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Miocene Scleractinia from the Holy Cross Mountains, Poland; Part *1* - Caryophylliidae, Flabellidae, Dendrophylliidae, and Micrabaciidae

ABSTRACT: Redescribed is an ahermatypic coral fauna from the Middle Miocene (Badenian) deposits (NN5 and NN6 Zones) exposed in the Korytnica Basin on the southern slopes of the Holy Cross Mountains, Central Poland. The fauna contains 14 species representing 12 genera and subgenera (of 14 species, 6 are new records in the Korytnica Clays). Using data obtained from observations of Recent corals, ecological requirements of the following genera from the Korytnica Clays have been presented: *Stephanophyllia, Caryophyllia, Acanthocyathus, Tethocyathus, Paracyathus, Polycyathus, Ceratotrochus, Ceratotrochus (Edwardsotrochus), Peponocyathus, Flabellum, Balanophyllia* and *Dendrophyllia.* A possibility of redeposition of coral fauna in some localities is discussed. Ahermatypic fauna from some other sites is interpreted as autochthonic, and a deep sublittoral zone is suggested as the life environment of these corals.

INTRODUCTION

The corals are relatively often represented in the Middle Miocene (Badenian) deposits of the Holy Cross Mountains, but they hitherto are rather poorly known. KOWALEWSKI (1930) listed, without any systematic description, 11 species from the Korytnica Clays. Miocene corals from Poland were investigated by DEMBIŃSKA-RÓŻKOWSKA (1932), who recognized 25 species (and subspecies) of hermatypic and ahermatypic corals from Korytnica surroundings. This paper deals with an assemblage of corals belonging to five families recognized from the Korytnica Clays; other corals (mainly hermatypic) are briefly characterized by RONIEWICZ & STOLARSKI (1991). The list of 16 ahermatypic species (8 genera) from the vicinity of Korytnica (DEMBIŃSKA-RÓŻKOWSKA 1932) has been revised and abridged (*see* Table 16) to 14 species (12 genera and subgenera). The specimens examined here come mainly from five localities in the Korytnica Basin (*see* Text-fig. 1). The sites Korytnica-Forest and Mt. Lysa which were systematically explored provided most of the material, the rest comes from Korytnica-Plebania, arable fields near Karsy, and Wierzbica sites. Specimens

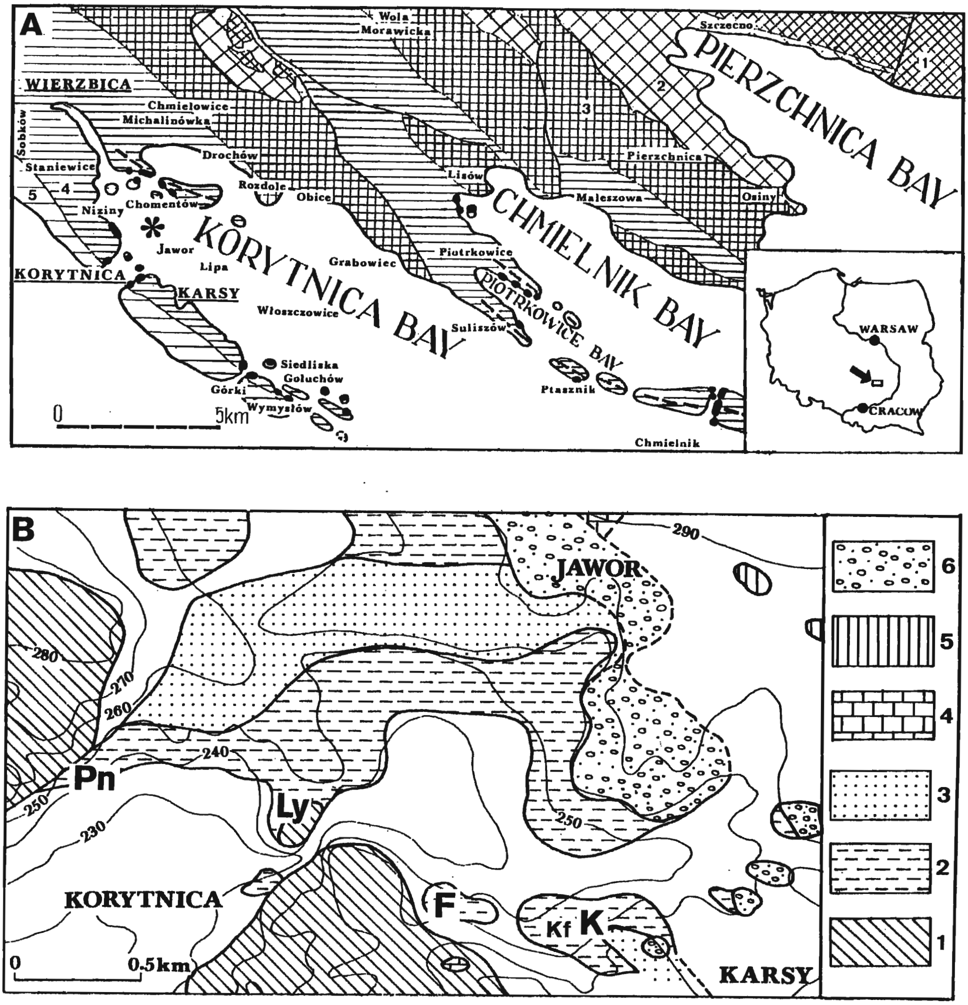


Fig. 1

A — Middle Miocene (Badenian) paleogeography of the zone of bays on the southern slopes of the Holy Cross Mts, Central Poland

Location of the Korytnica Basin is indicated with an asterisk; preserved littoral structures are marked with black spots; ridges in morphology that separate particular bays are marked with heavy dashes (*from* RADWAŃSKI 1969, *modified*)

Legend: *1* Cambrian (including locally Ordovician and Silurian), *2* Devonian, *3* Triassic, *4* Jurassic, *5* Cretaceous

B — Geological sketch-map of the south-western part of the Korytnica Basin (*from* GUTOWSKI 1984, *modified*)

Localities yielding the investigated corals are marked as follows: **Pn** — Korytnica-Plebania, **Ly** — Mt. Lysa, **F** — Korytnica-Forest, **K** — Karsy and **Kf** — arable field near *K* site

Lithology: *1* Jurassic substrate, *2* Korytnica Clays, *3* marly sands, *4* red-algal limestones, *5* sandy red-algal deposits with bentonites, *6* alluvial gravels; Pleistocene glacial deposits and Holocene are blank were obtained by washing clay samples (several dozen sacks, *ca* 50 kg each). Large coralla of *Flabellum roissyanum* MILNE-EDWARDS & HAIME and *Acanthocyathus transilvanicus* REUSS have been collected from the arable fields surrounding Korytnica village.

The bulk of material has been collected by the Author (STOLARSKI 1988), Ass.-Professor W. BAŁUK, and U. RADWAŃSKA M. Sc.

The described material is housed at the Institute of Paleobiology, Polish Academy of Sciences, in Warsaw. Two specimens of *Balanophyllia praelonga* (MICHELOTTI) are housed at the Museum of the Faculty of Geology, University of Warsaw. One exellently preserved specimen of *Flabellum roissyanum* MILNE-EDWARDS & HAIME (*see* Pl. 9, Fig. 5) belongs to the collection of U. RADWAŃSKA M. Sc.

GEOLOGICAL SETTING

The Middle Miocene (Badenian) marine sediments containing the investigated coral fauna crop out in the area of Korytnica, Karsy and Chomentów villages situated in the Korytnica Basin (*see* RADWAŃSKI 1969, BAŁUK & RADWAŃSKI 1977). The recent range seems to be of an erosive nature (GUTOWSKI & MACHALSKI 1984). The Korytnica Clays (upper part of NN5 and lower part of NN6 nannoplankton zones — *see* MARTINI 1977), 40-60 meters thick, together with the facies of oyster shellbeds lay directly on the Mesozoic substrate, or, locally (a borehole near Chomentów) on the Miocene brown-coal deposits. The upper part of the section, about 10 meters thick, consists of red-algal limestones and marly sands (BAŁUK & RADWAŃSKI 1977, GUTOWSKI 1984). On the basis of faunistic diversification, the Korytnica Clays have been divided into three parts (KOWALEWSKI 1930, BAŁUK & RADWAŃSKI 1977). The lower part of the clays with fauna like foraminifer *Palmula*, scaphopod *Dentalium (Antalis) badense* PARTSCH and abundant ahermaptypic corals *Peponocyathus duncani* REUSS, *Flabellum roissyanum* MILNE-EDWARDS & HAIME and *Ceratotrochus (Edwardsotrochus) duodecimcostatus* (GOLDFUSS) is represented at the sites Korytnica-Forest and Karsy. The oyster shellbeds facies with *Ostrea* cf. *frondosa* de SERRES, corals *Dendrophyllia taurinensis* MILNE-EDWARDS & HAIME and *Tethocyathus microphyllus* (REUSS) is exposed at the locality Mt. Lysa. The upper part with characteristic bivalved gastropod *Berthelinia*, faecal pellets *Tibikoia*, tubes of *Stirpulina* and cirripedes *Creusia* is exposed at the locality Korytnica-Plebania. The clays exposed throughout the arable fields contain fauna belonging to different parts of the section.

ABBREVIATIONS USED IN THE TEXT

Museums and Collections:

ZPAL — Institute of Paleobiology, Polish Academy of Sciences, Warsaw;
MWGUW — Museum of the Faculty of Geology, University of Warsaw;
UR — U. RADWAŃSKA'S collection.

Sites:

Af — arable fields surrounding the Korytnica village;
F — Korytnica-Forest;
K — Karsy;
Kf — Karsy (arable fields);
Ly — Mt. Łysa;
Pn — Korytnica-Plebania;
W — Wierzbica.

Other Terms:

C (1-n) —costae of cycle designated by a number;
D — distal diameter of corallum;
GCD — greater calicular diameter;
EAN — edge angle: an angle formed by intersection of two lateral corallum edges (exclusive of pedicel and crest);
F — frequency;
FAN — face angle: an angle formed by intersection of two corallum faces;
H — height of corallum;
LCD — lesser calicular diameter;
N — number of specimens;
P (1-n) — pali of a cycle designated by a number;
PD — proximal diametr of corallum;
r — correlation coefficient;
S — number of radial elements (septa);
S (1-n) — septa of cycle designated by a number;
SW — synapticulothecal wall;
TR — number of thecal rings.

SYSTEMATIC ACCOUNT

In the case of well known species a formal description is omitted and a limited synonymy is given.

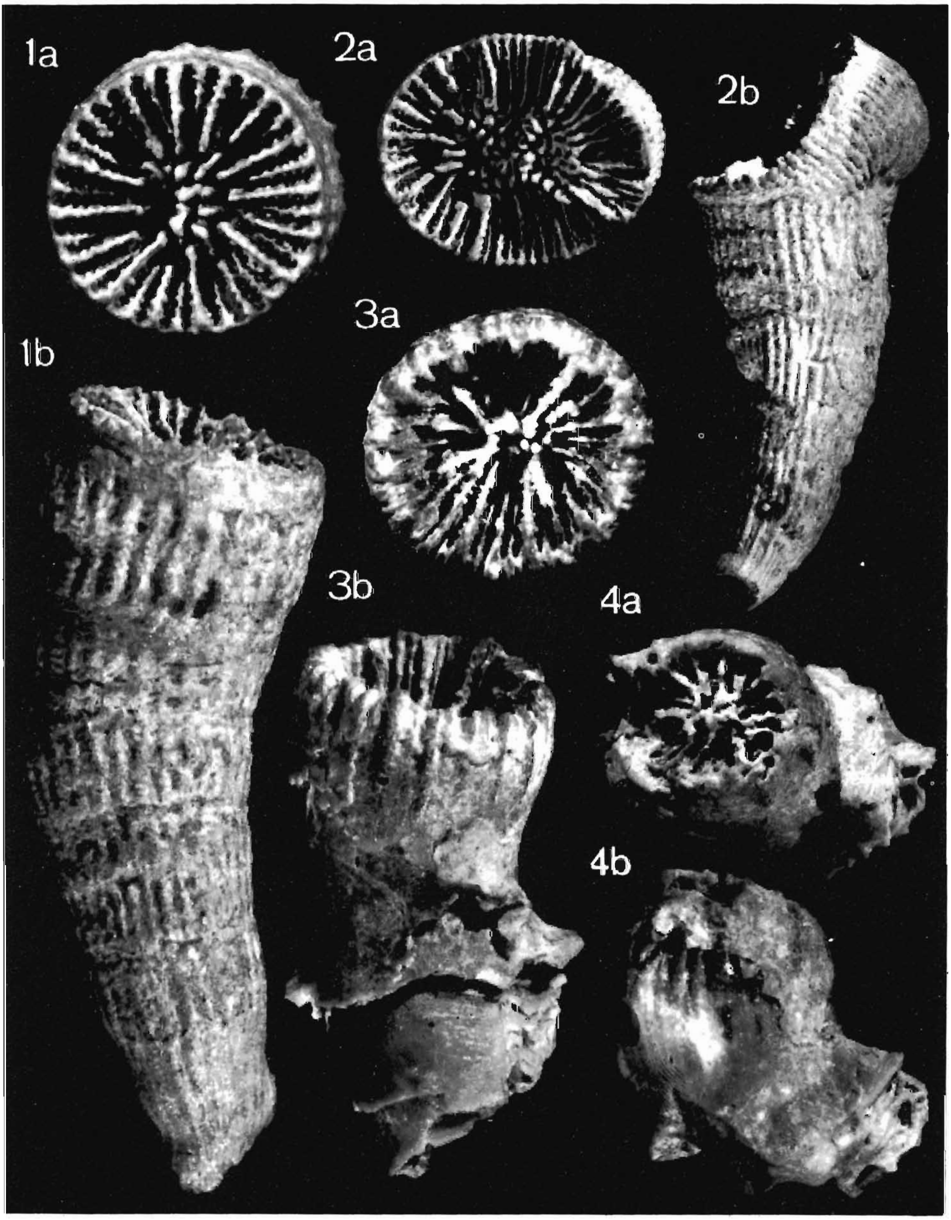
Order **Scleractinia** BOURNE, 1900
Suborder **Fungiina** VERRILL, 1865
Superfamily **Fungiicae** DANA, 1846
Family **Micrabaciidae** VAUGHAN, 1905

Genus *Stephanophyllia* MICHELIN, 1841
Stephanophyllia elegans (BRONN, 1837)
(Pl. 10, Figs 5-6)

1837. *Fungia elegans* BRONN; H. G. BRONN (3 *ed.*, 1856), p. 288; Pl. 36, Fig. 7.
1871. *Stephanophyllia imperialis* MICHELIN; A. E. REUSS, pp. 58-61; Pl. 36, Figs 1-5.
1871. *Stephanophyllia elegans* (BRONN); A. E. REUSS, pp. 61-62; Pl. 14, Fig. 6.
1932. *Stephanophyllia imperielis* MICHELIN; M. DEMBIŃSKA-RÓŻKOWSKA, pp. 136-137; Pl. 5, Fig. 1.
1961. *Stephanophyllia imperialis* MICHELIN; J. P. CHEVALIER, pp. 435-436; Fig. 157*b*.
? 1964. *Stephanophyllia nysti* MILNE-EDWARDS & HAIME; J. P. CHEVALIER, pp. 19-24; Pl. 2, Fig. 1.
1989. *Stephanophylia elegans* (BRONN); S. D. CAIRNS, p. 21.

MATERIAL: 2 well preserved juvenile specimens (ZPAL H. IX/154-155, 4 fragmentary specimens with preserved proximal parts (ZPAL H. IX/345-346, 5181-5182), and several septal fragments (ZPAL H. IX/56) from Korytnica-Forest.

DIMENSIONS (*in* mm) are given in Table 1.



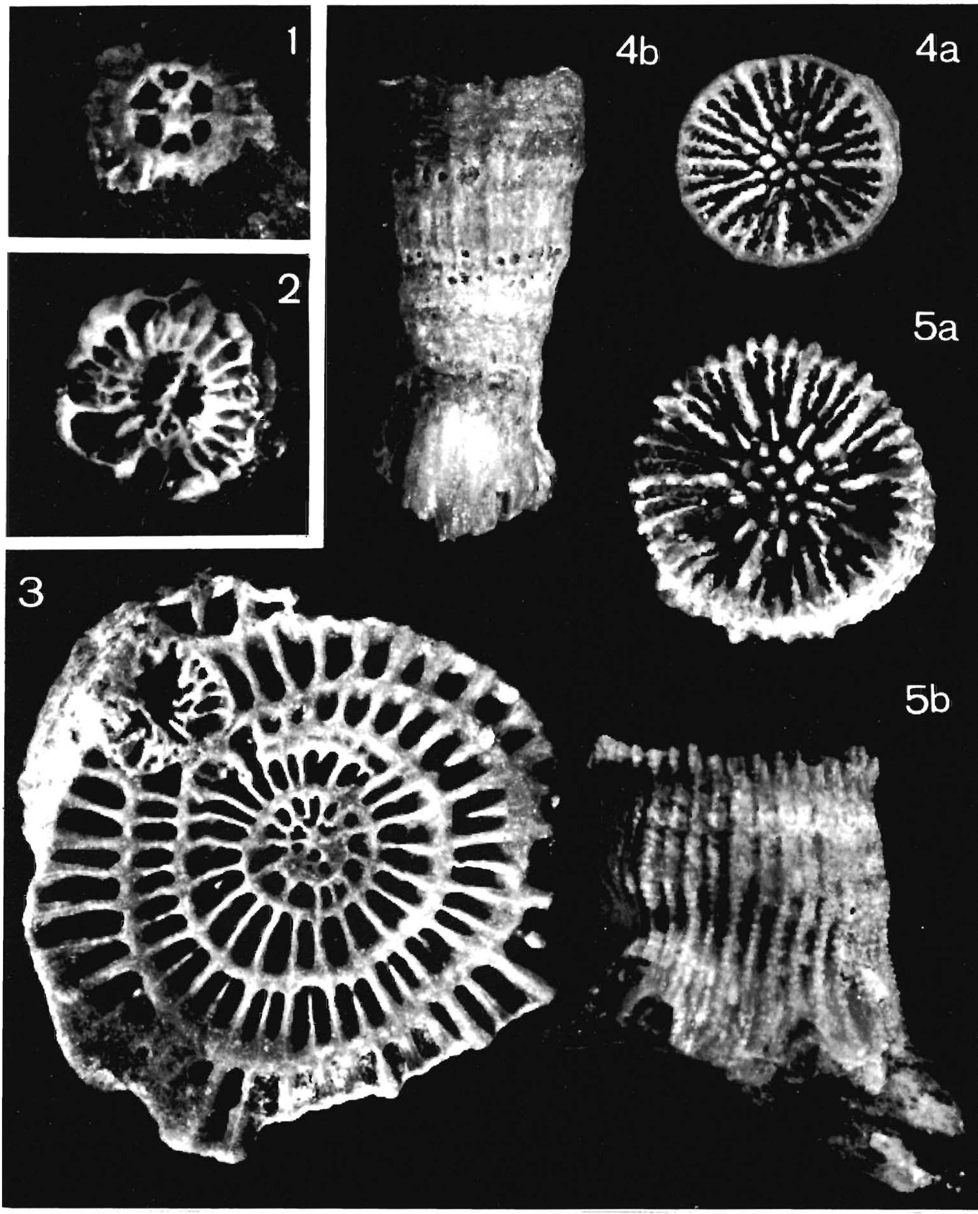
Caryophyllia sp.

1 — Well preserved specimen, ZPAL H. IX/121 (*1a* distal, *1b* side view), × 10; **2** — Example of "exuberant" growth, ZPAL H. IX/122 (*2a* distal, *2b* side view), × 5

Paracyathus sp.

3 — The best preserved specimen, ZPAL H. IX/123 (*3a* distal, *3b* side view); note a thick skeletal cover visible especially on the proximal part of the specimen and a darker coloring of the septa in comparision with the rest of the skeleton), × 5; **4** — Specimen showing irregularity of growth, ZPAL H. IX/124 (*4a* distal, *4b* side view), × 5

All photos taken by K. ZIELIŃSKA



Tethocyathus microphyllus (REUSS, 1871)

1 — First thecal stage (protosepta are visible), specimen ZPAL H. IX / 360; distal view, × 15; **2** — Second thecal stage with forming *S3* septa and wall of 3 thecal ring, ZPAL H. IX/362; distal view, × 15; **3** — Transverse section close to basis shows *ca* 6 thecal rings (from protothecal ring), ZPAL H. IX/359; the juvenile specimen (*at left*) is overgrown by the big one, × 10; **4** — Peculiar, elongated specimen with thecal pores, ZPAL H. IX / 358 (*4a* distal, *4b* side view), × 10; **5** — Specimen representing common cylindrical forms attached to an oyster shell, ZPAL H. IX/361 (*5a* distal, *5b* side view), × 10

All photos taken by K. ZIELIŃSKA

REMARKS: Basal shape in the investigated specimens is variable: some juvenile specimens are flat, the others are slightly convex (at the same stage of development). The largest specimen preserved fragmentarily (ZPAL H. IX/345) has generally concave base with a slight proximal protuberance (*ca* 9 mm in diameter).

Septal faces of described juvenile specimens (Pl. 10, Figs 5-6) are covered with prominent granulation (0.05-0.1 mm tall). The specimen at a later stage has rare, blunt granules, more numerous in the axial (younger) part of the corallum.

CHEVALIER (1961) distinguished *S. imperialis* from *S. elegans* on the basis of its greater dimensions (max. D=33 mm, H=20 mm, while *S. elegans* max, D=18. H=10), and concave base (slightly convex in *S. elegans*). Remaining features which differentiate the two species are qualitative and more subjective in character: costae in *S. imperialis* are peripherally thicker and more undulated, septa are thinner with less prominent distal dentation, synapticular connections in thecal plane are less regular than in *S. elegans*. CHEVALIER (1964) supposed that the following taxa: *S. imperialis*, *S. imperialis* var. *reussi* and *S. nysti* are conspecific; he considered that such features as thickness of radial elements, pattern of synapticular connections between costae and degree of development of costae are varying individually. CAIRNS (1989) considers that all Miocene and Pliocene European species could be reduced to one: *S. elegans*. Following CAIRNS (1989), the present author classifies specimens here described as *S. elegans*.

Table 1

Specimen No. ZPAL H.IX/	D	H	S
154 (Pl. 10, Fig. 6)	4.4	1.5	48
155 (Pl. 10, Fig. 5)	1.6	0.7	24
345	e.17	e.5	e.90

OCCURRENCE: Miocene of the Holy Cross Mts (Korytnica Basin), Podolia in the Ukraine (Pustomyty); known also from other Miocene localities of the Paratethys and Atlantic-Boreal bioprovinces; Pliocene of Italy and Belgium.

Suborder **Caryophylliina** VAUGHAN & WELLS, 1943
Superfamily **Caryophylliicae** GRAY, 1887
Family **Caryophylliidae** GRAY, 1847
Subfamily **Caryophylliinae** GRAY, 1847

Genus *Caryophyllia* LAMARCK, 1801

Caryophyllia sp.
(Text-fig. 2; Pl. 1, Figs 1-2)

1932. *Caryophyllia arcuata* MILNE-EDWARDS & HAIME; M. DEMBIŃSKA-RÓŻKOWSKA, p. 147; Pl. 6, Fig. 5.

MATERIAL: 15 specimens from Korytnica-Forest, 15 from Mt. Lysa, and several fragments from both sites (ZPAL H. IX/86-91, 121-122, 472, 475, 489-490, 5163-5180).

DIMENSIONS (*in* mm; N=23 for *S* and *D* measurements, and N=16 for *H* measurements) are given in Table 2 (*see also* Fig. 2).

DESCRIPTION: Corallum trochoid, slightly curved. Calice circular or slightly ellipsoidal. Flat or grooved attachment scar is observed on the proximal end of the corallum. The costae are broad, flat and extend to the base. Costae bear low, rounded granules which may be somewhat masked by pellicular "epithecal" bands (Pl. 1, Fig. *1b*). Septa differentiate into 3 orders (incomplete four cycles) and arranged in 9-10 systems. The difference in exsertness of all orders of septa is slight. Primary septa

Table 2

	AVERAGE	VARIANCE	RANGE
D	3.82	0.90	1.9-5.7
H	6.70	9.97	1.5-11.7
TR	1-4		
S	(24) 30-32 (44)		

are slightly more exert than secondary and extend about 0.8 distance to columella. Secondary septa extend about 0.5—0.7 and tertiary (if present) about 0.3—0.4 distance to columella. Septal faces covered with prominent granules (Pl. 1, Fig. *1a*). Secondary septa mainly provided with pali, but only if tertiary septa are developed in the system. The fossa is shallow. Columella composed mainly of a few papillae. The base consists of 1-4 thecal rings observed thanks to grinding.

REMARKS: One of the illustrated specimens (Pl. 1, Fig. 2) has 62 septa resulted from "exuberant" growth of regenerated radial elements. In the central part of the calice about 30 pillars (interpreted here as columellar papillae) are developed. Sometimes, in front of primary septa additional pali are developed (Pl. 1. Fig. *2a*), but this feature is not typical of *Caryophyllia*.

The features of the main bulk of investigated specimens agree with those of the specimens described as *C. arcuata* MILNE-EDWARDS & HAIME, 1848, by DEMBIŃSKA-RÓŻKOWSKA (1932) from Dryszczów in Podolia. The latter species, however, being originally diagnosed by a brief description lacking illustration, and whose holotype has been lost (*see* ZIBROWIUS 1974), is considered by the Author as an unvalid taxon.

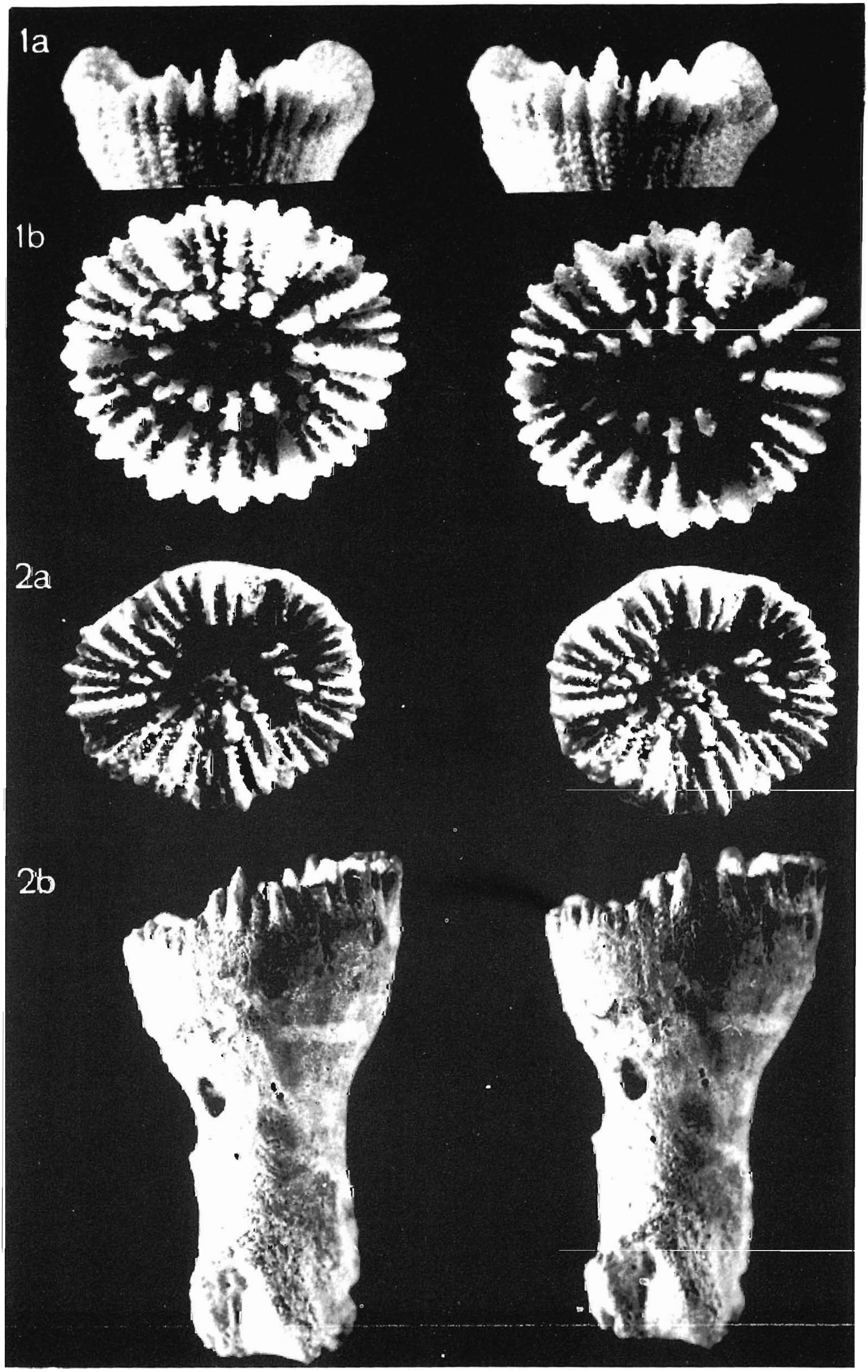
OCCURRENCE: Miocene of Holy Cross Mts (Korytnica Basin) and Podolia in the Ukraine (Dryszczów).

PLATE 3

Tethocyathus velatus (REUSS, 1860)

1 — Juvenile specimen attached to the mollusk shell, ZPAL H. IX/152 (*1a* distal, *1b* side view), × 15; **2-3** — Irregularity of growth, 2 — ZPAL H. IX/386, side view (note that diameter of the distal part of the corallum is smaller than diameter of the whole corallum), × 15, 3 — ZPAL H. IX/150, distal view, × 15; **4** — ZPAL H. IX/148 (*4a* distal, *4b* side view), × 10; **5** — ZPAL H. IX/153, side view, × 10; **6** — ZPAL H. IX/151 (*6a* distal, *6b* side view), × 10; **7** — ZPAL H. IX/149, side view (note distal irregularity), × 15

Figs 1, 3, 5 - 6 taken by K. ZIELIŃSKA; Figs 2, 4, 7 by M. DZIEWIŃSKI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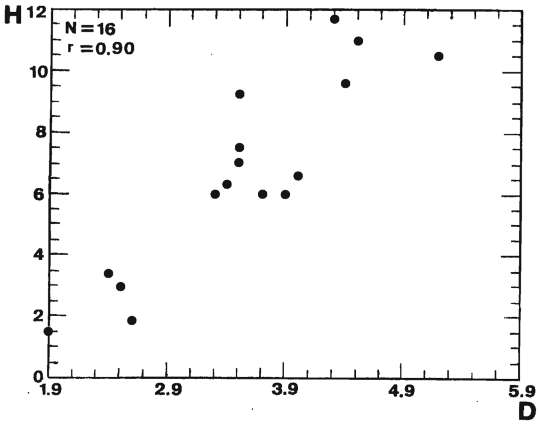


Fig. 2

Distal diameter/height ratio in *Caryophyllia* sp.

Genus *Acanthocyathus* MILNE-EDWARDS & HAIME, 1848

Acanthocyathus transilvanicus REUSS, 1871
(Pl. 5, Figs 2, 5)

1871. *Acanthocyathus transilvanicus* nov. sp.; A. E. REUSS, p. 17; Pl. 10, Figs 4-5.
1932. *Acanthocyathus vindobonensis* REUSS; M. DEMBIŃSKA-RÓŻKOWSKA, pp. 151-152; Pl. 5, Fig. 2.
1943. *Caryophyllia (Acanthocyathus) transilvanicus* (REUSS); T. W. VAUGHAN & J. W. WELLS, Pl. 41, Fig. 6.
1953. *Acanthocyathus transilvanicus* REUSS; M. MOENKE, pp. 253-256; Text-fig. 10.
1963. *Acanthocyathus verrucosus transilvanicus* REUSS; O. KÜHN, p. 99; Pl. 17, Fig. 8.
1972. *Acanthocyathus* cf. *verrucosus transilvanicus* REUSS; J. P. CHEVALIER, pp. 16-17; Pl. 1, Fig. 4.
1984. caryophyllid coral; W. BAŁUK & A. RADWAŃSKI, Pl. 1, Figs 1-2, 5; Pl. 2, Fig. 4; Pl. 3, Figs 1-2.

MATERIAL: 25 fragmentary preserved specimens from Korytnica-Forest (ZPAL H. I/261-270, 499-508; ZPAL H. IX/57, 348, 350, 5186-5189), 1 large specimen from Karsy (ZPAL H. IX/347) and 1 from arable fields surrounding Korytnica (ZPAL H. IX/349).

DIMENSIONS (*in* mm) are given in Table 3.

REMARKS: The investigated specimens are incomplete, therefore such features as number of pali, final number of septa can not be observed. Nevertheless, the spines on their all *C1* costae and lesser corallite curvatures are characteristic of the species *A transilvanicus*. On lateral surfaces of radial elements a spiniform granulation appears (up to 0.25 mm tall). Especially on lateral surface of pali, additional sharp denticulate menianes develop. Among investigated specimens, regenerated forms were found (Pl. 5, Fig. 5; *see also* BAŁUK & RADWAŃSKI 1984).

PLATE 4

Paracyathus cupula REUSS, 1871

1 — ZPAL H. IX/474 (*1a* stereoview of the upper calicular margin illustrating relative exsertness of septal cycles, *1b* stereoview of calice, illustrating columella, *P1-3* pali), × 10; **2** — The largest specimen within collection, ZPAL H. IX/92 (*2a* distal, *2b* lateral stereoview), × 5

All photos taken by M. DZIEWIŃSKI

Table 3

Specimen No. ZPAL H.	IX/347	IX/349	IX/348	I/269	I/266	I/262	IX/350	IX/5187
GCD	16.1	e.13	6.4	2.5	5.0	4.5	4.7	3.6
LCD	12.5	e.11	4.8	2.3	4.3	4.1	4.7	3.4
H	29.0	27.0	e.7	3.1	6.3	7.0	8.5	4.0
S	56	e.56	32	20	32	24	24	e.24

KÜHN (1963) distinguished adult forms of *A. transilvanicus* REUSS, 1871, from *A. verrucosus* MILNE-EDWARDS & HAIME, 1848, basing on the following features: tetrameral symmetry, development of spines on all costae up to the calicular edge, lesser curvature of corallite in the plane of *GCD*, larger corallite dimensions and greater number of septa (64 in *A. transilvanicus*, while 56 in *A. verrucosus*). Taken together these features are considered here as significative at the species rank.

OCCURRENCE: Miocene of the Holy Cross Mts (Korytnica Basin) and Carpathian Foredeep (Bęczyn); known also from other Miocene localities of the Paratethys; Miocene of the Madeire.

Genus *Tethocyathus* KÜHN, 1933

The genera *Tethocyathus, Trochocyathus, Paracyathus*, and *Concentrotheca* can be mistaken one for another because of common features. Revision of these genera based on detailed ontogenetic and microstructural research is neccessary as well as a precision of such morphological terms as: "epitheca" or "porcelaneous wall", "pali" or "paliform lobes" and "papillar columella".

The species *velatus* and *microphyllus* are considered here as beloning to the genus *Tethocyathus*, but the features of the latter species resemble those of *Concentrotheca laevigata* (POURTALÈS, 1871).

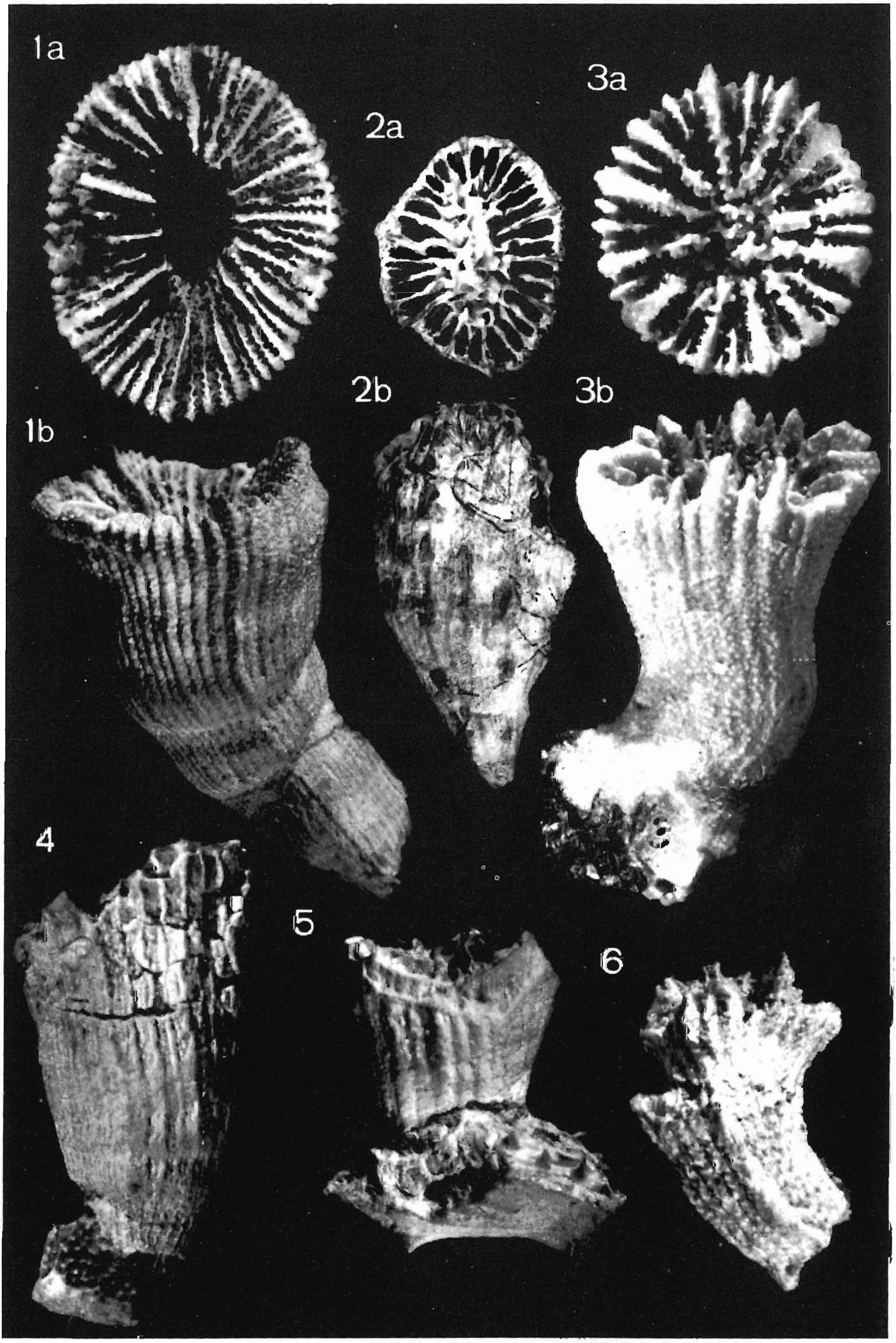
Tethocyathus microphyllus (REUSS, 1871)
(Text-fig. 3; Pl. 2, Figs 1-5; Pl. 12, Figs 2-5)

1871. *Thecocyathus microphyllus* nov. sp.; A. E. REUSS, p. 24; Pl. 2, Figs 8-9; Pl. 19, Fig. 1.
? 1871. *Paracyathus letochai* nov. sp.; A. E. REUSS, pp. 21-22; Pl. 16, Fig. 8.
1953. *Thecocyathus microphyllus* REUSS; M. MOENKE, pp. 259-262; Figs 13-15.
1961. *Tethocyathus* cf. *microphyllus* (REUSS); J. P. CHEVALIER, p. 327; Pl. 1, Figs 4-5.
1962. *Tethocyathus* cf. *microphyllus* (REUSS); J. P. CHEVALIER, p. 40; Pl. 1, Fig. 4.

PLATE 5

1 — *Ceratotrochus (Edwardsotrochus) duodecimcostatus* (GOLDFUSS, 1829), ZPAL H. IX/146 (*1a* distal, *1b* lateral view, × 5; **2** — *Acanthocyathus transilvanicus* REUSS, 1871; ZPAL H. IX/347 (*2a* distal, *2b* lateral view), × 2; **3** — *Paracyathus cupula* REUSS, 1871; ZPALL H. IX/380 (*3a* distal, *3b* lateral view), × 10; **4-6** — Examples of regenerated caryophylliid corals: 4 — ZPAL H. IX/370 and 6 — ZPAL H. IX / 371 are *Ceratotrochus (E.) duodecimcostatus* (GOLDFUSS, 1829), × 10; 5 — *Acanthocyathus transilvanicus* REUSS, 1871; ZPAL H. IX/348, × 10

All photos taken by K. ZIELIŃSKA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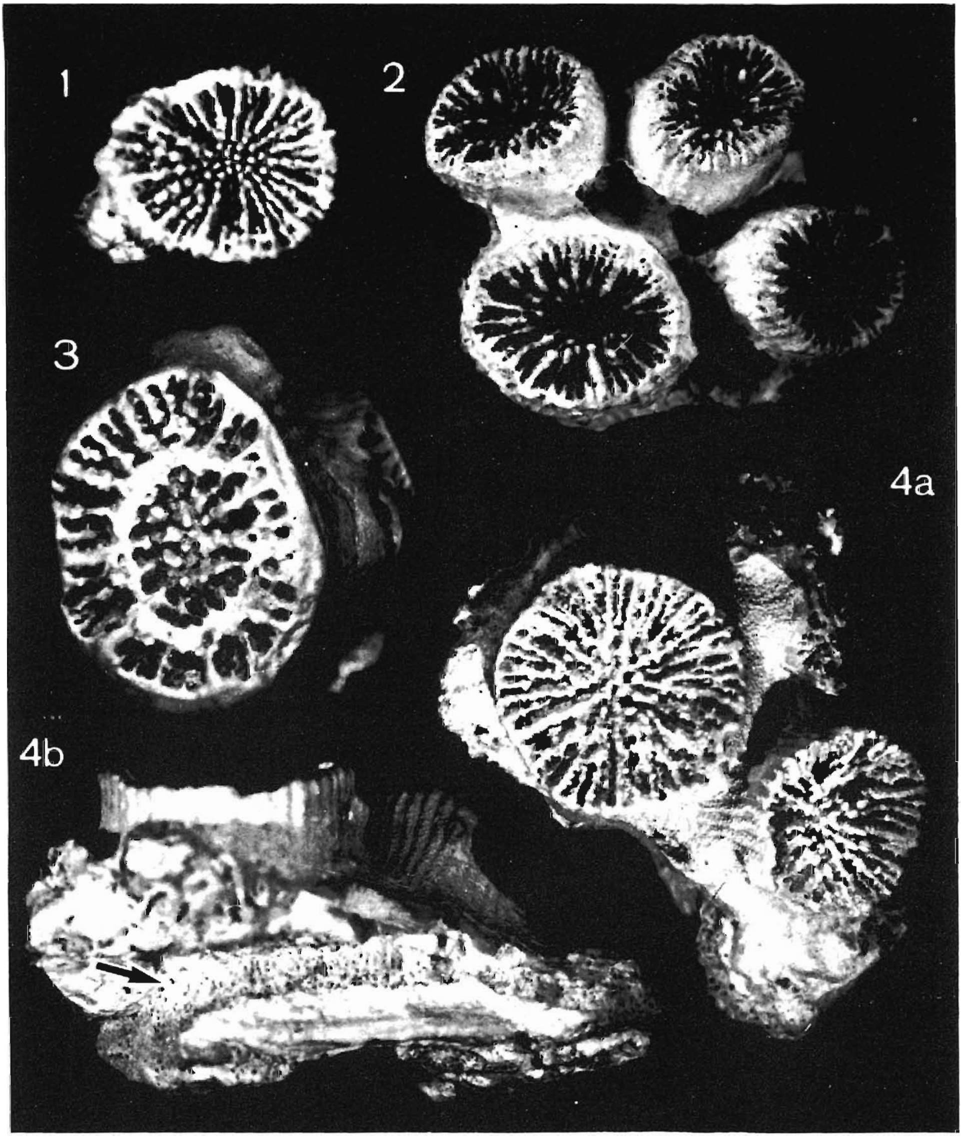


Polycyathus confertus (REUSS, 1847)

1 — ZPAL H. IX/112 (distal view), × 4.5; **2** — ZPALH. IX/107, small (4 corallites), complete colony (distal view), × 4; **3** — ZPAL H. IX/111, note scleranchymal ring joining septa (distal view), × 8; **4** — ZPAL H. IX/108, lamellar colony of *Porites vindobonarum prima* KÜHN (arrowed) encrusted with the colony of *P. confertus* (*4a* distal, *4b* lateral view), × 4.5

Fig. 2 taken by M. DZIEWIŃSKI; Figs 1, 3-4 by the Author

MATERIAL: 785 well preserved specimens from Mt. Lysa (ZPAL H. IX/53, 77, 237-244, 358-362, 501-502, 4245-5012).

DIMENSIONS (*in* mm, N=50) are given in Table 4 (*see also* Text-fig. 3).

Table 4

	AVERAGE	VARIANCE	RANGE
PD	4.8	1.1	1.0-7.0
D	3.9	1.6	0.9-8.0
H	4.1	3.4	0.4-8.0
TR	1-7		
S	(6-24) 40 (48)		

REMARKS: In general, the specimens examined agree with those described by REUSS (1871) differing from them in slightly smaller height (in REUSS' specimens height/diameter ratio is 9.5-11.5 /5.5. 5-7, rarely 8/7). Specimens described by CHEVALIER (1961, 1962) have *P1-2* much more developed than *P3*.

The specimens attributed herein to *Tethocyathus microphyllus* differ from *T. velatus* in more regular cylindrical shape and broader proximal part (in contrast with *T. microphyllus*, in *T. velatus* its *PD* is generally smaller than *D*), and in weaker "epithecal" wall (costae mainly well developed — *see* Pl. 2, Fig. 5*b*; *and* REUSS 1871, Pl. 2, Fig. 9a). Frequently, the septa of higher cycles and elements of papillar columella as well as pali are thicker in *T. microphyllus* than those in *T. velatus*. Less arcuate distal edge of septa (*S1* especially) and relatively shallow calices characterize *T. microphyllus* as well.

The form designated by REUSS (1871) as the holotype of *Paracyathus letochai* is possibly conspecific with *T. microphyllus*. Arrangement of 48 radial elements in *P. letochai* is the same as in some Korytnica specimens of *T. microphyllus*. Costae are not covered by epitheca. Sclerenchymal ring joining pali and septa does not have any taxonomical value and it seems to be connected with a reduction of polyp dimensions (compare similar "rings" in *T. velatus*: Pl. 3, Figs 3 and 6a).

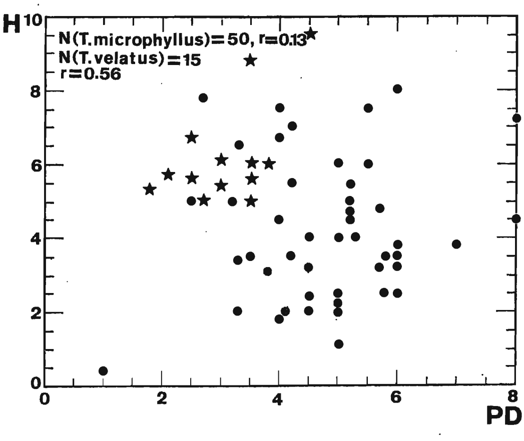


Fig. 3

Proximal diameter/height ratio in *Tethocyathus microphyllus* (REUSS) indicated by dots, and *Tethocyathus velatus* (REUSS) indicated by stars

The wall of the peculiar specimen (Pl. 2, Fig.4) is in places pierced by thecal pores which resemble wall perforation of guyniids. However, its remaining features (basal thecal rings, arrangement of radial elements, granulation) do not differ from those of other specimens of *T. microphyllus*.

By a careful grinding away of the substrate (mostly oyster shells) to which the proximal end of corallum was attached, the successive thecal rings (Pl. 2, Figs 1-3; Pl. 12, Figs 2-4) could be disclosed. The number of thecal rings in *T. microphyllus* is mainly 1-7 while it is 1-3 in *T. velatus*.

OCCURRENCE: Miocene of the Holy Cross Mts (Korytnica Basin) and Carpathian Foredeep (Bęczyn); other Miocene deposits of the Paraththys (Moravia), France (Provence), and northwest Africa (Morocco).

Tethocyathus velatus (Reuss, 1860)
(Pl. 3, Figs 1-7)

1871. *Thecocyathus velatus* Reuss; A. E. Reuss, pp. 23-24; Pl. 2, Figs 5-7.

MATERIAL: 117 specimens from Mt. Lysa (ZPAL H. IX/54-55, 81-85, 148-153, 386, 5083-5162, 6826-6845, 7416-7418).

DIMENSIONS (*in* mm, N=15) are given in Table 5 (*see also* Text-fig. 3).

Table 5

	AVERAGE	VARIANCE	RANGE
PD	2.7	0.6	1.3-4.5
D	3.2	0.6	2.1-4.8
H	6.1	1.7	4.0-9.5
TR	1-3		
S	24-46		

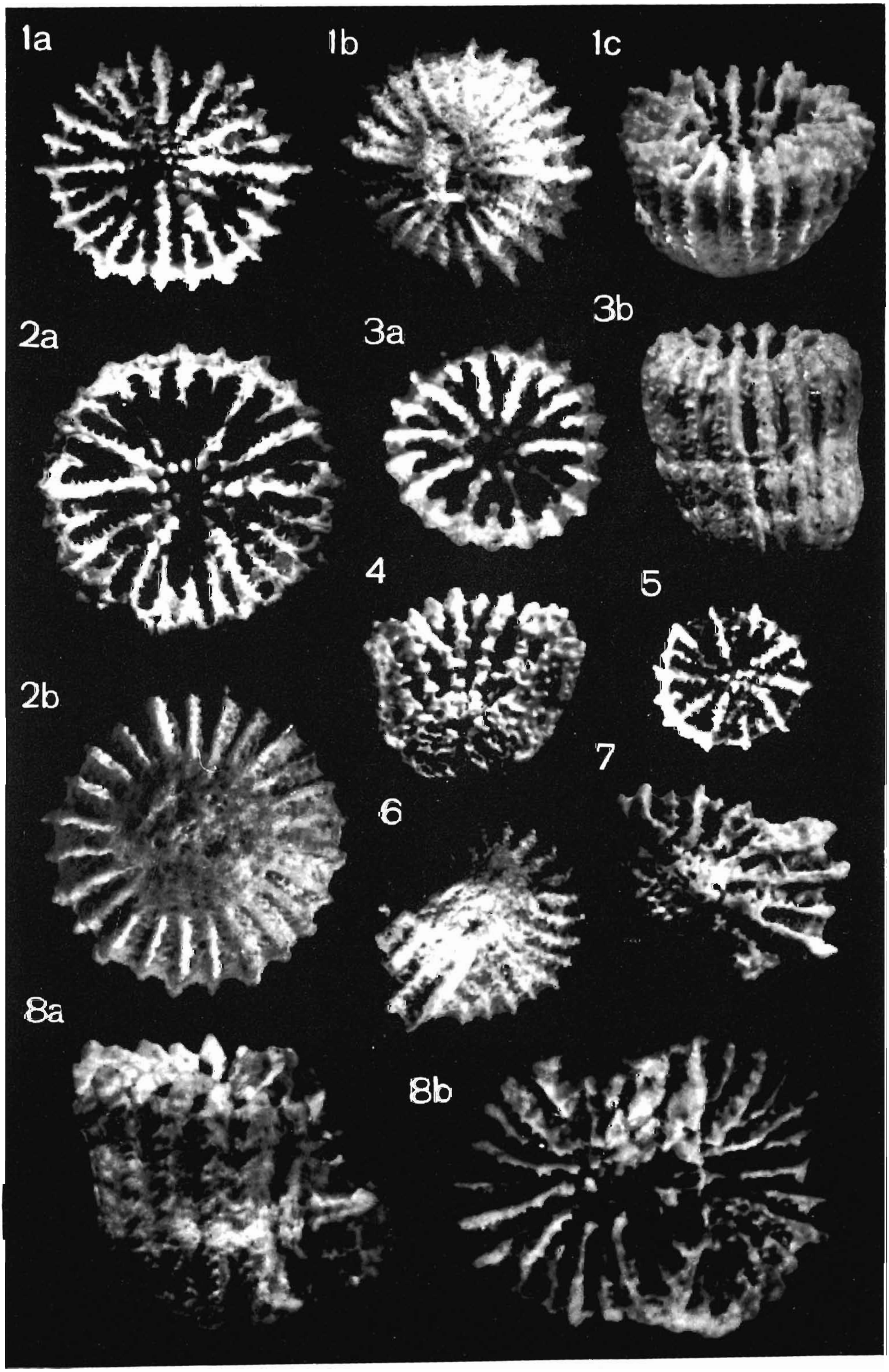
REMARKS: Differences and similarities of this species to *T. microphyllus* are presented in the description of the latter species. The Korytnica specimens are comparable to those described by Reuss (1871).

PLATE 7

Ceratotrochus granulatus Dembińska-Różkowska, 1932

1 — ZPAL H. IX/365 (**Neotype**) (*1a* distal, *1b* proximal, *1c* lateral view); **2** — ZPAL H. IX/364 (*2a* distal, *2b* proximal view); **3** — ZPAL H. IX/367 (*3a* distal, *3b* lateral view); **4** — ZPAL H. IX/366, longitudinal broken section; paliform lobes and spongy proximal part of the corallum are visible; **5** — ZPAL H. IX/370, juvenile individual (distal view); **6-8** — Examples of regeneration: 6 — ZPAL H. IX/368 (proximal view), 7 — ZPAL H. IX/369 (distal view), 8 — ZPAL H. IX/363 (*8a* lateral, *8b* distal view)

All photos × 15; taken by K. Zielińska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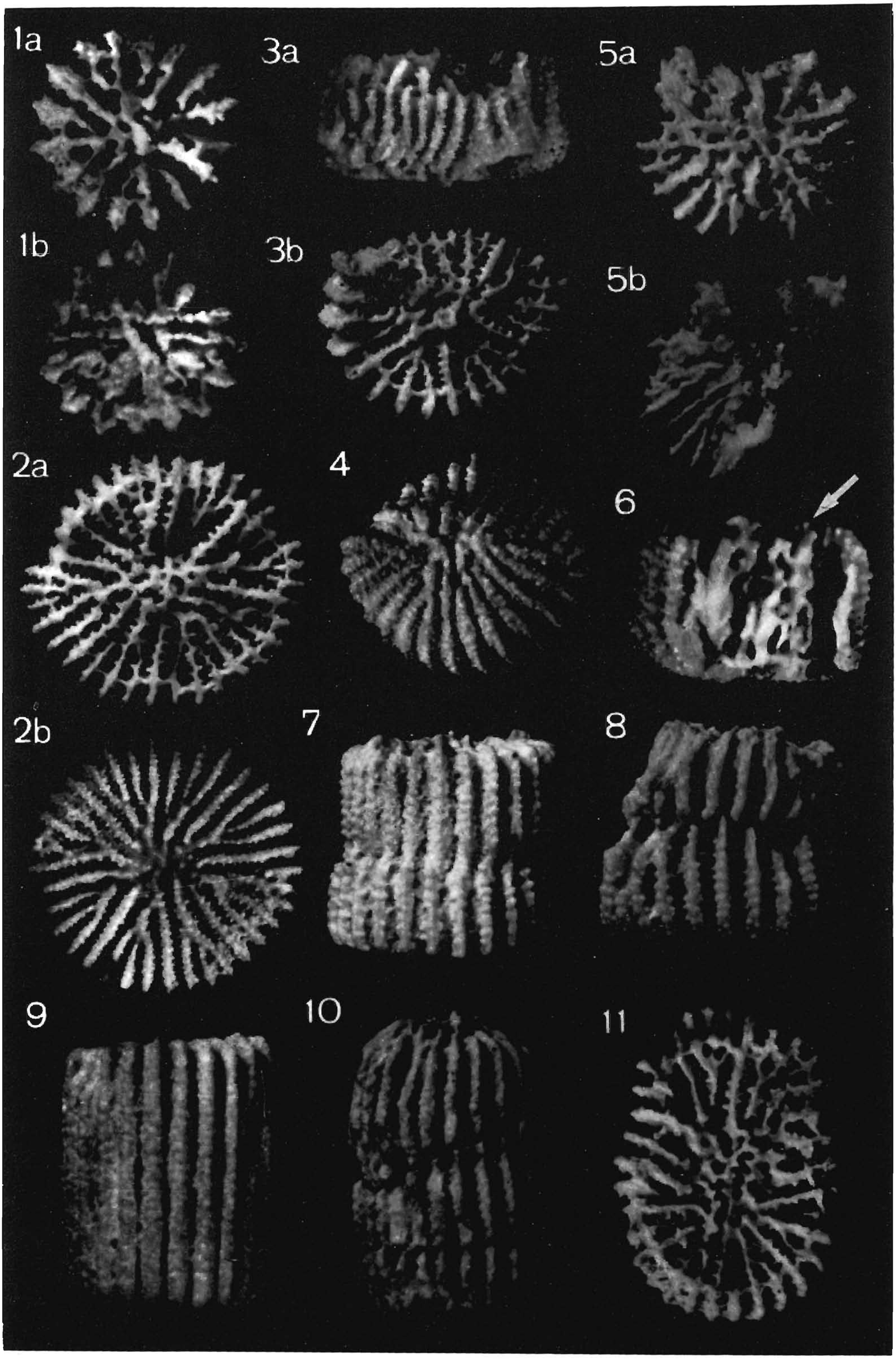
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11

OCCURRENCE: Miocene of the Holy Cross Mts (Korytnica Basin); other Miocene deposits of the Paratethys (Moravia).

Genus *Paracyathus* MILNE-EDWARDS & HAIME, 1848

Paracyathus cupula (REUSS, 1871)
(Text-fig. 4; Pl. 4, Figs 1-2; Pl. 5, Fig. 3)

1871. *Paracyathus cupula* nov. sp. ; A. E. REUSS, pp. 22-23; Pl. 3, Fig. 6.
1871. *Caryophyllia crispata* nov. sp. ; A. E. REUSS, pp. 14-15; Pl. 20, Fig. 1.
? 1932. *Caryophyllia crispata* REUSS; M. DEMBIŃSKA-RÓŻKOWSKA, p. 148; Pl. 6, Fig. 6; Pl. 7, Fig. 6.
1932. *Paracyathus cupula* REUSS; M. DEMBIŃSKA-RÓŻKOWSKA, p. 151; Pl. 6, Fig. 7.

MATERIAL: 210 well preserved specimens from Mt. Lysa (ZPAL H. IX/33-34, 92, 380-381, 473-474, 4042-4244).

DIMENSIONS (*in* mm, N=30) are given in Table 6 (*see also* Text-fig. 4).

Table 6

	AVERAGE	VARIANCE	RANGE
GCD	5.0	1.9	2.6-9.0
LCD	4.8	1.4	2.6-7.0
H	8.2	6.9	4.5-14.0
TR	1-4		
S	20-40		

REMARKS: The specimens show a policyclic base with 1-4 thecal rings. On lateral surfaces of septa and pali the ledge-like outgrowths (sort of menianes) are developed. The pali stand before all but last cycle of septa (Pl. 4, Figs 1*b*, 2*a*). At early stages the pali are distinguishable only in the front of *S1-2* (Pl. 5, Fig. 3). The specimens investigated agree well with those described by REUSS (1871) and DEMBIŃSKA-RÓŻKOWSKA (1932) as *P. cupula*.

PLATE 8

Peponocyathus duncani (REUSS, 1871)

1 — ZPAL H. IX/156, specimen with 16 septa (*1a* distal, *1b* proximal view); **2** — ZPAL H. IX/140, specimen with 36 septa (*2a* distal, *2b* proximal view); **3-4** — Regeneration: 3 — ZPAL H. IX/126 and 4 — ZPAL H. IX/128 examples of lateral regeneration (*3a* lateral, *3b* distal, *4* proximal view), 5 — ZPAL H. IX/127, proximal regeneration; **6** — ZPAL H. IX/160, longitudinal broken section, palus is arrowed; **7-8** — Examples of preserved stages of transversal division, 7 — ZPAL H. IX/161, 8 — ZPAL H. IX/130; **9** — ZPAL H. IX/157, the highest specimen with traces of transversal division; **10** — ZPAL H. IX/129, *"Father, son, and grandson"* example of unseparated specimens after transverse division; **11** — ZPAL H. IX/133, to show irregularity in lateral growth

All photos × 15; taken by K. ZIELIŃSKA

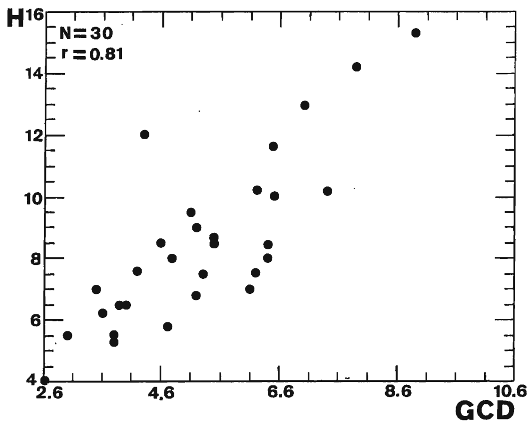


Fig. 4

Relationship of great calicular diameter to height of corallite in *Paracyathus cupula* (Reuss)

The specimen described by Reuss (1871) as *Caryophyllia crispata* (having *P1-2*, septal ornamentation, columella, external features of corallum of *P. cupula*) can be considered as a juvenile form of *P. cupula*. Specimens described as *C. crispata* by Dembińska-Różkowska (1932) from Korytnica could represents *P. cupula* as well (*P1-2* pali, columella composed of 3 papillae, S = 38).

OCCURRENCE: Miocene of the Holy Cross Mts (Korytnica Basin); other Miocene deposits of the Paratethys (Moravia).

Paracyathus sp.
(Pl. 1, Figs 3-4; Pl. 12, Fig. 6)

? 1932. *Caryophyllia cladaxis* Reuss; M. Dembińska-Różkowska, 1932, pp. 147-148; Pl. 6, Fig. 3.

MATERIAL: 7 proximally broken specimens from Mt. Lysa (ZPAL H. IX/40, 123-125, 5183-5185).

DIMENSIONS (*in* mm) are given in Table 7.

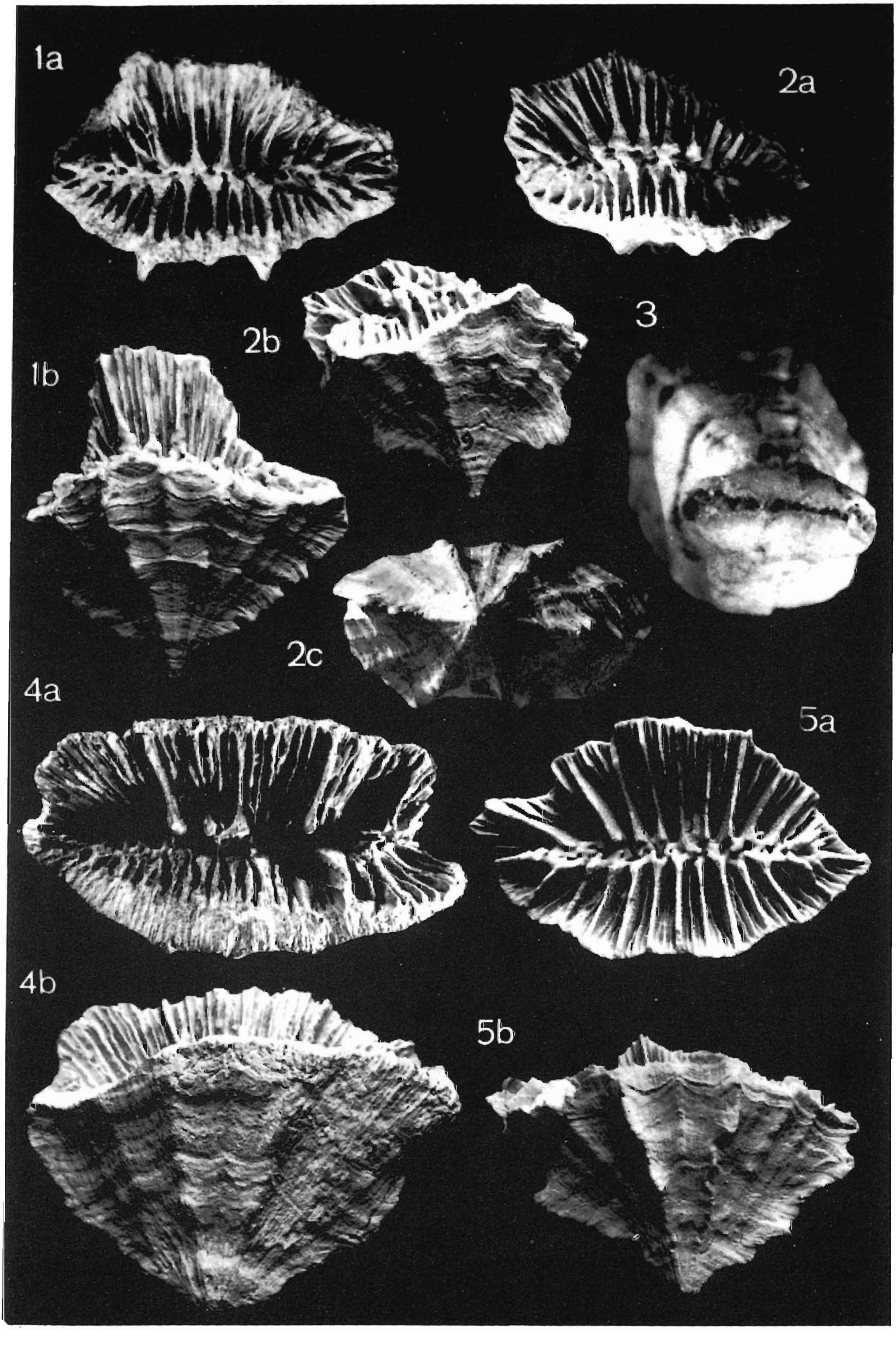
DESCRIPTION: The corallum is trochoid, subcylindrical. Thick, flaked away, extrathecal stereozone is developed, mainly in the proximal part of the corallum. Throught light-brown, sub-transparent surface of the stereozone, dark-pink (or reddish-brown) costae are visible. This coloration characterizes inner parts of radial elements as well. Calice subcircular or slighty ovate (*LCD/GCD* ratio: 0.86 in average, ranging from 0.8 to 0.93). Costae are subequal and flat, their distal parts only near the calicular edge become slightly prominent (Pl. 1, Fig. 3*b*). Costal granules, when

PLATE 9

Flabellum roissyanum Milne-Edwards & Haime, 1884

1 — ZPAL H. IX/382 (*1a* distal, *1b* lateral view), × 1. 5; **2** — ZPAL H. I/309 (*2a* distal, *2b* lateral, *2c* proximal view), × 1.5; **3** — ZPAL H. I/383, enlargement of pedicel, × 15; **4** — ZPAL H. I/305 (*4a* lateral view), × 1.5; **5** — UR (*5a* distal, *5b* proximal view), × 1.5

All photos taken by M. Dziewiński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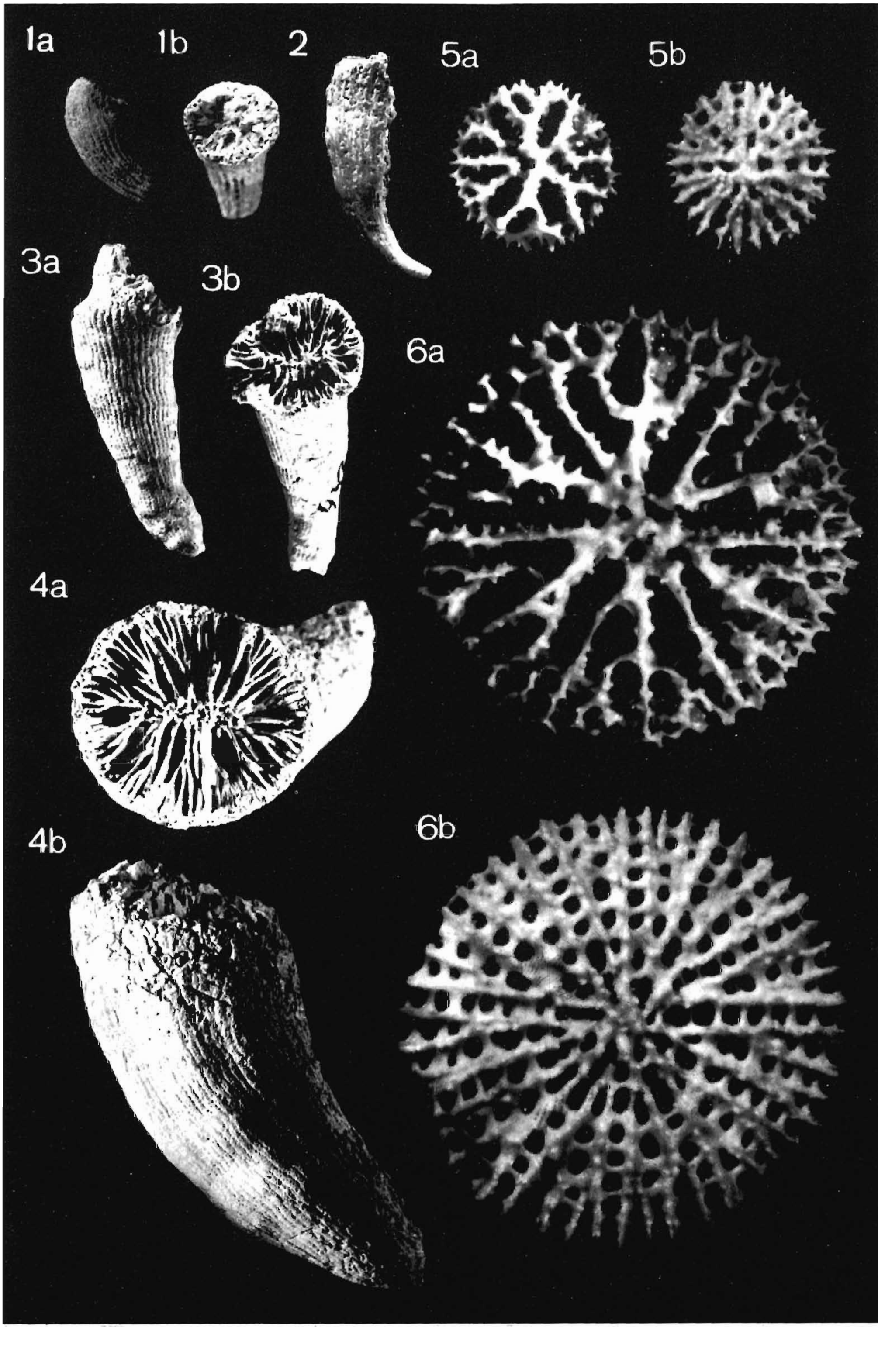
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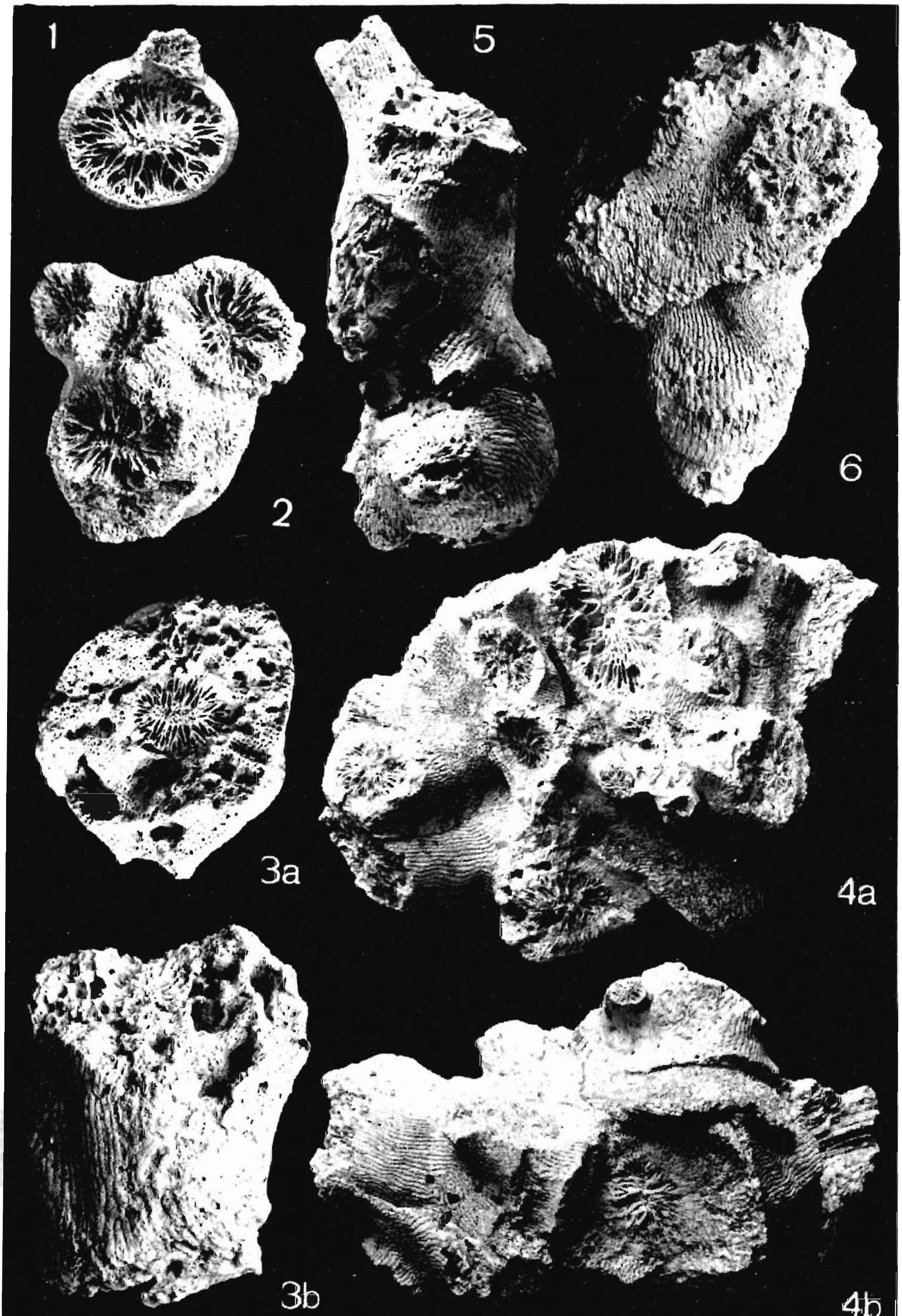
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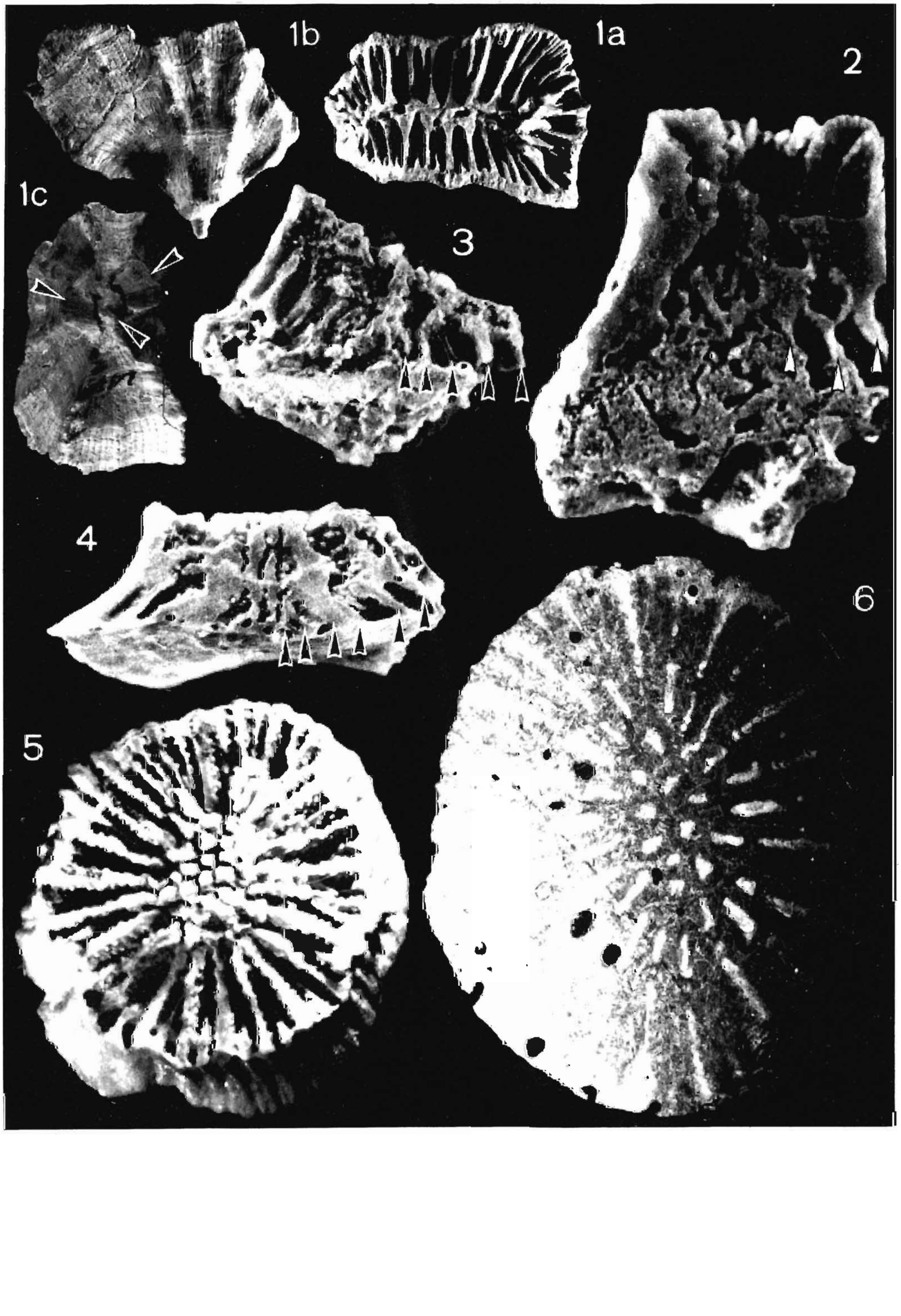
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present, are low and rounded. Septa exsert, arranged in 11-12 systems and differentiate into four cycles. The *S1-2* septa of subequal length and thickness, generally the highest of all, attain 1/3 of the corallite diameter; *S3* slightly shorter and thinner. Two crowns of pali are developed in front of *S1-3* septa (Pl. 12, Fig. 6); *P3* forming an external crown are slightly longer than *P1-2*. Septal faces covered with prominent granules (Pl. 1, Fig. 3*a*). Columella papillose, composed of a few pillars (Pl. 12, Fig. 6). Wall septothecal.

Table 7

Specimen No. ZPAL H.IX/	GCD	LCD	H	S
40	6.0	5.5	> 5.0	e.44
123	7.0	6.3	>11.6	44
124	5.0	4.0	> 7.0	e.36
125	5.2	4.6	>15.0	38
5183	8.2	7.6	> 8.3	46
5184	9.0	7.5	>11.0	e.46
5185	5.7	4.9	> 8.0	40

REMARKS: The specimen ZPAL H. IX/40 has an indistinguishable macroscopically crown of *P1-2* pali which has been revealed in thin section only (Pl. 12, Fig. 6). All investigated specimens are broken proximally. Structures inside the calice (pali, septa, columella) are also considerably damaged (the best preserved specimen is figured in Pl. 1, Fig. 3).

The specimen described by Dembińska-Różkowska (1932) as *C. cladaxis* has slightly larger calicular diametr (11 × 13 mm), flacked away surface and elongated pali in front of *S3*. However, some of the *ca* 25 pillars forming columella could be *P1-2* pali in fact. Therefore it is supposed that this specimen can represent forms described here as *Paracyathus* sp.

OCCURRENCE: Miocene of the Holy Cross Mts (Korytnica Basin).

PLATE 10

Balanophyllia praelonga Michelotti, 1838

1 — ZPAL H. IX/387 (*1a* lateral, *1b* distal view), note a stereome thickening of the coral skeleton, × 1.5; **2** — ZPAL H. IX/388 (lateral view), × 1.5; **3** — ZPAL H. I/246 (*3a* lateral, *3b* distal view), × 1.5; **4** — ZPAL H. I/234 (*4a* distal, *4b* lateral view), × 1.5

Stephanopyllia elegans (Bronn, 1837)

5 — ZPAL H. IX/155 (*5a* distal, *5b* proximal view), × 15; **6** — ZPAL H. IX/154 (*6a* distal, *6b* proximal view), × 15

Figs 1-4 taken by M. Dziewiński; Figs 5-6 by K. Zielińska

Genus *Polycyathus* Duncan, 1876

Polycyathus confertus (Reuss, 1847)
(Text-fig. 5; Pl. 6, Figs 1-4)

1847. *Cladocora conferta* nov. sp.; A. E. Reuss, p. 19; Pl. 3, Figs 4-5.
1871. *Cladangia conferta* (Reuss); A. E. Reuss, pp. 247-248; Pl 16, Figs 1-7; Pl. 18, Fig. 3.
1932. *Clandangia conferta* (Reuss); M. Dembińska-Różkowska, pp. 152-153; Pl. 4, Fig.9.

MATERIAL: 46 fragmentary and complete colonies (max. 4 corallites) from Mt. Lysa, Korytnica-Plebania and Wierzbica (ZPAL H. IX/76, 107-116, 5190-5224).

DIMENSIONS (*in* mm, N=30 calices of 22 fragmentary and complete colonies) are given in Table 8 (*see also* Text-fig. 5).

Table 8

	AVERAGE	VARIANCE	RANGE
GCD	5.7	1.1	3.7-7.5
LCD	5.3	0.8	3.5-7.0
H	4.2	2.4	2.5-7.0
S	(22) 38-42 (48)		

DESCRIPTION: Colony creeping. Corallites connected by one or several superimposed extrathecal sheets (Pl. 6, Fig. 2). Corallite surface and connecting sheets covered by low costae which are well individualized only at the calicular rim. Septa slightly exsert. Calices are rather shallow, with relatively deep axial pit. Septa differentiated into 12 *S1-2* septa slightly stronger than the *S3* septa and irregularly distributed, but well developed *S4* septa. With the exception of septa of the ultimate cycle, all others are provided with vertical projections. The projections are styliform, those situated axialwards being most delicate. The septal faces are covered by a prominent granulation which at the adaxial edge may transform in to a sort of menianes.

REMARKS: The Miocene specimens are very close to those of the Recent species presented by Zibrowius (1980) under the name of *P. muellerae* (Abel, 1959). The Recent Mediterranean form is considered here as the direct descendant of the Miocene form.

OCCURRENCE: Miocene of Holy Cross Mts (Korytnica Basin) and Podolia in the Ukraine (Zborów); known also from other Miocene localities of the Paratethys.

PLATE 11

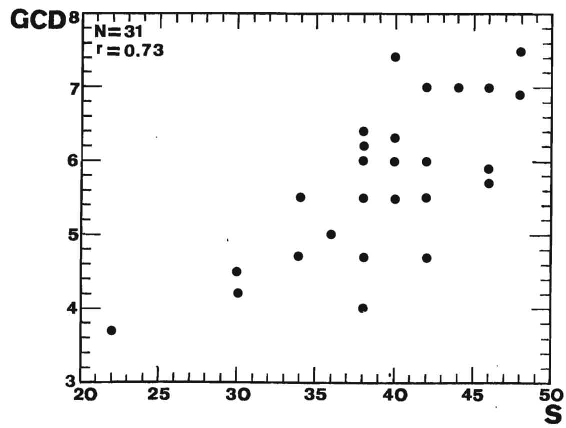
Dendrophyllia taurinensis Milne-Edwards & Haime, 1884

1 — ZPAL H. I/215 (distal view); **2** — ZPAL H. IX/388 (distal view; **3** — ZPAL H. I/246 (*3a* distal view, note very thick synapticulothecel wall; *3b* lateral view); **4** — ZPAL H. I/234 (*4a* lateral view of colony, *4b* basal view; note different ontogenetical stages of corallites); **5** — ZPAL H. IX/155; **6** — ZPAL H. IX/154

All photos of nat. size; taken by M. Dziewiński

Fig. 5

Relationship of septal number to great calicular diameter in corallites of *Polycyathus confertus* (REUSS)



Genus *Ceratotrochus* MILNE-EDWARDS & HAIME, 1848
Subgenus *Ceratotrochus* MILNE-EDWARDS & HAIME, 1848

Ceratotrochus granulatus DEMBIŃSKA-RÓŻKOWSKA, 1932
(Text-fig. 6; Pl. 7, Figs 1-8)

1932. *Ceratotrochus granulatus* n. sp.; M. DEMBIŃSKA-RÓŻKOWSKA, p. 140; Pl. 5, Fig. 4.

MATERIAL: 437 well preserved specimens from Korytnica-Forest and Mt. Lysa (ZPAL H. IX/1-12, 49-50, 67, 117-119, 363-369, 457, 6856-7265); very rare in Korytnica-Plebania (ZPAL H. IX/493)

The holotype of *C. granulatus*, figured by DEMBIŃSKA-RÓŻKOWSKA (1932; Pl. 5, Fig. 4), has been lost during the World War II and therefore the neotype is herein established.

NEOTYPE: Specimen from Korytnica-Forest (ZPAL H. IX/365), presented in Pl. 7, Fig. 1.

DIMENSIONS (*in* mm, N = 100) are given in Table 9 (*see also* Text-fig. 6).

PLATE 12

Flabellum roissyanum MILNE-EDWARDS & HAIME, 1884

1 — ZPAL H. I/287, specimen regenerated from a group of fragments (arrowed in *1c*; *1a* distal, *1b* lateral, *1c* proximal view), × 1.5

Tethocyathus microphyllus (REUSS, 1871)

2-4 — Longitudinal sections, to show successive thecal rings (arrowed from one side of section), × 10: 2 — ZPAL H. IX/4245, 3 — ZPAL H. IX/4246, 4 — ZPAL H. IX/4247; **5** — One of the largest specimens within collection, ZPAL H. IX/4950, × 8

Paracyathus sp.

6 — ZPAL H. IX/40, transverse thin section (negative); note two crowns of pali and columellar pillars; interseptal space is complettely filled with secondary deposits, × 14

Figs 1-4, 6 taken by M. DZIEWIŃSKI; Fig. 5 by the Author

Table 9

	NEOTYPE ZPAL H.IX/365	AVERAGE	VARIANCE	RANGE
D	2.1	2.6	0.3	1.0-3.7
H	2.2	1.4	0.4	0.4-3.5
S	24	(16) 20 (24)		

DESCRIPTION: Corallum variable in shape, ranging from patellate (Pl. 7, Fig. 2) to cylindrical (Pl. 7, Fig. 3). Calice circular or slightly ellipsoidal (particularly in juvenile specimens: Pl. 7, Fig. 5). Costae 0.10-0.25 mm wide separated by broad (about 0.3 mm) and shallow (about 0.25 mm) intercostal furrows. The costae bear irregular granules which may be somewhat masked by secondary sclerenchymal deposits.

Septa differentiated into 3 orders when arranged hexamerally (6/6/12), or into 2 orders when arranged decamerally (10/10) or endecamerally (11/11). Primary septa are equal to or slightly more exsert than secondary ones (generally septal exsertion about 0.30—0.35 mm). Primary septa extending about 0.8—0.9 the distance to columella and secondary about 0.3—0.5 the distance to columella. Septal faces bear prominent spiniform granules about 0.1 mm tall. Primary septa provided with 2-4 paliform lobes and secondary septa with 1-2 paliform projections, smaller than the former ones (Pl. 7, Fig. 4). The innermost paliform lobes and the columellar papillae are indistinguishable from each other in their size and shape. A spongy skeletal structure is developed in the proximal part of corallum (Pl. 7, Fig. 4).

REMARKS: The holotype (Dembińska-Różkowska 1932) was attached to a sand grain whilst none of the examined specimens from Korytnica was attached to any solid material. A shallow groove observed on the proximal end of some specimens may represent an attachment scar to an unpreserved substrate (Pl. 7, Fig. 1*b*). The holotype, coming from Dryszczów in Podolia is higher (5.5 mm) than the highest specimen (3.5 mm) from the Korytnica population.

Among investigated specimens some regenerated individuals have been observed (Pl. 7, Figs 6-8).

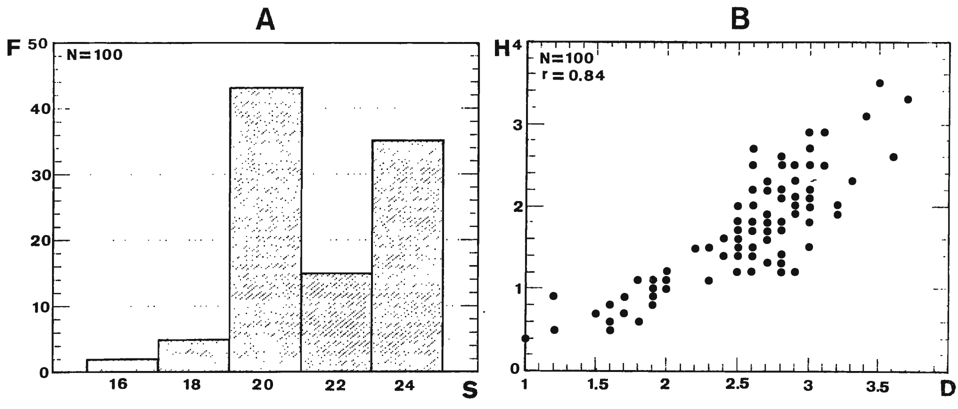


Fig. 6. **A** — Frequency histogram of *Ceratotrochus granulatus* Dembińska-Różkowska in relation to the septal number (note two distinct peaks for specimens having 20 and 24 septa); **B** — Distal diameter/height ratio

OCCURRENCE: Miocene of the Holy Cross Mts (Korytnica Basin) and Podolia in the Ukraine (Dryszczów).

Subgenus *Edwardsotrochus* CHEVALIER, 1961
Ceratotrochus (Edwardsotrochus) duodecimcostatus (GOLDFUSS, 1826)
(Text-fig. 7; Pl. 5, Figs 1, 4, 6)

1826. *Turbinolia duodecimcostata* nobis: GOLDFUSS, p. 52; Pl. 15, Fig. 6
1871. *Ceratotrochus duodecimcotatus* (GOLDFUSS); A. E. REUSS, pp. 25-26; Pl. 4, Figs 3-4
? 1932. *Ceratotrochus Kowalewskii* n. sp.; M. DEMBIŃSKA-RÓŻKOWSKA, pp. 139-140; Pl. 5, Fig. 5.
1961. *Ceratotrochus (Edwardsotrochus) duodecimcostatus* (GOLDFUSS); J. P. CHEVALIER, pp. 359-360; Text-figs 125, 126 a-b, 127-128.
1968. *Ceratotrochus (Edwardsotrochus) duodecimcostatus* (GOLDFUSS); J. P. CUIF, pp. 135-148; Text-Fig. 5; Pl. 3, Figs 10-11, ? 6-? 7
1984. caryophyllid coral; W. BAŁUK & A. RADWAŃSKI, Pl. 1, Figs 3; 4, 6; Pl. 2, Figs 1-3, 5-6; Pl. 3, Fig. 3.

MATERIAL: 2 best preserved specimens (ZPAL H. IX/146-147) and 104 more or less complete specimens (ZPAL H. IX/58, 344, 370-371, 416-456, 459, 491-492, 3558-3613) from Korytnica-Forest. Numerous fragments from the same site were collected under the name of *Ceratotrochus (E.)* sp. (ZPAL H. IX/406-415, 458, 471, 476-477, 3614-3623, 5013-5082).

DIMENSIONS (*in* mm) of 2 best preserved specimens are given in Table 10 (*see also* Text-fig. 7).

Table 10

Specimen No. ZPAL H.IX/	GCD	LCD	H	S
147 (Pl. 5, Fig. 1)	10.8	8.2	17.0	68
146	5.0	4.2	7.5	38

REMARKS: Costae (*C1-2*) are subequal and distinct. Hexameral arrangement of septa, granulation pattern on the septal flanks, and columella (seen in fossa) composed of flattened subhorizontal paliform lobes fit well to the diagnosis.

One of the illustrated specimens (Pl. 5, Fig. 1) is distally curved in plane of the lesser calicular diametr, while its proximal part is very slightly curved in plane of the greater calicular diameter.

The main bulk of collection consists of corallites flattened by compression (text-fig. 8*a*); they show features of the subgenus *Edwardsotrochus*, particulary the flattened subhorizontal paliform lobes. Ornamentation on the septal flanks is the same as in the best preserved specimens of *Ceratotrochus (E.) duodecimcostatus* (ZPAL H. IX/147). Abundance of flattened forms can be explained by fragility of their skeletons (deep fossa and delicate septa). Skeletons of *Edwardsotrochus* relatively little resistant to mechanical stress (predators activity or other mechanical damages) could be fragmented during the polyp life and then regenerate. As a result there are frequent coralla found in the material examined, initiated from regenerating fragments (Pl. 5, Figs 4, 6; *see also* BAŁUK & RADWAŃSKI 1984).

The less compressed forms (but damaged as well), with relatively little gaping calices somewhat resemble specimens of the I-group of *C. (E.) duodecimcostatus* in the (CUIF's collection 1968).

The species *C. kowalewskii* DEMBIŃSKA-RÓŻKOWSKA, 1932, is included to the synonymy of *C. (E.) duodecimcostatus* with some reservation, as a brief diagnosis given by DEMBIŃSKA-RÓŻKOWSKA (1932) lacks any information on the flattened shape of paliform lobes, typical of the subgenus *Edwardsotrochus*.

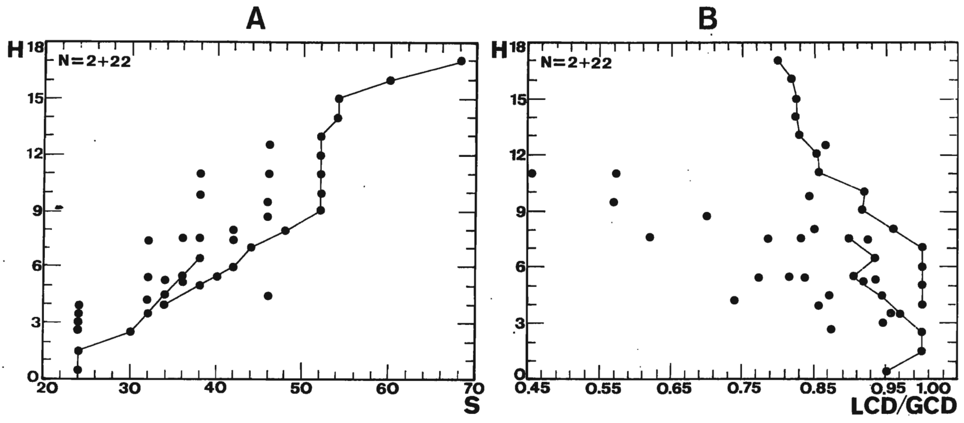


Fig. 7. **A** — Relationship of septal number to height in *Ceratotrochus (Edwardsotrochus) duodecimcostatus* (GOLDFUSS); **B** — Relationship of LCD/GCD ratio to height in *C. (E.) duodecimcostatus* (GOLDFUSS); specimens with LCD/GCD <0.75 are mainly flattened by compression

Dots connected with a line represent serial measurements of two specimens (ZPAL H. IX/146-147)

OCCURRENCE: Miocene of the Holy Cross Mts (Korytnica Basin); known also from other Miocene localities of the Paratethys and Atlantic-Boreal bioprovinces CAIRNS & WELLS (1987) described "*Ceratotrochus (E.)* sp. cf. *C. (E.) duodecimcostatus* (GOLDFUSS)" from the Miocene of Dominican Republic; Pliocene of southern Italy, France, Spain, and northwest Africa.

Subfamily **Turbinoliine** MILNE-EDWARDS & HAIME, 1848
Genus *Peponocyathus* GRAVIER, 1915

Peponocyathus duncani (REUSS, 1871)
(Text-fig. 8; Pl. 8, Figs 1-11)

1871. *Discotrochus Duncani* nov. sp.; A. E. REUSS, p. 29; Pl. 3, Fig. 13; Pl. 4, Figs 1-2.
1932. *Discotrochus Duncani* REUSS; M. DEMBIŃSKA-RÓŻKOWSKA, p. 141; Pl. 5, Fig. 6.
1953. *Discotrochus duncani* REUSS; M. MOENKE, pp. 249-251; Fig. 7.
1964. *Cylindrophyllia duncani* (REUSS); J. P. CHEVALIER, pp. 6-9; Pl. 1, Fig. 4; Pl. 2, Fig. 6.
1982. *Kionotrochus (Cylindrophyllia) duncani* (REUSS); D. WAYER, Pl. 7, Figs 1-5.
1982. *Kionotrochus (Cylindrophyllia) lecomptei* WELLS; D. WAYER, Pl. 7, Figs 6-9.

MATERIAL: 4905 well preserved specimens from Korytnica-Forest, Mt. Lysa and Korytnica-Plebania (quantitative proportins in particular sites are, respectively 4:1:0.01; ZPAL H. IX/13-32, 35-39, 41-48, 51-52, 59-66, 68-75, 78-80, 93-106, 120, 126-145, 156-236, 260-343, 351-357, 372-379, 390-403, 478-488, 494-500, 503-3505, 5225-6815, 6816-6825).

DIMENSIONS (*in* mm, N=350) are given in Table 11 (*see also* Text-fig. 8).

REMARKS: WELLS (1937) assigned the species to the genus *Kionotrochus* DENNANT, 1906, but CHEVALIER (1964) included it in *Cylindrophyllia* YABE & EUGUCHI, 1937, whilst ZIBROWIUS (1980) suggested that it possibly belongs to *Peponocyathus* GRAVIER, 1915. On the other hand, MORI & MINOURA (1983) when dealing with intraspecific variation within a population of *Cylindrophyllia orientalis* (YABE & EUGUCHI) suggested that *K. duncani* should be placed into the genus *Cylindrophyllia*. In his revision of the genus *Peponocyathus*, CAIRNS (1989) synonymized *Cylindrophyllia* with *Peponocyathus*.

A great variability observed among the specimens examined concerns the shape (cylindrical, discoid, cupolate), diameter and height of corallum (Text-fig. 8), number and ornamentation of radial elements and the degree of columella development. The ornamentation of lateral septal surfaces is varying from granular to ledge-like type resembling the meniane ornamentation known in Mesozoic and Cenozoic corals (GILL 1967, GILL & RUSSO 1980, RONIEWICZ 1982, ZIBROWIUS 1984). Distal and external margins of radial elements vary in their ornamentation as well. Important is also varying degree of development of pali and of the costal part of radial elements.

Within the collections frequent are coralla at diverse stages of transverse division (Pl. 8, Figs 7-8 and 10; *see also* WEYER 1982, Pl. 7, Figs 1 and 8-9). In addition, regeneration may be observed among the investigated specimens (Pl. 8, Figs 3-5).

Table 11

	AVERAGE	VARIANCE	RANGE
D	2.6	0.1	2.0-3.7
H	1.4	0.1	0.7-3.3
S	(16) 24 (36)		

OCCURRENCE: Miocene of the Holy Cross Mts (Korytnica Basin), Carpathian Foredeep (Bęczyn) and Podolia in the Ukraine (Dryszczów); known also from other Miocene localities of the Paratethys; Oligocene and Miocene of Atlanic-Boreal bioprovince.

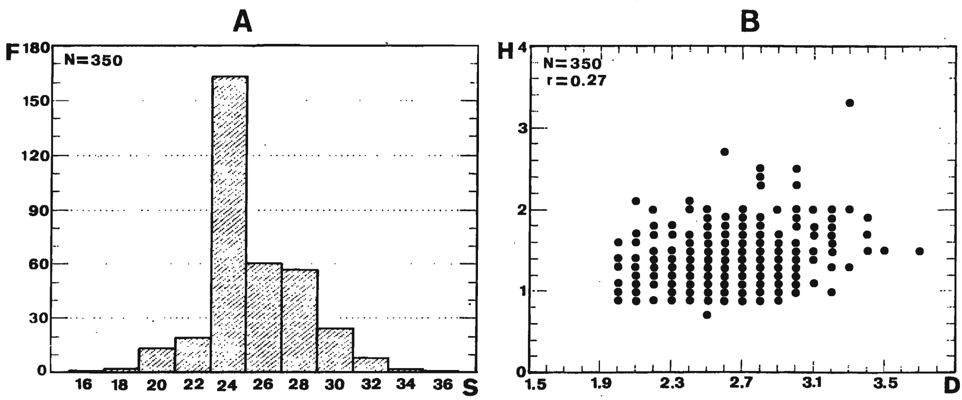


Fig. 8. **A** — Frequency histogram of *Peponocyathus duncani* (REUSS) in relation to the septal number (note one distinct peak for specimens having 24 septa); **B** — Distal diameter/height ratio

Superfamily **Flabellicae** BOURNE, 1905
Family **Flabellidae** BOURNE, 1905

Genus *Flabellum* LESSON, 1831

The species *Flabellum roissyanum* MILNE-EDWARDS & HAIME described here is related to the group of species with 6-septal intial stage and with particularly well developed face and lateral crets.

Flabellum roissyanum MILNE-EDWARDS & HAIME, 1848
(Text-fig. 9; Pl. 9, Figs 1-5; Pl. 12, Fig. 1)

1857. *Flabellum roissyanum* MILNE-EDWARDS & HAIME; H. MILNE-EDWARDS, p. 86.
1932. *Flabellum zejszneri* n. sp. ; M. DEMBIŃSKA-RÓŻKOWSKA, pp 141-144; Pl. 5, Fig. 8.
1932. *Flabellum zejszneri* var. *juncta* n. var.; M. DEMBIŃSKA-RÓŻKOWSKA, p. 144; Pl. 5, Fig. 9.

1932. *Flabellum sussi* REUSS; M. DEMBIŃSKA-RÓŻKOWSKA, p. 145; Pl. 6, Fig. 1.
1932. *Flabellum reussi* PROCHAZKA; M. DEMBIŃSKA-RÓŻKOWSKA, pp. 145-146; Pl. 5, Fig. 10
1953. *Flabellum zejszneri* DEMBIŃSKA-RÓŻKOWSKA; M. MOENKE, pp. 262-264.
1960. *Flabellum roissyanum* MILNE-EDWARDS & HAIME; E. KOJUMDGIEVA, pp. 22-23; Pl. 6, Fig. 10.
1961. *Flabellum avicula* (MICHELOTTI) var. *roissyana* MILNE-EDWARDS & HAIME; J. P. CHEVALIER, pp. 387-388; Text-Fig. 135 *h*; Pl. 14, Figs 12-13.
1963. *Flabellum roissyanum* MILNE-EDWARDS & HAIME; O. KÜHN, pp. 86-88; Pl. 17, Figs 1-2.

MATERIAL; 321 specimens from Korytnica-Forest, 52 from Mt. Lysa and 40 from arable fields (ZPAL H. I/271-296, 300-328, 337-385, 389-498; ZPAL H. IX/245-259, 382-385, 3506-3557, 6846-6855, 7266-7384).

DIMENSIONS (*in* mm, N=50) are given in Table 12 (*see also* Text-fig. 8). The largest specimen found in Korytnica has H=37, GCD=58, LCD=22 and complete 6 cycles septa developed (MAZUŚ 1975).

Table 12

	AVERAGE	VARIANCE	RANGE
GCD	20.5	151.5	2.1-45.0
LCD	11.0	32.8	1.7-22.0
H	16.0	64.4	2.1-28.0
FAN	37	58	20-54
EAN	78	582	24-117
S	6 S1 on basal plate and specimens of H from 2mm to 28 (37) mm have 12-104 (192) septa		

REMARKS: In the studied specimens of *F. roissyanum* the most variable features are: *EAN* angle (in specimens of H > 20 mm is 70-120, most frequently *ca* 95), calice oblation (*LCD/GCD* ratio in specimens of H > 20 mm is 0.45-0.75, most frequently 0.5-0.6), number and shape of face crests (as a rule *FC1* are most prominent), lateral crests (*LC*) development (*see* Pl. 7, Fig. 1*b*, 2*b*) and of undulation of inner edges of septa. The *FAN* angle in specimens of H > 20 mm (32-54, most frequently 40) is less variable than the *EAN* angle.

Interseptal rows of scars can be observed on the internal surface of the wall. These scars represent traces of attachment of soft tissue (desmocytes) to the skeleton (WISE 1970, SORAUF & PODOFF 1977, RONIEWICZ & MORYCOWA 1987). The shape of pedal disc varies from completely flat to a tube-like (Pl. 7, Fig. 3).

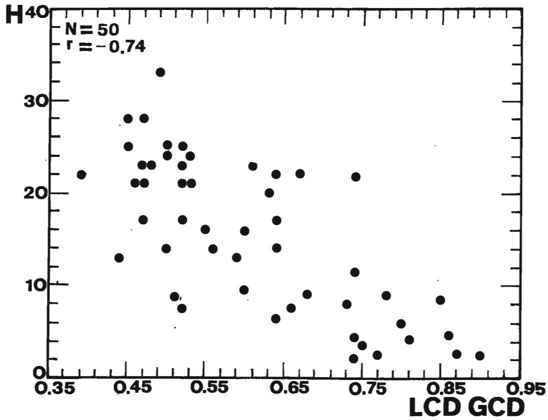
Among investigated specimens some regenerated individuals have been observed (Pl. 12, Fig. 1).

Features of the Korytnica specimens agree with those of the neotype illustrated by CHEVALIER (1961, Pl. 14, Figs 12-13) and KÜHN (1963, Pl. 17, Fig. 1) as well as with those of the hypotype (KÜHN 1963, Pl. 17, Fig. 2). Morphological variability represented by three species (one with a new subspecies) described by DEMBIŃSKA-RÓŻKOWSKA (1932) corresponds to the range of intrapopulational variability of *F. roissyanum* from Korytnica.

The species *Flabellum zejszneri* was erected by DEMBIŃSKA-RÓŻKOWSKA (1932) to emphasize differences between Korytnica specimens and forms described as *F. roissyanum* by REUSS (1871). The specimens described by the latter author seem to be, however, close to the group of *F. austriacum* PROCHÁZKA. On the other way, KOJUMDGIEVA (1960) synonymized *F. zejszneri* DEMBIŃSKA-RÓŻKOWSKA

Fig. 9

Relationship of LCD/GCD ratio to height in *Flabellum roissyanum* MILNE-EDWARDS & HAIME



with *F. roissyanum* MILNE-EDWARDS & HAIME. Specimens described by DEMBIŃSKA-RÓŻKOWSKA (1932) as *F. reussi* PROCHÁZKA, seem to be the grown forms of *F. roissyanum*, because their wall and septa are thickened by stereome, and septa *S6* and adjacent septa *S5* as well as septa *S5* and septa S4 are irregularly fused (*see* morphotype *in* Pl. 9, Fig. 4). DEMBIŃSKA-RÓŻKOWSKA (1932) overlooked these facts and described a new subspecies, *F. zejszneri* var. *juncta*, with septa *S6-S5* and *S5-S4* fused together in the same way as the above mentioned, but she considered this feature (together with a thick wall) as diagnostic features of *F. reussi*.

OCCURRENCE: Miocene of the Holy Cross Mts (Korytnica Basin), Carpathian Foredeep (Bęczyn); known also from other Miocene localities of the Paratethys; Pliocene of Italy.

Suborder **Dendrophylliina** VAUGHAN & WELLS, 1943
Family **Dendrophylliidae** GRAY, 1847
Genus *Balanophyllia* WOOD, 1844

VAUGHAN & WELLS (1943) noted that the distinction between *Balanophyllia* WOOD, 1844 (attached, polycyclic forms) and *Eupsammia* MILNE-EDWARDS & HAIME, 1848 (free, monocyclic forms) is useful in handling collections but can hardly be accepted as a taxonomical criterion. CAIRNS (1979), as well as ZIBROWIUS (1980), renounced this distinction including both solitary forms into the genus *Balanophyllia*.

Balanophyllia praelonga (MICHELOTTI, 1838) (Text-fig. 10; Pl. 10, Figs 1-4)

1841. *Turbinolia praelonga* MICHELOTTI; H. MICHELIN, p. 40; Pl. 9, Fig. 1.
1932. *Balanophyllia* aff. *praelonga* MICHELOTTI; M. DEMBIŃSKA-RÓŻKOWSKA, pp. 135-136; Pl. 4, Fig. 4.
1953. *Eupsammia irregularis* (SEGUENZA); M. MOENKE, pp. 243-246; Figs 3-5.
1964. *Eupsammia praelonga* (MICHELOTTI); J. P. CHEVALIER, pp. 25-26; Pl. 2, Fig. 5.

MATERIAL: 36 specimens from Mt. Lysa and 7 specimens from Korytnica-Forest; several fragments from both locality (ZPAL H. I/187, 229, 234, 246, 257; ZPAL H. IX/387-388, 404-405, 460, 7385-7415, and MWGUW/2000.

DIMENSIONS (*in* mm, N = 14) are given in Table 13 (*see also* Text-fig. 10).

REMARKS: Specimens rarely are straight, more frequently curved (mostly in plane of *GCD*: Pl. 10, Figs 2, 4; curved in plane of *LCD* also occur: Pl. 10, Figs 1, 3). Sometimes epithecal bands covering the costae are present. Some specimens in their apical part have interseptal spaces filled (partially or completely) with stereome (Pl. 10, Fig. 1*b*). Monocylic type of development and lack of the attachment scar seem to be typical of the species.

Infaunal borings found mainly on the inner side of the corallite curvature (Pl. 10, Figs 2 and 4) may indicate a buried mode of life of these corals.

Table 13

	AVERAGE	VARIANCE	RANGE
GCD	8.6	37.4	3.7-24.0
LCD	7.8	33.0	3.1-22.0
H	16.4	110.7	7.0-39.0
S	32-86		

Specimens described by MOENKE (1953) from Bęczyn as *E. irregularis* (SEGUENZA) have features of *B. praelonga*, as their corallite are free, monocyclic with similar pattern of radial elements in calice; they have similar dimensions as the Korytnica forms representing early ontogenetic stages.

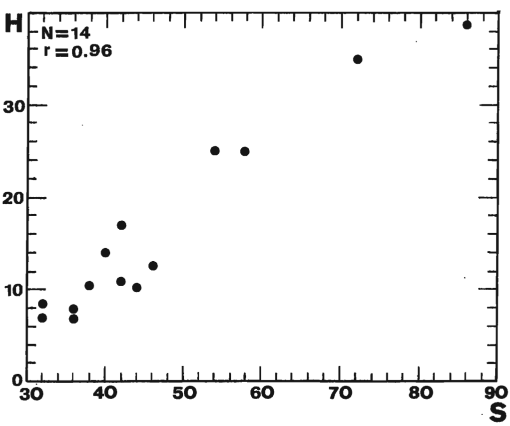


Fig. 10

Relationship of septal number to height in *Balanophyllia praelonga* MICHELOTTI

OCCURRENCE: Miocene of the Holy Cross Mts (Korytnica Basin) and Carpathian Foredeep (Bęczyn); known also from other Miocene localities of the Paratethys.

Genus *Dendrophyllia* de BLAINVILLE, 1830
Dendrophyllia taurinensis MILNE-EDWARDS & HAIME, 1848
(Pl. 11, Figs 1-6)

1860. *Dendrophyllia taurinensis* MILNE-EDWARDS & HAIME; H. MILNE-EDWARDS, p. 116, III.
1871. *Balanophyllia varians* REUSS; A. E. REUSS, pp. 56-57; Pl. 15, Figs 3-5.
1871. *Balanophyllia concinna* REUSS; A. E. REUSS, p. 57; Pl. 15, Figs 1-2.
1932. *Balanophyllia varians* REUSS; M. DEMBIŃSKA-RÓŻKOWSKA, p. 134; Pl. 4, Fig. 5.
1932. *Balanophyllia concinna* REUSS; M. DEMBIŃSKA-RÓŻKOWSKA, pp. 134-135; Pl. 3, Fig. 5.
1932. *Dendrophyllia prismatica* REUSS; M. DEMBIŃSKA-RÓŻKOWSKA, p. 137; Pl. 4, Fig. 7.
1932. *Dendrophyllia taurinensis* MILNE-EDWARDS & HAIME; M. DEMBIŃSKA-RÓŻKOWSKA, pp. 137-138; Pl. 4, Fig. 8.
1953. *Balanophyllia* aff. *varians* REUSS; M. MOENKE, pp. 246-247.
1953. *Dendrophyllia taurinensis* MILNE-EDWARDS & HAIME; M. MOENKE, pp. 247-248.
1965. *Dendrophyllia taurinensis* MILNE-EDWARDS & HAIME; O. KÜHN pp. 302-304; Pl. 2, Figs 20-21.

MATERIAL: 432 fragmentary colonies from Mt. Lysa (ZPAL H. I/1-186, 188-228, 230-233, 235-245, 247-256, 258-260 and ZPAL H. IX/389, 3624-3795, 3868-4041; 58 specimens from the same locality, and interpreted as juvenile forms, were collected under the name of *Dendrophyllia* sp. (ZPAL H. IX/3796-3853, 3857-3867).

DIMENSIONS (*in* mm) of the 6 best preserved corallites of the largest colony (ZPAL H. I/234) are given in Table 14.

Table 14

	ZPAL H.I/9					
	1	2	3	4	5	6
corallite GCD without SW	19.0	4.5	9.0	7.5	8.0	9.5
corallite GCD with SW	20.0	4.7	11.0	12.0	16.0	27.0
corallite LCD without SW	13.5	4.3	8.5	6.0	6.5	8.0
corallite LCD with SW	15.3	4.5	11.0	10.0	14.5	24.0
S	96	44	48	48	48	48

REMARKS: In synonymizing diverse species distinguished so far from Korytnica, the Author has based on a great variability of forms occurring at Mt. Lysa locality. This variability can be observed among others within:

(*i*). one colony: different dimensions of the columella in the corallites of similar diameters;
(*ii*). diverse colonies from the same site: for example, different colonies shapes caused by environmental conditions (Pl. 11, Figs 2-4).

Differences in ontogentical development of particular corallites (septa, costae, synapticulotheca, columella, frequency of budding) interfere with ennumerated variations (*see* VERON 1982).

The problem of variation in ahermatypic corals is discussed by ZIBROWIUS (1984). On the example of the dendrophyllid *Astroides calycularis* he shows that local hydrodynamical conditions can cause the development of various colony shapes, from submassive to phaceloidal. Another example of high morphological variability is given by Recent *D. ramea*. It can be observed, on illustrations presented by ZIBROWIUS (1980, Pl. 86, Figs A, E, G), that primary monopodial colony branching can be followed in two different ways: either formation of relatively long descendant second-order embranched corallites or short ones with significantly lesser diameters than in the first-order embranchments. This example shows a possible pattern of intraspecific variation in *D. taurinensis*.

OCCURRENCE: Miocene of the Holy Cross Mts (Korytnica Basin) and Carpathian Foredeep (Bęczyn); known also from other Miocene localities of the Paratethys.

REMARKS ON ECOLOGY

The Recent ahermatypic and non-constructional corals (*sensu* SCHUHMACHER & ZIBROWIUS 1985) occur in the temperature from about 1.8° to about 35° C (mainly between 4.5° — 10° C) and at the depth of 0-6328 meters (the richest from 50 to 300 m). The method of estimating of temperature-depth ranges for fossil assemblages of ahermatypic corals (mainly Cenozoic) was based on present-day limits of ahermatypic genera (WELLS 1967). However, erroneous temperature-depth interpretations (using data from tables given by VAUGHAN & WELLS 1943, *and* WELLS 1967) can arise due to the following aspects (*see also* ZIBROWIUS 1989).

The ranges of recent coral genera are based on fragmentary data (informations on part of the real range only).

Data are mistaken; compare data on *Sphenotrochus* discussed by ZIBROWIUS (1989).

Great ecological plasticity of corals is possible, as evidenced *e. g.* by the bathymetric range of the Recent *Caratotrochus* which, according to WELLS (1956), is from 27 to 732 meters. ZIBROWIUS (1980) reports, however, that though the depth characteristic of *Ceratotrochus magnaghii* CECCHINI is from about 100 to 400 m in open basin, the species can be found in the submarine caves at 7-40 m. Eurybathic genera *Flabellum* and *Fungiacyathus* show still greater depth ranges of 22-2300 m and 99-6328 m respectively (CAIRNS 1989). Basing on requirements of individual species (for example various North-East Atlantic species of *Caryophyllia*; see ZIBROWIUS 1989) is more precise than on a whole range of a given genus. Some coral genera are represented by eurybathic species (for example *Flabellum*), others are represented by a few (or single) species which have restricted ecological requirements (for example deep-water genus *Leptopenus*). In the case of extinct forms, there is possible only a more or less successful attempt in comparing their morphology with that of Recent

Table 15
Ecology and phylogeny of the Korytnica corals

Left side of the table: ecological requirements of the genera described in this paper and distribution of the species occurring in localities of the Korytnica Basin

GENUS	BATHYMETRIC RANGE /m/	TERMIC RANGE /°C/	SITES					
			Kf	F	Ly	Pn	W	Af
Stephanophyllia	C 15- 815 Wb	C 6.7-22.3 V	■	■				
Caryophyllia	V 0-3100 Z	V 2.8-27.0 V		■	■			
Acanthocyathus	Wb 27- 732 Wa	V 12.5-26.7 V	■	■				■
Tethocyathus	Wa 13-1046 V	V 7.5-21.0 V			■			
Paracyathus	Z 6-1472 Wa	V 4.7-27.7 V			■			
Polycyathus	Z 1.5- 100 Z	V 21.2-26.7 V			■	■	■	
Ceratotrochus	Z 7- 732 Wa	V 5.5-17.2 V	■	■	■	■		
C. (Edwardsotrochus)	?	?		■				
Peponocyathus	C 44-?2100 Z	C 6.2-21.0 V	■	■	■	■		
Flabellum	Wa 3-3190 Z	V 1.7-27.6 V	■	■	■			■
Balanophyllia	V 0-1150 Z	V 6.7-27.7 V		■	■			
Dendrophyllia	Z 6-1200 Wb	V 7.0-27.0 V			■			■

species and in this indirect way to guess paleoecological conditions. Basing on ecological requirements of Recent genera when the overlapping of ecological ranges takes place, one can assume a natural mixing of the coral fauna for an effect of living of diverse species on the border of their ecological limits.

The bathymetric-thermic relationships of the Miocene species of the genera in question could be different from the relationships of the Recent genera and species.

The coral debris in beds considered may be allochthonous. For the reason that coral fauna from some sites in the Korytnica Basin may be of mixed character.

Temperature-depth requirements of the coral genera occurring in the Korytnica Basin (Table 15) were used to less precise estimating of paleo-ecological conditions. Estimated depths and temperature ranges for the Koryt-nica sites would be as follows:

Korytnica-Forest: 44 - 732 m, 12.5° - 17.2° C (1 hermatypic coral species co-occurrs), Mt. Lysa: 44 - 100 m, 9.7° - 17.2° C ; 21.2° - 26.7° C for *Polycyathus* (2 hermatypic coral species co-occur), Korytnica-Plebania: 44 - 100 m, 6.2° - 17.2° C; 21.2° - 26.7° C for *Polycyathus* (3 hermatypic coral species co-occur).

The upper limit of bathymetric estimations for all the Korytnica sites constitutes the upper *Peponocyathus* range and the exact upper limit of *P.*

Right side of the table: hypothetical ecological and phylogenetic descendants of some coral species from the Korytnica Basin
Referenced ecological data from: **C** — Cairns (1989); **V** — Vaughan & Wells (1943); **Wa** — Wells (1956); **Wb** — Wells (1967); **Z** — Zibrowius (1980)

FOSSIL SPECIES	RECENT SIMILAR SPECIES (?DESCENDANT) AND ITS BATHYMETRIC RANGE /m/	
Stephanophyllia elegans	*S. complicata*	229-397
Caryophyllia sp.	?	
Acanthocyathus transilvanicus	*A. grayi*	37-490
Tethocyathus microphyllus *Tethocyathus velatus*	*Concentrotheca laevigata* *T. variabilis*	183-800 250-860
Paracyathus cupula *Paracyathus* sp.	*P. arcuatus* ?	201-343
Polycyathus confertus	*P. muellerae*	(1.5 subm.caves)-32
Ceratotrochus granulatus	?	
C. (E.) duodecimcostatus	?	
Peponocyathus duncani	*P. folliculus*	50-990
Flabellum roissyanum	?*F. pavonicum* group	223-271
Balanophyllia praelonga	*B. gigas*	90-500
Dendrophyllia taurinensis	*D. ramea*	(6) 40- 60 (18[illegible])

australiensis (DUNCAN 1870). Specimens of *P. duncani* (REUSS, 1871) found in the Korytnica Basin are close, however, to Recent *P. folliculus* (POURTALÈS, 1868) the upper depth limit of which is 50 m. The Korytnica-Forest site seems to contain a deeper-water fauna of ahermatypic corals, and the only hermatypic coral (*see* RONIEWICZ & STOLARSKI 1991), that is a minute colony of *Stylophora* may have lived in unfavorable conditions which is seemingly confirmed by its dwarfed size.

DEMBIŃSKA-RÓŻKOWSKA (1932)	STOLARSKI (1991, this paper)
Korytnica Chomentów Karsy	Korytnica (F, Ly, Pn, Af sites), Karsy (Kf site), Wierzbica (W site)
	* *Stephanophyllia elegans*
Caryophyllia cladaxis —?→	*Paracyathus* sp.
Caryophyllia crispata —?	
	* *Caryophyllia* sp.
Acanthocyathus vindobonensis →	*Acanthocyathus transilvanicus*
	Tethocyathus microphyllus
	Tethocyathus velatus
Paracyathus cupula →	*Paracyathus cupula*
	* *Polycyathus confertus*
	* *Ceratotrochus granulatus*
Ceratotrochus kowalewskii —?→	*C.* (*E.*) *duodecimcostatus*
Discotrochus duncani →	*Peponocyathus duncani*
Flabellum reussi	
Flabellum suessi	
Flabellum zejszneri zejszneri →	*Flabellum roissyanum*
Flabellum zejszneri juncta	
Balanophyllia aff. *praelonga* →	*Balanophyllia praelonga*
Balanophyllia irregularis	
Balanophyllia concina	
Balanophyllia varians	
Dendrophyllia taurinensis →	*Dendrophyllia taurinensis*
Dendrophyllia prismatica	
Dendrophyllia sp.	

▨ – "oyster marls" from Korytnica and Chomentów █ – "plastic clays" from Korytnica, Karsy and Chomentów	* – The species described by DEMBIŃSKA-RÓŻKOWSKA (1932) from localities outside the Holy Cross Mts

In addition to a greather depth, a soft, clayey bottom, might be another unfavorable factor hindering installation of larvae (RONIEWICZ & STOLARSKI 1991).

The species *Stephanophyllia elegans* (BRONN, 1837) mostly resembles Recent Indo-Pacific *S. complicata* MOSELEY, 1876, which lives at the depth of 229-367 m, and does not resemble *S. fungulus* ALOCK, 1902, which is living at the depths to 15 m and marks the upper bathymetric limit of the genus. The species *Flabellum roissyanum* MILNE-EDWARDS & HAIME, 1884, with a thin pedicel mostly

REUSS (1871) and PROCHÁZKA (1893)		DEMBIŃSKA-RÓŻKOWSKA (1932)	MOENKE (1953)
VIENNA BASIN Baden	MORAVIA Rudoltice (Rudelsdorf)	PODOLIA (UKRAINE) Dryszczów	CARPATHIAN FOREDEEP Bęczyn
■			
		■	
■ (PROCHÁZKA)		■	■
	■		■
	■		
	■		
		■	
■			
■		■	■
■?■ non *F. roissyanum* from Korytnica			■ *F. zejszneri*
			■
	■ *B. varians*	■ *B. varians*	■ *B. varians* *D. taurinensis*

Table 16

A synonymized and updated list of coral species described from the Korytnica Basin and their distribution in selected Miocene localities of the Paratethys approches to the Recent *F. pavonicum* group of species living at the depths of 223-271 m. Taking into account the remarks on *P. duncani* (REUSS, 1871), given above, it seems that ahermatypic fauna from the Korytnica-Forest site originated at the depths below 100 m.

The coral fauna of the Mt. Lysa site shows greater diversity than the former one: beside ahermatypic genera (five known in the former site) fragments of dwarfed hermatypic colonies can be found here. The development of *Dendrophyllia taurinensis* MILNE-EDWARDS & HAIME, 1884, as well as *Tethocyathus microphyllus* (REUSS, 1871), is likely to be connected with the availability of a suitable substrate formed by abundant oyster shells, mainly *Ostrea frondosa* de SERRES. The two hermatypic genera found at the site — *Porites* and *Siderastraea* — are known (*see* RONIEWICZ & STOLARSKI 1991) as relatively eurytopic ones. In the Korytnica Basin they probably lived in rather deeper waters (dwarfed colonies), if they are not an allochthonous component. The occurrence of the species indicative of deep-water environment as: *Flabellum roissyanum* MILNE-EDWARDS & HAIME, 1884, and *Peponocyathus duncani* (REUSS, 1871) does not permit for an unequivocal interpretation of the shell-bed facies as distinctly shallow-water one (BAŁUK & RADWAŃSKI 1977). The Korytnica-Plebania site with the most shallow-water fauna in the Korytnica Clay section (RONIEWICZ & STOLARSKI 1991) contains some foreign deeper-water elements characteristic of the Korytnica-Forest site, such as *Peponocyathus duncani* (REUSS, 1871) and *Ceratotrochus granulatus* DEMBIŃSKA-RÓŻKOWSKA, 1932. This may be explained either by the redeposition of shallow-water fauna into sublittoral environment or its development in the intermediate area between the deep-water and shallow-water zones, where the conditions were favorable neither for the ahermatypic (rare) nor the hermatypic corals (underdeveloped colonies of *Tarbellastraea* and *Porites*).

FAUNISTIC RELATIONSHIPS

The described ahermatypic fauna has much in common with the one described by DEMBIŃSKA-RÓŻKOWSKA (1932) from other Miocene sites. This is especially true of Dryszczów in Podolia (*see* Table 16, since all species (six of them, including specimens of *Syzygophyllia brevis* REUSS, 1890; *see* RONIEWICZ & STOLARSKI 1991) from Dryszczów are present at Korytnica, especially in the Korytnica-Forest site. The Miocene ahermatypic fauna of Bęczyn (MOENKE 1953; *see also* Table 16) is also closely related as six of nine ahermatypic species of Bęczyn are present at Korytnica. It also shows close relationship with the coral fauna of the Badenian from the Vienna Basin and Moravia (REUSS 1871; *see also* RONIEWICZ & STOLARSKI 1991, *and* Table 16). For instance, the sites Korytnica-Forest and Mt. Lysa resemble in the composition of ahermatypic fauna the sites Baden (Badener Tegel) and Rudoltice (= Rudelsdorf) (Oberer Tegel), respectively. There are also similarities (most often individual species) to the fauna of other sites from the Parathetys. For instance, from Slovakia and Hungary there are 5 common ahermatypic species and 9 genera/subgenera (*compare* KOPEK 1952); from Bulgaria there are 1 common species and 4 genera /subgenera (*compare* KOJUMDGIEVA 1960). From the Miocene sites of the North Sea Basin there are 4 common species and 7 genera/subgenera (*compare* KREJCI 1926, CHEVALIER 1964). Numerous species seem to have very wide geographical distribution, e. g. *Acanthocyathus transilvanicus* REUSS, 1871, *Ceratotrochus (E.) duodecimcostatus* (GOLDFUSS, 1829), and *Peponocyathus duncani* (REUSS, 1871). One species is hitherto known from a limited area of Dryszczów in Podolia

(*Ceratotrochus granulatus* DEMBIŃSKA-RÓŻKOWSKA, 1932). It is highly probable that at least some of the described fossil species have their direct descendants in the Recent fauna of the Atlantic or of the Mediterranean (*see* Table 15), for example: *Peponocyathus duncani* (REUSS, 1871) → *P. folliculus* (POURTALES, 1868), and *Polycyathus confertus* (REUSS, 1847) → *P. muellerae* (ABEL, 1959).

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KORALOWCE MIOCEŃSKIE (Scleractinia) Z GÓR ŚWIĘTOKRZYSKICH; CZĘŚĆ *1* — Caryophyllidae, Flabellidae, Dendrophylliidae, Micrabaciidae

(Streszczenie)

Bogaty materiał koralowców (Scleractinia) z mioceńskich osadów Basenu Korytnicy (*patrz* fig. 1) posłużył do przeprowadzenia rewizji ich wcześniejszych oznaczeń (*patrz* DEMBIŃSKA-RÓŻKOWSKA 1932; *oraz* tab. 16). Opisano 14 gatunków koralowców ahermatypowych należących do 12 rodzajów i podrodzajów z rodzin: Caryophylliidae, Flabellidae, Dendrophylliidae oraz Micrabaciidae (*patrz* fig. 2-10, tab. 1-14 oraz pl. 1-12).

Używajac danych pochodzących z obserwacji koralowców współczesnych dokonano próby analizy ekologicznej zespołu występującego w iłach korytyńskich. Faunę koralowcową z pewnych stanowisk (Korytnica-Plebania, Góra Łysa) uznano za niejednorodną pod względem swych wymagań ekologicznych. Fauna ahermatypowa z innych stanowisk (Korytnica-Las) została zinterpretowana jako autochtoniczna, zaś środowiskiem jej życia wydaje się być strefa głęboko-sublitoralna.

Składem gatunkowym korale mioceńskie z Basenu Korytnicy nawiązują do zespołów znanych z osadów miocenu osłaniających się u brzegu Karpat (Męczyn) oraz innych stanowisk Paratetydy, m. in. z Dryszczowa na Podolu, Moraw (Rudelsdorf = Rudoltice) oraz z Basenu Wiedeńskiego (Baden).

We współczesnej faunie ahermatypowej Morza Śródziemnego i Atlantyku można doszukać się szeregu podobieństw, a niektóre gatunki są prawdopodobnie potomkami filogenetycznymi form znanych z miocenu (*patrz* tab. 15).