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REVISION OF THE GENUS *CLADOPHYLLIA* AND DESCRIPTION OF *APOCLADOPHYLLIA* GEN.N. (CLADOPHYLLIIDAE FAM.N., SCLERACTINIA)

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Syntypes of *Lithodendron dichotomum* Goldfuss are reexamined. The following Middle and Upper Jurassic species of the genus *Cladophyllia* Milne-Edwards et Haime, 1851 are revised: *C. minor* Beauvais, 1975, *C. conybearei* Milne-Edwards et Haime, 1851 and *C. dichotoma* (Goldfuss, 1821), and *C.* cf. *excelsa* (Koby, 1988) is described. Genus *Schizosmilia* Koby, 1889 is regarded here as a later subjective synonym of *Cladophyllia*. Some corals described under the name of *Schizosmilia* are recognized as representatives of the new genus *Apocladophyllia* with the type species *A. nowaki* sp.n. The genera *Cladophyllia* and *Apocladophyllia* represent a new Jurassic/Cretaceous family,, Cladophylliidae fam.n., suborder Stylinina Alloiteau, 1952.

Key words: Scleractinia, Jurassic, Cretaceous.

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INTRODUCTION

The corals described in the present paper belong to little known and rare components of fossil assemblages and are not commonly encountered in collections. Their stratigraphic range is from the Bajocian to the Albian.

The genus *Cladophyllia* has been given diverse synonymic names. A considerable number of species belonging to this genus have been described under the synonymic name of *Schizosmilia* Koby. However, in geological and paleontological literature the name *Schizosmilia* was given to Upper Jurassic and Lower Cretaceous corals which show features different from those characteristic of the genus *Cladophyllia* proper. The above mentioned corals are distinguish here as the new genus, *Apocladophyllia*.

The following considerations are based upon specimens from the Natural History Museum, London (NHM) which were kindly made available for us by Dr. Brian Rosen, specimens from the Goldfuss collection deposited in Geologische-Paläontologisches Institut der Universität Bonn (GPIU) which were made available by Dr. H. K. Erben, specimens from Paläontologisches Museum der Humboldt Universität Berlin (MBK) shown to us by Dr. H. Jaeger, as well as specimens from the collections at the Ústředni Ústav Geologický, Praha (UUG), kindly made available to us by Dr. Helena Eliášová. Included are also specimens stored at the Institute of Geological Sciences of the Jagiellonian University in Cracow (UJ).

Acknowledgements. — Photographs of the corals described were taken by the late Miss Maria Czarnocka, Mrs Maria Wyrzykowska and Mr. Krzysztof Fedorowicz, the drawings were made by Mrs. Danuta Sławik. Thin sections were prepared by Mrs. Mirosława Nowińska and Mr. Władysław Wyżga. The authors gratefully acknowledge the assistance of the persons mentioned above.

DESCRIPTIONS

Abbreviations used in the descriptions: c-c distance between corallite centres, d corallite diameter, D colony diameter, d col diameter of columella, dl diameter of lumen, dtr diameter of trabeculae, H colony height, s number of septa, S1...Sn septa of succeeding size orders; dimensions are in milimetres if not stated otherwise.

Suborder **Stylinina** Alloiteau, 1952
Family **Cladophylliidae** nov.

Type genus: *Cladophyllia* Milne-Edwards et Haime, 1851.

Diagnosis. — Radial elements of the septal type. Trabeculae branching, arranged in series. Diameter of main trabeculae from 50 to 90 μm. Thin secondary trabeculae expressed on septal sufaces in the form of sharp granulae. Inner septal edge ornamented with auriculae. Septotheca formed by well developed and abortive septa. Columella essential. Intratentacular budding through symmetrical division by septal wall.

Included genera. — *Cladophyllia* Milne-Edwards et Haime, 1851, *Apocladophyllia* gen.n., *?Halysitastraea* Geyer, 1968.

Stratigraphic range. — Bajocian — Albian.

Systematic position. — The family Cladophylliidae nov. is included here to the suborder Stylinina. The reason for this are small size of septal trabeculae, lateral ornamentation of septa in the form of fine granulae, regular denticulation of the internal septal edge in the form of auriculae, and styliform columella. It should be noted that in corals of various taxonomical groups (*Actinastraea*, *Thamnasteria*), relatively regular denticulations can develop which, however, do not have the form of auriculae. The latter term was introduced by Gill (1977) to designate the denticulation typical of a group of genera (*Stylina*, *Heliocoenia*, *Stylosmilia*, *Enallhelia*, *Goniocora*) and characterized by a particular depression of the dorsal side of denticles and presence of rods connecting the major septa with columella. The

auricular structure of denticles has been considered as a feature of a high systematic rank (Gill 1977).

The family Cladophylliidae differs from Stylinidae in radial elements of the septal type and exclusively intratentacular budding. Hitherto, the family Cladophylliidae includes genera which show only phaceloid (pseudocolonial) growth form.

Comments on the genera included. — The genus *Cladophyllia* is known to occur from the Bajocian to the Albian and has been reported from both epicontinental and geosynclinal sediments of Europe, North America and Madagascar. The range of *Apocladophyllia* is limited to the geosynclinal regions: the Tithonian of the Carpathians and ?Kimmeridgian-Portlandian of the Taurus Mts. The genus *Halysitastraea* has been reported from the Lower Kimmeridgian of Columbia.

The genus *Cladophyllia* may be regarded as an ancestral form of *Apocladophyllia.* This is indicated by the structural (table 2) similarities between these two genera and by their geographical distribution and stratigraphical range. As compared with *Cladophyllia,* the genus *Apocladophyllia* shows a new feature — the apophyses linking the corallites. Such structures have been recognized in various taxonomic groups of the order Scleractinia and appear as a morphological feature of a restricted taxonomic value. They are known to occur in the Callovian *Lochmaeosmilia* Wells (1943), in the Lower Kimmeridgian *Halysitastraea* Geyer (1968), and in the Hauterivian genus *Actinastraeopsis* Sikharulidze (1977), as well as in systematically remote Triassic distichophylliid corals (*Retiophyllia* Cuif; Roniewicz 1974, 1989).

With due reservations, we include to Cladophylliidae the genus *Halysitastraea* Geyer which was previously assigned to the family Amphiastraeidae. According to Geyer (1968, 1969) in the above mentioned genus budding is of the "Taschenknospung" type. However, this statement has not been documented by convincing illustrations. The drawing of the corallite cross-section (Geyer 1968: fig. 4) shows bilaterally symmetric arrangement of septa with one septum crossing the corallite axis. The pattern resembles that of amphiastraeids but similar arrangement can be occasionally observed in cross sections of typically developed cladophylliids when columella joins the septum S1. In addition, it is worth noting that the linking of corallites by apophyses, which is observed in *Halysitastraea*, has not been recognized in Amphiastraeidae.

Genus *Cladophyllia* Milne-Edwards et Haime, 1851

Type species: *Lithodendron dichotomum* Goldfuss, 1826; designation by Wells (1933).

Synonymy. — *Schizosmilia* Koby, 1888 (type species: *S. excelsa* Koby, 1888), *Schizosmiliopsis* Beauvais, 1963 (type species: *Schizosmilia corallina* Koby, 1888).

Diagnosis emended. — Phaceloid. Corallites free, temporarily fused with walls. Increase by septal division with succeeding dichotomic forking of corallites. Symmetry radial or radiobilateral. Corallites subcircular in section. Calicular edge sharp; septa nonexsert. Septal faces with small and sharply pointed granulae. Inner edge with regular, auricular denticles. Interseptal anastomosis present. Columella essential, trabecular. Endotheca composed of tabuloid dissepiments and incomplete ring of large peripheral dissepiments Septotheca thick with transversely wrinkled surface. Trabeculae of the diameter between 30 ad 80 μm.

Species included. — Bajocian — Bathonian: *C. babeana* Milne-Edwards et Haime, 1851, *C. minor* Beauvais, 1975, *C. morondavensis* Alloiteau, 1958. Oxfordian: *C. cony-*

bearei Milne-Edwards et Haime, 1951. Upper Oxfordian/Lower Kimmeridgian: *C. excelsa* (Koby 1888), *C. rollieri* (Koby, 1888). Kimmeridgian: *C. turolensis* (Geyer, 1955). Tithonian: *C. dichotoma* (Goldfuss, 1826). Neocomian: ?*C. clemencia* Fromentel, 1857, *C. tobleri* Koby, 1896, ?*C. stewarte* Wells, 1944. Albian: *C. furcifera* Roemer, 1888.

Apart from the above mentioned, the name *Cladophyllia* is applied to a number of corals. The appartenence of some of them to *Cladophyllia* cannot be confirmed due to the poor preservational state of the skeleton (e.g. Doggerian *C. choffati* Koby, 1884, *C. tenuis* Koby 1889: compare Beauvais 1966), while that of the others is questionable because of different type of wall, symmetry, budding, etc, mentioned in descriptions (Discussion, p. 170).

Stratigraphic range. — Bajocian — Albian.

Discussion. — *(1) Emendation of diagnosis:* Milne-Edwards and Haime (1851a) differentiated the genus *Cladophyllia* without indication of the type species. Wells (1933: 90) has designated as type species *Lithodendron dichotomum* Goldfuss, 1826 which was first in the list of species presented by Milne-Edwards and Haime (1851a). This choice turned out to be rather unfortunate since the syntypes of *L. dichotomum* were highly altered by silicification. However, in spite of the poor state of preservation, they reveal such typical generic features as: symmetrical division of calices, dichotomic forking of corallites, radiobilateral symmetry of the septal apparatus and presence of a thick and wrinkled outer wall.

The original diagnosis as well as the successive ones (Milne-Edwards and Haime 1851a, 1851b, 1857) characterized the genus *Cladophyllia* very briefly. The most precise diagnosis of the genus was given by Koby (1889: 545) and has been generally accepted. Different interpretation of the genus *Cladophyllia* was presented by Beauvais (1963, 1964). The conclusions presented here do not agree with

Table 1

Comparison of corallite dimensions and number of septa in different *Cladophyllia* species

Species	d	s	Age	Author
turolensis	2—2.5	40—50	Kimmeridgian	Geyer 1965
morondavensis	2—3	48	Bathonian	Alloiteau 1958
rollieri	2.5—3	24+n	„Astartian"	Koby 1888
ramea	2.5—3.5	18—24	„Rauracian"	Koby 1884
corallina	3—5	18—24	„Rauracian"	Koby 1888
conybearei	3—4	24+n	Oxfordian	herein
minor	3—4	24+n	Bathonian	herein
stewarte	3—4	24	Urgonian	Wells 1944
babeana	4—5 (6)	24	Bathonian	M. —E. and H. 1851b
furcifera	(2.5) 4—7	24+n	Albian	Wells 1933
dichotoma	4—5	24+n	Tithonian	herein
excelsa	4—6	24	„Astartian"	Koby 1888
cf. *excelsa*	4—5.3	24—30	Kimmeridgian	herein
tobleri	5	24	Neocomian	Koby 1896

Beauvais' interpretation and are, in general, consistent with traditional understanding of the genus *Cladophyllia* (see p. 176, footnote 1).

The emendation lies in extension of the list of diagnostic generic features to cover those which have been observed in well preserved specimens of the Bathonian species, *C. minor* Beauvais. These features include the skeleton microstructure.

In addition to the phaceloid growth form, the most evident generic feature is the corallite division by a wall of septal origin into two equivalent portions which is rarely encountered among corals. Apart from the related genus *Apocladophyllia*, such a division has been confirmed for a few Mesozoic corals, e.g. the Triassic genus *Protoheterastraea* Wells (1937; see also Cuif 1973) Jurassic *Lochmaeosmilia* Wells (1933), *Texastraea* Wells (1973), *Polymorphastraea* Koby (1907) and *Connectastraea* Koby (1905; =*Pseudodiplocoenia* Alloiteau (1958), =*Bussonastraea* Beauvais (1965, 1966); see also Roniewicz 1970) as well as the Cretaceous genera *Actinastraea*, d'Orbigny, 1849 (see Morycowa 1971) and *Actinastraeopsis* Sikharulidze (1977).

A notable feature of *Cladophyllia* is a temporary coalescence of columella with one of the septa S1. Such coalescence can be observed at the bottom of the calice and makes the septal apparatus similar to that of the Amphiastraeina.

(2) *Synonymy.* — *Schizosmilia* Koby (type species: *S. excelsa* Koby, 1888) is regarded here as a later subjective synonym of the genus *Cladophyllia*. Koby included three species to the genus *Schizosmilia*: *excelsa*, *rollieri* and *corallina*. The assemblage of generic features of *Schizosmilia* listed by Koby (1888: 435) is essentially identical with those presented in the emended diagnosis of *Cladophyllia*. The difference lies in two points. According to Koby, the colony of *Schizosmilia* is ramose or submassive owing to the coalescence of corallites; the budding is considered to be "intercalincale". The first feature has no diagnostic meaning since the direct fusion of corallites by walls is known to occur in species described as *Schizosmilia* (Koby 1888: 435—437), in *Cladophyllia* (among others *C. minor* Beauvais, herein p. 171), in *Apocladophyllia* gen.n. and in *Halysitastraea* Geyer (1968).

The designation of the budding as "intercalicinale", repeated in Koby's text three times, is obviously a typing error and should read "intracalicinale", as one can judge from the illustrations (Koby 1888: 436 and pl. 114: 3b, 3c, 3d). The figures show the intracalicular budding exclusively, i.e. the symmetric division (pl. 114: 3b) and rejuvenescence localized at the calicular axis (3c), or at the calicular periphery (3d).

The congenerity of species described by Koby as *Schizosmilia* and *Cladophyllia* is confirmed by illustrations of the type material of *S. excelsa*. The illustrations show the radiobilateral arrangement of the septal apparatus and budding through septal division and rejuvenescence (*op. cit.*). Koby (1889: 546) notices that in both *Schizosmilia* and *Cladophyllia* a specific fissiparous type of budding is observed. Both genera, originally ranged into different groups (Koby 1884: *Cladophyllia* — Astraeidae; Koby 1888: *Schizosmilia* — Cyathophyllidae, Madréporaires rugeux) have been eventually included by this author to the group „Madréporaires rugeux" (Koby 1889).

Schizosmiliopsis Beuvais, 1963 (type species: *S. corallina* Koby, 1888), proposed as a new name to replace *Schizosmilia* Koby, falls into the snonymy of *Cladophyllia*, as later subjective synonym.

(3) *Species included.* — The attempts to define the specific content of the genus were rendered difficult by the fact that *Cladophyllia* has been confused with other corals resembling it in their external features, especially in phaceloid

growth form. A number of species described under the generic name of *Cladophyllia* have been reported from the Jurassic (see Lathuilière 1989). Some of such corals, indeed, show features consistent with the diagnosis of the genus. Others, however, show different manner of budding or the presence of costosepta and "collerettes epithécales", e.g. *C. articulata* Milne-Edwards, 1857, *C. calamiformis* Étallon, 1860, *C. furcata* Étallon, 1859, *C. humberti* Étallon, 1859, *C. picteti* Étallon, 1859, *C. suprajurensis* Étallon, 1860, *C. thurmanni* Étallon, 1869, *C. turbinata* Gregory, 1900 (compare Milne-Edwards 1857, Étallon 1859, 1860, Koby 1889, Gregory 1900). The latter structures which are of dissepimental origin (Roniewicz 1976: 75) represent elements different from the wrinkles of the wall in *Cladophyllia*. The majority of the corals having costae and "collerettes epithécales" belong to *Calamophylliopsis*, *Stylosmilia*, or *Goniocora* which are commonly encountered in the Jurassic. At least, some species ascribed to *Cladophyllia* by ancient authors, e.g. *C. funiculus* Milne-Edwards (1857), *C. laevis* Milne-Edwards (1857), *C. grandis* Bolsche (1866), have corallite diameters of ca. 10 mm, exceeding much those observed in the taxa of the confirmed assignement to *Cladophyllia* (table 1), or, as *C. clemencia* de Fromentel, 1857, have diameters much smaller (1.5—2 mm). The systematic positions of the species mentioned remain more or less doubtful.

Among the Cretaceous forms hitherto included to *Cladophyllia*, the majority are apparently lack features characteristic of this genus. In addition, such forms reveal elements which are not observed in *Cladophyllia*, namely (?)costosepta covered with epitheca as in *C. stewarte* Wells (1944), lateral budding as in *C. miroi* Felix (1891), corallite surface covered by presumable costae as in *C. crassilamellata* Fromentel (1867), or presumably lamellar columella as in *C. birleyae* Gregory (1899). The information available from the literature is not sufficient for a reliable analysis of the structures of the corals discussed.

Out of the three Triassic species assigned originally to *Cladophyllia*, two belong to the genus *Volzeia* Cuif, 1966 (*subloevis* d'Orbigny, *subdichotoma* Münster: compare Cuif 1975), and one (*C. septanectens* Loretz) shows similarities to *Siderosmilia* Beauvais (1986). None of them reveals features common with *Cladophyllia* with the exception of phaceloid growth form.

The corallite diameters and the number of septa encountered in the group of nominal species conforming to the diagnosis of *Cladophyllia* reveal only small variability (table 1). The exceptions are *C. morondavensis* Alloiteau and *C. turolensis* Geyer, with the septa more abundant than in any other species. The pattern of the septal apparatus in the forms investigated here is also variable (fig. 1). Unfortunately, the range of variability could not be established.

(4) *Systematics.* — The genus *Cladophyllia* was diversely classified. Koby included it originally (1884) to Astraeoidae and finally (1889: 572) to the group of "Madrépores rugeux" (now discriminated as the sub-order Amphiastreina). Vaughan and Wells (1943) and Wells (1956) assigned the genus in question to Faviidae. Alloiteau (1957) transferred it temporarily to Stylinidae, a suggestion reaffirmed in later publications (Alloiteau 1958, Beauvais 1964). Finally, the genus *Cladophyllia* was placed into the group of *incertae sedis* by Beauvais (1963, under the name of *Schizosmiliopsis*) and later by Roniewicz (1976, as *Schizosmilia*).

Because of the specific set of features, corresponding to some extent to stylinids, the genus under consideration is chosen as typical of the new family within the sub-order Stylinina characterized by small size of trabeculae, fine granulation of septal faces and internal septal edge provided with auriculae (see also p. 167).

In the following review, the species are discussed in stratigraphical order.

Cladophyllia minor Beauvais, 1975
(pl. 15: 1—3, pl. 16: 1, 2; fig. 1)

1975. *Cladophyllia babeana minor*: Beauvais in: Negus and Beauvais, pl. 1: 3ab, listed in table 1 on p. 195; description lacking.

Holotype (after Negus and Beauvais 1975): Paris, No. 2528, Bajocian; unfigured. *Paralectotype*: coll. Negus, NHM R.49643, Great Ooolite, Bathonian, Fairford, Gloucestershire; figured by Negus and Beauvais 1975: pl. 1: 3ab.

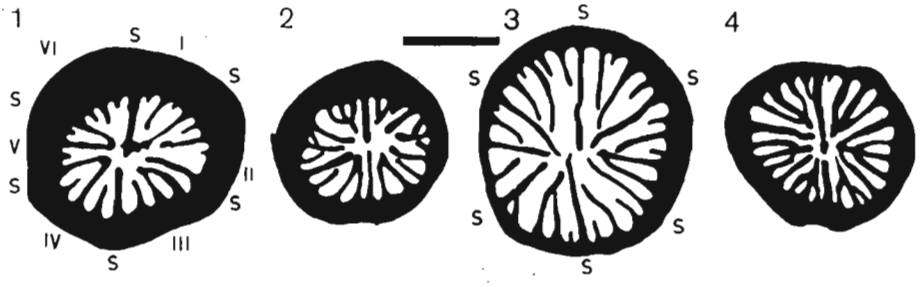

Fig. 1. Symmetry in the genus *Cladophyllia*: *1* C. minor Beauvais, 1975, NHM R.9639; *2* C. *conybearei* Milne-Edwards et Haime, 1851, NHM R.8383; *3* C. cf. *excelsa* (Koby, 1888), MBK 350. 10; *4* C. *dichotoma* (Goldfuss, 1826), MBK 351. *I—VI* septal systems, *S* septa of the 1st order. Scale bar 2 mm.

Material examined. — NHM R.9212 (with 8 thin sections), R.9638, R.9639 (with 13 thin sections), R.56786, all from Fairford, East of Cirencester, Gloucestershire.

Dimensions:

Specimen No.	d	s
R.56786	2.8—3 (3.5)	24+nS4
R.9212	(2.5) 3 (3.5)	24
R.9638	(2.5) 3 (3.5)	24+nS4

Description. — Colony dense, D from 40 to 100 mm and H from 30 to 60 mm. Corallites cylindrical, free or in places fused with their walls. Bifurcation at the angle of 40—60 degrees, and at the distance of about 10 mm. Incerease by symmetrical division of the calice (pl. 15: 1d,e; fig. 2). Rejuvenescence frequent: new calicular rim situated eccentrically or adaxially (pl. 15:1c). Wall surface transversely wrinkled (pl. 15:3c), in places marked with light, longitudinal striation. Calices deep, with thin and sharp margins (pl. 15:3ab). Septa nonexsert. Septal apparatus regular, usually formed by 24 septa differentiated into three size orders and accidental septa S4. The septa S1 and S2 approach to the axis and join to the columella (pl. 15: 1e, 2). Symmetry of the septal apparatus from radial to radio-bilateral. Generally, the latter is observed at the initial stage of budding when two opposing S1 septa join to the columella. The septa S3 are long, usually free, rarely anastomozing with S2. At the calice bottom, the adaxial portions of septa S1 and S2 are widened (pl. 15: 1e, 2). In longitudinal section, internal septal edges show regular, auricular denticulation, the auriculae at their adseptal part being flattened dorsally (pl. 16: 1f, 2). In septa S1—S2, auriculae are provided with rods connecting with columella (pl. 16: 1f, g, 2). Lateral septal sides ornamented with sharply pointed, abundant granulae (pl. 16: 1b-d). Endotheca composed of large, thin-walled tabuloid dissepiments cutting the lumen and large rare vesicles leaning against the wall (pl. 16: 1f, 2). Columella trabecular, thin, substyliform,

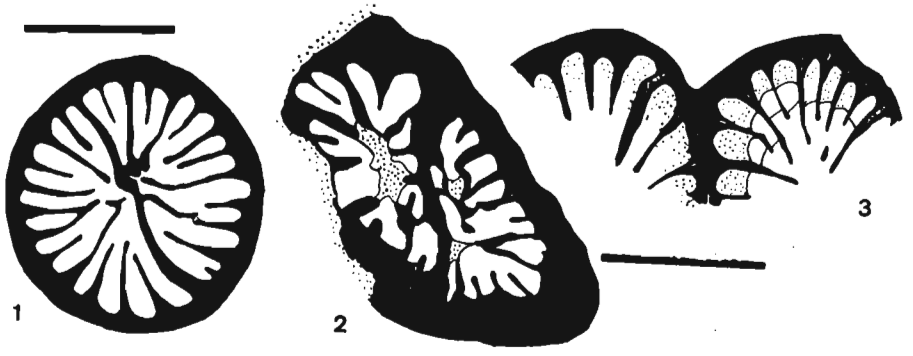

Fig. 2. Stages of corallite division in *Cladophyllia minor* Beauvais, 1975: *1* NHM R.9292, initial stage characterized by fusion of septa, *2* NHM R.9639, advanced stage with new septa on the wall surface developed, *3* NHM R.9639, late stage with median wall line marked and a constriction developing between two corallites. Scale bar 2 mm.

hidden deeply in the calice, distally free, while fused with the septa S1—S2 to form a thick axial structure at the calicular bottom. Corallite wall septothecal, thickened by stereome (pl. 16: 1a, d, 2). In the process of budding, a diving wall is formed. It is founded on two opposite septa S1 and a columella which fuse together and divide the parent calice into equivalent portions. The new septa arise on the dividing wall at an early stage of its formation (pl. 16: 1a). A median wall line appears at the stage when a constriction between new calices begins to develop (pl. 16: 1a, fig. 2: 3). The dividing wall become thick and eventually split along the median line into two portions completing walls of the new individuals.

Microstructure. — Original microstructure is preserved in vestiges. In the septum, there are visible outlines of trabeculae about 30—80 μm in diameter (pl. 16: 1b-e). Trabecular thin lateral offsets (ca. 30 μm in diameter) emerge on the septal flanks as sharp granulae (pl. 16: 1c, f). On the wall surface, there is marked vertical dense stration corresponding to peripheral portions of septa. Additionally, in the wall structure a microstriation can be seen (width ca. 30μm, see oblique section pl. 16: 1b; compare Description of *C.* cf. *excelsa*, p. 175, pl. 17: 3ab) the origin of which remains unknown due to the recrystallization of the skeleton.

Remarks. — This species has a relatively well expressed radial symmetry and shows insignificant tendency towards anastomosis of septa. The species differs from *C. babeana* Milne-Edwards et Haime (1851b) in smaller corallite diameters.

The auriculae observed here do not have V-shaped longitudinal sections (compare Gill 1977). The auricular dorsal depression is highly reduced and expressed as a flattening on the dorsal side of the denticle.

Occurrence. — France, Langres (Hte Marne) and England, Crickley Hill (Gloucestershire): Bajocian (after Negus and Beauvais 1975). England, Fairford (Gloucestershire): Bathonian.

Cladophyllia conybearei Milne-Edwards et Haime, 1851

(pl. 17: 1, 2; figs. 1, 3)

1851b. *Cladophyllia conybearei*: Milne-Edwards and Haime, 91, pl. 16: 2a-c.
1857. *Cladophyllia conybearei* Milne-Edwards et Haime; Milne-Edwards and Haime, t. 2, 365.

Lectotype: figured in Milne-Edwards and Haime 1851b: pl. 16: 2a-c.
Type locality and horizon: Steeple Ashton, Coral Rag, Oxfordian.
Material examined. — Topotypes NHM R.253 and R.8383.

Dimensions:

d	s
3—4	24

Description. — Bifurcation at the angle of 50—90 degrees, at the distance exceeding 10 mm. Increase by symmetrical septal division of the calice; rejuvenescence present. Corallite surface covered with thick wrinkles. Radial elements marked on the surface as longitudinal narrow striation. Calicular rim thin, septa

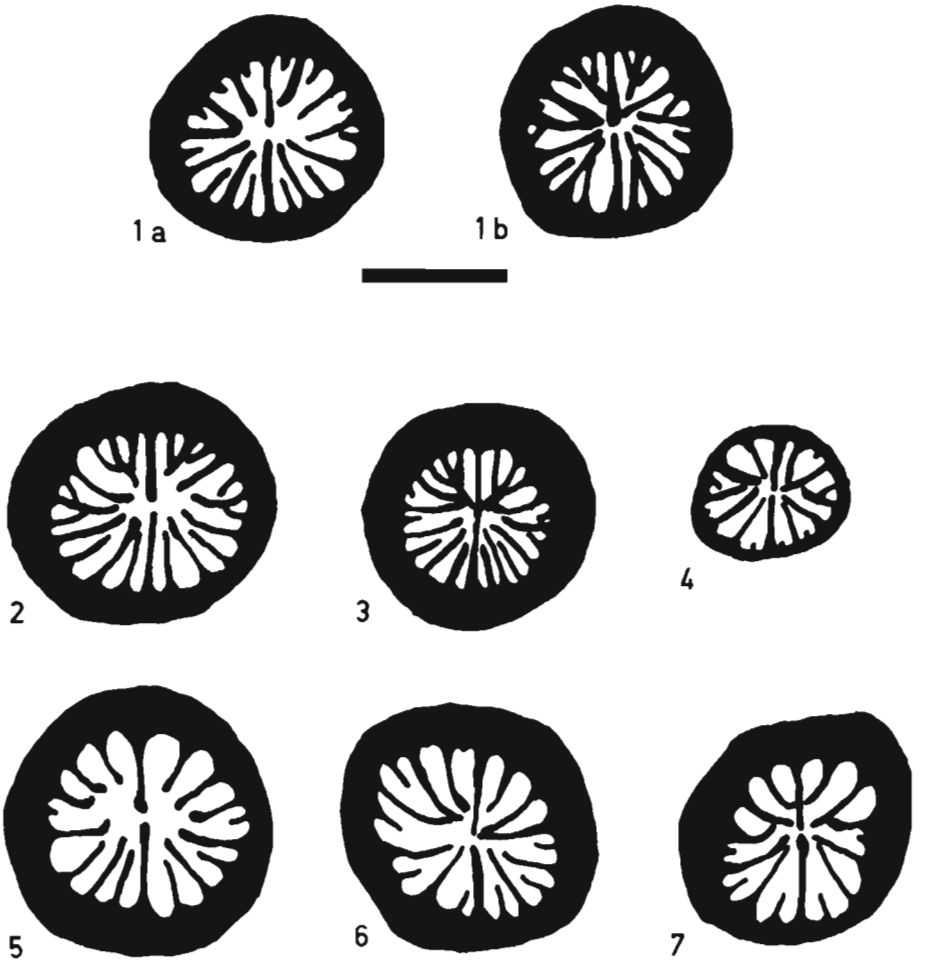

Fig. 3. Arrangement of septa in *Cladophyllia conybearei* Milne-Edwards et Haime, 1851: *1a* calice from the colony NHM R.8383 in distal view, *1b* a view of the deeper part of the calice. *2*, *3*, *4* distally eroded specimens showing septal anastomosis characteristic of diverse deep parts of calices. *5*, *6*, *7* calices from the colony NHM R.253 showing septal relationships observed at distal parts of the calices. Scale bar 2 mm.

nonexsert. At the calicular bottom there is a small columella joined to at least one septum S1 (pl. 17: 1c). Septal apparatus composed of septa of 3 size orders disposed in radiobilateral manner (pl. 17: 1ab, 2bc; fig. 3). Septal faces ornamented with sharp, small granules. Internal edge with regularly spaced large denticles. The septa S3 in the IIIrd and IVth sectors are longer than in the remaining ones, and in the calice they remain free (fig. 3). The septa S2 and S3 from the Ist, IInd, IVth and VIth sectors are regularly anastomosing and forming triads which, in turn, can anastomose with some septa S1.

Remarks. — *C. conybearei* seems to differ from the type species in nearly amphiastraeoid arrangement of septa in lower parts of the calices. Such arrangement is observed in calices with distal parts destroyed. It is probable, however, that the apparent difference is due to the preservational state of the specimens examined.

Occurrence. — England, Steeple Ashton: Oxfordian, Coral Rag.

Cladophyllia cf. *excelsa* (Koby, 1888)
(pl. 17: 3—6; figs. 1, 4)

v.1977. *Cladophyllia dichotoma* (Goldfuss); Roniewicz: 619.

Material. — MBK, coll. Brotzen, numerous corallite fragments from Czarnogłowy (Zarnglaff in the ancient literature) and 2 thin sections. MBK 351.8 and 351.13.

Dimensions (in mm):

Specimen No	d	s	remarks
MBk 351.10	4.	24S1—S3+nS4	juvenile A
	4.5	24S1—S3+nS4	juvenile B
different fragments in the box MBK 351	5. —5.3		adults

Description. — Corallites forking (pl. 17: 4) at relatively large distance (maximum 25 mm). Calice deep, calicular rim thin, septa distally free, at the bottom two opposite septa S1 approaching the axis. In the examined specimens columella cannot be distinguished. Septa differentiated into 4 size orders; the septa S4 (pl. 17: 6) are relatively long and numerous (6—10). Symmetry radiobilateral. In the calice two planes of bilateral symmetry can be distinguished: a plane indicated by two opposing septa S1 and another one slightly marked by two opposing septa S2 from the IIIrd and Vth sectors (figs. 1, 4). Anastomosis involving S2 and neigh-

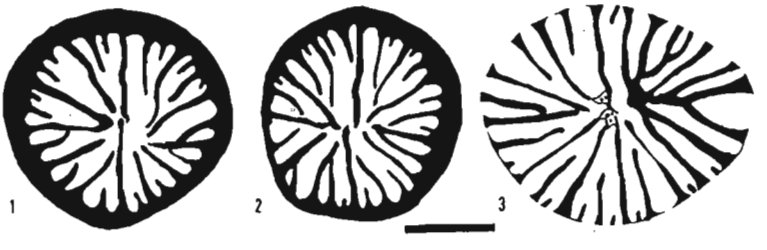

Fig. 4. *Cladophyllia* cf. *excelsa* (Koby, 1888): 1, 2 juvenile calices MBK 351.10 in distal view and 3 adult specimen MBK 351.8 in cross section with slightly marked two planes of symmetry. Scale bar 2 mm.

bouring septa can be observed in the mentioned sectors. Small and sharp granulae are seen on septal faces. Endotheca is formed of tabuloid dissepiments and completed by rare, large vesiculae leaning against the wall. Septotheca is formed by subequal and adhering peripheral parts of septa. On the corallite surface the septa are separated from one another by slightly marked furrows. The interseptal furrows continue on the rims of the transverse accretional bands (pl. 17: 3ab). The rims correspond to earlier, especially expanded calicular margins marked on the corallite surface in the process of growth. The external surface of peripheral parts of septa is covered with longitudinal microstriation (width $\geqslant 30$ μm, pl. 17: 3b).

Remarks. — The corallite diameters exceed those observed in the syntypes of *C. dichotoma* (see below). The anastomosis, irregular and involving septa S1—S4, differs from that in the type species as well. We consider the form under discussion as representing a separate species which cannot be determined on the basis of the available material. In corallite diameters, the form resembles *C. excelsa* Koby, 1888 from the "Astartian" of the Jura Mts. (Koby 1888: 435, pl. 114: 3, 3a-d).

Occurrence. — Poland: Czarnogłowy, Kimmeridgian, Aulacostephanus pseudomutabilis Zone.

Cladophyllia dichotoma (Goldfuss, 1826)

(pl. 18: 1—3; fig. 1)

v.1826. *Lithodendron dichotomum* Goldfuss: pl. 13: 3a and 3b
1884. *Cladophyllia ramea* Koby: 178, pl. 107: 1—3
1964. *Cladophyllia dichotoma* Goldfuss; Beauvais: 117, pl. 2: 6
1968. *Cladophyllia dichotoma parallela* Goldfuss; Geyer, pl. 2: 1a-c
? 1974. *Cladophyllia dichotoma* Goldfuss; Reyeros de Castillo: 18, pl. 6: 1—3, 5, 6
? 1981. *Cladophyllia dichotoma* Goldfuss; Beauvais and Rieuf: 356, pl. 1: 1.

Syntypes: GPIU, coll. Goldfuss; figured in Goldfuss 1826: pl. 13: 3ab, Beauvais 1964: pl. 2: 6ab (forma *parallela*), and herein pl. 4: 1, 2.

Type locality and *horizon*: Giengen, Schwabische Alb, Tithonian.

Material examined. — Both syntypes (GPIU) and 1 specimen from Nattheim MBK 350, coll. Ewald.

Dimensions:

	d	s
forma *parallela*	(3) 4.5 (5)	12S1/S2+nS3
forma *flexuosa*	(4) 4.8 (5)	uncountable
specimen from Nattheim	3—4	24+n

Description. — Goldfuss distinguish two forms: *parallela* (1826: pl. 13: 3a) and *flexuosa* (pl. 13: 3b), represented by two colonies from Giengen. In the forma *parallela*, corallites are densely crowded, bifurcating at the acute angles and at the distance exceeding 10 mm; after forking, corallites are subparallel. In the forma *flexuosa* the colony is loose, built of corallites growing in various directions, forking at the distance of ca. 10 mm and at the angle of about 90 degrees. In both forms the corallite surfaces are wrinkled. In the colony parallela there were observed the following features: thin calicular rim, septotheca, septa S1 and S2 joining the columella, regularly distributed septa S3 and frequently anastomosing S2 and S3 (fig. 1). In some corallites calicular pit is eccentrical.

Remarks. — Complete silicification of both syntypes has certain morphological features of the corallites obliterated. The features of the septal apparatus are not

clearly recognizable; the primary features of the wall surface are preserved fragmentarily as the wall is covered with siliceous spherulites[1]). The septa emerging in places on such surfaces simulate costae. Other typical cladophylliid features are well observable: budding by symmetrical fission followed by bifurcation of the corallite, slightly eccentric position of the axial pit and septal anastomosis.

Colony from Nattheim is similarly deeply silicified as those from Giengen. Corallites are parallel, calices have slightly eccentric axial pit. Bilateral symmetry is accentuated by fusion of columella and septum S1, while radial symmetry is visible in rather regular anastomosis of septa S2 and S3 (triades) in all sectors. The species has all parameters fitting *C. ramea* Koby 1884.

Due to the poor state of preservation of the type material the specific features of *C. dichotoma*, apart from dimensions, are insufficiently diagnosed. Under this specific name corals are described from the Oxfordian of France (Beauvais 1964), Corse (Beauvais and Rieuf 1981), Upper Jurassic of Mexico (Reyeros de Castillo 1974), Lower Kimmeridgian of Columbia (Geyer 1968). Among them, the Mexican form is described with a number of septa significantly smaller than that in typical materia, while that of the Corse apparently has thicker microstructure as the distal septal edge shows rather thick denticulation.

Occurence. — Germany: Schwabische Alb: Tithonian. Swiss: Jura Mts.: Oxfordian. France: Vosges and Dept. Meuse: Oxfordian. (?)Corse: Oxfordian. Columbia: Lower Kimmeridgian. (?)Mexico: Upper Jurassic.

Genus *Apocladophyllia* nov.

Type species: *Apocladophyllia nowaki* sp.n.

Derivation of the name. — Greek *apo* — from, corresponding to the presumable origin of the new genus from the genus *Cladophyllia*.

Diagnosis. — Phaceloid. Corallites connected by blind, lateral corallite extensions — apophyses. Increase by dichotomous division of the calice by septal wall. Symmetry radial, or radiobilateral at the stage preceeding the division. Corallites subpolygonal or subcircular in cross section. Wall septothecal, external surface longitudinally striated and transversely wrinkled. Radial elements of septal type, nonexsert and free. Internal septal edge with auricular denticles, lateral faces with sharp and small granulae. Columella essential, trabecular. Dissepiments subhorizontal at the center and oblique at the wall. Trabeculae of about 30 to 80 μm in diameter, rarely larger.

Species included. — Upper Tithonian: *Apocladophyllia nowaki* sp.n.; ?Kimmeridgian — Portlandian, upper Tithonian — lower Berriasian: *A. koniakensis* (Ogilvie, 1897).

Stratigraphic and geographical ranges. — ?Kimmeridgian — Portlandian in the Taurus Mts., Tithonian — Berriasian in the External Carpathians.

The lower stratigraphic range of the genus in question is uncertain since the age of coral-bearing strata from the Taurus Mts (Alloiteau 1939) has not been estimated with sufficient accuracy.

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[1]) This was the reason for misidentification of the morphological features of this coral by Beauvais (1964: 117), e.g. costae at the vicinity of calice, perforation of the septa at the internal edge, columellar septum instead of essential columella, distally convex endothecal elements, and extracalicular budding. The misidentifications mentioned above led this author to erroneous interpretation of the Goldfuss species and, consequently, of the genus *Cladophyllia*.

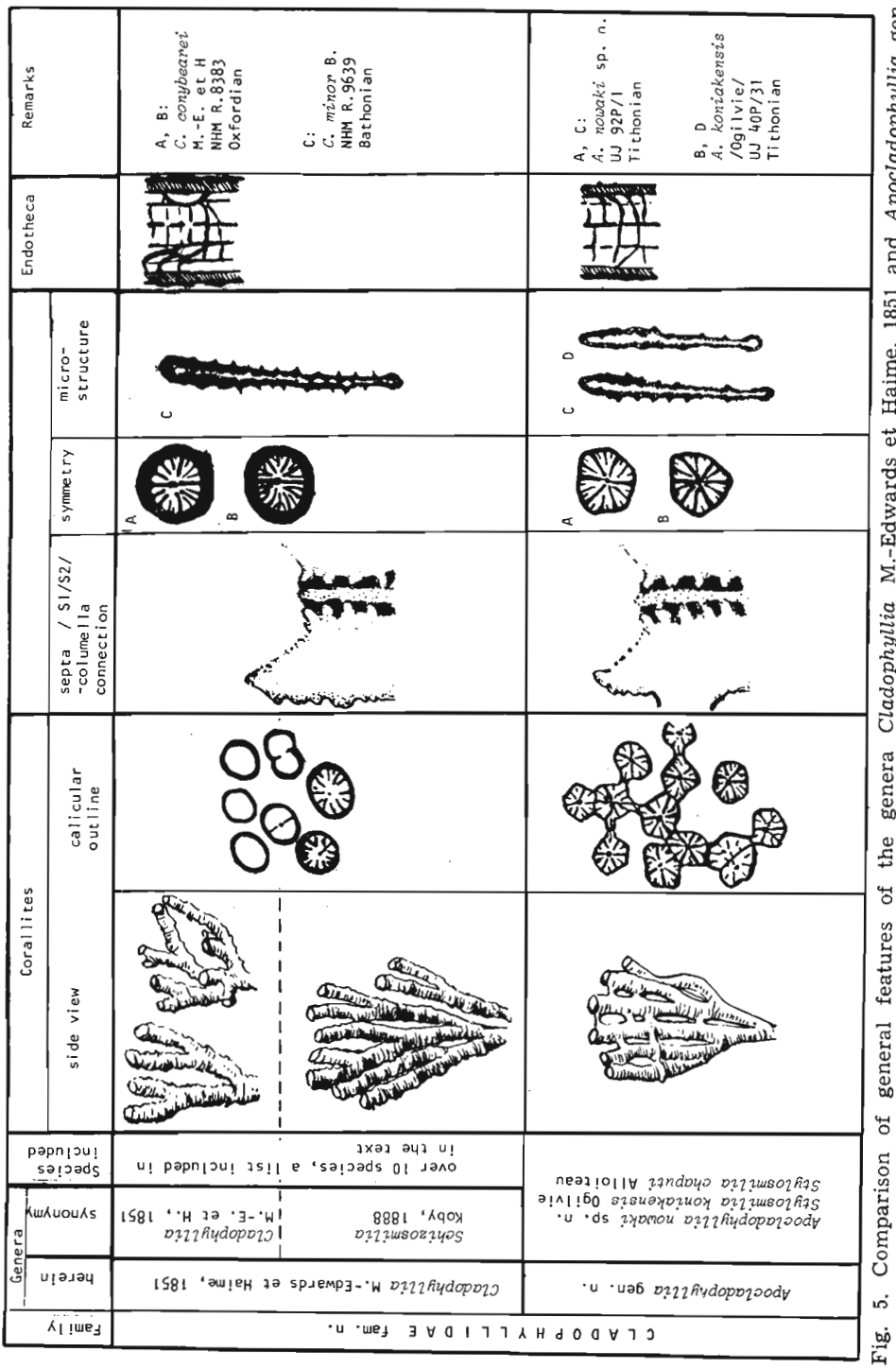

Fig. 5. Comparison of general features of the genera *Cladophyllia* M.-Edwards et Haime, 1851 and *Apocladophyllia* gen.n.

Remarks. — Diagnosis presented above was based on the features observed in the type species, confirmed by data obtained from *Apocladophyllia koniakensis* (Ogilvie, 1897).

Table 2

Comparison of *Cladophyllia* (Bajocian-Albian) and *Apocladophyllia* (Tithonian-Berriasian)

Stratigraphic range	Bajocian-Albian	Tithonian-Berriasian
corallites	straight or tortuous biforking, free or fused with walls	straight or tortuous biforking, connected by apophyses or fused with walls
surface	horizontally wrinkled vertically striated	horizontally wrinkled vertically striated
wall	septotheca	septotheca
calice	subcircular edge sharp, axial pit slightly eccentric	subpolygonal edge sharp, axial pit central
columella	small, trabecular joining septa	small, trabecular joining septa
septa	nonexsert, rather anastomosing	nonexsert, rather free
internal edge	regular denticles	regular denticles
lateral ornamentation	small, sharp granules	small sharp granules
symmetry	radial to radiobilateral	radial, radiobilateral at the start of budding
endotheca	subtabular with large dissepiments at the wall	subtabular
budding	equivalent division by opposing septa S1	equivalent division by opposing septa S1
rejuvenescence	present	lacking
diameter of trabeculae	main ca. 30—80μm	ca. 30—80 (120) μm
	secondary ca. 30 μm	

The genus *Apocladophyllia* gen.n. differs from *Cladophyllia* in having apophyses and radial arrangement of septa; radiobilateral symmetry appears only in the calices involved in the process of division (table 2, fig. 5). On the basis of the species examined, one can judge that both genera, additionally, differ in the shape of auriculae (compare Descriptions of *C. minor* and *A. nowaki*).

Apocladophyllia is similar to the genus *Halysitastraea* Geyer, 1968 through the phaceloid growth form, the presence of apophyses and the dimensions of corallites. The determination of their relationship will be possible after the type materials have been re-examined.

Apocladophyllia and the Hauterivian genus *Actinastraeopsis* Sicharulidze, 1974 have the following features in common: phaceloid growth form, apophyses, symmetrical division of corallites and styliform columella. Genus *Apocladophyllia* differs from *Actinastraeopsis* in the lack of the permanent anastomosis between septa S2 and S3 and in smaller trabeculae (the diameters of trabeculae in *A. nowaki* range from 30—70 μm, while those in *Actinastraeopsis* from ca. 60 to 140 μm as it has been found in the form belonging to this genus and described as *Schizosmilia* aff. *corallina* Koby in Morycowa 1971: pl. 13: 4).

Apocladophyllia is similar in its growth form to the Lower Cretaceous genus *Texastraea* Wells. Judging from the original illustrations (Wells 1973: pl. 1: 2, 3) the genus *Texastraea* is characterized by styliform columella, increase by symmetrical division of calice by the septal wall, palisaded corallites which cluster in places,

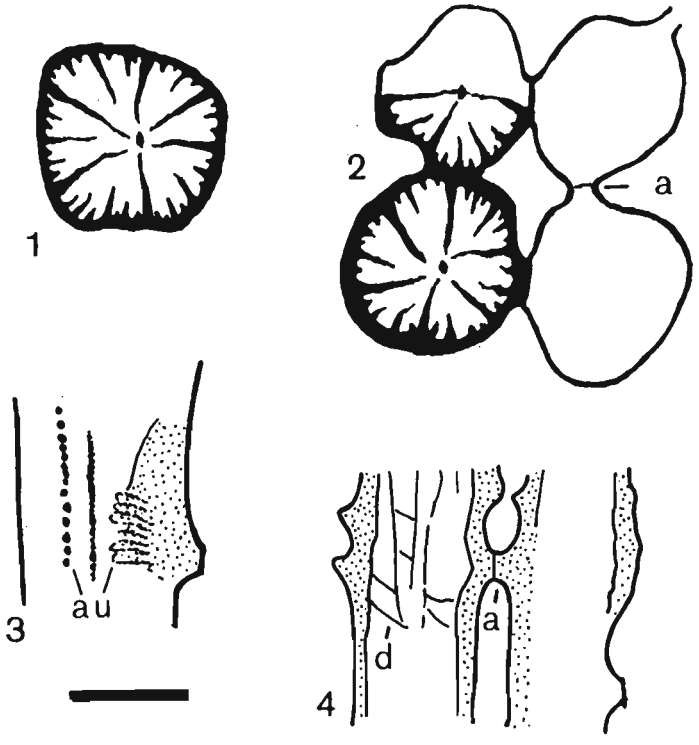

Fig. 6. *Apocladophyllia nowaki* gen. et sp.n., UJ 92P/1: 1, 2 distribution of septa and apophyses; 3 sketch drawing of the ornamentation of septal inner edge in longitudinal corallite section; 4 sketch drawing of corallites in longitudinal section showing rare dissepiments and distribution of apophyses. Scale bar 2 mm.

and coarse ornamentation of the distal septal edge (i.e. relatively thick trabeculae). The latter two features suggest relationship (even congenerity) of *Texastraea* with *Actinastraeopsis* rather than with the genus *Apocladophyllia*.

In the mode of budding, shape of corallites and in development of apophyses, *Apocladophyllia* resembles the Doggerian genus *Lochmaeosmilia* Wells, 1943. Because of this Wells included (1943) the Tithonian species of *Apocladophyllia* (originally described as *Stylosmilia koniakensis* Ogilvie, 1897) to *Lochmaeosmilia*. The genera discussed differ from one another in the septal arrangement and microstructure. In *Apocladophyllia* the arrangement is regular, radial or radiobilateral, while particularly irregular and anastomosing in *Lochmaeosmilia*. As to the septal microstructure, unfortunately, the direct data remain unknown. Nevertheless, coarse and rare lateral ornamentation in *Lochmaeosmilia* and that minute and dense in *Apocladophyllia* justify the assumption that the two genera are microstructurally different.

At the end of the review, the relation between *Apocladophyllia* and *Stylosmilia* Milne-Edwards et Haime, 1848 is wort mentioning, as the earliest known species from the generic range of *Apocladophyllia* have been originaly ascribed to the latter genus. The most general features of the both genera are in common, and this allows for their assignment into the sub-order Stylinina. However, they represent the families differing from each other in the type of radial elements and budding: *Stylosmilia* — this with costosepta and extracalicular budding, i.e. Stylinidae, while *Apocladophyllia* — that with septa and intracalicular budding, i.e. Cladophylliidae.

Apocladophyllia nowaki sp.n.

(pl. 19: 1a-f; pl. 20: 1a-d; pl. 21: 1a-d; pl. 22: 2; figh. 1, 5, 6, 7)

Holotype: UJ 92P/1, pls. 19—21, 22: 2; figs. I, 5, 6, 7.

Type locality: Rudzica near Cieszyn in the External Carpathians, Poland.

Type horizon: Upper Tithonian, Cieszyn beds, Chitinoidella Zone.

Derivation of the name. — In memory of the late Dr. Wiesław Nowak, student of the Carpathian geology.

Diagnosis. — Corallites from 3 to 4 mm in diameter, septa 24—48 in number, arranged in 6 systems and differentiated into 4 size orders.

Material. — Holotype colony UJ 92P/1 with thin sections UJ 20/1—11.

Dimensions:

D	130×200
H	ca. 150
d	2.7—3.5 (3.8)
dl	1.8—3.3 (3.5)
dcol	ca. 150 μm
c—c	(2.5) 3. —3.5 (4.3)
s	24—48
wall thickness	0.16—0.32
dtr	ca. 80 μm

Description. — Colony phaceloid, submassive (pl. 19: 1a). Corallites straight, densely crowded, forking at the acute angle, linked by numerous and relatively thin apophyses (pl. 19: 1b-f; pl. 20: 1a, b, e; fig. 6) or joined by walls. The apophyses develop as lateral corallite extensions containing prolonged septa and dissepiments. The extensions of the neighbouring corallites meet one another and fuse together

with their walls their lumina being isolated (pl. 19: 1ef). Corallite surface transversely wrinkled with delicate accretionary lines and longitudinally striated. Corallites subpolygonal in section (pl. 19: 1b-d), calices subpolygonal or subcircular. Symmetry radial with the exception of corallites involved in budding. Septa usually free, disposed into 6 systems and differentiated into 4 size orders. The septa S1 reach to the columella, the remainning septa are differentiated in length depending the cycle. The septa S4 have been observed in rare adult corallites. Internal edge ornamented with auriculae (pl. 21: 1a-d; fig. 6: 3) with characteristic dorsal depressions on their dorsal sides relatively well marked (pl. 21: 1a-c). Septal faces

Fig. 7. *Apocladophyllia nowaki* gen. et sp.n., UJ 92P/1: corallites in successive developmental stages illustrating corallite division by septal wall followed by forking. Scale bar 2 mm.

covered with small and sharp granulae. Columella small, styliform, central. Endotheca built of large and rare tabuloid dissepiments subhorizontal at the axial part (pl. 20: 1d) and slightly inclined axialwards at the periphery. Wall septothecal. Increase by symmetrical division of the corallite by septal wall (fig. 7). Forking frequent.

In the cross section of septa, there are visible vestiges of trabeculae rarely exceeding diameter of 80 μm (pl. 22: 2).

Remarks. — *A. nowaki* differs from *A. koniakensis* in much less angular corallites, far larger diameters (table 3), more numerous and rather free septa, rare dissepiments and relatively thin apophyses.

Occurrence. — As for the holotype.

Apocladophyllia koniakensis (Ogilvie, 1897)

(pl. 22: 1a-d; fig. 8)

1897. *Stylosmilia Koniakensis* Ogilvie: 118, pl. 15: 3, 3ab
1939. *Stylosmilia Chaputi* Alloiteau: 6, pl. 1: 1—3
1955. *Schizosmilia koniakensis* (Ogilvie); Geyer: 191
1964. *Stylosmilia chaputi* Alloiteau; Morycowa: 494, pl. 21: 2ab
?1973. *Stylosmilia chaputi* Alloiteau: Turnšek: 17, pl. 10: 3

1974. *Schizosmilia koniakensis* (Ogilvie); Morycowa: 472, pl. 8: 1; pl. 12: 1; text-fig. 8
v.1990. *Schizosmilia koniakensis* (Ogilvie); Eliášová: (in press)

Lectotype: Lost; figured in Ogilvie 1897: pl. 15: 3ab.

Type locality: Koňakov, External Carpathians, Czechoslovakia.

Type horizon: Štramberg limestone, Tithonian.

Material examined: — Coll. Eliášová (UUG, Praha): colonies from Koňakov, Štramberk, Mikulov; coll. Chaput (MNHN, Paris): colony from deposits of the age estimatet at Kimmeridgian — Portlandian of the Taurus Mts, region Küre, Turkey; coll. Morycowa (UJ, Cracow): colonies from exotic limestones of the Štramberk type, from the Carpathians: Woźniki near Wadowice (UJ 40P/31, thin sections UJ 10/22—26) and Kruhel Wielki near Przemyśl (UJ 38P/1—6, thin sections UJ 8/1—2).

Dimensions:

d	1.3—1.8(2)
dcol	100—200 μm
c—c	2—3
c—c after division	1.5—2
s	12—24
dtr	30—80 (120) μm

Description. — Colony phaceloid, partially submassive, composed of densely crowded corallites (pl. 22: 1c). Apophyses large (pl. 22: 1a). Forking at the acute angle, frequent. Corallite shapes subpolygonal or subcircular (pl. 22: 1a; fig. 8). Wall variable in thickness. Corallites covered with transversal growth wrinkles and longitudinal striation, the latter extending upon the whole surface, the wrinkles including. On the striae, single rows of equidistant, small granulae are visible. Corallites linked by apophyses or fused directly by walls. Septa differentiated into 3 size orders, disposed into 6 systems (fig. 8). Symmetry radial or radio-bilateral. The plane of symmetry passes through the septum S1 adjoining the columella or,

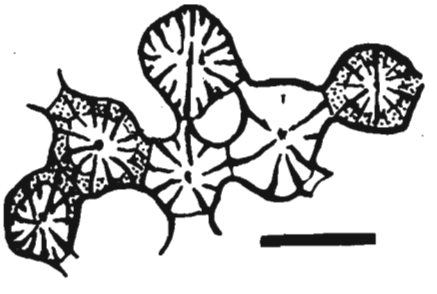

Fig. 8. *Apocladophyllia koniakensis* (Ogilvie, 1896), UJ 40P/31: transverse section showing walls of variable thickness, radially arranged septa and large apophyses. Scale bar 2 mm.

in dividing corallites, through the opposing S1 septa fused to the columella (pl. 22: 1b). Septa S1 and S2 long, subequal, anastomosing, septa S3 distinctly shorter and in small number. Internal edge with auriculae (pl. 22: 1d). Septal faces with small, sharp granulae. Columella relatively large, circular or flattened in cross section. Wall septothecal. Dissepiments subhorizontal or slightly inclined axialwards at the wall.

Septal microstructure preserved in the form of well limited, opaque vestiges of trabeculae.

Remarks. — The measurable features of *A. koniakensis* seem to be very stable as it is shown in the data from literature (table 3). The species has been illustrated with a series of figures by Morycowa (1974).

Table 3

Apocladophyllia koniakensis and *A. nowaki* in the literature and collections

		Taxa	Diameter		Corallites		Number of rodial elements	Distribution		Authors
			corallite	calice	free	joint		age	region	
Apocladophyllia gen. n.	*A. koniakensis* (Ogilvie)	*Stylosmilia koniakensis*		1.0–1.5(2)			12—16 +n	U. Tithonian	W. Carpathians	Ogilvie 1897
		Schizosmilia koniakensis	(0.9) 1.3—1.8(2.0)	(0.7) 1.0—1.5	(2.1) 2.5 (3.2)	1.5–2.0	24	U. Tithonian	W. Carpathians	Morycowa 1974
		Schizosmilia koniakensis	1.2–1.8	0.9–1.4			12—24 (10–11 long)	U. Jurassic	W. Carpathians	M. Książkiewicz coll., U. J.
		Stylosmilia chaputi	1.0–1.75	0.9 1.0–1.5			24 (12 long)	?Kimmeridgian Portlandian	Taurus Mts. reg. Küre	Alloiteau 1939
		Stylosmilia chaputi	1.0–1.5	0.9–1.3	ca. 3.0		24 (12 long)	U. Tithonian L. Berriasian	W. Carpathians	Morycowa 1964
		?*Stylosmilia chaputi*	0.8–1.7				12+S3	U. Oxfordian L. Kimmeridgian	S. Slovenia	Turnšek 1973
		Apocladophyllia nowaki	2.7–3.8	1.8–3.5			(24) 48	U. Tithonian L. Berriasian	W. Carpathians	W. Nowak coll., U. J.

The species discussed was assigned successively to the genus *Stylosmilia* and to *Schizosmilia*, which is the later subjective synonym of *Cladophyllia* (Discussion p. 169). The assignement to *Stylosmilia* is not justified, since that genus is diagnosed by costosepta and extracalicular budding. The presence of apophyses and radial symmetry well expressed exclude this species from the range of *Cladophyllia*.

It is worth noting that *Cladophyllia clemencia* de Fromentel, 1857 from the Hauterivian of St. Dizier resembles much *A. koniakensis* in its long corallites of small diameters (1.5—2 mm) and increase through septal division (compare de Fromentel 1857, 1867 and two specimens preserved in the collection de Fromentel NMHN Paris).

Occurrence. — Czechoslovakia, External Carpathians (Koňakov, Štramberk, Mikulov): upper Tithonian. Poland, External Carpathians (Woźniki near Wadowice and Kruhel Wielki near Przemyśl): upper Tithonian — lower Berriasian (Crassicolaria Zone). ?Yugoslavia (Slovenia): upper Oxfordian-lower Kimmeridgian. Turkey, Taurus Mts.: ?Kimmeridgian-Portlandian.

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ELŻBIETA MORYCOWA I EWA RONIEWICZ

REWIZJA RODZAJU *CLADOPHYLLIA* I OPIS NOWEGO RODZAJU *APOCLADOPHYLLIA* (CLADOPHYLLIIDAE FAM.N., SCLERACTINIA)

Streszczenie

Zrewidowano trzy gatunki rodzaju *Cladophyllia* Milne-Edwards et Haime 1851: *C. minor* Beauvais, 1975, *C. conybearei* Milne-Edwards et Haime, 1851, *C. dichotoma* (Goldfuss), oraz opisano *C. cf. excelsa* (Koby, 1888) pls. 15—18; figs. 1—4). Stwierdzono, iż *Schizosmilia* Koby, 1889 jest młodszym subiektywnym synonimem *Cladophyllia*. Spośród korali najwyższej jury i dolnej kredy zaliczanych dotychczas do *Stylosmilia* lub *Schizosmilia* wyodrębniono nowy rodzaj, *Apocladophyllia* (pls. 19—22; figs. 5—8), z gatunkiem typowym *A. nowaki* sp.n. Do nowego rodzaju zaliczono oprócz tego gatunek opisany przez Ogilvie (1896) jako *Stylosmilia koniakensis*, a przez Alloiteau (1939), jako *S. chaputi*.

Zwrócono uwagę na następujące cechy obu rodzajów: małe średnice trabekul, aurikularną ornamentację brzegu wewnętrznego septów, drobnoguzkową ornamentację boków septalnych, która świadczy o licznych rozgałęzieniach głównych trabekul, wykształcenie elementów radialnych w postaci septów, ścianę septotekalną, endotekę złożoną głównie z dużych, subtabularnych dysepimentów, oraz symetryczny podział kielicha ścianą pochodzenia septalnego. Rodzaj *Apocladophyllia* różni się od *Cladophyllia* obecnością ślepych wyrostków łączących korality — apofyz, oraz wyraźnie radialnym ułożeniem septów. Cienkie trabekule z licznymi bocznymi odgałęzieniami i występowanie regularnego ząbkowania typu aurikularnego na brzegu wewnętrznym septów pozwalają na włączenie ich do podrzędu Stylinina. Ze względu na charakter elementów radialnych rodzaje te wyodrębniono od innych Stylinina, jako nową rodzinę Cladophyllidae.

Rodzaj *Cladophyllia* jest znany od bajosu do albu z obszarów geosynklinalnych i epikontynentalnych, natomiast *Apocladophyllia* ma zasięg ograniczony do najwyższej jury i dolnej kredy na obszarach geosynklinalnych. Ze względu na podobieństwa cech i następstwo stratygraficzne można je uważać za rodzaje bezpośrednio powiązane filogenetycznie.

EXPLANATION OF PLATES 15—22

Plate 15

Cladophyllia minor Beauvais, 1975
Fairford, Gloucestershire, Bathonian

1*a-e*. Specimen No NHM R.9639: *a* side view, ×1; *b* calicular view, ×1; *c* and *d* details, ×10; *e* transverse section cutting the calices nearly to the calicular bottom (lower calice) and at a distance from it (upper calice), ×15. Note:

the corallites disposed in a chain and fused with their walls (1*c*), rejuvenescence (1*c*), corallites at the early and late stages of division (1*d* and 1*e*), small, styliform columella and long septum S1 approaching to it (1*e*, upper calice), and rare septal anastomosis (compare with pl. 17).

2. Specimen No NHM R.9212: transverse section of the calice cut just above the calicular bottom, showing thickened columella joining the opposite septa S1 and swollen internal edges of the septa S1 and S2 surrounding it, ×15; the plane of cutting lies at the level intermediate between those from 1*e*.

3*a-c*. Specimen No NHM R.56786: *a* calicular view, ×3 and *b* a detail showing thin calicular margins, ×10; *c* two corallites fused with their wrinkled walls, ×3.

Plate 16

Cladophyllia minor Beauvais, 1975
Fairford, Gloucestershire, Bathonian

1*a-g*. Specimen NHM R.9639: *a* slightly oblique transverse section of the corallite at an early stage of division, ×15; *b* a fragment with microstriation in the wall, ×30; *c* a detail, the lateral septal ornamentation and vestiges of septal microstructure are visible, ×60; *d* transverse section showing vestiges of trabecular microstructure, ×60; *e* oblique section of the corallite at an advanced stage of division displaying thick intercorallite wall with a midline, ×15; *f*, *g* longitudinal section, ×16.

2. Specimen NHM R.9212: longitudinal section, ×20.

Note in *1f, g* and *2*: the shape of auriculae on septa S1—S2, the rods connecting septa with columella (arrow) and the endotheca composed of large tabuloid and vesicular (double arrow) dissepiments.

Plate 17

Cladophyllia conybearei Milne-Edwards et Haime, 1851
Steeple Ashton, Oxfordian

1*a-c*. Specimen No NHM R.253: *a* and *b* well preserved deep calices, × ca. 12; *c* eroded calices with columella exposed, ×10.

2*a-c*. Specimen No RHM R.8383: *a* small underdeveloped corallite, ×10; *b* eroded calice, ×12; *c* calicular view of the colony, ×3.3. Note the bilaterality in septal arrangement.

Cladophyllia cf. *excelsa* (Koby, 1888)
Czarnogłowy, Pomerania, Aulacostephanus pseudomutabilis Zone, Kimmeridgian

3.*a,b*. Specimen: MBK 351: *a* corallite wall with peripheral parts of septa marked on the surface, ×15; *b* a detail with well marked microstriation, ×45.

4. Specimen MBK 351.14: corallites a the early stage of forking, ×10.

5. Specimen MBK 351.10: distal part of the young corallite showing two opposing septa S1 in fusion, ×10.
6. Specimen MBK 351.8: thin section exposing bilaterality and anastomois of septal apparatus, ×10.

Plate 18

Cladophyllia dichotoma (Goldfuss, 1826)
Giengen, Tithonian

1*a*,*b*. Syntype colony, forma *parallela*, Giengen, GPIU, coll. Goldfuss: *a* calicular view, ×1; *b* side view, ×1.
2. Syntype colony, forma *flexuosa*, Giengen, GPIU, coll. Goldfuss: side view, ×1.
3*a*-*c*. Specimen from Nattheim, MBK 350: *a* and *b* calices in distal view, ×10; *c* calicular view of the colony. Note radiobilateral symmetry of the septal apparatus, small columella, and septothecal wall in 3*a* and 3*b*; siliceous spherulites thicken the original structure.

Plate 19

Apocladophyllia nowaki gen. et sp.n.
Rudzica, Upper Tithonian, UJ 92P/1

1*a*-*f*. *a* Fragment of erroded colony surface, ×1; *b* UJ 20/2: transverse section showing septal arrangement and intercorallite apophyses, ×10; *c*, *d* UJ 20/1: transverse sections showing radial and radiobilateral symmetry and a dividing corallite, ×8; *e* UJ 20/2: apophyse in transverse section, ×40; *f* UJ 20/9: apophyse in longitudinal section, ×40.

Plate 20

Apocladophyllia nowaki gen. et sp.n.
Rudzica, Upper Tithonian, UJ 92P/1

1*a*-*d*. *a* UJ 20/7: longitudinal oblique section showing styliform columella and auricular ornamentation of inner septal edges, ×10; *b* UJ 20/10: longitudinal corallite section showing auricular ornamentation, ×8; *c* a detail, ×100; *d* UJ 20/9: endotheca in longitudinal section, ×5. Picture 1*b* presented as a positive, white others as negatives.

Plate 21

Apocladophyllia nowaki gen. et sp. n.
Rudzica, Upper Tithonian, UJ 92P/1

1*a*-*d*. *a*-*c* UJ 20/10: longitudinal sections of septa S2 and S3 with auricular denticles on the internal edge, ×104; d UJ 20/11: longitudinal tangential section of septum with auriculae in side view, ×104.

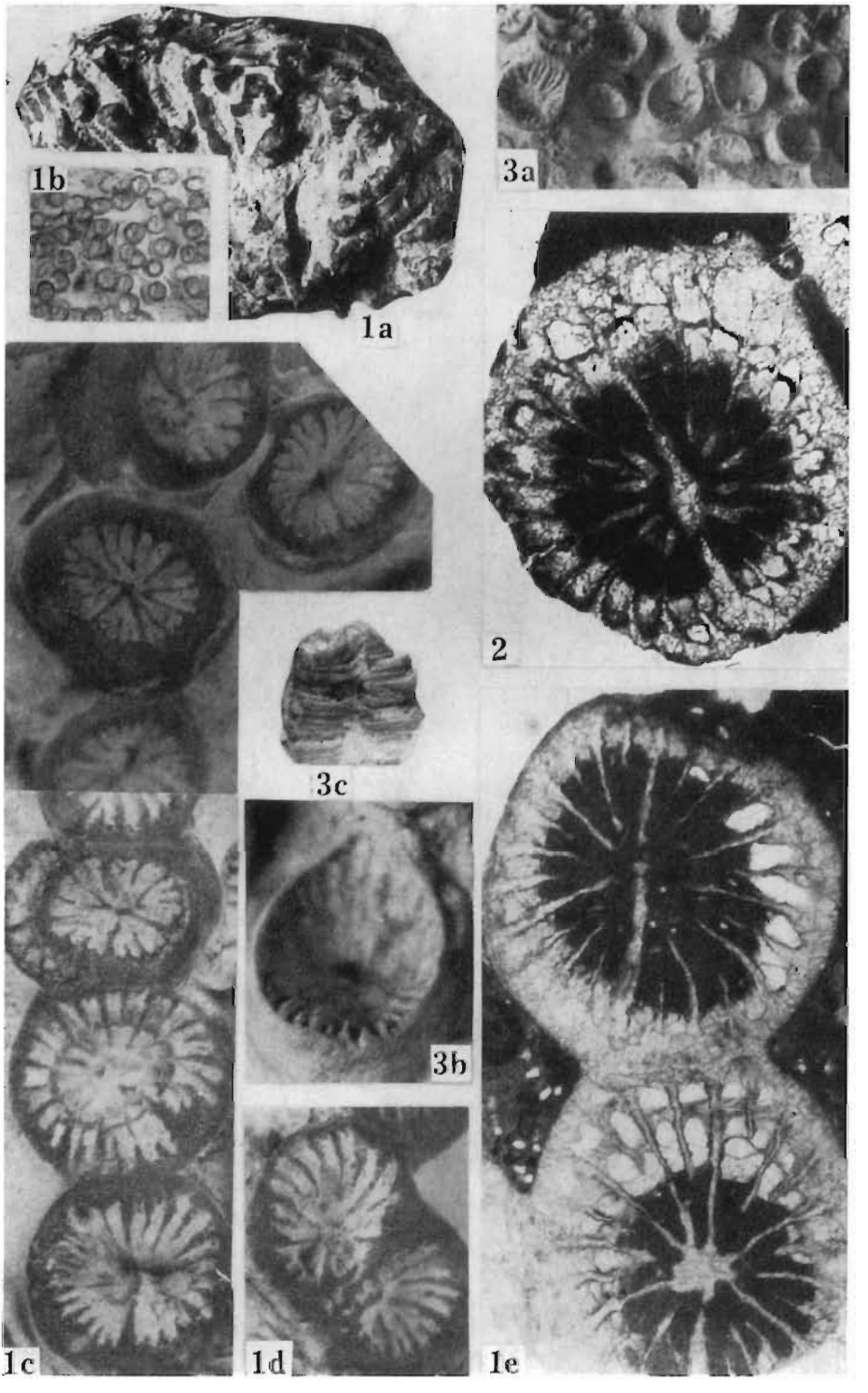
Plate 22

Apocladophyllia koniakensis (Ogilvie, 1897)
Woźniki, Upper Tithonian, UJ 40P/31

1*a-d*. *a* UJ 10/22: transverse section showing radial symmetry of corallites, dividing corallites and intercorallite apophyses, ×10; *b* a fragment of the same thin section: corallite at an early stage of division, bilateral symmetry well marked, ×33; *c* colony surface; ×1; *d* UJ 10/26: longitudinal oblique section with rare apophyses, ×5.

Apocladophyllia nowaki gen. et sp.n.
Rudzica, Upper Tithonian, UJ 92P/1

2. Section UJ 20/2: traces of trabecular microstructure in transverse section of septa, ×100.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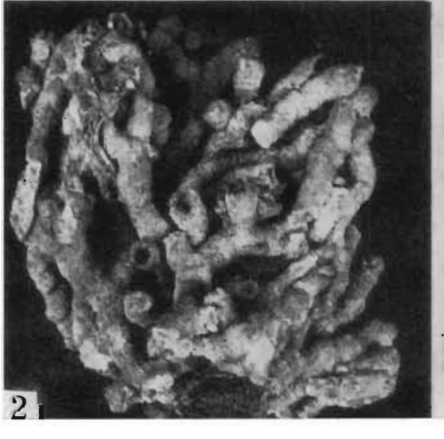
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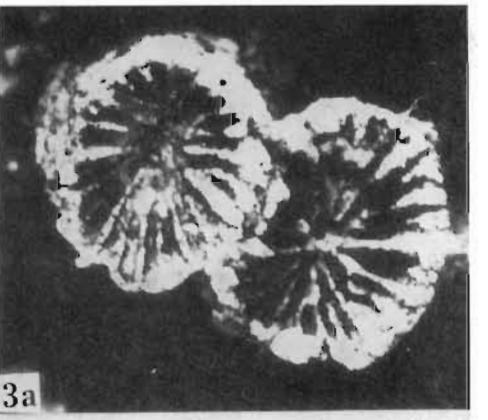
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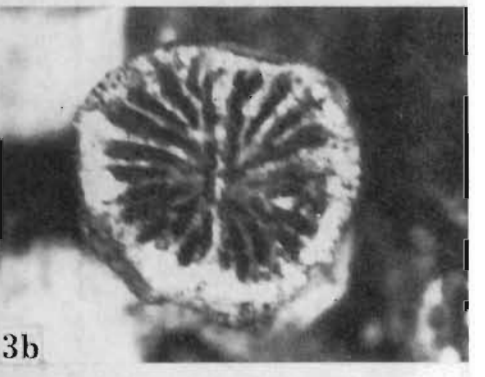
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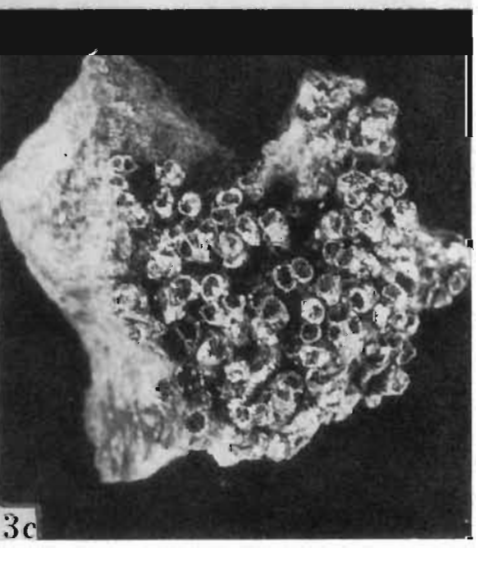
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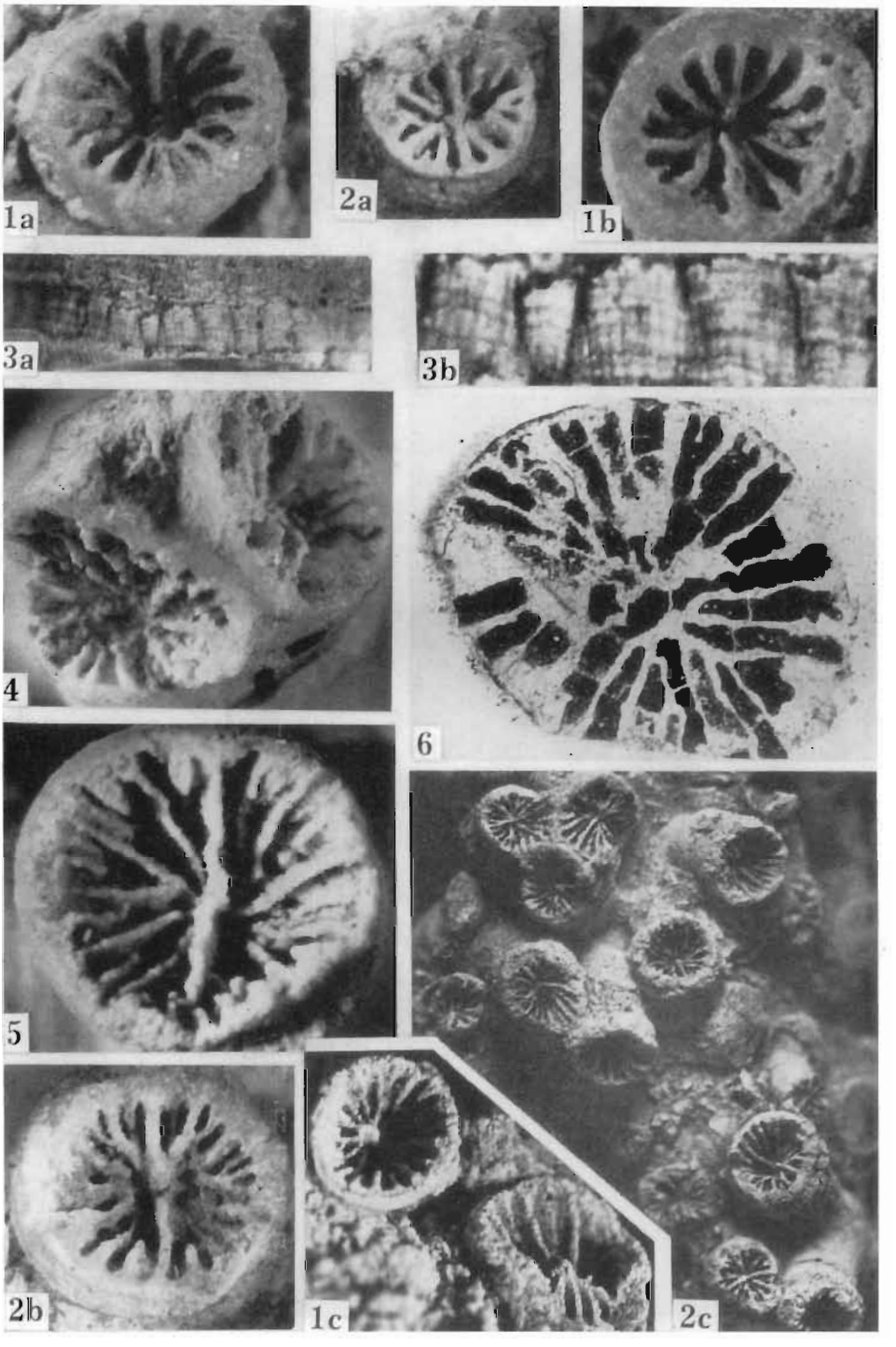
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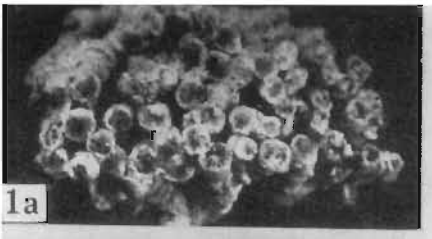
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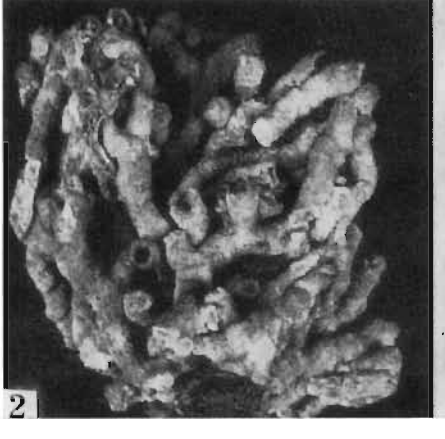
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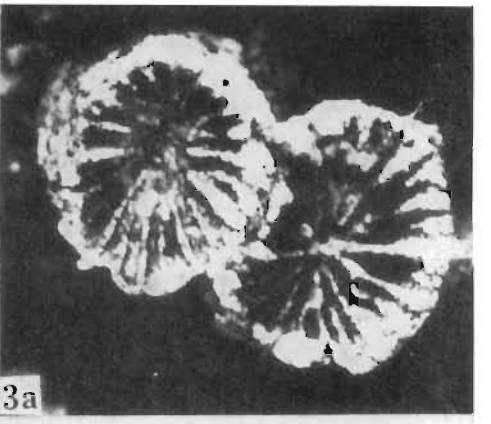
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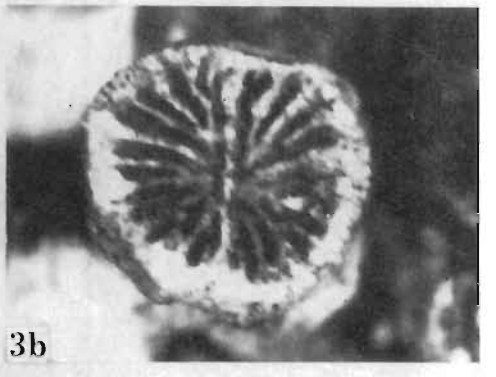
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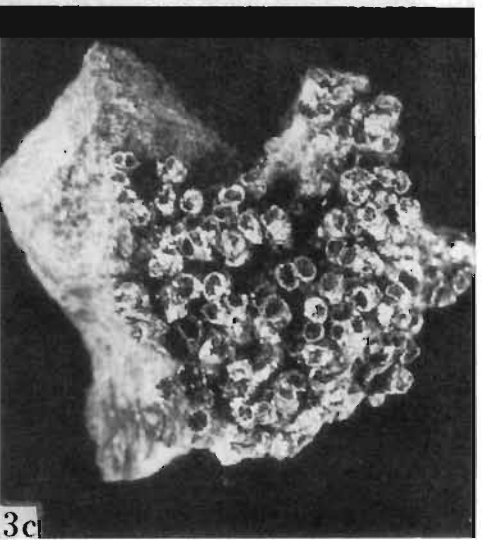
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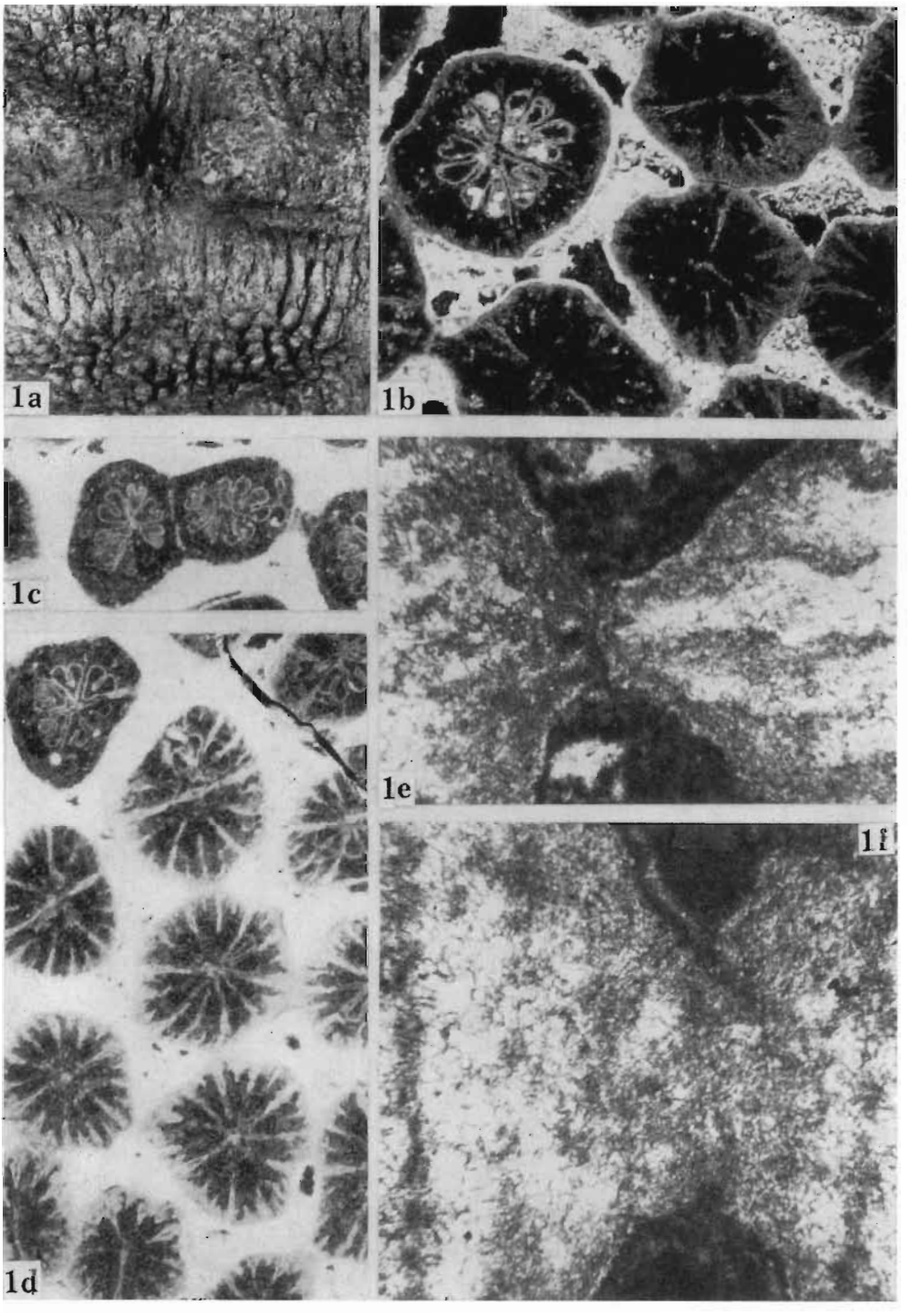
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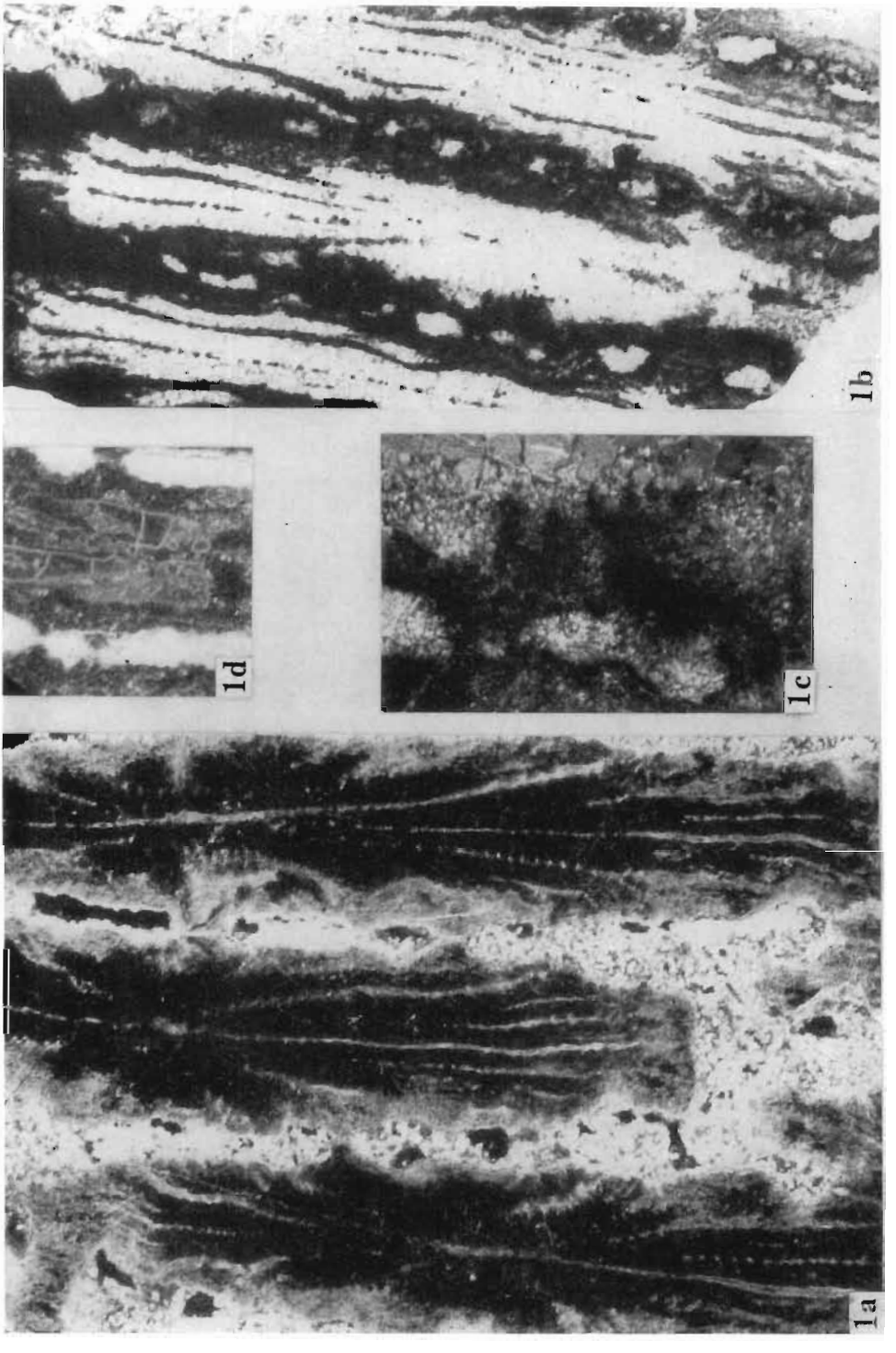
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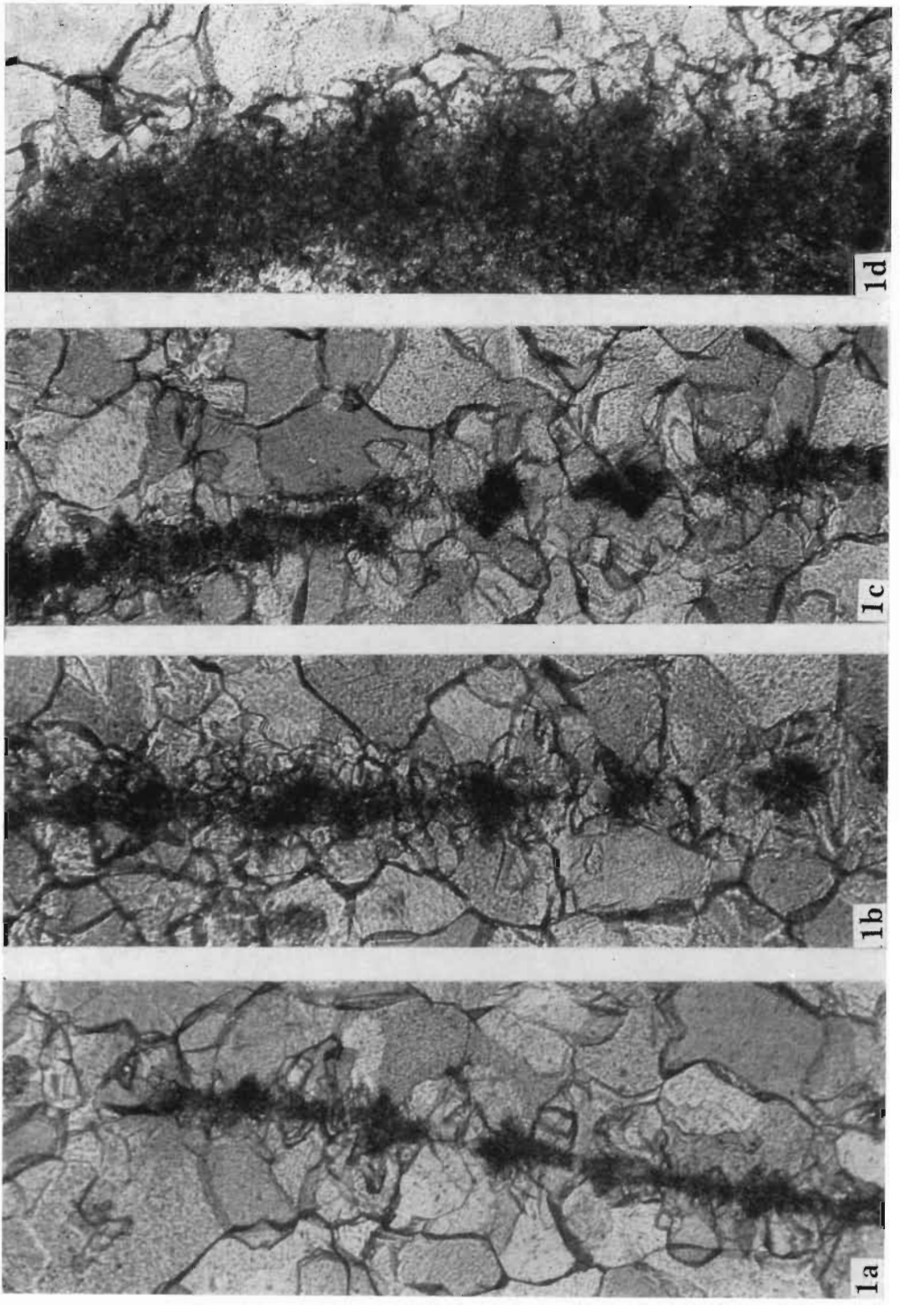
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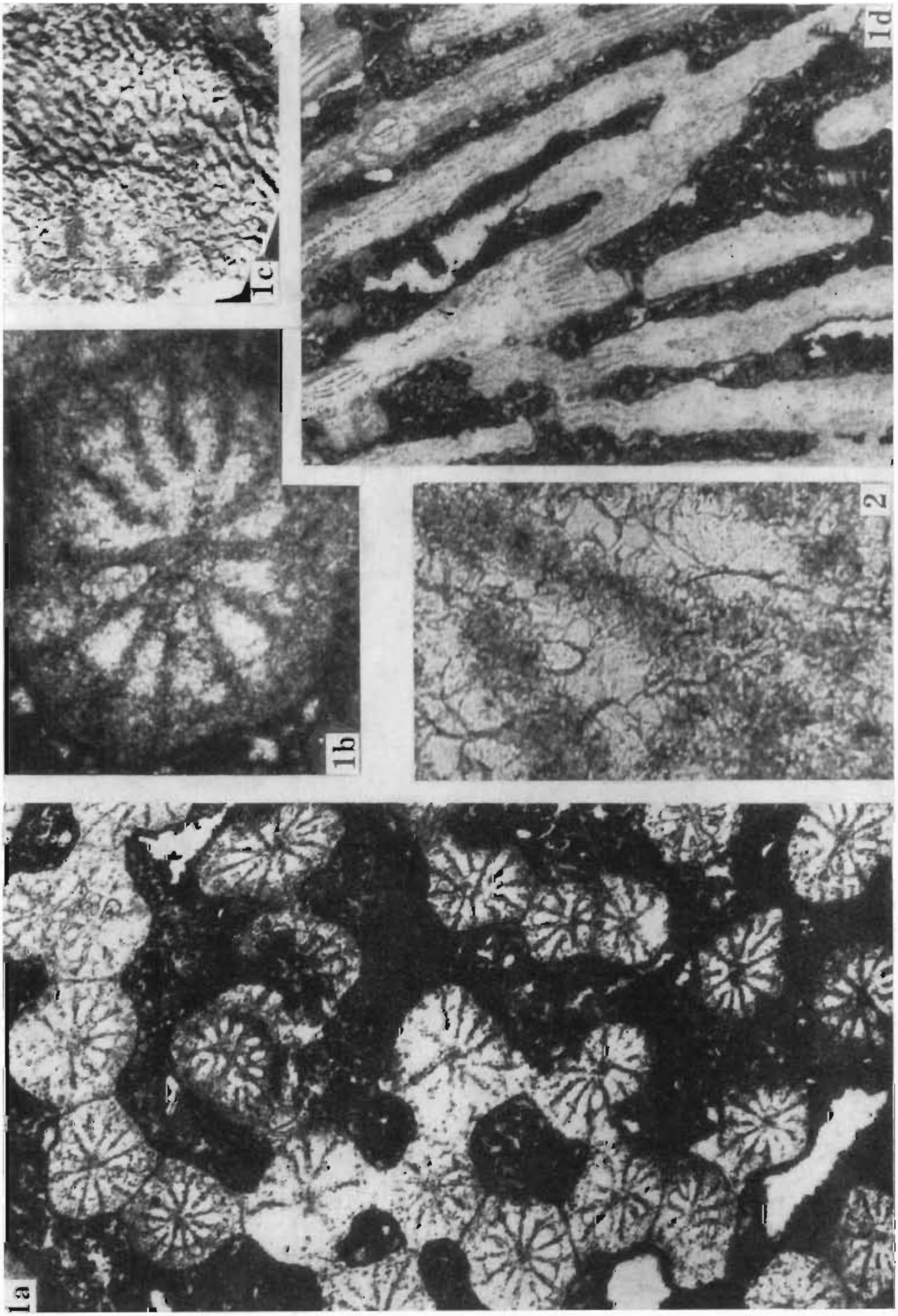
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