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SCLERACTINIAN CORALS FROM THE MIDDLE MIOCENE SALT DEPOSITS IN CARPATHIAN FOREDEEP, POLAND

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Two forms of ahermatypic corals, *Caryophyllia salinaria* (Reuss) and *Vielicyathus zejszneri* gen. et sp. n. are described from Middle Miocene salt-bearing sediments of the Wieliczka and Bochnia salt mines. The corals are thought to have been redeposited penesynchronously into the salinary basin by means of sedimentary gravity mass movements.

Key words: ahermatypic Scleractinia, Tertiary, Badenian, Carpathian Foredeep, Poland.

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INTRODUCTION

The corals here under consideration come from Middle Miocene sediments exposed in the salt mines of Wieliczka and Bochnia in the vicinity of Cracow (fig. 1). In the Wieliczka mine the corals occur in conglomeratic saline deposits which constitute the upper portion of the so called "stratified salts" (Gaweł 1962). The deposits are of Badenian age (table 1) as indicated by their localisation within the *Uvigerina costai* foraminiferal zone (Łuczowska 1978, Kolasa and Ślącza 1985a). Excellent state of preservation gives and insight into the microstructure of skeletons and allows to investigate the mode of growth of the coral discussed. This led to the revision of the diagnosis of *Caryophyllia salinaria* (Reuss) and resulted in recognition of a new species which represents a new genus, *Vielicyathus zejszneri*.

Most of the material here under consideration is deposited in the Museum of the Wieliczka salt mine (abbreviated here as MZKW). A few specimens come from the collection of ing. J. Wiewiórka, MS (Wieliczka

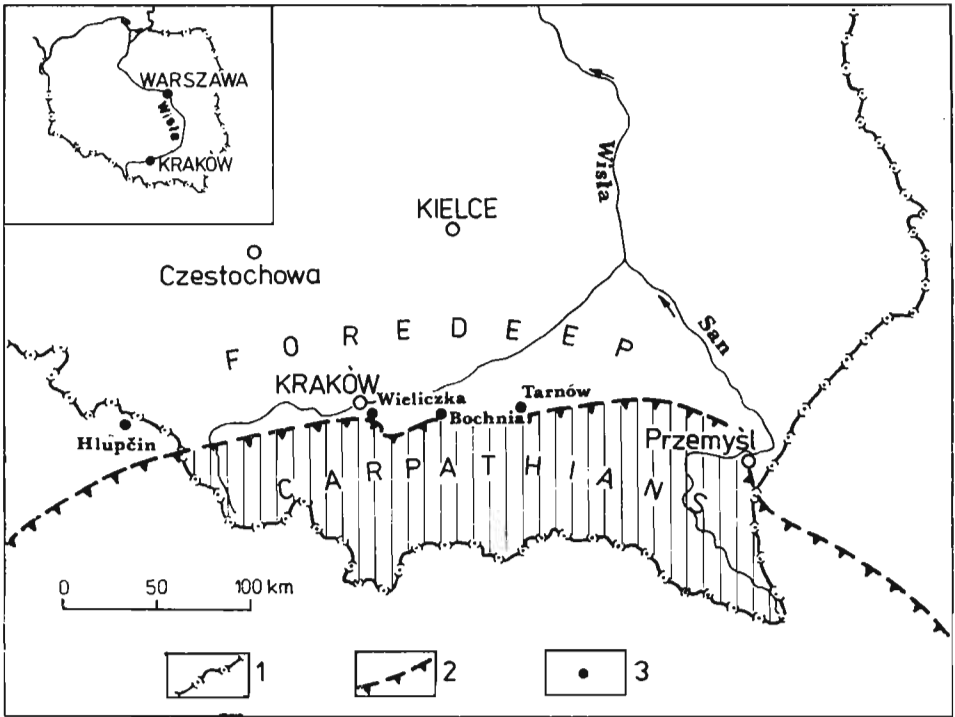


Fig. 1. Location of coral sites. 1 state border, 2 front of Carpathian Overthrust, 3 coral sites.

Table 1
Occurrence of corals in the Miocene profile of the Carpathian Foredeep, foraminiferal zones of the Badenian after Łuczowska 1978

Region	CARPATHIAN FOREDEEP	
	Foraminiferal zones	Distribution of Corals: Wieliczka, Bochnia
SARMATIAN		
BADENIAN	Hanzawaia crassisepta Neobulimina longa	
	Uvigerina costai	[Cross-hatched pattern]
	Candorbulina suturalis	
KARPATHIAN		

salt mine) and one coral — from the collection of ing. T. Steindel (Bochnia salt mine).

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MODE OF OCCURRENCE OF THE CORALS EXAMINED

Wieliczka

The collection from the Wieliczka mine consists of 66 specimens singled out from the enclosing rock and a number of specimens which are still inserted in it. The majority of the specimens investigated is incomplete which is due to their friability. The specimens were collected from salt-bearing conglomerates and breccia sediments which are known as the "spiza salts" (fig. 2). These sediments are composed of clastic material which may show graded bedding and cross-stratification. Sporadically there are also intercalations of marls and mudstones containing planktic foraminifera. The conglomerates and breccias include: blocks and pebbles derived from Miocene sandstones, marls and mudstones, fragments of flysh rocks, blocks and crystals of salt and sandy materials. All these clasts are enclosed in a saline-clayey matrix. There are also references in

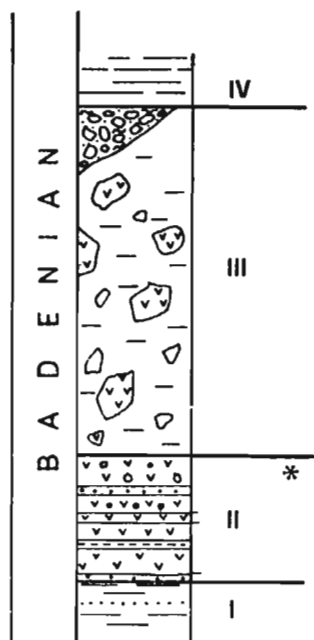


Fig. 2. The lithostratigraphic profile of the salt-bearing formation in Wieliczka (after Słaczka and Kolasa 1985a, simplified). I Skawina beds, II stratified salts, *coral horizon, III "Zuber salts", IV Chodenice beds.

literature to the occurrence of corals in clays interbedding the salt beds (Zejszner 1845).

In the salt-bearing deposits relatively rich micro- and macrofauna is known (see below), as well as land flora (Zabłocki 1930, Łańcucka-Środoniowa 1984).

The corals from Wieliczka belong to two species: *Caryophyllia salinaria* (Reuss) and *Vielicyathus zejszneri* gen. et sp. n. They are enclosed in halite crystals or in mass of salt grains (pl. 46: 2). They may also occur in clays which are associated with salts (pl. 46: 1). The calices of corals and the intraskeletal voids are filled with salt or clay. Occasionally such voids are empty. The skeletons are friable but show no significant mechanical deformations. Also their mineralogical composition has not been much altered and the skeletons are remained aragonitic.

Bochnia

Vielicyathus zejszneri from the salt mine in Bochnia shows similar state of preservation and comes from sediments of the same age as those in the Wieliczka mine.

COMMENTS ON LIFE CONDITIONS

Corals from Wieliczka and Bochnia are represented by ahermatypic forms: an endemic species (*C. salinaria*) hitherto known exclusively from the Middle Miocene (Badenian) of the Carpathian Foredeep (Zejszner 1845, Reuss 1867, Roemer 1870, Rózkowska 1932) and a new species (*Vielicyathus zejszneri*).

In reconstruction of the life environment of the corals discussed due consideration is given to the associated organic remains and to the life conditions of the recent ahermatypic corals, as well as to character of sediment.

Recent ahermatypic corals occur in marine waters showing normal salinity (from 2.7 to 4.0‰, optimum 3.6‰), within a wide range of temperature (from about -1.1°C to 36°C , mostly between 4.5° and 10°) and depth (from 0 to about 6.000 m, optimum 180—550 m). The corals belonging to the genus *Caryophyllia* are found at depth range from 0 to about 2.800 m (Vaughan and Wells 1943, Wells 1956, Cairns 1982). Accordingly, the life conditions of the corals under consideration may be assigned to a wide range of temperature and depth but a narrow interval of salinity.

Normal salinity of the basin waters populated by Badenian corals is indicated by the composition of fauna co-occurring with corals in salt-bearing deposits. From the Badenian deposits of Wieliczka a rich fauna has been described: foraminifera (Reuss 1867, Małecki 1954, Łuczowska 1967), numerous molluscs (bivalves and gastropods) and bryozoans; be-

sides, there are known annelids, crustaceans (mainly ostracods) and echinoderms (Reuss 1867, Kulka 1980 and others). In the clay material filling some of the coralla, we have found benthic and planktic foraminifera (mainly of the genus *Globigerina*), as well as broken mollusc shells.

A relatively rich epifauna is to be found on corals: coral juveniles, polychaete tubes (to 1 mm in diameter), and incrusting colonies of bryozoans. In the external skeletal parts, very thin (30—90 μm in diameter) borings occur (pl. 43: 1b, pl. 44: 3a). Neither corals nor any of the organisms from salt-bearing deposits mentioned here are characteristic of the hypersaline conditions.

As far as depth is concerned, the assemblage of organisms co-occurring with corals suggests depth comparable to the neritic zone rather than deep sea. The type of sediment filling the coralla — dark clayey sediment — is an evidence of a calm environment.

In their biotope the corals found favourable conditions of development and this is indicated by their frequency and large size of some coralla. In the conglomerate with clay matrix from Wieliczka, the corals are scattered or occur in agglomerations. More than ten individuals per 1 m² may be observed in the beds (Kolasa 1985). This relatively high coral frequency indicates high original population density.

The caryophylliids lived on clayey bottom. Their size and regular shape of the largest individuals (Zejszner 1845, Reuss 1867, Roemer 1890 and herein pl. 41) suggest development in a calm environment. Individuals which had been overturned might develop in a worm-like form, lying on the bottom. On their surface settled planulae (pl. 44: 3a) and other epifauna in search of any stable substrate in sediment bottom conditions.

The above indicated environment which was characterized by relatively shallow, low energy marine waters showing normal salinity, was situated in the southern part of the primary basin of the Carpathian Foredeep. The presence of corals and other fossils indicative of such an environment in the salt bearing sediments is explained by penesynchronous redeposition by means of gravity mass movements flowing to more northern parts of the basin (Kolasa and Ślącza 1985b).

DESCRIPTIONS

Suborder **Caryophylliina** Vaughan et Wells, 1943

Family **Caryophylliidae** Gray, 1847

Genus *Caryophyllia* Lamarck, 1801

Type species: Madrepora cyathus Ellis et Solander, 1786 (by subsequent designation of Stokes and Broderip 1828).

Discussion. — The species occurring in salt deposits of Wieliczka have been known in the literature as *Caryophyllia* Lamarck and *Coenocyathus* Milne-Edwards

et Haime (see synonymy of *C. salinaria*). Both genera are closely neighbouring in the family Caryophylliidae. The main difference between the two is that *Coenocyathus* is able to form colonies whereas *Caryophyllia* is a simple coral (Zlatarsky 1982 includes into the genus *Coenocyathus* both colonial and simple forms).

Chevalier (1966: 967) reports that several species with typical features of *Coenocyathus* (Recent *C. dohyrni* and *C. diesbrechti*) have coenosarcal or intracalicular budding, both leading to dendroid growth form. According to this author the intracalicular budding is typical of *Coenocyathus*. While discussing *Coenocyathus lobatus* (l.c.: 965) — having incrusting colonies — he points out that its coenosarcal budding is not typical of the genus *Coenocyathus*.

Reuss (1859) presents the Oligocene species, *Coenocyathus costulatus*, which forms colonies of unequal individuals (l.c.: pl. 1: 3). This seems to be a case of coenosarcal budding on the surface of large individuals. Also *Coenocyathus depauperatus* Reuss (1872: 211, pl. 3: 8, 9) from the Miocene of the Viena Basin has the form of colony with coenosarcal increase; fig. 9 shows two large, fused individuals with numerous young ones which grow from the coenosarc and belong to two generations; fig. 8 presents two fused calices in the similar stage of development. In the last case one of the individuals seems to grow out from the wall of the other.

Caryophyllia salinaria (Reuss) described here, occurs as a simple coral with small individuals which never attain the adult size (pl. 41: 1a, c) distributed on its surface. The nineteenth century authors included this species to the genus *Caryophyllia*. Rózkowska (1932) on the other hand considered it as colonial form belonging to the genus *Coenocyathus*. We accept the earlier view and include the species in *Caryophyllia*. We consider it an aggregational not colonial form. We also point to the need of reviewing the existing generic names for the species with coenosarcal budding as within this group one may expect an aggregational growth form.

Caryophyllia salinaria (Reuss, 1847)

(figs. 3, 4, pl. 41: 1a—c, pl. 42: 1a—e)

1845. *Caryophyllia crassa* Zejszner: 3, pl. 7: 1, 2.

1845. *Caryophyllia Boczkowskii* Zejszner: 4, pl. 7: 1, 2.

1847. *Cyathina salinaria* Reuss: 15, pl. 2: 1—4 (*vide* Reuss 1867: 107).

1867. *Caryophyllia salinaria* Reuss; Reuss: 107, pl. 5: 6—9.

1870. *Caryophyllia salinaria* Reuss; Roemer: 399, pl. 41: 5, 6.

1932. *Coenocyathus crassus* Zejszner; Rózkowska: 149, pl. 6: 2.

Material. — Four specimens: MŻKW III-410/11, MŻKW III-985/1—3; three thin sections: MŻKW III-985/1a—c.

Holotype lost; *neotype* has been chosen from among the examined specimens.

Neotype: MŻKW III-410/11; pl. 41: 1a—c. A specimens with distal part preserved and proximal broken.

Dimensions (in mm):

Specimens No.	max. d of corallite	d of calice	d proximal	H	s
MŻKW III-410/11	30×33	23×25	18×20	> 85	56(14S1/S2+14S3+28S4)
MŻKW III-985/1	22	20	20	> 15	ca. 56
MŻKW III-985/2 (enclosed in salt)	16×20	—	—		ca. 56
MŻKW III-000/0	16×19	—	—	8	ca. 56

Description.— Simple. Adult individuals trochoid, cylindrical, straight, sometimes bent proximally. In the distal part of the corallum S1 and S2 ribs equal, well developed, protruding, Calice subcircular or slightly ovate. Calicular edge sharp. An initial bud in form of the "pocket" visible on the calicular edge. Costosepta differentiated into three or four size orders (fig. 3, pl. 41: 1c, pl. 42: 1a). Septa exsert, arranged mainly in 14 systems. The S1 and S2 septa of subequal length and thickness, attain 1/3 of the corallite diameter; S3 slightly shorter, with long pali; S4 very short, regularly spaced. The pali developed exclusively in front of S3, often folded. Septal distal edge nearly smooth. Lateral surface ornamented by small sharp granules arranged in rows along the course of trabeculae. The inner edge of S1 and S2 with paliform lobes. Columella feeble, parietal. Endothecal elements sparse, thin, tabuloid. Wall septothecal.

On the surface of the neotype corallum, numerous juvenile subcylindric caryophylliids may be observed. They have extrathecal stereozone of thick and smooth surface (pl. 41: 1a, 1c). The youngest ones have six S1 and two S2, at the diameter of 0.6 mm (pl. 48: 2). Young individuals developed of larvae settled on the corallum lying on the bottom. The taxonomic affiliation of the juvenile forms has not yet been determined.

C. salinaria may have lateral or coenosarcral increase (see Zejszner 1845: pl. 1: 2).

Microstructure.— Radial elements of closed type (fig. 4). Trabeculae small, densely spaced (5/100 μm), often poorly distinguishable within mid-septal zone (pl. 42: 1c—e). The mid-septal zone straight or slightly wavy. The width of primary septum falls within 50—150 μm and depends on the individual's age. In adult individuals it is about 50—80 μm when the total thickness of S1 septum (middle part) is about 250 μm (pl. 42: 1a—e). Wall septothecal, formed of widened, peripheral ends of radial elements and completed by epicostal stereozone. Stereozone composed of concentric layers with fibrous structure. The fibres arranged radially.

Remarks.— Rózkowska (1932) reports this species from the Miocene deposits of Wieliczka, Bochnia and Zgłobice near Tarnów (fig. 1). No specimens from the last

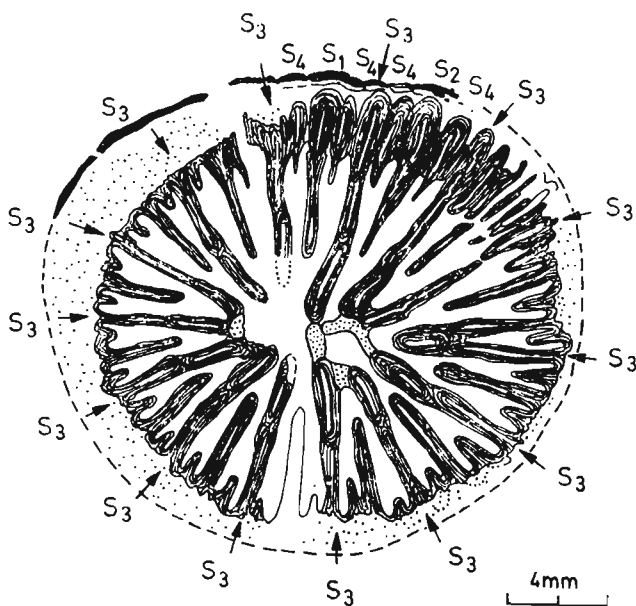


Fig. 3. *Caryophyllia salinaria* (Reuss): neotype, MZKW III-410/11 transverse section, radial elements and pali in front of S3. S₁—S₄ costosepta of succeeding orders.

two sites are illustrated and therefore one cannot be sure whether they represent *Caryophyllia* or the newly described genus *Vieliccyathus*.

For the species described above, we use the name formed by Reuss (1847). The specific names introduced two years earlier by Zejszner (1845, see synonymy), fall within the category of forgotten names as one of them has never been used again (*C. boczkowskii*) and the other—only once, over eighty years after original publication (*C. crassa*). Contrary to this, *C. salinaria* has been accepted in the literature of the 19th century.

Occurrence.—The salt mine in Wieliczka: stratified salts ("spiza"), Badenian (foraminiferal zone *Uvigerina costai*). Hlupčín (= Hultschin in Roemer 1870) in Opava Silesia (Czechoslovakia), Badenian.

Genus *Vieliccyathus* nov.

Type species: Vieliccyathus zejszneri gen. et sp. n.

Derivation of name: from type locality name, Wieliczka.

Diagnosis.—Simple. Radial elements of an open type, their costal part poorly developed. Pali in front of S3 septa. Columella parietal. Wall of archaeothecal type. Endotheca dissepimental, poorly developed.

Monotypic genus.

Discussion.—The genus *Vieliccyathus* is very close to *Caryophyllia* from which it differs in open-type radial elements and archaeothecal wall. From *Coenocyathus* it differs in non-colonial growth form. Unfortunately, poor knowledge of *Coenocyathus* species does not allow any detailed comparison between the two genera. The only exception is Recent *C. anthophylloides* M. Edwards et Haime (a colonial

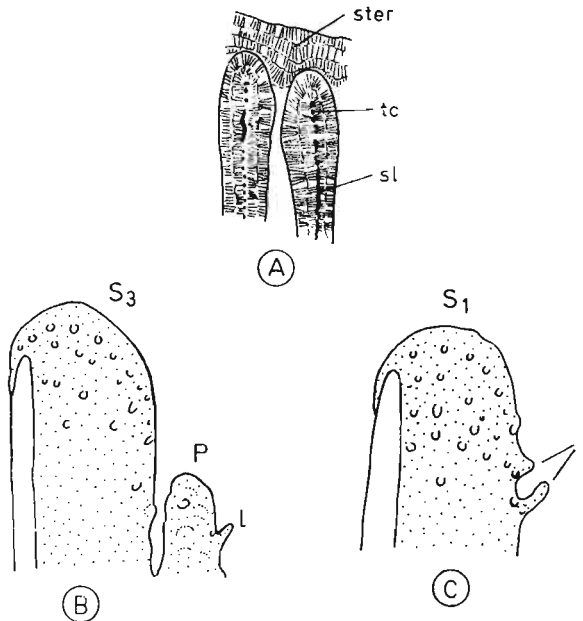


Fig. 4. *Caryophyllia salinaria* (Reuss): A scheme, transverse section of the peripheral part of the corallum radial elements of a closed type; B S1—S2 septa in side view, schematized; C S3 septum in side view, schematized. l septal lobe, p palus, sl mid-septal line, ster external stereozone, tc trabecular centres, wl wall line.

caryophylliid) described by Chevaier (1966: 964, fig. 19). The type species of the genus *Vielicyathus* resembles it in skeleton structure and microstructure (archaeothecal wall) and differs, among others, in its simple growth form.

Vielicyathus zejszneri gen. et sp. n.

(figs. 5, 6; p. 43: 1—6; pl. 44: 1—3; pl. 45: 1, 2; pl. 46: 1—6; pl. 47: 1—4; pl. 48: 1, 2)

Syntypes: MŻKW III-413/3, pl. 43: 4a—c; MŻKW III-413/14, pl. 43: 2 and pl. 48: 1a—c; MŻKW III-986/4, pl. 44: 3a, b; MŻKW III-985/6, pl. 45: 1a, b; MŻKW III-986/16, pl. 47: 3 and pl. 48: 1a—c).

Type locality: Wieliczka near Cracow.

Type horizon: stratified salts "spiza", Badenian (foraminiferal zone *Uvigerina costai*).

Derivation of name: *zejszneri* — dedicated to Ludwik Zejszner (Zeuschner 1805—1871), professor of geology and paleontology of the Jagiellonian University in Cracow.

Diagnosis. — Juvenile individuals subcylindrical with thick, smooth extrathecal stereozone. Adult individuals trochoid, bent proximally, often with numerous transverse narrowings rhythmically alternating with enlargements. Surface bare or

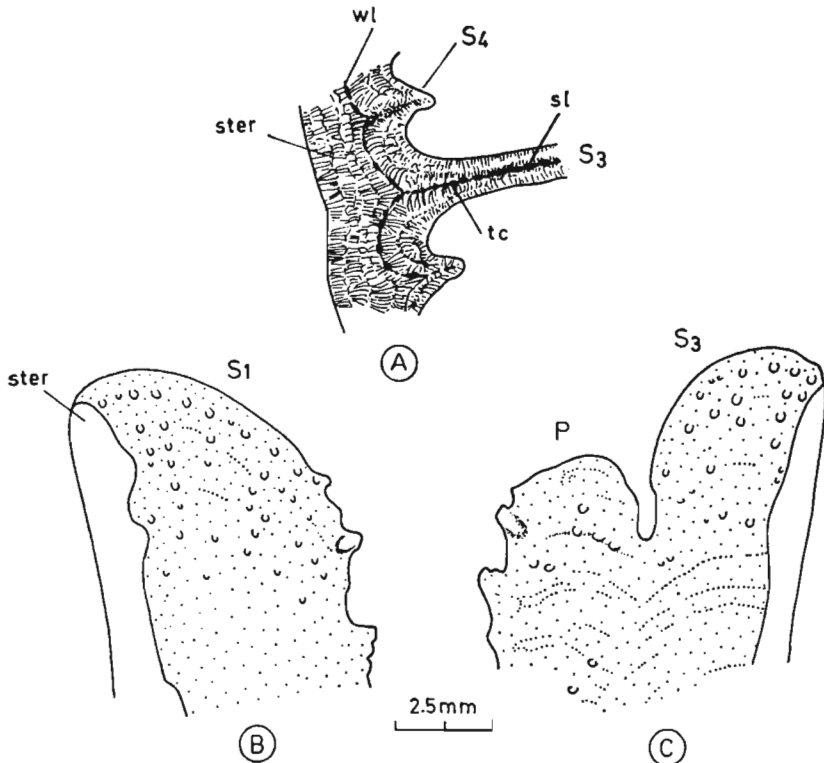


Fig. 5. *Vielicyathus zejszneri* gen. et sp. n.: A scheme, transverse section of the peripheral part of the corallum, radial elements of an open type; B specimen MŻKW III-985/6, side view of S1—S2 septa, the peripheral part of S1 radial element variable in structure; C the same specimen, side view of S3 septum with a palus and lobes. Other explanations see fig. 4.

covered by thin epitheca. Maximum diameter—about 50 mm, height—more than 60 mm, number of septa—66. Pali long. Parietal columella of loose structure. Dissepiments sparse, irregularly spaced.

Material.—Sixty two specimens from Wieliczka: MŻKW III-412/1—3, 413/1—23, 414/1—2, 472, 620, 985/4—38; a specimen from Bochnia; three thin sections (transverse and longitudinal): MŻKW III-985/4a, 16a, 25a.

Dimensions (in mm):

max. d of adults	20—50
d of calices	18—48
d of proximal end from about 0.6	
H (broken coralla) > 60	
■	up to 66

Description.—Adult individuals trochoid, subcylindrical, straight and bent most often at the proximal end. Numerous transverse narrowings of coralla (pl. 43: 2, 3, 4a, b, 6). Sparse ornamentation in the form of nodes. Extrathecal stereozone granular, mainly on the surface of the proximal part. Calice subcircular or slightly ovate. Calice edge sharp. Radial elements exsert, arranged into 12—18 systems, most often 14. S1 and S2 septa subequal, their length about 1/3 of the calicular diameter. S3 slightly shorter with flat pali reaching the centre of the calice. Pali folded with well developed nodes on their sides. The distal edge of septa almost smooth or poorly ornamented with small, sharp dentation. The inner edge of S1 and S2 septa with paliform lobes. Columella composed of poorly fused trabecular projections of septa and pali. Wall archaeothecal. Endothecal elements thin, scarce, tabuloid.

Microstructure.—In mid-septal zone small densely spaced trabeculae, 5—8/100 μm (pl. 48: 1b). Frequently, mid-septal trabeculae dissolved resulting in development of

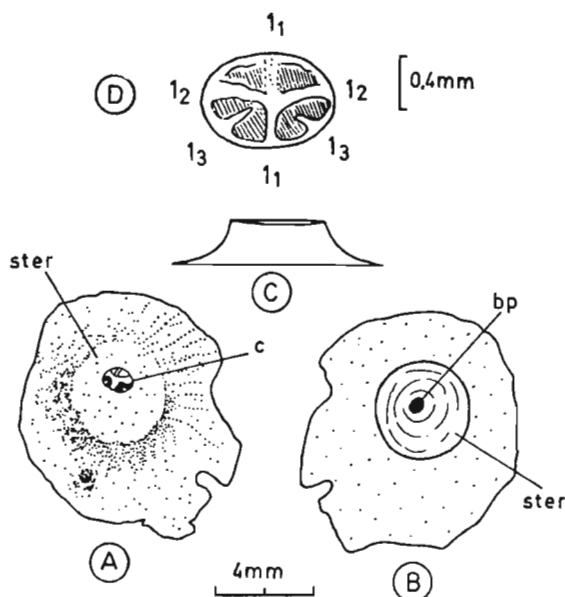


Fig. 6. Juvenile caryophylliid indet. from the surface of *Caryophyllia salinaria*, MŻKW III-410/11: A distal view; B proximal view, marked growth lines of external stereozone, the outline of basal plate in the centre; C lateral view; D calice (from A) magnified to show protosepta, bp basal plate, c calice, ster external stereozone, 1₁—1₃ succeeding orders of protosepta.

a mid-septal fissure. On internal surfaces of radial elements, broken along the mid-septal fissure, visible the outlines of trabeculae arranged in series or in strongly asymmetrical divergent system with rudimentary costal part (fig. 5, pl. 45: 1b). Almost symmetrical arrangement of trabeculae in pali. Wall archaeothecal (*sensu* Alloiteau 1957, and Chevalier 1971), formed of vertical trabeculae arranged in a row which is the continuation of a row of trabeculae running along septal mid-line (pl. 48: 1a—c). Sometimes on the prolongation of the mid-line appear pseudocosta.

Occurrence. — Wieliczka salt mine: stratified salts ("spiza"), Badenian (foraminiferal zone *Uvigerina costai*); Bochnia salt mine: Badenian.

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KORALOWCE ZE ŚRODKOWOMIOCEŃSKICH UTWORÓW SOLONOŚNYCH ZAPADLIKA PRZEDKARPACKIEGO

Streszczenie

Opracowane koralowce pochodzą z utworów solonośnych badenu, ściślej — z warstw odpowiadających poziomowi otwornicowemu *Uvigerina costai* (Łuczowska 1967, 1978, Kolasa i Ślącza 1985a), odsłaniających się w kopalni soli w Wieliczce i Bochni.

Zbiór koralowców z kopalni w Wieliczce złożony jest z około 80 okazów. W większości są to okazy niekompletne ze względu na ich bardzo kruche szkielety. Zostały one zebrane z brekcji (fig. 2) występującej w stropowej części „soli spizowej” (Kolasa i Ślącza 1985b). Koralowiny są uwięzione w kryształach lub agregatach kryształów solnych (pl. 46: 2), bądź też w masie ilastej towarzyszącej brekcji solnej (pl. 46: 1). Kielichy koralowców i przestrzenie śródszkieletowe wypełnione są solą lub ilem, sporadycznie są one puste. Szkielety nie uległy przeobrażeniu mineralicznemu, zachowały się bowiem w pierwotnej postaci aragonitowej.

Koralowce z utworów solonośnych Wieliczki reprezentowane są przez ahermatypowy, endemiczny gatunek, *Caryophyllia salinaria* (Reuss) (figs. 3, 4, pls. 41, 42) znany dotychczas wyłącznie ze środkowomioceńskich (badeńskich) utworów polskiej strefy przykarpackiej (Zejszner 1845, Reuss 1867, Rózkowska 1932) i Śląska Opawskiego (Roemer 1870, Rózkowska 1932), oraz nowokreowany gatunek z rodziny Caryophyllidae: *Vielicyathus zejszneri* gen. et sp. n. (fig. 5, pls. 43—48).

Okaz *Vielicyathus zejszneri* z kopalni soli w Bochni wykazuje podobny stan zachowania i pochodzi z tych samych wiekowo utworów, co koralowiny z Wieliczki.

Przy próbie określenia środowiska życia opisanych koralowców wzięto pod uwagę wymagania współczesnych koralowców ahermatypowych, charakter zespołu organizmów towarzyszących oraz typ osadów wypełniających i otaczających koralowiny. Na tej podstawie uważa się, że koralowce te żyły w morzu spokojnym, o zasoleniu normalnym lub prawie normalnym, niezbyt głębokim (porównywalnym z głębokościami strefy nerytycznej), na słabo skonsolidowanym, mulastym dnie. Zasiedlały one południową strefę basenu zapadliska przedkarpackiego, skąd wraz z innym materiałem były przenoszone prądami zawieszinowymi i grawitacyjnymi w głębsze, bardziej północne strefy basenu. Są one zatem fauną penesynchronicznie redeponowaną do utworów solonośnych badenu.

EXPLANATIONS OF THE PLATES 41—48

All specimens from Badenian, Wieliczka with the exception of pl. 44: 1a—c — Badenian, Bochnia

Plate 41

Caryophyllia salinaria (Reuss), neotype, MŻKW III-410/11

1. a, b corallum in side views, protruding costae on the prolongation of S1 and S2 and juvenile caryophylliids (sp. indet.), natural size; c calicular view, the axial part a little damaged, $\times 3$.

Plate 42

Caryophyllia salinaria (Reuss), MŻKW III-985/1

1. a corallum in transverse section, pali in front of S3 and fragments of thin epitheca, $\times 3$; b longitudinal section of radial elements and dissepiments, $\times 3$; c a fragment of the inner edge of palus with slightly marked trabeculae in the septal mid-line, \times appr. 95; d the same palus and trabecular lobes (arrows) of the two neighbouring pali, $\times 46$; e septotheca in transverse section, radial elements of closed type with poorly developed costal part, layers of extrathecal stereozone, $\times 46$. Note the initiation of the mid-septal fissure resulted from dissolution and washing out of trabecular tissue.

Plate 43

Vielicyathus zejszneri gen. et sp. n. Shapes of coralla and external ornamentation

1. MŻKW III-413/16: a broken corallum in distal view, $\times 2$; b smooth external surface, $\times 2$.

2. MŻKW III-413/14, syntype: transverse narrowings of the corallum and juvenile individuals, $\times 2$.
3. MŻKW III-413/19: corallum with transverse narrowings and bent proximal part, $\times 2$.
4. MŻKW III-413/3, syntype: a side view, transverse narrowings and nodular ornamentation of the external corallum surface, $\times 2$; b a fragment of the same, $\times 3$; c proximal view, $\times 5$.
5. MŻKW III-620/1: a subcylindrical form with smooth surface, $\times 2$.
6. MŻKW III-985/7: corallum with transverse narrowings and fissure-like trace of damage on the external surface done at the lifetime of individual, $\times 2$.

Plate 44

Vielicyathus zejszneri gen. et sp. n.

1. Specimen of Bochnia (T. Steidel's collection): a transverse broken section, \times ca. 0.66; b the same, $\times 2$; c external surface of the corallum with clearly marked ornamentation and a trace of a damaged juvenile (arrow), $\times 1.3$.
2. MŻKW-413/7, syntype: transverse broken section, $\times 2$.
3. MŻKW III-985/4, syntype: a corallum surface with settled juvenile caryophylliids (arrows), $\times 2$; b longitudinal axial section, with juvenile individual (arrow) settled on the surface, $\times 2$; c transverse section, $\times 2$.

Plate 45

Vielicyathus zejszneri gen. et sp. n.

1. MŻKW III-985/6, syntype: a corallum fragment; b radial elements (S1—S2 septum at left, columella in the middle, S3 septum+palus at right) broken along the mid-septal fissure and showing internal surfaces with growth lines and delicate traces of trabeculae (left), $\times 5$.
2. MŻKW III-413/15: two corallites of different size fused with side surfaces. The external surface of the smaller one ornamented by vertical rows of delicate granulation (see also pl. 46: 4), $\times 2$.

Plate 46

Vielicyathus zejszneri gen. et sp. n.

1. MŻKW III-414/1, 2/P₂: coralla in salt-bearing conglomerate, $\times 1$.
2. MŻKW III-412/1—3: corallum in salt aggregate, $\times 1$.
3. MŻKW III-413/22: longitudinal broken section, in peripheral parts of the corallum one can see longitudinal sections of two opposite S4 septa (arrows) broken along the mid-septal fissure, in the centre overgrown septal lobes forming columella, $\times 5$.
4. MŻKW III-413/15: corallum surface covered by rows of fine granulation.
5. MŻKW III-985/21: longitudinal broken section, seen along septal lobes, $\times 3$.
6. MŻKW III-985/18: transverse broken section, thick external stereozone visible; in place of wall and mid-septal zones occurs a fissure resulted from dissolution and washing out of trabecular tissue, $\times 5$.

Plate 47

Caryophylliid indet.

1. MZKW III-410/11: juvenile caryophylliid indet. in upper view, an individual detached from the side surface of the specimen *C. salinaria* figured in pl. 41: 1.

Vielicyathus zejszneri gen. et sp. n.

2. MZKW III-985/9: corallum in distal (a) and side (b) views, on the latter the proximal end visible, $\times 3$.
3. MZKW III-985/16: two juveniles in lateral view broken off the substrate, $\times 3$ (see also pl. 48: 1).
4. MZKW III-413/20: a group of juveniles torn off from the surface of an adult individual, $\times 3$.

Plate 48

Vielicyathus zejszneri gen. et sp. n.

1. MZKW III-985/16: a transverse section, $\times 10$; b a detail with thick external stereozone, septa of open type with the mid-line extending into the wall, trabeculae visible in the septum, $\times 90$ (see also pl. 47: 3), c palus in front of S3 (arrow), $\times 45$.
2. A juvenile torn off the side surface of an adult (MZKW III-985/25): six S1 visible, six S2 poorly marked, the wall line passing into the mid-septal line, thick stereozone composed of succeeding layers, \times ca. 40.

