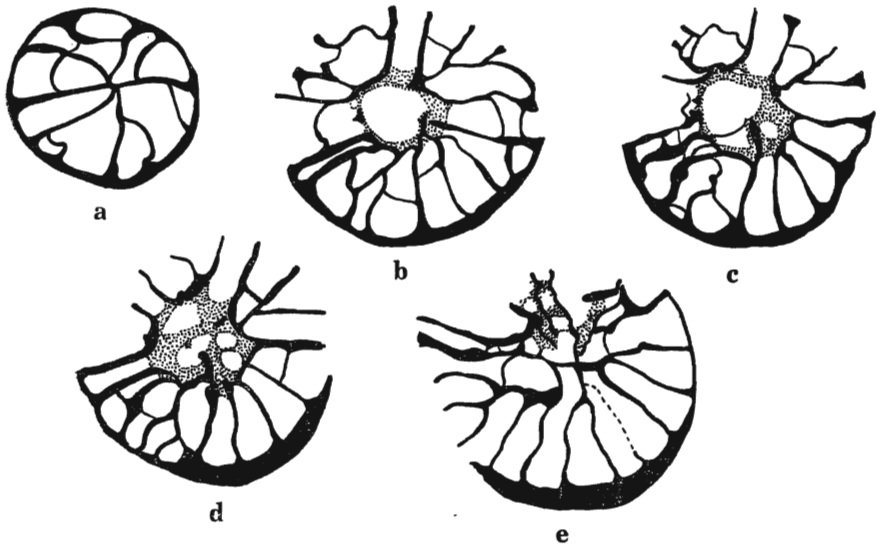

Fig. 16

Commutia miranda sp. n.; specimen No. Z. Pal. P. Tc-6/60 (holotype), × 5

a transverse section of the neanic stage, *b-d* successive transverse sections of the ephebic stage, *e* transverse section of the ephebic stage, beneath calice bottom

counter-zaphrentoid arrangement in which most metasepta increase their length from alar septa towards cardinal septum. Some traces of phyllotheca may be also seen in the manner of connecting some metasepta.

Remarks. — The involved ontogeny described above, the rapidly changing arrangement and length of proto- and metasepta and the disappearance of phyllotheca at the end of the individual development are the main characters which distinguish the specimen described from other corallites of this genus. They seem to the present writer sufficient for separating it and erecting a new species. The youngest development stage studied, although very similar to the neanic stages of other species of *Commutia* gen. n., does not, however, settle the matter of this species being part of *Commutia* gen. n. It requires continued studies on more complete materials.

Occurrence. — Dalnia near Karczówka Monastery, Holy Cross Mts, *Wocklumeria* or *Gattendorfia* Stage.

Commutia multitabulata sp. n.
(Text-fig. 17; Pl. 6)

Holotype: specimen No. Z. Pal. P. Tc-6/63, figured in Pl. 6, Fig. 1*a—f*.
Type horizon: Wocklumeria or *Gattendorfia* Stage.
Type locality: Dalnia Hill near Kielce, Holy Cross Mts.
Derivation of the name: Lat. *multitabulata* — with many tabulae.

Material. — Five corallites without proximal ends, two of them having the bottom of calice preserved.

Dimensions (in *mm*):

Specimen No. Z. Pal. P.	Number of septa	Diameter	Note
Tc-6/61	18	6.8 × 7.3	Ephebic stage
„	12	4.5 × 5.0	Neanic stage
Tc-6/62	22	7.4 × 8.8	Ephebic stage
„	20	6.8 × 7.3	Late neanic stage
„	17	5.5 × 6.1	Neanic stage
Tc-6/63	21	10.2 × 10.2	Calice
„	21	8.8 × 9.2	Ephebic stage
„	13	5.3 × 6.3	Neanic stage
Tc-6/64	17 (?)	6.2 × 8.0	Ephebic stage
Tc-6/65	10 (?)	6.3 × 7.1	Ephebic stage

Diagnosis. — A *Commutia* with many tabulae; axial tube only partly in the form of phyllotheca; counter septum well developed, shorter than the remaining protosepta.

Description. — The transverse section of the holotype (Text-fig. $17_{1d, e}$; Pl. 6, Fig. 1*c, d*) has been made in the cylindrical part of corallite. Major septa in principle have two lengths: nine (or eight) of them long, forming an axial tube, including five protosepta (except for counter septum) and twelve (or thirteen) shorter ones (including counter septum). Arrangement of long and short septa irregular. Counter quadrants predominate over cardinal ones as early as in the neanic stage in both the number and volume. In the ephebic stage, cardinal quadrants occupy only about a quarter of the corallite and have two metasepta each.

It is difficult to define the name of the axial tube. Most septa of which it is composed join each other forming phyllotheca, but two or three septa in counter quadrants may be free and this part of tube is closed by a tabulae, that is, a modified cyathotheca. Inside the axial tube, there may occur transverse (Text-fig. 17_{1e}) or ringlike (Text-fig. 17_{1d}) sections of tabulae.

Longitudinal section (Text-fig. 17*lf, g*; Pl. 6, Fig. 1*e, f*). Of several successive longitudinal sections, the illustrations present two which are traced next to the axis of corallite in the plane of cardinal and counter septum. In the part youngest ontogenetically, there occur the sections of three septa radially coming apart upwards. This seems to be the beginning of phyllotheca, although axial tabellae rise in this part of corallite steeply and join the central one of three septa. In the part of section

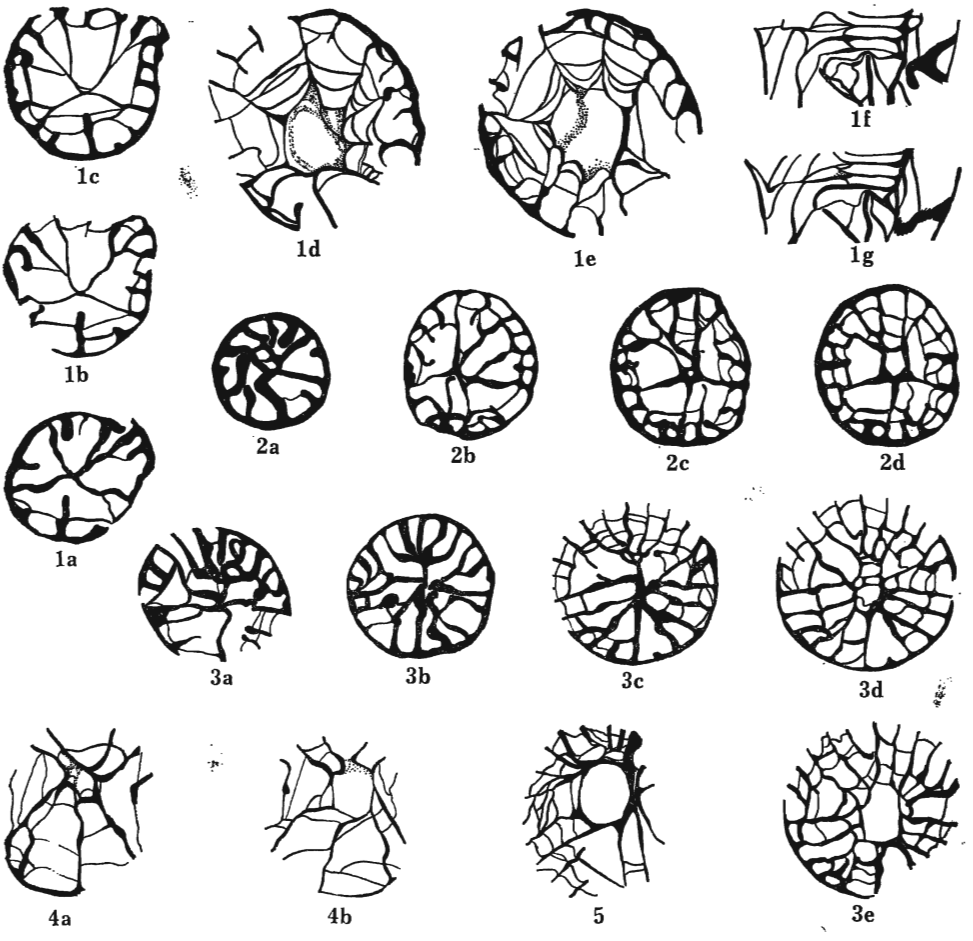

Fig. 17

Commutia multitabulata sp. n.; × 3

1a-g — Specimen No. Z. Pal. P. Tc-6/63 (holotype): *1a—1c* successive transverse sections of the neanic stage, *1d,1e* successive transverse sections of the ephebic stage, *1f,1g* successive longitudinal sections.

2a-d — Specimen No. Z. Pal. P. Tc-6/61: *2a,2b* successive transverse sections of the neanic stage, *2c,2d* successive transverse sections of the ephebic stage.

3a-e — Specimen No. Z. Pal. P. Tc-6/62: *3a—3c* successive transverse sections of the neanic stage, *3d,3e* successive transverse sections of the ephebic stage.

4a, b — specimen No. Z. Pal. P. Tc-6/65; successive transverse sections of the ephebic stage.

5 — Specimen No. Z. Pal. P. Tc-6/64; transverse section of the ephebic stage.

older ontogenetically, there remains only the septum which belongs to cardinal quadrants and which limits the axial tube. From the side of the external wall it is joined by a few very steep peripheral tabellae which form a tabular fossula. Many, flat axial tabellae are distributed at almost equal intervals and horizontally in the axial part of corallite. On the side of counter septum, they turn into raised, domelike peripheral tabellae of this zone. The boundary between the axial and peripheral part of tabularium is not in this place as sharp as on the side of cardinal septum, but quite distinct.

Individual variability. — Corallites assigned to *C. multitabulata* sp. n. are so irregular and variable that each specimen should be described separately. To avoid this necessity, the writer has presented illustrations of all available specimens (Text--fig. 17). It seems that particular attention should be paid to (*a*) the occurrence of the paired arrangement of septa with a few underdeveloped additional metasepta (Text--fig. $17_{4a, b}$); (*b*) the development of many (Text-fig. 17_{3a-e}) or very few, long metasepta and a phyllotheca which appears late in ontogeny; (*c*) the individual development characteristic of most corallites studied, in which the arrangement and trace of septa are so irregular that they seem to be pathological; counter septum is usually the most difficult to separate if a specimen has not the nepionic or early--neanic stage preserved.

Remarks. — Despite undoubtedly large differences and without the knowledge of the youngest ontogenetic stages, the writer has assigned the specimens described above to a common species and to the genus *Commutia* gen. n. It is not unlikely that the study of an adequately rich and complete material will allow him to correct his standpoint. The differences which occur in comparison with the remaining species have been presented in the diagnosis.

Occurrence. — Dalnia near Karczówka Monastery, Holy Cross Mts, *Wocklumeria* or *Gattendorfia* Stage.

Family **Dalniidae** fam. n.
(Type genus: *Dalnia* gen. n.)

Genera assigned: by monotypy.

Geographical and stratigraphic range: Holy Cross Mts, Poland, *Wocklumeria* or *Gattendorfia* Stage.

Diagnosis. — Solitary corallites without dissepiments and with alar and counter-lateral septa appearing as the first and predominating throughout the ontogeny; microstructure lamellar.

Remarks. — The taxonomic position and rank of the family has been decided by the writer on the basis of ontogeny. This position may seem to be one-sided and insufficiently founded, as the youngest development stages are absent from the material described. The following two general conclusions should, however, be drawn from the review of not yet very rich results of studies on Tachylasmatina subord. n. and from the studies conducted on the Polish material:

(*1*) Ontogeny and in particular its nepionic and neanic stages are almost invariable in this group of corals. These stages are nearly indistinguishable in viarious genera of the family Tachylasmatidae from the Lower Devonian to the Upper Permian (Carruthers 1919, Hudson 1936, Schindewolf 1942, Kullmann 1965, Fedorowski 1968, and others).

(*2*) An appropriately large, documented and fixed qualitative deviation from the developmental pattern of the Tachylasmatidae should be separated from the phylogenetic succession in this family. Other structures are evolved within that family on the basis of a permanent development in younger stages.

The accelerated formation of alar and counter-lateral septa prior to that of cardinal and counter ones and the predominance of these septa during the entire ontogenetic development are precisely such an appropriately large deviation. The inhibition of the growth and secretion of cardinal and counter protosepta cannot be considered as accidental. They were observed in several corallites and the tetraseptal development phase is very distinctly marked by a one to two milimeters growth of the corallite, which with their dimensions of a few milimeters is a sector of a considerable length. It is worth mentioning at the same time that in all the specimens under study nearly a half of the cross section of the corallite, representing the cardinal quadrants, is at first aseptal.

At the same time, ontogeny determines the assignment of Dalniidae fam. n. to Tachylasmatina subord. n. The lack of counter septum in younger developmental phases, its underdevelopment in the ephebic stage and its appearance as the last of all protosepta, which are the main diagnostic characters of the suborder, are at the same time diagnostic for the family Dalniidae fam. n.

Genus *DALNIA* gen. n.
(Type species: *D. tetraseptata* sp. n.)

Derivation of the name: Dalnia — after the type locality.
Species assigned: by monotypy.
Geographical and stratigraphic range: as for the family.

Diagnosis. — Dalniidae with axially connected alar and counter-lateral septa.

Remarks. — In the genus *Dalnia* gen. n., predominant are alar and counter-lateral septa, much the same as in *Tachylasma* sensu Schindewolf and *Ufimia* Stuckenberg. As indicated in the remarks concerning the family, and in the description of the type species, the development and arrangement of these septa are quite different and do not give evidence of a close relationship between these genera.

Dalnia tetraseptata sp. n.
(Text-fig. 18; Pl. 5, Figs 1—3)

Holotype: specimen No. Z. Pal. P. Tc-6/68, figured in Pl. 5, Fig. 1*a*—*c*.
Type horizon: Wocklumeria or *Gattendorfia* Stage.
Type locality: Dalnia Hill near Kielce, Holy Cross Mts.
Derivation of the name: tetraseptata — after four predominant protosepta.

Material. — Five corallites with partly preserved proximal ends, two of them with fragmentary calices.

Dimensions (in *mm*):

Specimen No. Z. Pal. P.	Number of septa	Diameter	Note
Tc-6/66	11	4.0×4.8	Ephebic stage
Tc-6/67	9	3.1×3.1	Ephebic stage
Tc-6/68	11	3.7×4.3	Ephebic stage
,,	11	4.7×5.0	Calice
Tc-6/69	8 (9 ?)	3.0×3.2	Ephebic stage

Diagnosis. — As for the genus.

Description. — Corallites slender, slightly extending in calice. Alar and counter-lateral protosepta, connected with each other still in the bottom of calice, here form a slight elevation.

Transverse section of the holotype (Text-fig. 18_3; Pl. 5, Fig. 1c). Extended alar and counter-lateral septa are arranged subparallel to each other. They fuse in the axial part of the corallite forming together a sort of letter K whose horizontal bar results from a deflection of one of the alar septa. Cardinal septum thicker than the remaining protosepta, reaches a little more than 1/4 of the diameter of corallite. Counter septum and five metasepta occur as nodes in the external wall or are separated only in its microstructure.

Longitudinal section has not been illustrated. No tabulae have been found in a 3 mm-long sectioned fragment of the younger part of the holotype. In the transverse section of the ephebic stage, four sections of tabulae occur near the axis of corallite. Thus, they were very widely spaced and probably raised towards the place of fusion of alar and counter-lateral septa in the axis of corallite.

Ontogeny. — The occurrence of only four protosepta (alar and counter-lateral ones) has been found in the youngest of all the studied sections of the holotype having a diameter of 2.8 × 3.1 mm. No cardinal septum occurs even in microstructure. It appears with a diameter of 3.5 × 3.7 mm at the end of the neanic stage. Counter septum develops only in the ephebic stage. The tetraseptal development stage described above makes up a characteristic feature of this species, genus and family. One may suppose that protosepta are formed in succession from the beginning, the same as in the family Tachylasmatidae. A single free alar septum, which already three mm above joins the remaining protosepta, has been found in the youngest section of specimen No. Tc-6/67.

Individual variability. — Specimens assigned to this species differ from each other to a fairly considerable degree. These differences may now be of only taxo-

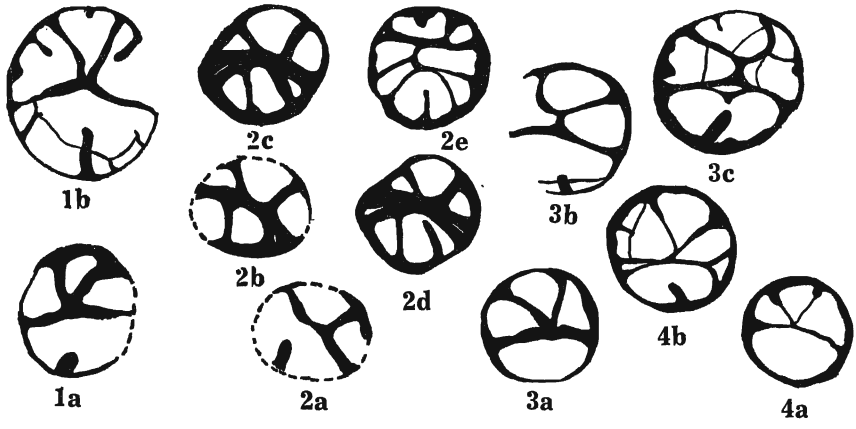

Fig. 18

Dalnia tetraseptata sp. n.; × 5

1a, b — Specimen No. Z. Pal. P. Tc-6/66: *1a* transverse section of the late neanic stage, *1b* transverse section of the ephebic stage.

2a-e — Specimen No. Z. Pal. P. Tc-6/67: *2a* late nepionic stage, *2b—2e* successive transverse sections of the ephebic stage.

3a-c — Specimen No. Z. Pal. P. Tc-6/68 (holotype): *3a* transverse section of early neanic stage, *3b* transverse section of late neanic stage, *3c* transverse section of the ephebic stage.

4a, b — Specimen No. Z. Pal. P. Tc-6/69: *4a* transverse section of early neanic stage, *4b* transverse section of the ephebic stage.

nomic importance, which, however, cannot be stated with a complete certainty with such a scarcity of material. Particularly variable are: (*a*) the arrangement of alar and counter-lateral septa which may form something like the letter K; (*b*) very late appearance of counter septum (specimens Nos Tc-6/67 and Tc-6/69); its presence in the younger part of the ephebic stage is not marked at all in these corallites; (*c*) a later or earlier appearance and the degree of the development of cardinal septum; (*d*) the number and degree of the development of metasepta; particularly different than the others is specimen No. Tc-6/67. The degree of the thickening of structural elements, the size of specimens and the ratio of the number of septa to the diameter of corallite are also different, but they do not seem to be as important as the differences given above.

Occurrence. — Dalnia near Karczówka Monastery, Holy Cross Mts, *Wocklumeria* or *Gattendorfia* Stage.

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Poznań, July, 1972

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PLATE 1

1 — *Calophyllum diffusum* sp. n.; Specimen No. Z. Pal. P. Tc-6/1 (holotype)
1a, 1b successive transverse sections of the neanic stage (peels), *1c* transverse section of the ephebic stage (peel).

2 — *Calophyllum diffusum* sp. n.; Specimen No. Z. Pal. P. Tc-6/2, transverse section of the ephebic stage (slide).

3 — *Colophyllum(?) bipartitum* sp. n.; Specimen No. Z. Pal. Tc-6/5, (holotype)
3a transverse section of the neanic stage (peel), *3b—3e* successive transverse sections of the ephebic stage (peels).

4 — *Plerophyllum regulare* sp. n.; Specimen No. Z. Pal. P. Tc-6/11 (holotype), transverse section of the ephebic stage (slide).

5 — *Plerophyllum regulare* sp. n.; Specimen No. Z. Pal. P. Tc-6/13, transverse section of the ephebic stage (slide).

6 — *Plerophyllum penetrale* sp. n.; Specimen No. Z. Pal. P. Tc-6/15 (holotype)
6a transverse section of the neanic stage (slide), *6b,6c* successive transverse sections of the ephebic stage (peels).

All figures × 5

PLATE 2

1 — *Soshkineophyllum internectum* sp. n.; Specimen No. Z. Pal. P. Tc-6/7 (holotype)
1a general view of the holotype (× 6), *1b* calice bottom of the holotype (× 9), *1c* late neanic stage, showing *Calophyllum*-type of septal development (slide, × 5), *1d* transverse section of the ephebic stage, beneath the calice bottom (slide, × 5), *1e* transverse section of the lower part of the calice (peel, × 5).

2 — *Ufimia makowskii* Różkowska, 1969; Specimen No. Z. Pal. P. Tc-6/16
2a—2c successive transverse sections of the ephebic stage (peels, × 5).

PLATE 3

1 — *Bradyphyllum differentiatum* sp. n.; Specimen No. Z. Pal. P. Tc-6/9
1a transverse section of the late neanic stage (slide), *1b,1c* successive transverse sections of the ephebic stage (peels).

2 — *Bradyphyllum differentiatum* sp. n.; Specimen No. Z. Pal. P. Tc-6/8 (holotype)
2a—2d successive transverse sections of the ephebic stage (*2b* slide; *2a,2c,2d* peels).

All figures × 5

PLATE 4

1 — *Pentaphyllum pauperum* sp. n.; Specimen No. Z. Pal. P. Tc-6/19 (holotype)
1a,1b successive transverse sections of the neanic stage (peels, × 5).

2 — *Pentaphyllum pauperum* sp. n.; Specimen No. Z. Pal. P. Tc-6/20, transverse section of the late neanic stage (peel, × 5).

3 — *Antikinkaidia triseptata* sp. n.; Specimen No. Z. Pal. P. Tc-6/22 (holotype), × 5
3a—3d successive transverse sections of the ephebic stage (*3a,3b* peels; *3c,3d* slides), *3e* transverse section near the calice bottom (peel).

4 — *Commutia longiseptata* sp. n.; Specimen No. Z. Pal. P. Tc-6/53, transverse section of the ephebic stage (slide, × 5).

5 — *Commutia longiseptata* sp. n.; Specimen No. Z. Pal. P. Tc-6/55 (holotype)
5a general view of the holotype (× 6), *5b* transverse section of the late nepionic stage (peel, × 5).

6 — *Commutia miranda* sp. n.; Specimen No. Z. Pal. P. Tc-6/60 (holotype), × 5
6a transverse section of the neanic stage (peel), *6b—6d* successive transverse sections of the ephebic stage (peels).

PLATE 5

1 — *Dalnia tetraseptata* sp. n.; Specimen No. Z. Pal. P. Tc-6/68 (holotype), × 5
1a transverse section of the early neanic stage (peel), *1b* transverse section of the late neanic stage (peel), *1c* transverse section of the ephebic stage (peel).

2 — *Dalnia tetraseptata* sp. n.; Specimen No. Z. Pal. P. Tc-6/69, × 5
2a transverse section of the early neanic stage (peel), *2b* transverse section of the ephebic stage (peel).

3 — *Dalnia tetraseptata* sp. n.; Specimen No. Z. Pal. P. Tc-6/67, × 5
3a—3c successive transverse sections of the early ephebic stage (peels), *3d* transverse section of the ephebic stage (peel).

4 — *Commutia szulczewskii* sp. n.; Specimen No. Z. Pal. P. Tc-6/34, × 5
4a transverse section of the nepionic stage (peel), *4b* transverse section of the ephebic stage (peel).

5 — *Commutia szulczewskii* sp. n.; Specimen No. Z. Pal. P. Tc-6/29, general view of the ephebic stage (× 3.5).

6 — *Commutia szulczewskii* sp. n.; Specimen No. Z. Pal. P. Tc-6/23, × 5
6a, 6b successive transverse sections of the neanic stage (peels), *6c* transverse section of the ephebic stage with not fully closed phyllotheca (peel).

7 — *Commutia szulczewskii* sp. n.; Specimen No. Z. Pal. P. Tc-6/33 (holotype).
7a general view of holotype (× 3.5), *7b—7d* successive transverse sections of the neanic stage (peels, × 5).

8 — *Commutia szulczewskii* sp. n.; Specimen No. Z. Pal. P. Tc-6/36, well preserved calice (× 7).

9 — *Commutia szulczewskii* sp. n.; Specimen No. Z. Pal. P. Tc-6/35, the bottom of the calice with visible phyllotheca (× 7).

PLATE 6

1 — *Commutia multitabulata* sp. n.; Specimen No. Z. Pal. P. Tc-6/63 (holotype)
1a, 1b successive transverse sections of the neanic stage (*1a* peel, *1b* slide), *1c,1d* successive transverse sections of the ephebic stage (peels), *1e,1f* successive longitudinal sections (peels).

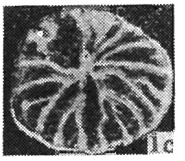
2 — *Commutia multitabulata* sp. n.; Specimen No. Z. Pal. P. Tc-6/62, transverse section of the ephebic stage (slide).

3 — *Commutia multitabulata* sp. n.; Specimen No. Z. Pal. P. Tc-6/61, transverse section of the ephebic stage (peel).

All figures × 5


1a


1b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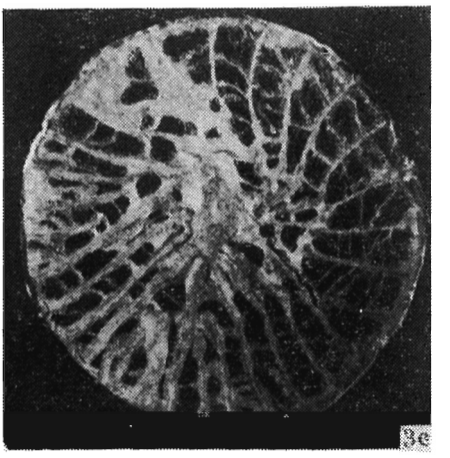
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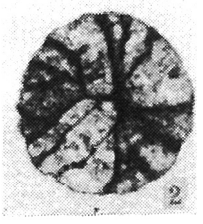
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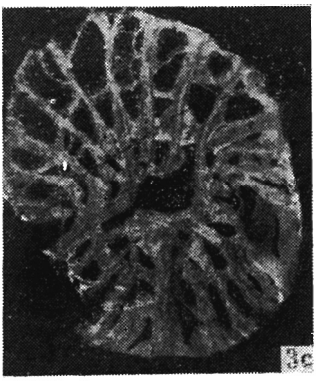
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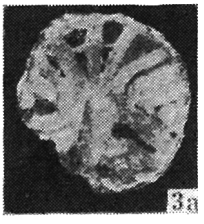
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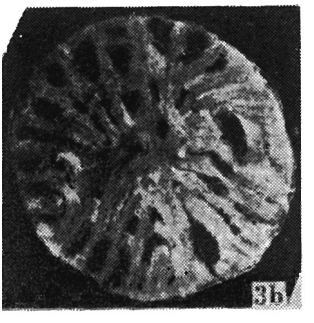
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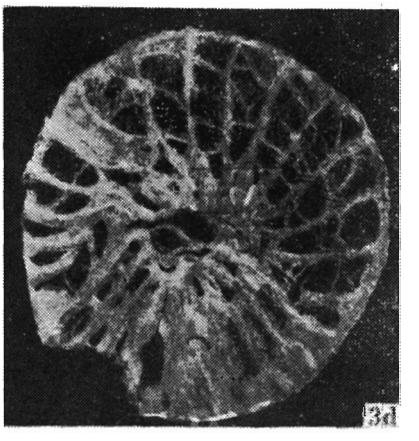
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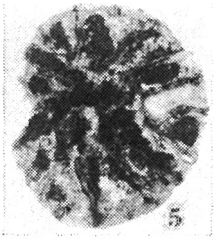
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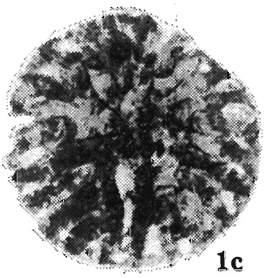
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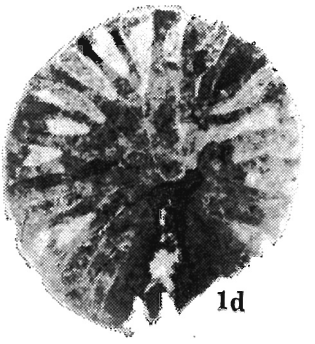
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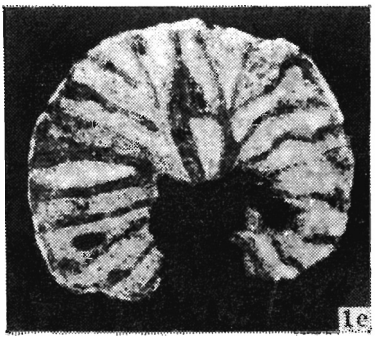
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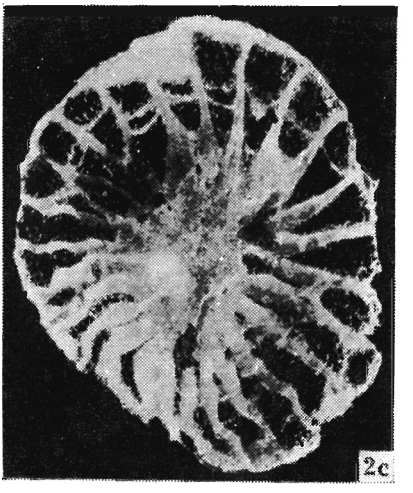
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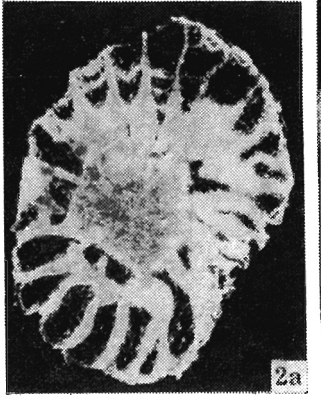
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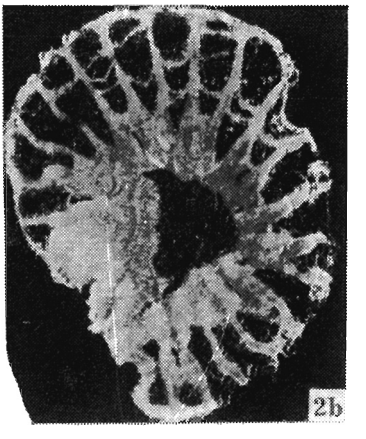
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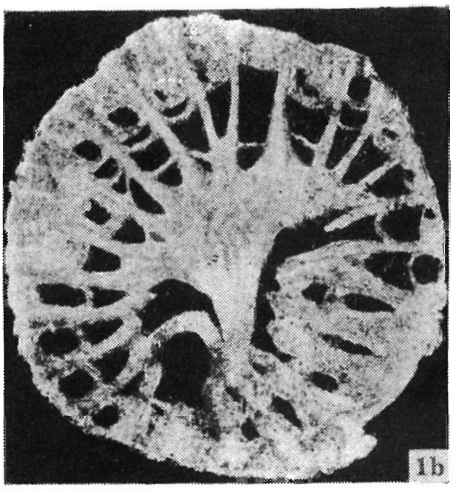
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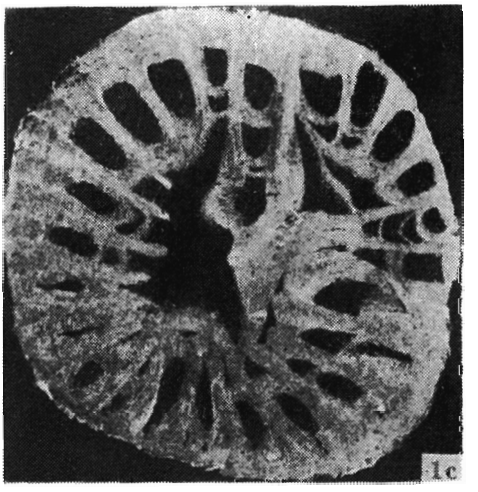
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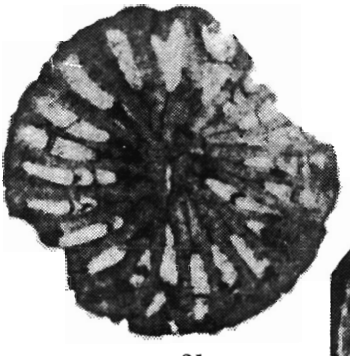
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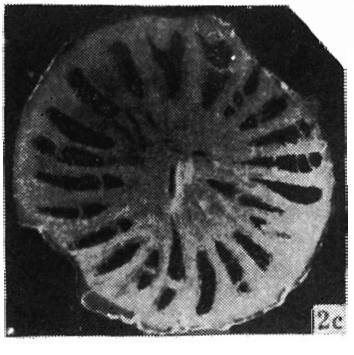
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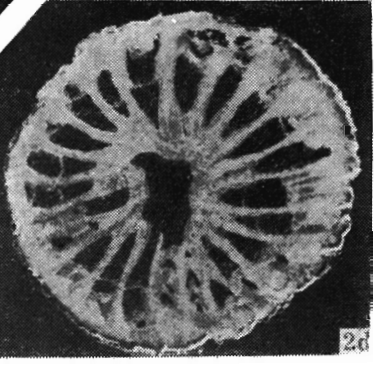
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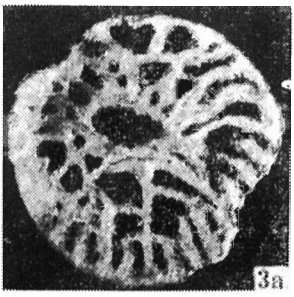

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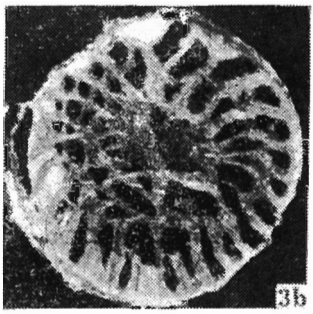

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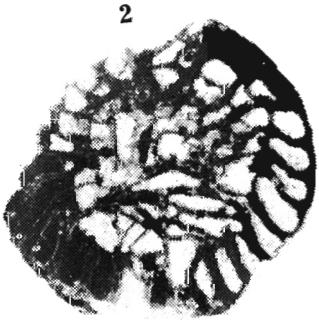

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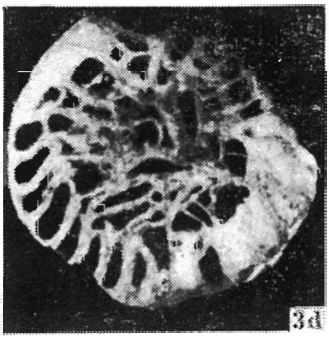

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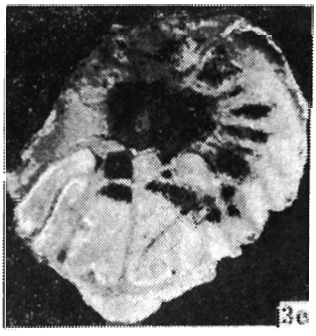

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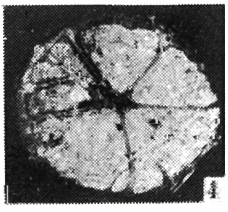

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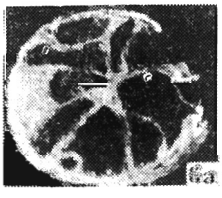

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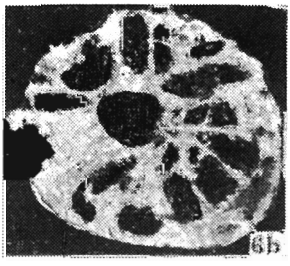

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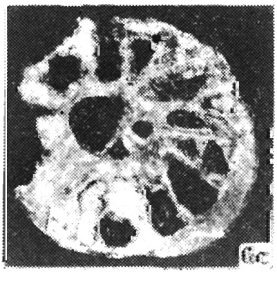

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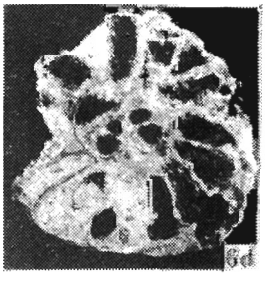

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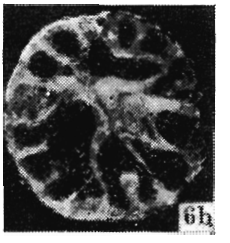
3d


4a


4b


5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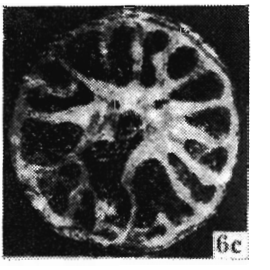
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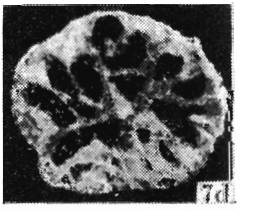
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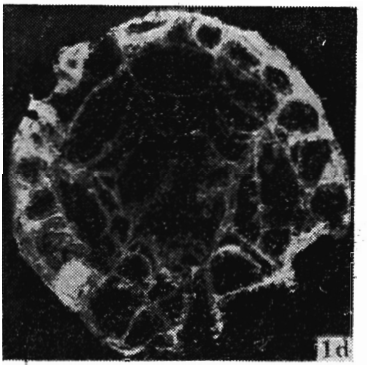

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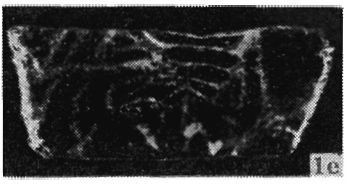

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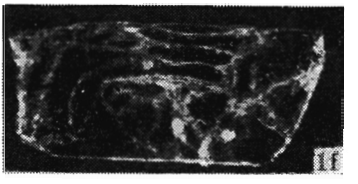

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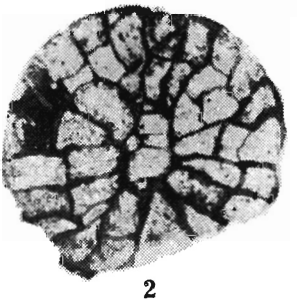

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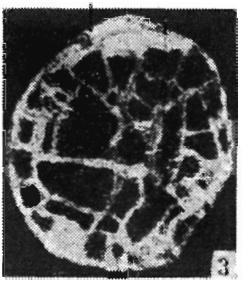

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J. FEDOROWSKI

OSOBNICZE KORALE CZTEROPROMIENNE Z NADRODZINY POLYCOELACEAE ORAZ PODRZĘDU TACHYLASMATINA subordo n. Z DALNI W GÓRACH ŚWIĘTOKRZYSKICH

(Streszczenie)

Przedmiotem pracy jest analiza stosunkowo rzadkich i słabo poznanych osobniczych korali czteropromiennych, występujących w osadach synsedymentacyjnych żył neptunicznych z pogranicza dewonu i karbonu na Dalni koło Karczówki w Górach Swiętokrzyskich (*por.* Szulczewski 1971, 1973). W badanym materiale, który ma istotne znaczenie dla poznania rozwoju ontogenetycznego oraz taksonomii rozważanej grupy korali, stwierdzono obecność (*por.* fig. 1—18 oraz pl. 1—6), prócz jednego gatunku ustanowionego w famenie Gór Świętokrzyskich poprzednio (Różkowska 1969), 14 nowych gatunków należących do 9 rodzajów (w tym 3 są nowe) z 4 rodzin (w tym jedna rodzina oraz podrodzina są nowe). Korale o pentafyloidalnym typie rozwoju osobniczego wydzielono w nowy podrząd Tachylasmatina subordo n., uzasadniając jednocześnie ich odrębność w stosunku do nadrodziny Polycoelaceae Roemer, 1883.

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