ACTA PALAEONTOLOGICA POLONICA

Vol. 23 1978 No. 3

ANDRZEJ GAŹDZICKI, HEINZ KOZUR, RUDOLF MOCK AND JERZY TRAMMER

TRIASSIC MICROFOSSILS FROM THE KORYTNICA LIMESTONES AT LIPTOVSKÁ OSADA (SLOVAKIA, ČSSR) AND THEIR STRATIGRAPHIC SIGNIFICANCE

Abstract. — Foraminifers, sponge spicules, conodonts, and holothurian sclerites are recognized in the Korytnica Limestones at Liptovská Osada (West Carpathians, Slovakia). Five new holothurian sclerite species are erected, namely *Eocaudina liptovskaensis* sp.n., *Kuehnites slovakensis* sp.n., *Praecaudina mostleri* sp.n., *Theelia liptovskaensis* sp.n., and *Theelia trammeri* sp.n. The Korytnica Limestones are assigned to the Lower Carnian (Cordevolian), basing upon the entire microfossil assemblage. The Korytnica Limestones are also demonstrated to be time equivalent to the Upper Cassian Beds of the Dolomites.

INTRODUCTION

The Korytnica Limestones make a new lithostratigraphic unit established recently by Bujnovský *et al.* (1975) in the Triassic of the West Carpathians. The name is after the geographic locality (Korytnická valley) near Liptovská Osada, Slovakia (fig. 1). The unit is homogeneous

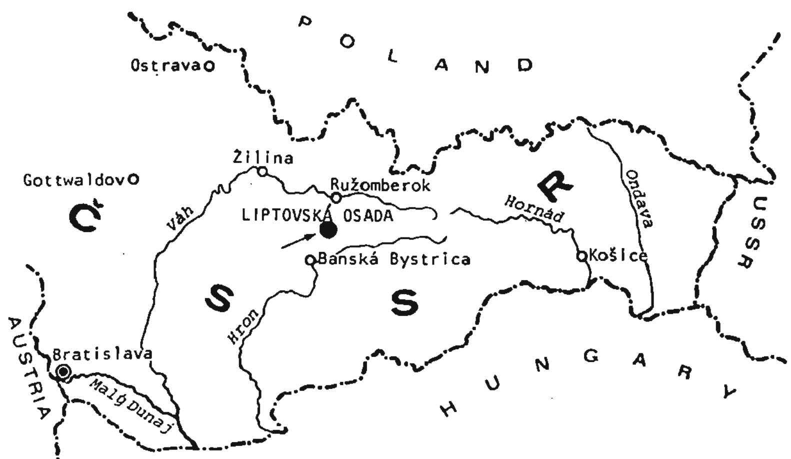


Fig. 1. Locality map of the Korytnica Limestones at Liptovská Osada (Slovakia).

in lithology and distinct from the underlying Reifling and/or Raming Limestones as well as the overlying Lunz Member (Jablonský 1973 *b*: fig. 21; Bujnovský *et al.* 1975: fig. 5; see also fig. 2 herein).

The present paper is aimed to describe the foraminifers, sponge spicules, conodonts, and holothurian sclerites occurring abundantly in the investigated Korytnica Limestones, and to evaluate their stratigraphic significance. The samples were taken by A. Gaździcki in 1976 from the type section of the Korytnica Limestones (see fig. 2). Totally, 15 samples approximating jointly 65 kg in weight were analysed. They were macerated with acetate acid; furthermore, they supplied 40 thin sections for microfacies study. Aside of the microfossils studied in the present paper, the samples contain also fairly abundant ostracodes, scolecodonts, cephalopod arm hooks, crinoid and echinoid fragments, and fish debris.

A. Gaździcki is responsible for microfacies analysis and foraminifer identification, H. Kozur and R. Mock for holothurian sclerite study, and J. Trammer for sponge spicule and conodont identifications.

The SEM micrographs were taken in the Laboratory of Electron Microscopy of the Nencki Institute of Experimental Biology, Warsaw, and in the Geological Institute of the Dionýz Štúr, Bratislava. The foraminifers, sponge spicule, and conodont collections are housed at the Institute of Paleobiology of the Polish Academy of Sciences, Warsaw (abbreviated as ZPAL); the holothurian sclerite collection is housed at the Department of Geology and Paleontology of the Faculty of Natural Sciences of the Comenius University, Bratislava (abbreviated as PFUK).

This works is a contribution to the IGCP Project "*Triassic of the Tethys Realm*".

MICROFACIES ANALYSIS

The Korytnica Limestones are dark-grey to black regularly bedded limestones with thin intercalations of calcareous shales. In the investigated section (fig. 2, see also Bujnovský *et al.* 1975) they overlie the Raming Limestones represented by grey to light-grey biohermic limestones. Their microfacies characteristics is based upon 40 thin sections, the localization of which in the depositional sequence is shown in fig. 2.

The uppermost Raming Limestones (sample R_1) comprise crinoid-algal (*Tubiphites*) biosparites (pl. 41: 6) with fragments of calcareous sponges, brachiopods, sessile foraminifers, and intraclasts (see also Jablonský 1971, 1973*a*, *b*, 1975; Mišik 1972; Bujnovský *et al.* 1975). In contrast, the Korytnica Limestones (samples R_2—R_9 and L_1—L_5) are dominated by brownish, mostly laminated biomicrites (pl. 41: 1—4) interlayered sometimes with crinoid biopelsparenites (pl. 41: 5).

The Korytnica Limestones are fairly homogeneous in microfacies. The most common components of the laminated biomicrites are sponge spicules

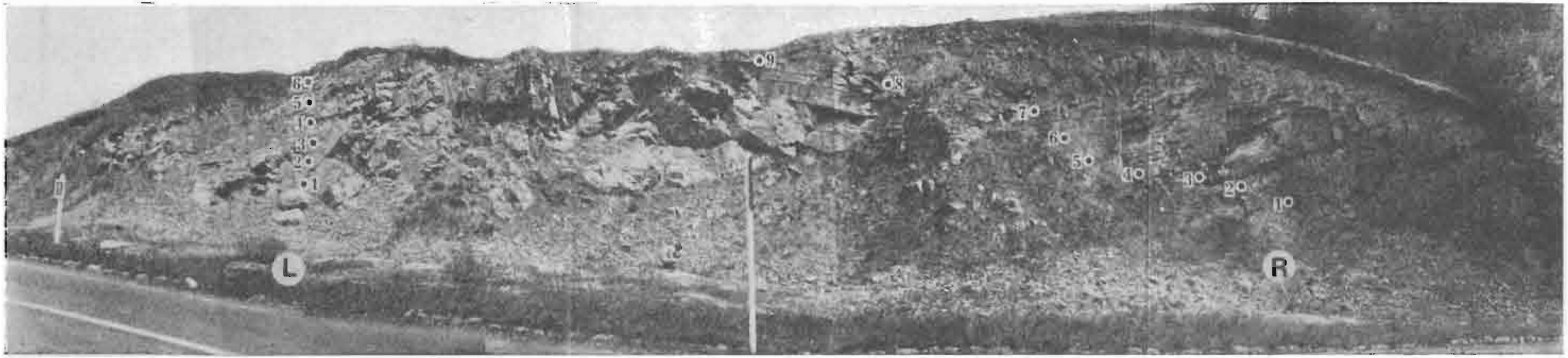


Fig. 2. Type locality and key beds of the Korytnica Limestones (first quarry in the cut of the major road south of Liptovská Osada; photo taken by A. Gaździcki in May 1976). *L* — left side of the quarry, *R* — right side of the quarry; sampling: L_1—L_6 and R_1—R_9.

(pl. 41: 1—2), minute crinoid fragments (pl. 41: 3), and brachiopod debris (pl. 41: 4); there are also thin-walled shells of juvenile bivalves (*Halobia*?), abundant nodosariids, ostracodes, and spores *Globochaete alpina* Lombard. The biomicritic mass includes small amounts of a brownish, opaque matter (organic matter?).

The biopelsparenites (pl. 41: 5) are composed of crinoid, brachiopod, bivalve, and gastropod debris as well as of ostracodes, solenopores, and pellets. They comprise fairly abundant foraminifers of the genera *Ophthalmidium*, *Involutina*, *Tolypammina* (sample R_4), *Earlandia*, and *Galeanella*? (samples R_6—R_8), algae *Tubiphites obscurus* Maslov (sample R_7), and microproblematic *Ladinella porata* Ott (sample R_6) (see also Jablonský 1973*a*, Bujnovský *et al.* 1975).

FORAMINIFERS

(pls 42—45)

Thirty nine foraminifer taxa have been found in the investigated section of the Korytnica Limestones (fig. 2). Their frequency distributions among the samples are given in table 1.

Most species recorded are well known from other areas of the Tethys Realm (see Zaninetti 1976) and hence, they are not systematically described in this paper. Nevertheless, the majority of the investigated foraminifers are here illustrated (pls 42—45) to show their variability and facilitate future discussions.

When classifying the foraminifers, the system of Loeblich and Tappan (1964) has been used. The list of the foraminifer species recorded in the Korytnica Limestones comprises:

Ammodiscus cf. *planus* Loeblich, 1946
Ammodiscus sp. — pl. 45: 7
Glomospira sp.
Turritellella sp.
?*Turritellella* sp. — pl. 43: 9—10
Tolypammina gregaria Wendt, 1969 — pl. 42: 9—11
Tolypammina sp.
Lituotuba sp. — pl. 45: 6
?*Ammobaculites* sp. — pl. 43: 12
Placopsilina? *hyerensis* Brönnimann and Zaninetti, 1972
?*Placopsilina* sp.
Gaudryinella aff. *kotlensis* Trifonova, 1967 — pl. 43: 7
Gaudryinella sp. — pl. 43: 8
Earlandia amplimuralis (Pantić, 1972)
Earlandia tintinniformis (Mišík, 1971)
Earlandinita sp. — pl. 43: 11
?*Endothyra* sp. — pl. 42: 5
Endothyranella sp.
Agathammina austroalpina Kristan-Tollmann and Tollmann — pl. 43: 5—6
Agathammina sp.
Ophthalmidium exiguum Koehn-Zaninetti, 1969 — pl. 43: 4
Ophthalmidium sp. — pl. 43: 1—3
Galeanella? *infundibuliforme* (Jablonský, 1973) — pl. 42: 1—4
Nodosaria sp. — pl. 45: 3
Astacolus sp. — pl. 45: 4
Darbyella sp.
Dentalina sp.
?*Frondinodosaria* sp. — pl. 45: 1
Lenticulina sp. — pl. 45: 2
Pachyphloides klebelsbergi (Oberhauser, 1960) — pl. 44: 8
Pachyphloides oberhauseri Sellier de Civrieux and Dessauvagie, 1965
Pachyphloides sp. — pl. 44: 7, 9

Duostomina sp. — pl. 42: 6—8
Involutina eomesozoica eomesozoica (Oberhauser, 1957) — pl. 44: 1
Involutina gaschei praegaschei Koehn-Zaninetti, 1969 — pl. 44: 5
Involutina sinuosa cf. *pragsoides* (Oberhauser, 1964) — pl. 44: 4
Involutina planidiscoides (Oberhauser, 1964) — pl. 44: 2
Involutina sp. — pl. 44: 3
?*Involutina* sp. — pl. 44: 6

The families Ammodiscidae and Nodosariidae predominate in number of both species and individuals in the foraminifer assemblage, being represented by 8 and 9 species, respectively. There are 6 species of the family Involutinidae but they are represented only by singular individuals. The families Lituolidae (3 species), Ataxophragmiidae (2 species), Moravamminidae (3 species), Endothyridae (2 species), Fischerinidae (2 species), Nubeculariidae (2 species), Milioliporidae (1 species), and Variostomatidae (1 species) occur in subordinate numbers of individuals.

The genera *Placopsilina*, *Gaudryinella*, and *Pachyphloides* are for the first time recorded in the Triassic of Slovakia.

The microproblematic *Cucurbita infundibuliforme* reported by Jablonský (1973*a*) is attributed to the foraminifers, namely *Galeanella*? *infundibuliforme* (see also Zaninetti 1977).

Stratigraphic significance of the foraminifer assemblage. — Only some foraminifers recorded in the Korytnica Limestones appear significant stratigraphically. These are mostly involutinids (*I. eomesozoica eomesozoica*, *I. gaschei praegaschei*, and *I. planidiscoides*), as well as *Pachyphloides klebelsbergi*, *P. oberhauseri*, *Placopsilina*? *hyerensis*, *Gaudryinella* aff. *kotlensis*, and *Ophthalmidium exiguum*.

Generally, the above mentioned foraminifer species permit attribution of the investigated strata to the Ladinian — Carnian (see Zaninetti 1976). Actually, *P. klebelsbergi* and *G.* aff. *kotlensis* indicate Lower Carnian age (Oberhauser 1960, Trifonova 1967), whereas *P. oberhauseri* and *Placopsilina*? *hyerensis* indicate Carnian in general (Oberhauser 1960, Sellier de Civrieux and Dessauvagie 1965, Zaninetti 1976). One may note that in the type section of the Cassian Beds at St. Cassian, Dolomites, the species *P. klebelsbergi* occurs in the Upper Cassian Beds, i.e., Lower Carnian, Cordevolian (Oberhauser 1960, see also Urlichs 1974, 1977); it occurs also in the similar stratigraphic position in the Caucasus (Efimova 1974).

A characteristic involutinid assemblage is for the first time recorded in the Korytnica Limestones (sample R_4), including *I. eomesozoica eomesozoica*, *I. gaschei praegaschei*, *I. sinuosa* cf. *pragsoides*, and *I. planidiscoides*. Such assemblages are, indeed, typical of the Upper Ladinian to Lower Carnian strata of the Tethys Realm (Zaninetti 1976).

The investigated foraminifer assemblage appears somewhat impoverished but nevertheless, it resembles the time equivalent faunas reported from other Tethyan areas, e.g. the Alps (Oberhauser 1960, 1964; Zaninetti 1976), Hungary (Resch 1972), Bulgaria (Trifonova 1967, 1972),

Table 1

Frequency distributions of foraminifers in the Korytnica Limestones at Liptovská Osada

	L 1	L 2	L 3	L 4	L 5	L 6	R 1	R 2	R 3	R 4	R 5	R 6	R 7	R 8	R 9
Ammodiscus cf. *planus*			1			1					10				
Ammodiscus sp.	4	9			10	1		1	2	8	43	9	5		2
Glomospira sp.				1						2					3
Turritellella sp.									1						
?*Turritellella* sp.														2	
Tolypammina gregaria										27			2	2	5
Tolypammina sp.	1	2			2						12	2			
Lituotuba sp.											1				
?*Ammobaculites* sp.										1					1
Placopsilina? *hyerensis*													2		
?*Placopsilina* sp.									1						
Gaudryinella aff. *kotlensis*															2
Gaudryinella sp.										2			2	1	1
Earlandia amplimuralis								1							
Earlandia tintinniformis							2	3				3	1		1
Earlandinita sp.										1					
?*Endothyra* sp.										1					
Endothyranella sp.															1
Agathammina austroalpina										1					3
Agathammina sp.									4						
Ophthalmidium exiguum			1						1	1					2
Ophthalmidium sp.					6			2	3	10	24	2	2	1	2
Galeanella? *infundibuliforme*													5	2	
Nodosaria sp.	2		1		6		2	4	6	1	4	4			1
Astacolus sp.								2				1			
Darbyella sp.								1	1						
Dentalina sp.					2					1					
?*Frondinodosaria* sp.										1					
Lenticulina sp.						3		2		1	2	3			
Pachyphloides klebelsbergi		2					1	8	2	1			2		
Pachyphloides oberhauseri	1							4		3					
Pachyphloides sp.			1		1			8	11			1			
Duostomina sp.								1	1	4	2	1			
Involutina eomesozoica eomesozoica										1					
Involutina gaschei praegaschei								1							
Involutina sinuosa cf. *pragsoides*										1					
Involutina planidiscoides										1					
Involutina sp.										1		2			
?*Involutina* sp.					3										

Caucasus (Efimova 1974), Espahk Formation of Iran (Brönnimann *et al.* 1974), or Samana Suk section of Pakistan (Zaninetti and Brönnimann 1975).

SPONGE SPICULES

(pls 46, 47)

Ten morphologic types of sponge spicules have been found in the investigated section. Their frequency distributions among the samples are given in table 2. The terminology used follows Rauff (1893—1894), Laubenfels (1955), Reif (1967), and Mostler (1971*b*). The following sponge spicules occur in the Korytnica Limestones:

Table 2

Frequency distributions of sponge spicules in the Korytnica Limestones at Liptovská Osada

	L 1	L 2	L 3	L 4	L 5	L 6	R 1	R 2	R 3	R 4	R 5	R 6	R 7
oxytriactine		20	5	15	2	6	13	16	4	4	8	3	
oxycalthrop		5		1							2		
protriaene							3	1					
prodichotriaene	1												
orthodichotriaene	12	55	15		5			11	38	115	104	100	5
oxyhexactine	1	10			1			1					
sphaeraster		3			3			4		12	2	3	6
oxyaster			1								1		
amphiaster		2											
rhizoclone		1											

1 Triactines:
   oxytriactine — pl. 47: 4
2 Tetractines:
   oxycalthrop — pl. 47: 3
3 Triaenes:
   protriaene,
   prodichotriaene,
   orthodichotriaene — pl. 46: 1—4, 6
4 Hexactines:
   oxyhexactine — pl. 46: 5
5 Polyactines:
   sphaeraster — pl. 47: 2,
   oxyaster — pl. 47: 1
   amphiaster — pl. 47: 5
6 Desmas:
   rhizoclone.

The investigated spicules are mostly megascleres, with microscleres represented only by the polyactines. As demonstrated by table 2, only the orthodichotriaenes and oxytriactines occur fairly abundantly, while all other spicules play subordinate roles. One may notice a structural variability among the orthodichotriaenes; in fact, there are even forms transitional to the orthotrichotriaenes (pl. 46: 3).

Sponge spicules and the natural classification. — The spicules recorded in the Korytnica Limestones can be assigned to the following natural taxa (cf. Laubenfels 1955; Reif 1967; Mostler 1971*b*): protriaene, prodichotriaene, orthodichotriaene, sphaeraster, oxyaster, amphiaster — class Demospongea, order Choristida;

oxycalthrop — class Demospongea, order Carnosida (?); rhizoclone — class Demospongea, order Lithistida, suborder Rhizomorina;

oxyhexactin — class Hyalospongea;

oxytriactine — class Calcispongea, order Pharetronida.

Only the choristid and pharetronid sponges occurred in any considerable amounts in the Korytnica Limestones. However, a single sponge contains usually more spicules than there are in the investigated samples altogether and hence, one may conclude that the sponges played but a subordinate role in the benthos of the Korytnica Limestones.

Stratigraphic significance of the sponge spicules. — Mostler (1972*a*) recognized the guide associations of sponge spicules in the Triassic of the Alps. The investigated assemblage from the Korytnica Limestones resembles most closely the association II of Mostler (1972*a*), that is the association indicative of the Lower Carnian (Cordevolian). It differs from the association I in that it lacks anadiene spicules; while from the association III it differs in the absence of megaclone and promesotriaene spicules. The stratigraphic value of the sponge spicule associations of Mostler (1972*a*) cannot be ultimately accepted as yet; nevertheless, it is to be noted that the age attribution of the Korytnica Limestones based upon the spicule association is entirely consistent with those after the conodonts, foraminifers, and holothurian sclerites.

CONODONT FAUNA AND ITS AGE

(pls 47, 48)

The following conodonts have been found in the investigated section (their frequency distributions among the samples are given in table 3):

Gondolella navicula Huckriede, 1958 — pl. 48: 7

Gondolella polygnathiformis Budurov and Stefanov, 1965, pl. 48: 1.

Gladigondolella malayensis Nogami, 1968 — pl. 47: 6, pl. 48: 2—5.

Multielement *Gladigondolella tethydis* (Huckriede, 1958) *sensu* Kozur and Mostler, 1971*a*; there are only fragments of the ramiform elements, mostly PA_1 and PC_1 elements *sensu* Kozur and Mostler (1971*b*).

Enantiognathus jungi (Mosher, 1968) — pl. 48: 8

Neospathodus sp. — pl. 48: 6.

The species *G. malayensis* and *E. jungi* co-occurring in the sample R_2 indicate the uppermost Langobardian and Cordevolian (cf. Mosher 1968,

Table 3

Frequency distributions of conodonts in the Korytnica Limestones at Liptovská Osada

	L 1	L 3	L 5	R 2	R 3	R 4	R 6	R 7
Gondolella navicula	3		1			5	2	1
Gondolella polygnathiformis								1
Gladigondolella malayensis				4	2			
Gladigondolella tethydis ME (fragments)		+		+		+		
Enantiognathus jungi				2				
Neospathodus sp.				1				

Kozur and Mostler 1972, Krystyn 1973). *G. polygnathiformis* recorded in the sample R_7 ranges since the Cordevolian up through the Tuvalian (Kozur and Mostler 1972). However, the investigated specimen appears morphologically close to its ascendant *G. excelsa*, while the separation of both the forms is known to have taken place at the Langobardian/Cordevolian boundary. Hence, the sample R_7 can be assigned to the Cordevolian. The occurrence of multielement *G. tethydis* in the samples R_2, R_4, and L_3 does not contradict the above age attribution, as *G. tethydis* ranges in the Austro-Alpine Province since the Fassanian up through the Julian (Kozur and Mostler 1972).

In summary, the Korytnica Limestones are to be assigned to the Lower Carnian (Cordevolian), basing upon the conodonts; the lowermost part of the unit may, however, represent the uppermost Ladinian (Langobardian) as well.

HOLOTHURIAN SCLERITES

(pls 49—53)

The sequence of the Korytnica Limestones at Liptovská Osada contains a lot of excellently preserved holothurian sclerites. This fauna of holothurian sclerites is dominated by *Theelia koeveskalensis* Kozur and Mostler, 1971 and *Eocaudina cassianensis* Frizzell and Exline, 1955. Less frequent, but also common are *Achistrum triassicum* Frizzell and Exline, 1955 and *Theelia immisorbicula* Mostler, 1968. All other species are very rare.

The frequency distribution among the samples are given in table 4.

Stratigraphic significance of the holothurian sclerites. — The holothurian fauna is typical for the *Theelia koeveskalensis* Zone (Cordevolian) in

Table 4

Frequency distributions of holothurian sclerites in the Korytnica Limestones at Liptovská Osada

	L 1	L 2	L 3	L 4	L 5	L 6	R 1	R 2	R 3	R 4	R 5	R 6
Acanthotheelia aff. *ladinica*								1				
Acanthotheelia spinosa		1								1		
Achistrum triassicum	3	11	1	1	1	4				14	2	
Calclamna germanica		1						2		3		
Calclamna nuda				1	1					3		
Eocaudina cassianensis	22	37	24	16	12	4	4	36	7	33	4	53
Eocaudina liptovskaensis n.sp.								1		1		
Eocaudina ramosa	3	8			2	1		1		4	2	2
Kuehnites slovakensis n.sp.		1										
Praecaudina mostleri n.sp.					1					1		
Priscopedatus triassicus										2		
Theelia guembeli							2					1
Theelia immisorbicula	2	5	2	2	1		4	4		16	1	2
Theelia koeveskalensis	2	8	1	8	11	4		1	6	25		9
Theelia aff. *lata*									2			1
Theelia liptovskaensis n.sp.				1						1		2
Theelia trammeri n.sp.	1	1								2		1
Theelia undata										3		1

the sense of Mostler (1972*b*). The Cordevolian guide forms are *Theelia koeveskalensis* Kozur and Mostler (1971) and probably also *Theelia guembeli* Kristan-Tollman (1963). The dominance of *Eocaudina cassianensis* Frizzell and Exline (1955) and the occurrence of highly developed typical exemplars of *Acanthotheelia spinosa* Frizzell and Exline (1955) are also characteristic of the Cordevolian holothurian faunas.

DESCRIPTIONS

Genus *Acanthotheelia* Frizzell and Exline, 1955

Acanthotheelia aff. *ladinica* Kozur and Mostler, 1971

(pl. 49: 1)

Remarks. — Only one broken specimen is present. It differs from *A. ladinica* Kozur and Mostler, 1971 in having no typical spines at the outer margin of the rim opposite to the interspoke spaces. Moreover the diameter of the hub is considerably wider than in *A. ladinica* Kozur and Mostler and the lower surface of the hub is somewhat concave, the upper surface somewhat convex.

Occurrence. — A similar form was observed in the Ballabona-Cucharón complex of the Sierra de Carrascoy, southeastern Spain, in the Cordevolian.

Acanthotheelia spinosa Frizzell and Exline, 1955
(pl. 49: 2—3)

1955. *Acanthotheelia spinosa* Frizzell and Exline: 112, figs 7—8.

Remarks. — Typical specimens with well developed denticulation at the inner margin of the rim are characteristic for the Cordevolian. The specimens from the Korytnica Limestones at Liptovská Osada belong to these forms.

Occurrence. — Illyrian to Cordevolian (Alps, Hungary, West Carpathians, Dinarids, and Turkey).

Genus *Achistrum* Etheridge, 1881

Achistrum triassicum Frizzel and Exline, 1955 emend. Kristan-Tollmann, 1963
(pl. 49: 4—6)

1955. *Achistrum triassicum* Frizzell and Exline: 98, pl. 4: 30, 32, 33 (non 31).
1963. *Calcligula triassica* (Frizzell and Exline, 1955) emend.; Kristan-Tollmann: 366, pl. 5: 1—4; pl. 6: 1—8; pl. 7: 1.

Remarks. — Frequent in the Cordevolian of Slovakia, Hungary, and the Alps. The exact taxonomic separation of this species against other species of the genus *Achistrum* is difficult so that the exact stratigraphic range of *A. triassicum* Frizzell and Exline cannot be given. In the Upper Norian, this species is still present.

Genus *Calclamna* Frizzell and Exline, 1955

Calclamna germanica Frizzell and Exline, 1955
(pl. 49: 7—9)

1955. *Calclamna germanica* Frizzell and Exline: 76—77, pl. 2: 1—5.

Occurrence. — Anisian to Liassic.

Calclamna nuda (Mostler, 1971)
(pl. 50: 1—2)

1971*a*. *Calclamnella nuda* n.sp.; Mostler: 6, pl. 1: 9—10.
1972. *Calclamna nuda* (Mostler); Kozur and Mock: 7 (discussion to *Calclamna misiki*), pl. 3: 4—5.

Occurrence. — Middle Anisian — Norian.

Genus *Eocaudina* Martin, 1952

Eocaudina cassianensis Frizzell and Exline, 1955
(pl. 51: 1—4)

1955. *Eocaudina cassianensis* Frizzell and Exline: 84, pl. 2: 20.

Occurrence. — Langobardian — Julian. Very frequent in the Cordevolian of the Alps, Hungary, and West Carpathians.

Eocaudina liptovskaensis Kozur and Mock, sp.n.
(pl. 50: 5—6)

Derivatio nominis: After the occurrence at Liptovská Osada.
Holotypus: Specimen No. 77-II/7, pl. 50: 5.
Locus typicus: Liptovská Osada.
Stratum typicum: Cordevolian, Korytnica Limestones, sample R_2.

Material. — Two specimens.

Diagnosis. — Plane sieve plates. A central solid axis without pores is surrounded by 8 strongly radially elongated pores. In direction to the outer margin somewhat lesser radially elongated great pores follow. Near the margin the pores are subcircular. The outer margin is subcircular, suboval or subrectangular and bears long spines that are in all cases situated opposite to the pores.

Comparison. — *Eocaudina spinosa* Mostler, 1968 has outside of the radially elongated central pores only very small pores. *Eocaudina spinosa* Mostler, 1968 and *Eocaudina liptovskaensis* sp.n. may represent a new genus.

Occurrence. — Known from the type locality only.

Eocaudina ramosa Kozur and Mostler, 1971
(pl. 50: 3)

1971*b*. *Eocaudina ramosa* n.sp.; Kozur and Mostler: 24—25, pl. 1: 2—3.

Occurrence. — Langobardian (very frequent), Cordevolian (rare): Hungary, Austria, Slovakia.

Genus *Kuehnites* Mostler, 1969
Kuehnites slovakensis Kozur and Mock, sp.n.
(pl. 50: 4)

Derivatio nominis: After the occurrence in Slovakia.
Holotypus: Specimen No. 76-X/20, pl. 50: 4.
Locus typicus: Liptovská Osada.
Stratum typicum: Cordevolian, Korytnica Limestones, sample L_2.

Material. — One specimen.

Diagnosis. — Outline subcircular. Rim moderately broad and rather well elevated with spines at the outer margin opposite to the pores. The 4 main "spokes" are primarily and secondarily forked so that at least 10 pores and therefore 10 spines at the outer margin are present. Up to 12 pores are observed.

Comparisons. — Mostler, 1969, 1972*b* has shown the development from the genus *Canisia* (*Canisia zankli* group with 4 unforked spokes joint in central part by a spoke-like narrow bridge) to forms in which a part of the spokes (mostly 2) is forked (*Kuehnites inaequalis* Mostler, 1969). Mostler, 1972*b* has established the new species *Kuehnites turgidus* for form with broad rim and *K. dumosus* for forms with narrow to moderately broad rims in which the 4 "spokes" are all forked. Kozur and Mock, 1972 have emended *Kuehnites inaequalis* Mostler, 1969 to include all forms of the *Canisia* — *Kuehnites inaequalis* line with branched "spokes" to *Kuehnites inaequalis* Mostler, 1969. After the creation of *Kuehnites dumosus* Mostler, 1972 and *K. turgidus* Mostler, 1972 it seems to be better to make the following separation of species in the above mentioned transitional line:

1. All "spokes" unbranched: *Canisia* Mostler, 1972 pro *Ludwigia* Mostler, 1969 (*Canisia zankli* group).
2. Some, but not all "spokes" branched: *Kuehnites inaequalis* Mostler, 1969.
3. All 4 "spokes" primarily branched, no secondary forking: *Kuehnites dumosus* Mostler, 1972.
4. All 4 "spokes" branched, at least one branch secondarily forked: *Kuehnites slovakensis* sp.n.

It seems that all these form species occur in one natural species (*Kuehnites inaequalis* Mostler, 1969), because all transitions occur. But in spite of this fact in the form taxonomy it seems better to make the above mentioned separation.

Occurrence. — Cordevolian — Norian (Slovakia, Austria).

Genus *Praecaudina* Mostler, 1970 emend.

Remarks. — Mostler, 1970 has established the genus *Praecaudina* for concavo-convex sclerites with hexagonal to octogonal outline and with (3—) 4 great central pores, 1—2 concentric outer rows of smaller pores and inward-bent rim. All transitions exist between *Praecaudina hexagona* Mostler, 1970, the type species of *Praecaudina*, and *Protocaudina rigaudae* Mostler, 1970. There exist also transitional forms between "*Eocaudina*" *subhexagona* Gutschick, Canis and Brill, 1967 and *Praecaudina hexagona* Mostler, 1970 (see Kozur and Mock, 1972). *Protocaudina hexagonaria* Martin, 1952 is far more near to *Praecaudina* Mostler, 1970 than to *Protocaudina* Croneis, 1932.

A new species of *Praecaudina* described below, *P. mostleri* sp.n., has all characteristics of *Praecaudina*, but a subcircular outline. The outer rim is elevated, but not inward-bent. This new species shows clear transitional character to the concavo-convex "*Eocaudina*" species of the "*Eocaudina*" subhexagona group. In agreement with the proposals by Kozur and Mock, 1972 all these forms will be included in the emended genus *Praecaudina* Mostler, 1970. A new diagnosis of this genus is therefore necessary.

Emended diagnosis. — Concavo-convex sieve plates of subcircular to hexagonal, sometimes also octogonal outline. In the central part 4 great pores are situated surrounded by 1—2 concentric rows of mostly smaller pores. At the outer margin a rim or a somewhat thickened zone is present. Sometimes the inner margin of the rim is inward-bent.

The following species belong to *Praecaudina* Mostler, 1970 in the emended scope:

Protocaudina hexagonaria Martin, 1952
Eocaudina subhexagona Gutschick, Canis and Brill, 1967
Praecaudina hexagona Mostler, 1970
Praecaudina mostleri Kozur and Mock, sp.n.

Comparisons. — *Eocaudina* Martin, 1952 can be distinguished by a different arrangement of the pores and by the plane sieve plates. No thickened margin or rim is present in *Eocaudina* Martin, 1952.

Protocaudina Croneis, 1932 comprises circular wheel-like sclerites.

Occurrence. — ?Ordovician, ?Silurian, Devonian — Triassic.

Praecaudina mostleri Kozur and Mock, sp.n.
(pl. 51: 5—6)

Derivatio nominis: In honour of Prof. Dr. H. Mostler, Innsbruck.
Holotypus: Specimen No. 77-II/1, pl. 51: 5.
Locus typicus: Liptovská Osada.
Stratum typicum: Cordevolian, Korytnica Limestones, sample R_4.

Material. — Two specimens.

Diagnosis. — Strongly concavo-convex sieve plates with subcircular to suboval or subrectangular outline. Opposite to the pores the outer margin is mostly clearly outward-bent (but not always at all pores). Outer margin somewhat to clearly thickened or elevated, but inner margin of the rim is never inward-bent. The 4 central pores are great, circular to subcircular. The concentric row of outer pores has 12 circular to subcircular pores of strongly different size.

Comparisons. — *Praecaudina hexagona* Mostler, 1970 has a hexagonal to octogonal outline and irregularly or rectangularly shaped pores.

At *Praecaudina subhexagona* (Gutschick, Canis and Brill, 1967) the outer margin is not outward-bent opposite the pores. Moreover two rows of pores are present in this species.

Praecaudina hexagonaria (Martin, 1952) has a roughly hexagonal outline without outward-bending of the outer margin opposite to the pores. Moreover the outer pores are semicircular to triangular in this species.

Occurrence. — Known from the type locality only.

Genus *Priscopedatus* Schlumberger, 1890 emend. Frizzell and Exline, 1955

Priscopedatus triassicus Mostler, 1968

(pl 51: 7)

1968. *Priscopedatus triassicus* n.sp.; Mostler: 18—19, pl. 6: 1—13.

Occurrence. — Anisian to Norian.

Genus *Theelia* Schlumberger, 1890

Theelia guembeli Kristan-Tollmann, 1963

(pl. 50: 9)

1963. *Theelia guembeli* n.sp.: Kristan-Tollmann: 370—371, pl. 8: 7.

Occurrence. — Cordevolian (Southern Alps, Hungary, Spain, West Carpathians).

Theelia immisorbicula Mostler, 1968 emend. Kozur and Mock, 1972

(pl. 53: 8—9)

1968. *Theelia immisorbicula* n.sp.; Mostler: 26—27, pl. 5: 1.
1972. *Theelia immisorbicula* Mostler; Kozur and Mock: 16—17, pl. 7: 5—12.

Occurrence. — Anisian to Norian.

Theelia koeveskalensis Kozur and Mostler, 1971

(pl. 52: 2—9)

1971b. *Theelia koeveskalensis* n.sp.; Kozur and Mostler: 30, pl. 2: 2—4.

Remarks. — The excellently preserved material of *Theelia koeveskalensis* Kozur and Mostler, 1971 from the Korytnica Limestones at Liptovská Osada shows in almost all specimens 2-4 marginal teeth at the inner margin of the rim above the spokes. Kozur and Mostler, 1971b could observe this denticulation only at very few specimens.

Occurrence. — Frequent in the Cordevolian of Hungary and Slovakia. Very rare (most probably homeomorph forms, see Kozur and Mock, 1972) in the Lower Norian of Silická Brezová (Slovakia).

Theelia aff. *lata* Kozur and Mostler, 1971
(pl. 50: 7—8)

Remarks. — Only 3 broken specimens of this *Theelia* species are present. The wide, entirely plane hub corresponds to *Theelia lata* Kozur and Mostler, 1971, but the number of spokes is lesser (10) than in this species (13—18). The denticulation of the inner margin is considerably lesser than in *Theelia lata* Kozur and Mostler, 1971.

Theelia planata Mostler, 1968 has a smaller hub with central pit at the lower surface and an undenticulated inner margin of the rim.

Occurrence. — *Theelia lata* is known from the Cordevolian of Hungary and Slovakia.

Theelia liptovskaensis Kozur and Mock, sp.n.
(pl. 53: 1—3)

Derivatio nominis: After the occurrence at Liptovská Osada.
Holotypus: Specimen No. 77-III/22 figured in pl. 53: 1.
Locus typicus: Liptovská Osada.
Stratum typicum: Cordevolian, Korytnica Limestones, sample R_4.

Material. — Four specimens.

Diagnosis. — Circular small wheels with 12—14 spokes. The width of the spokes is the same throughout length or the spokes are only a little broader in the middle part of its length. Rim low, slightly inward-bent. Inner margin of the rim finely denticulated. Hub moderately wide, somewhat lower than the upper surface of the rim. Lower surface of the hub slightly concave, upper surface very slightly convex.

Comparisons. — *Theelia simoni* Kozur and Mock, 1972 and *Theelia patinaformis* Mostler, 1970 are similar, but both have a smooth inner margin of the rim.

Occurrence. — Known from the type locality only.

Theelia trammeri Kozur and Mock, sp.n.
(pl. 53: 4—7)

Derivatio nominis: In honour of Dr. J. Trammer, Warsaw.
Holotypus: Specimen No. 76-X/7 figured in pl. 53: 4.
Locus typicus: Liptovská Osada.
Stratum typicum: Cordevolian, Korytnica Limestones, sample L_2.

Material. — Five specimens.

Diagnosis. — Great wheels with subcircular outline. Rim narrow, inner margin almost not inward-bent, coarsely denticulated. Outer margin of the rim outward-bent opposite the interspoke spaces, but without spines. Hub small to moderate wide with plane lower and upper surface. Spokes (10—12) narrow, width equal throughout.

Comparisons. — *Theelia trammeri* Kozur and Mock sp.n. seems to derive from *Acanthotheelia spinosa* Frizzell and Exline, 1955 by lost of spines at the outer margin of the rim. A derivation of a hitherto undescribed *Theelia* from the Ladinian is also possible.

Occurrence. — Known from the type locality only.

Theelia undata Mostler, 1968
(pl. 51: 8—9; pl. 52: 1)

1968. *Theelia undata* n.sp.; Mostler: 30, pl. 5: 5.

Remarks. — *Theelia serta* Speckmann, 1968 is most probably a younger synonym of *Theelia undata* Mostler, 1968.

Occurrence. — Anisian to Cordevolian (West Carpathians and Alps).

FINAL REMARKS

When recognizing the Korytnica Limestones for a new lithostratigraphic unit in the West Carpathians, Bujnovský *et al.* (1975) assigned the investigated strata to the Middle Carnian (Julian) on the basis of the brachiopod and bivalve fauna. Jablonský (1973*b*) claimed previously those strata to represent either the Cordevolian, or Julian.

The present study of the microfauna of the Korytnica Limestones permits their unequivocal attribution to the Lower Carnian (Cordevolian). Indeed, all the investigated microfossil groups indicate the latter substage.

The Korytnica Limestones were suggest (Jablonský 1973*b*, Bujnovský *et al.* 1975) to resemble generally the Cassian Beds of the Dolomites. However, according to Urlichs (1974, 1977) and Fürsich and Wendt (1977) the Lower Cassian Beds represent the Upper Ladinian (Langobardian), and the Upper Cassian Beds the Lower Carnian (Cordevolian). Then, the Korytnica Limestones are equivalent only to the Upper Cassian Beds. When the Lower Cassian Beds were deposited in the Dolomites, quite different facies of the Reifling and/or Raming Limestones prevailed in the area of Liptovská Osada (Hronic — Choč nappe).

Zakład Paleobiologii
Polska Akademia Nauk
Al. Żwirki i Wigury 93
02-089 Warszawa, Poland
(A. Gaździcki)

Staatliche Museen Meiningen
Schloß Elisabethenburg
DDR — 61 Meiningen
(H. Kozur)

Katedra Geologie a Paleontológie
Prirodovedeckej Fakulty Univerzity
Komenského
Gottwaldovo nám. 19
886-02 Bratislava, ČSSR
(R. Mock)

Instytut Geologii Podstawowej
Uniwersytet Warszawski
Al. Żwirki i Wigury 93
02-089 Warszawa, Poland
(J. Trammer)

December 1977

REFERENCES

BRÖNNIMANN, P., ZANINETTI, L., MOSHTAGHIAN, A. and HUBER. H. 1974. Foraminifera and microfacies of the Triassic Espahk formation, Tabas area, east central Iran. — *Riv. Ital. Paleont.*, **80**, 1, 1—48.

BUJNOVSKÝ, A., KOCHANOVÁ, M. and PEVNÝ, J. 1975. Korytnica Limestones — a new litho-stratigraphical unit and its fauna. — *Geologické práce, Správy*, **63**, 21—53.

EFIMOVA, N. A. 1974. Triassic Foraminifera of the North-West Caucasus and Cis-Caucasus. — *Quest. Micropaleont.*, **17**, 54—83.

FRIZZELL, D. L. and EXLINE, H. 1955. Monograph of fossil holothurian sclerites. — *Bull. Univ. Missouri School Min. Met.*, **89**, 1—204.

FÜRSICH, F. T. and WENDT, J. 1977. Biostratonomy and palaeoecology of the Cassian Formation (Triassic) of the Southern Alps. — *Palaeogeogr., Palaeoclimat., Palaeoecol.*, **22**, 257—323.

GUTSCHICK, R. C., CANIS, W. F. and BRILL, K. G. 1967. Kinderhook (Mississipian) holothurian sclerites from Montana and Missouri. — *J. Paleont.*, **41**, **6**, 1461—1480.

JABLONSKÝ, E. 1971. Segmentierte Kalkschwämme-Sphinctozoa der Westkarpaten (von der Lokalität Liptovská Osada). — *Geol. zborn., Geologica Carpathica*, **22**, 2, 333—346.

— 1973*a*. Mikroproblematika aus der Trias der Westkarpaten. — *Ibidem*, **24**, 2, 415—423.

— 1973*b*. Liptovská Osada. *In*: Bystrický, J. (ed.), Triassic of the West Carpathians Mts. — Guide to excursion D. 10 Congress of Carpathian-Balkan Geological Association, *GÚDŠ*. 107—109.

— 1975. *Colospongia andrusovi* n.sp., eine neue Art von segmentierten Kalkschwämmen (Sphinctozoa) aus der Trias der Westkarpaten. — *Geol. zborn., Geologica Carpathica*, **26**, 2, 267—273.

KOZUR, H. and MOCK, R. 1972. Neue Holothurien-Sklerite aus der Trias der Slowakei. — *Geol. Paläont. Mitt. Innsbruck*, **2**, 12, 1—47.

— and — 1974. Holothurien-Sklerite aus der Trias der Slowakei und ihre stratigraphische Bedeutung. — *Geol. zborn., Geologica Carpathica*, **25**, 1, 113—143.

— and MOSTLER, H. 1971*a*. Probleme der Conodontenforschung in der Trias. — *Geol. Paläont. Mitt. Innsbruck*, **1**, 4, 1—19.

— and — 1971*b*. Holothurien-Sklerite und Conodonten aus der Mittel- und Obertrias von Köveskal (Balatonhochland, Ungarn). — *Ibidem*, **1**, **10**, 1—36.

— and — 1972. Die Bedeutung der Condonten für stratigraphische und paläogeographische Untersuchungen in der Trias. — *Mitt. Ges. Geol. Bergbaustud.*, **21**, 777—810.

KRISTAN-TOLLMANN, E. 1963. Holothurien-Sklerite aus der Trias der Ostalpen. — *Sitzber. Österr. Akad. Wiss., Math. Naturw. Kl.*, **1**, 172, 351—380.

KRYSTYN, L. 1973. Zur Ammoniten- und Conodonten-Stratigraphie der Hallstätter Obertrias (Salzkammergut, Österreich). — *Verh. Geol. B.—A.*, **1**, 113—153.

LAUBENFELS, M. W. De 1955. Porifera. *In*: Moore, R. C. (ed.), Treatise on invertebrate paleontology, part E. — Geol. Soc. Amer. und Univ. Kansas Press, 21—122.

LOEBLICH, A. R. and TAPPAN, H. 1964. Foraminiferida. *In*: Moore, R. C. (ed.), Treatise on invertebrate paleontology, part C. — Geol. Soc. Amer. and Univ. Kansas Press, **2**, 1—2, 55—900.

MARTIN, W. R. 1952. Holothuroidea from the Iowa Devonian. — *J. Paleont.*, **26**, **5**, 728—729.

MIŠIK, M. 1972. Lithologische und fazielle Analyse der mittleren Trias der Kerngebirge der Westkarpaten. — *Acta Geol. Geogr. Univ. Comeniae, Geologica*, **22**, 5—154.

MOSHER, L. C. 1968. Triassic conodonts from western North America and Europe and their correlation. — *J. Paleont.*, **42**, 4, 879—947.

MOSTLER, H. 1968. Holothurien-Sklerite aus der oberanisischen Hallstätterkalken. — *Veröff. Univ. Innsbruck, Alpenkundl. Studien*, **2**, 1—44.

— 1969. Entwicklungsreihen triassischer Holothurien-Sklerite. — *Ibidem*, **18**, 1—53.

— 1970. Über einige Holothurien-Sklerite aus der Süd- und Nordalpinen Trias. 339—360. Festband Geol. Inst. 300-Jahr-Feier Univ. Innsbruck.

— 1971*a*. Holothuriensklerite aus anisischen, karnischen und norischen Hallstätterkalken. — *Geol. Paläont. Mitt. Innsbruck*, **1**, 1, 1—30.

— 1971*b*. Häufigkeit und Bedeutung von Schwammspiculae in triassischen Mikrofaunen. — *Ibidem*, **1**, 11, 1—19.

— 1972*a*. Die Spiculae triassischer Porifera. — *Mitt. Ges. Geol. Bergbaustud.*, **21**, 539—546.

— 1972*b*. Holothuriensklerite der alpinen Trias und ihre stratigraphische Bedeutung. — *Ibidem*, **21**, 729—744.

OBERHAUSER, R. 1960. Foraminiferen und Mikrofossilien "incertae sedis" der ladinischen und karnischen Stufe der Trias aus den Ostalpen und aus Persien. — *Jb. Geol. B.—A., Sb.*, **5**, 5—46.

— 1964. Zur Kenntnis der Foraminiferengattungen *Permodiscus*, *Trocholina* und *Triasina* in der alpinen Trias und ihre Einordnung zu den Archaeodisciden. — *Verh. Geol. B.—A.*, **2**, 196—210.

RAUFF, H. 1893—1894. Palaeospongiologie. Erster oder allgemeiner Theil, und zweiter Theil, erste Hälfte. — *Palaeontographica*, **40**, 1—346.

REIF, W.-E. 1967. Schwammspicula aus dem Weissen Jura Zeta von Nattheim (Schwäbische Alb). — *Ibidem*, **127**, A, 3—6, 85—102.

RESCH, W. 1972. Statistische Untersuchungen der Foraminiferen-Faunen aus dem Profil Köveskal/W-Ungarn (Fassan — tiefers Cordevol). — *Mit. Ges. Geol. Bergbaustud.*, **21**, 513—538.

SELLIER DE CIVRIEUX, J. M. and DESSAUVAGIE, T. F. J. 1965. Reclassification de quelques Nodosariidae, particulièrement du Permien au Lias. — *Publ. Inst. Et. Rech. Min. Turquie*, **124**, 1—178.

SPECKMANN, P. 1968. Holothurien-Sklerite aus der Mittel-Trias der Ostalpen. — *Mitt. Bayer. Staatssaml., Paläont. hist. Geol.*, **8**, 197—218.

TRIFONOVA, E. 1967. Some new Triassic foraminifera in Bulgaria. — *Ann. Univ. Sofia, Fac. Géol. Géogr.*, **60**, 1, 1—8.

— 1972. Triassic Foraminifera in North-Bulgaria. — *Mitt. Ges. Geol. Bergbaustud.*, **21**, 499—505.

URLICHS, M. 1974. Zur Stratigraphie und Ammonitenfauna der Cassianer Schichten von Cassian (Dolomiten-Italien). — *Österr. Akad. Wiss., Schrr. Erdwiss. Kom.*, **2**, 207—222.

— 1977. Zur Alterstellung der Pachycardientuffe und der Unteren Cassianer Schichten in den Dolomiten (Italien). — *Mitt. Bayer. Staatssaml., Paläont. hist. Geol.*, **17**, 15—25.

ZANINETTI, L. 1976. Les Foraminifères du Trias. Essai de synthèse et corrélation entre les domaines mésogéens européen et asiatique. — *Riv. Ital. Paleont.*, **82**, 1, 1—258.

— 1977. Sur quelques synonymes du genre *Galeanella* Kristan, 1958, un Foraminifère de la Téthys triassique. — *Note Lab. Paléontol. Univ. Genève*, **2**, 1—3.

— and BRÖNNIMANN, P. 1975. Triassic Foraminifera from Pakistan. — *Riv. Ital. Paleont.*, **81**, 3, 31—36.

ANDRZEJ GAŻDZICKI, HEINZ KOZUR, RUDOLF MOCK I JERZY TRAMMER

TRIASOWE MIKROSKAMIENIAŁOŚCI Z WAPIENI KORYTNICKICH REJONU LIPTOWSKIEJ OSADY (SŁOWACJA) I ICH ZNACZENIE STRATYGRAFICZNE

Streszczenie

Przedmiotem niniejszej pracy jest analiza zespołów mikroskamieniałości z wapieni korytnickich odsłaniających się w Zachodnich Karpatach w rejonie Liptowskiej Osady na Słowacji (figs 1—2). Wzmiankowane wapienie zawierają liczne mikroskamieniałości, z których szczegółowo opracowano otwornice, igły gąbek, skleryty holoturii i konodonty (pls 41—53; tab. 1—4). Nowe gatunki rozpoznano jedynie w obrębie sklerytów holoturii. Są to: *Eocaudina liptovskaensis* sp.n., *Kuehnites slovakensis* sp.n., *Praecaudina mostleri* sp.n., *Theelia liptovskaensis* sp.n. i *Theelia trammeri* sp.n. Na podstawie wszystkich zbadanych mikroskamieniałości określono wiek wapieni korytnickich na dolny karnik (kordewol). Należy podkreślić, że także i igły gąbek, którym nie przypisuje się zazwyczaj znaczenia stratygraficznego mogą być przewodnie w zespole. Stwierdzono, że wapienie korytnickie z Karpat zawierają tę samą asocjację igieł gąbek co równowiekowe utwory Alp (por. Mostler 1972a).

W nawiązaniu do sugestii Jablonský'ego (1973*b*) i Bujnovský'ego i innych (1975) o ogólnym podobieństwie wapieni korytnickich do warstw z St. Cassian w Dolomitach przeprowadzono dokładniejszą korelację tych dwóch kompleksów. W wyniku ustalono, że wapieniom korytnickim odpowiada jedynie górna część warstw z St. Cassian.

Niniejsza praca została wykonana w ramach problemu międzyresortowego PAN MR II/3.

АНДЖЕЙ ГАЗЬДЗИЦКИ, ХАЙНЦ КОЦУР, РУДОЛЬФ МОЦК, ЕЖИ ТРАММЕР

ТРИАСОВЫЕ МИКРООКАМЕНЕЛОСТИ ИЗ КОРЫТНИЦКИХ ИЗВЕСТНЯКОВ РАЙОНА ЛИПТОВСКОЙ ОСАДЫ (СЛОВАКИЯ) И ИХ СТРАТИГРАФИЧЕСКОЕ ЗНАЧЕНИЕ

Резюме

В настоящей работе представлен анализ ассоциации микроокаменелостей из корытницких известняков, обнажающихся в Западных Карпатах в районе Липтовской Осады в Словакии (фиг. 1—2). Вышеуказанные известняки содержат многочисленные микроокаменелости, из которых детально разработано форами-

ниферы, спикулы губок, склериты голотурий и конодонты (пл. 41—53; табл. 1—4). Новые виды обнаружены только в группе склеритов голотурий: *Eocaudina liptovskaensis* sp. n., *Kuehnites slovakensis* sp. n., *Praecaudina mostleri* sp. n., *Theelia liptovskaensis* sp. n. и *Theelia trammeri* sp. n.. На основе всех изученных микроокаменелостей возраст корытницких известняков соответствует карнийскому ярусу (кордеволь). Следует подчеркнуть, что спикулы губок, хотя не считаются руководящими ископаемыми, могут иметь стратиграфическое значение в ассоциации. Обнаружено, что корытницкие известняки из Карпат содержат ту же ассоциацию спикул губок, что и синхронные отложения Альп (Мостлер 1972).

Что касается предположения Яблонски (1973б) и Буйновски и др. (1975) об общем сходстве корытницких известняков с кассианскими слоями Доломитовых Альп проведена детальная корреляция этих комплексов, в результате которой установлено, что корытникцим известнякам соответствует только верхняя часть кассианских слоёв.

EXPLANATION OF THE PLATES 41—53

Plate 41

Microfacies from the Korytnica Limestones (Lower Carnian, Cordevolian) at Liptovská Osada

1. Laminated biomicrite with sponge spicules and thin-walled shells of juvenile bivalves, × 10; sample L_5.
2. Biomicrite with sponge spicules, × 60; sample L_2.
3. Crinoid biomicrite, × 60; sample R_3.
4. Crinoid-brachiopod biomicrite, × 60; sample R_6.
5. Biopelsparenite composed of crinoid, brachiopod and algal (*Solenopora*) debris with onkolitic crusts, overlaid with crinoid biomicrite, × 7; sample R_4.
6. Crinoid biopelsparrudite, × 7; sample R_2.

Plate 42

Foraminifers from the Korytnica Limestones (Lower Carnian, Cordevolian) at Liptovská Osada

1—4. *Galeanella? infundibuliforme* (Jablonský), × 130; *1—3* from sample R_7, *4* from sample R_8, ZPAL F. XXII/R_7, R_8.

5. ?*Endothyra* sp., × 110; sample R_4, ZPAL F. XXII/R_4.

6—8. *Duostomina* sp., *6* × 80, *7*, *8* × 65; *6* from sample R_4, *7* from sample R_6, *8* from sample R_2, ZPAL F. XXII R_2.

9—11. *Tolypammina gregaria* Wendt, *9* × 110, *10*—11 × 40; sample R_4, ZPAL F. XXII/R_4.

Plate 43

Foraminifers from the Korytnica Limestones (Lower Carnian, Cordevolian) at Liptovská Osada

1—3. *Ophthalmidium* sp., *1*, *2* × 80, *3* × 110; *1* from sample R_9, *2* from sample R_4, *3* from sample R_2, ZPAL F.XXII/R_4, R_9.
4. *Ophthalmidium exiguum* Koehn-Zaninetti, × 400; sample R_3, ZPAL F. XXXII/R_3.
5—6. *Agathammina austroalpina* Kristan-Tollmann and Tollmann, × 250; *5* from sample R_4, *6* from sample R_9, ZPAL F. XXII/R_4, R_9.
7. *Gaudryinella* aff. *kotlensis* Trifonova, × 110; sample R_9, ZPAL F. XXII/R_9.
8. *Gaudryinella* sp., × 110; sample R_9, ZPAL F. XXII/R_9.
9—10. ?*Turritellella* sp., *9* × 80, *10* × 110; sample R_8, ZPAL F. XXII/R_8.
11. *Earlandinita* sp., × 70; sample R_4, ZPAL F. XXII/R_4.
12. ?*Ammobaculites* sp., ×40; sample R_4, ZPAL F. XXII/R_9.

Plate 44

Foraminifers from the Korytnica Limestones (Lower Carnian, Cordevolian) at Liptovská Osada

1. *Involutina eomesozoica eomesozoica* (Oberhauser), × 110; sample R_4, ZPAL F. XXII/R_4.
2. *Involutina planidiscoides* (Oberhauser), × 110; sample R_4, ZPAL F. XXII/R_4.
3. *Involutina* sp., × 110; sample R_4, ZPAL F. XXII/R_4.
4. *Involutina sinousa* cf. *pragsoides* (Oberhauser), × 60; sample R_4, ZPAL F. XXII/R_4.
5. *Involutina gaschei praegaschei* Koehn-Zaninetti, × 60; sample R_2, ZPAL F. XXII/R_2.
6. ?*Involutina* sp., × 110; sample L_5, ZPAL F. XXII/L_5.
7, 9. *Pachyphloides* sp., *7* × 60, *9* × 110; sample R_3, ZPAL F. XXII/R_3.
8. *Pachyphloides klebelsbergi* (Oberhauser), × 40; sample R_3, ZPAL F. XXII/R_3.

Plate 45

Foraminifers from the Korytnica Limestones (Lower Carnian, Cordevolian) at Liptovská Osada

All figures are SEM photographs

1. ?*Frondinodosaria* sp., × 100; sample R_4, ZPAL F. XXII/1.
2. *Lenticulina* sp., × 60; sample R_4, ZPAL F. XXII/2.
3. *Nodosaria* sp., × 75; sample R_4, ZPAL F. XXII/3.
4. *Astacolus* sp., × 60; sample R_2, ZPAL F. XXII/4.
5. *Pachyphloides* sp., × 75; sample R_2, ZPAL F. XXII/5.
6. *Lituotuba* sp., × 100; sample R_5, ZPAL F. XXII/6.
7. *Ammodiscus* sp., × 200; sample R_5, ZPAL F. XXII/7.

Plate 46

Sponge spicules from the Korytnica Limestones (Lower Carnian, Cordevolian) at Liptovská Osada

All figures are SEM photcgraps × 100

1. Orthodichotriaene; sample R_4, ZPAL Pf. II/1.
2. Orthodichotriaene; sample R_5, ZPAL Pf. II/2.

3. Orthodichotriaene, a form transitional to orthotrichotriaene; sample L^2, ZPAL Pf. II/3.
4. Orthodichotriaene; sample R_6, ZPAL Pf. II/4.
5. Oxyhexactine; sample L^2, ZPAL Pf. II/5.
6. Orthodichotriaene; sample R_5, ZPAL Pf. II/6.

Plate 47

Sponge spicules and a conodont from the Korytnica Limestones (Lower Carnian, Cordevolian) at Liptovská Osada

All figures are SEM photographs

1. Oxyaster, × 200; sample R_5, ZPAL Pf. II/7.
2. Sphaeraster, × 200; sample R_4, ZPAL Pf. II/8.
3. Oxycalthrop, × 100; sample L_2, ZPAL Pf. II/9.
4. Ocytriactine, × 100; sample L_2, ZPAL Pf. II/10.
5. Amphiaster, × 250; sample L_2, ZPAL Pf. II/11.
6. *Gladigondolella malayenesis* Nogami, × 450; sample R_2, ZPAL C. IX/3.

Plate 48

Conodonts from the Korytnica Limestones (Lower Carnian, Cordevolian) at Liptovská Osada

All figures are SEM photographs × 100 (only figure 8 × 200)

1. *Gondolella polygnathiformis* Budurov and Stefanov; sample R_7, ZPAL C. IX/1.
2. *Gladigondolella malayensis* Nogami, a juvenile form in side view; sample R_3, ZPAL C. IX/2.
3. *Gladigondolella malayensis* Nogami; sample R^2, ZPAL C. IX/3.
4. *Gladigondolella malayensis* Nogami, a juvenile form in bottom view; sample R_3, ZPAL C. IX/4.
5. *Gladigondolella malayensis* Nogami, bottom view; sample R_2, ZPAL C. IX/5.
6. *Neospathodus* sp.; sample R_2, ZPAL C. IX/6.
7. *Gondolella navicula* Huckriede; sample R_4, ZPAL C. IX/7.
8. *Enantiognathus jungi* (Mosher); sample R_2, ZPAL C. IX/8.

Plate 49

Holothurian sclerites from the Korytnica Limestones (Lower Carnian, Cordevolian) at Liptovská Osada

All figures are SEM photographs.

1. *Acanthotheelia* aff. *ladinica* Kozur and Mostler: upper view, × 120; sample R_2, PFUK 372.

2—3. *Acanthotheelia spinosa* Frizzell and Exline, *2* × 120, *3* × 100; *2* from sample R_4, *3* from sample L_2, PFUK 359, 6660.

4—6. *Achistrum triassicum* Frizzell and Exline, *4—5* × 60, *6* × 60 and × 250; *4* from sample L_2, *5* from sample R_4, *6* from sample L_5, PFUK 6658, 368, 392.

7—8. *Calclamna germanica* Frizzell and Exline, *7* × 110, *8* × 100; 7 from sample R_4, *8* from sample R_2, PFUK 350, 371.

9. *Calclamna germanica* Frizzell and Exline, a transition form to *Calclamna nuda* (Mostler), × 110; sample R_4, PFUK 351.

Plate 50

Holothurian sclerites from the Korytnica Limestones (Lower Carnian, Cordevolian) at Liptovská Osada
All figures are SEM photographs

1—2. *Calclamna nuda* (Mostler), *1* × 120, *2* × 170; *1* from sample R_4, *2* from sample L_4, PFUK 352, 340.
3. *Eocaudina ramosa* Kozur and Mostler, × 50; sample L_1, PFUK 6655.
4. *Kuehnites slovakensis* Kozur and Mock sp.n., holotype, × 150; sample L_2, PFUK 6667.
5. *Eocaudina liptovskaensis* Kozur and Mock sp.n., holotype, × 110; sample R_2, PFUK 369.
6. *Eocaudina liptovskaensis* Kozur and Mock sp.n., × 120; sample L_4, PFUK 336.
7—8. *Theelia* aff. *lata* Kozur and Mostler, upper views, *7* × 150, *8* × 130; *7* from sample R_3, *8* from sample R_6, PFUK 339, 396.
9. *Theelia guembeli* Kristan-Tollmann, upper view, × 300; sample R_1, PFUK 370.

Plate 51

Holothurian sclerites from the Korytnica Limestones (Lower Carnian, Cordevolian) at Liptovská Osada
All figures are SEM photographs

1—4. *Eocaudina cassianensis* Frizzell and Exline, *1*, *3—4* × 70, *2* × 60; *1*, *3* from sample L_3, *2* from sample L_1, *4* from sample L_5, PFUK 387, 6657, 384, 391.
5. *Praecaudina mostleri* Kozur and Mock sp.n., holotype, × 100; sample R_4, PFUK 364.
6. *Praecaudina mostleri* Kozur and Mock sp.n., × 120; sample R_4, PFUK 366.
7. *Priscopedatus triassicus* Mostler, × 120; sample R_4, PFUK 366.
8—9. *Theelia undata* Mostler, *8* × 175, *9* × 150; sample R_4, PFUK 355, 365.

Plate 52

Holothurian sclerites from the Korytnica Limestones (Lower Carnian, Cordevolian) at Liptovská Osada
All figures are SEM photographs

1. *Theelia undata* Mostler, a transition form to *Th. koeveskalensis* Kozur and Mostler, upper view, × 140; sample R_4, PFUK 357.
2—9. *Theelia koeveskalensis* Kozur and Mostler, *8—9* lower views, *2*, *4—7* × 150, *3* × 140, *8* × 175; *2*, *6—7* from sample L_2, *3* from sample L_1, *4* from sample L_4, *5* from sample L_5, *8* from sample R_3, PFUK 6662, 6653, 333, 389, 6666, 343.

Plate 53

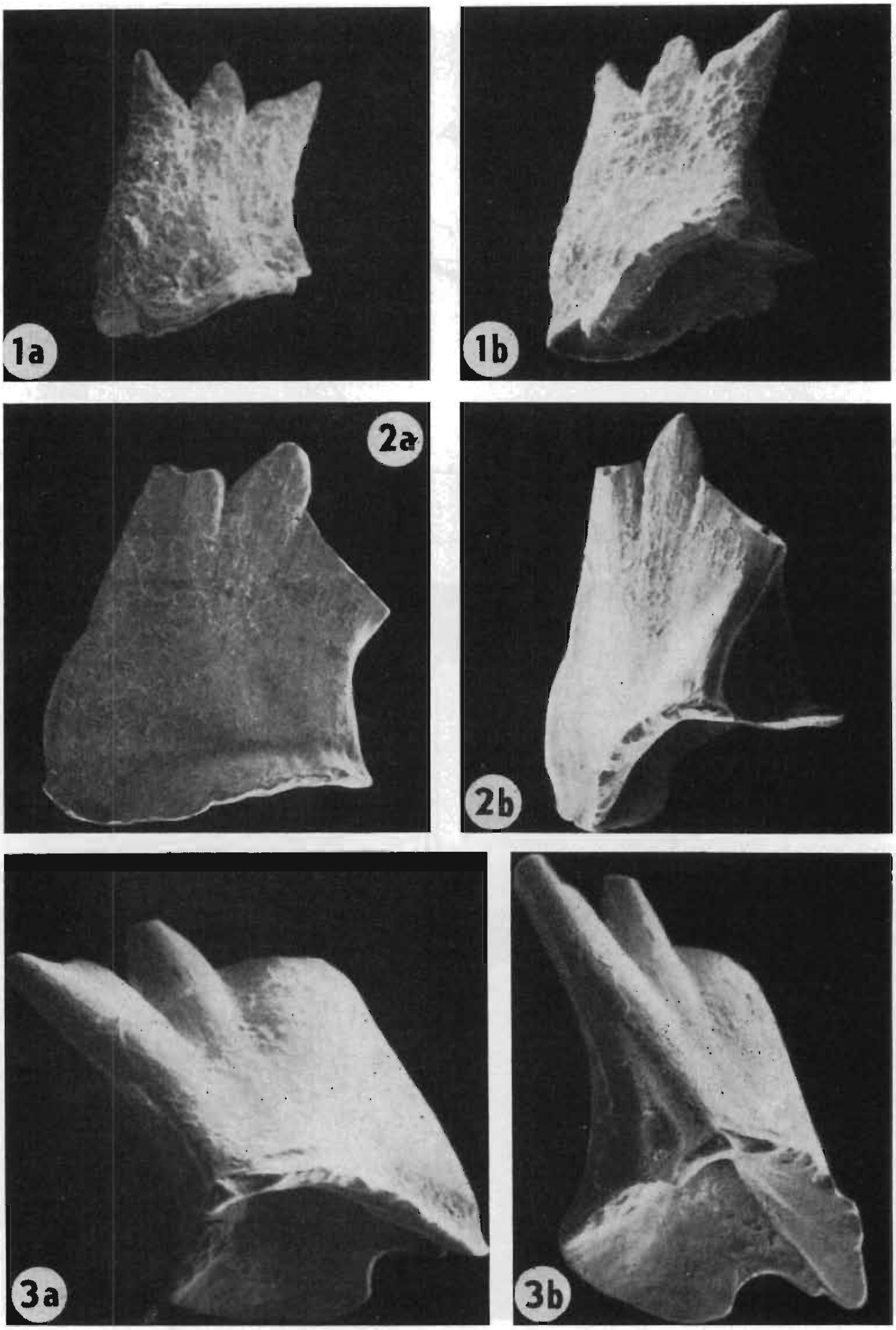
Holothurian sclerites from the Korytnica Limestones (Lower Carnian, Cordevolian) at Liptovská Osada
All figures are SEM photographs

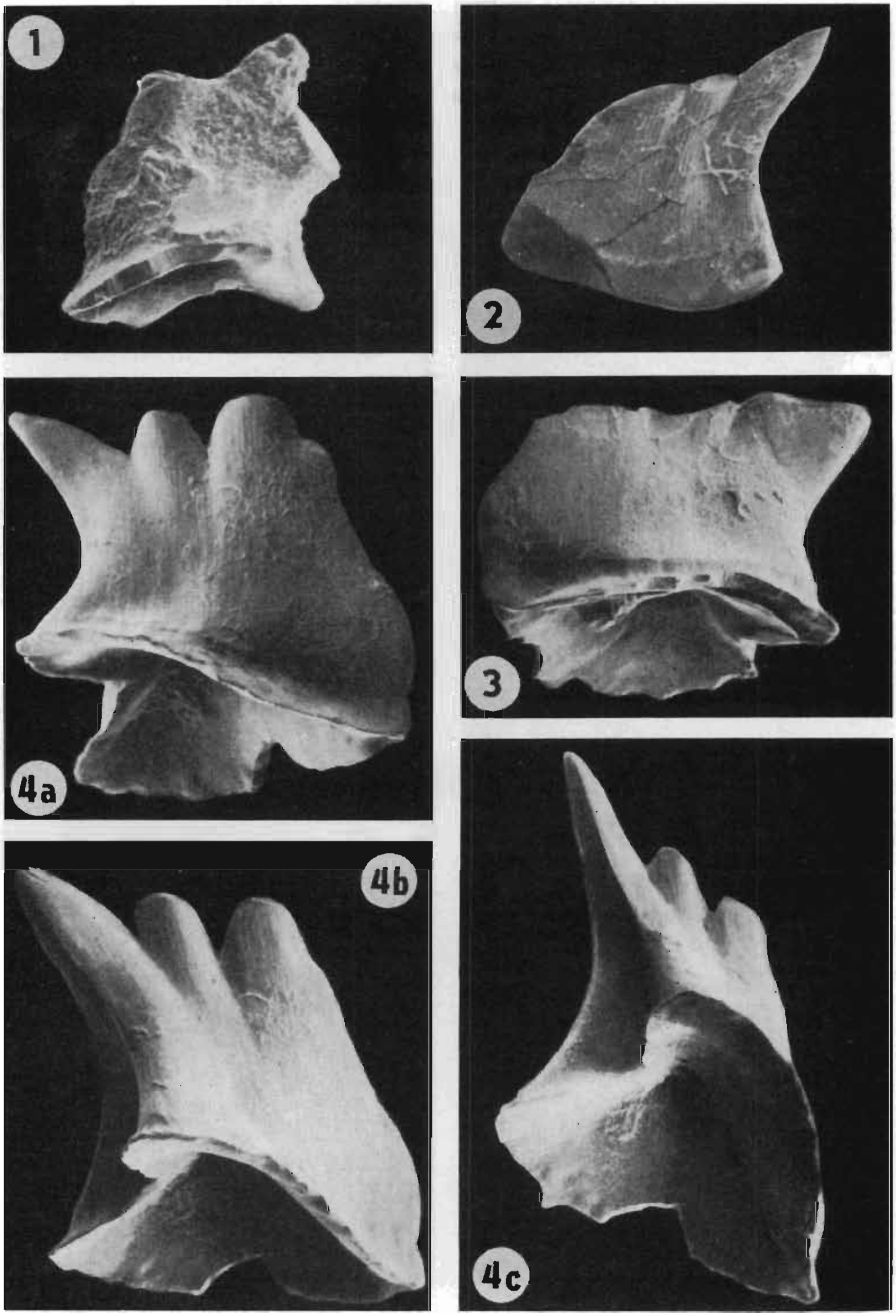
1. *Theelia liptovskaensis* Kozur and Mock sp.n., holotype, × 200; sample R_4, PFUK 354.
2. *Theelia liptovskaensis* Kozur and Mock sp.n., × 200; sample R_6, PRUK 398.

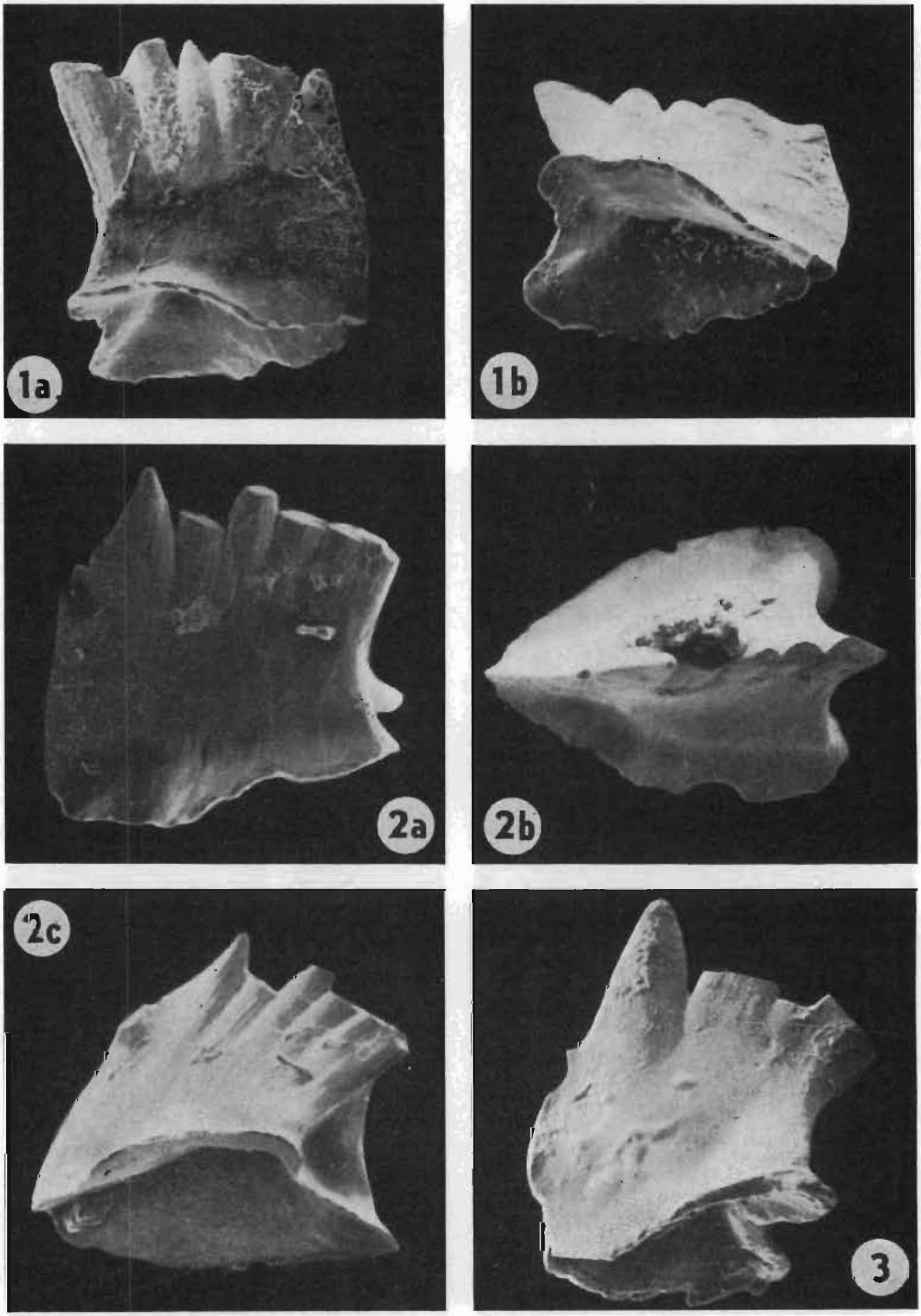
3. *Theelia liptovskaensis* Kozur and Mock sp.n., × 225; sample L_2, PFUK 383.
4. *Theelia trammeri* Kozur and Mock sp.n., holotype, upper view, × 90; sample L_1, PFUK 6651.

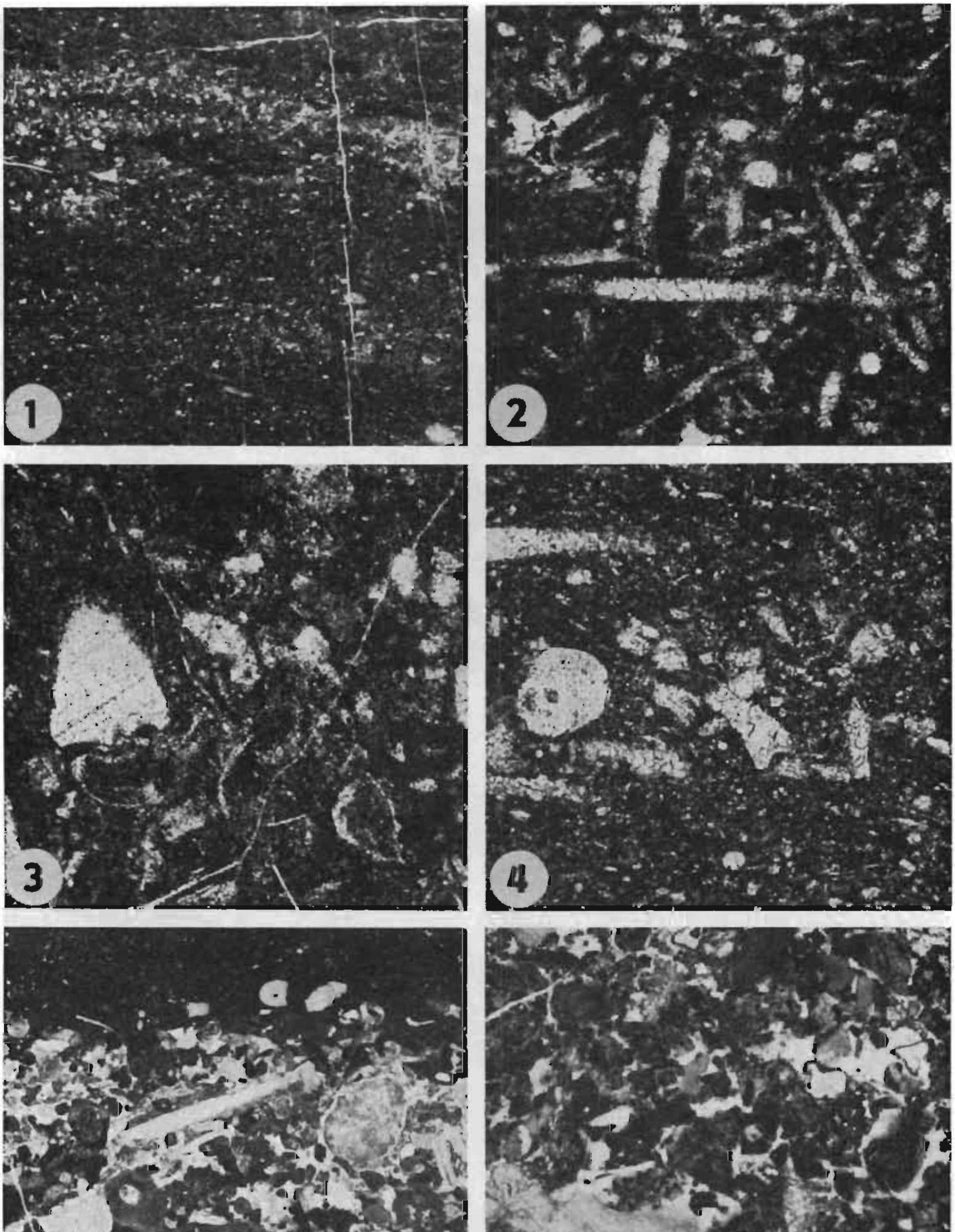
5—7. *Theelia trammeri* Kozur and Mock sp.n., *5—6* upper views, *7* — lower view, × 100; *5* from sample R_6, *6* from sample R_4, *7* from sample L_2, PFUK 397, 353, 6661.

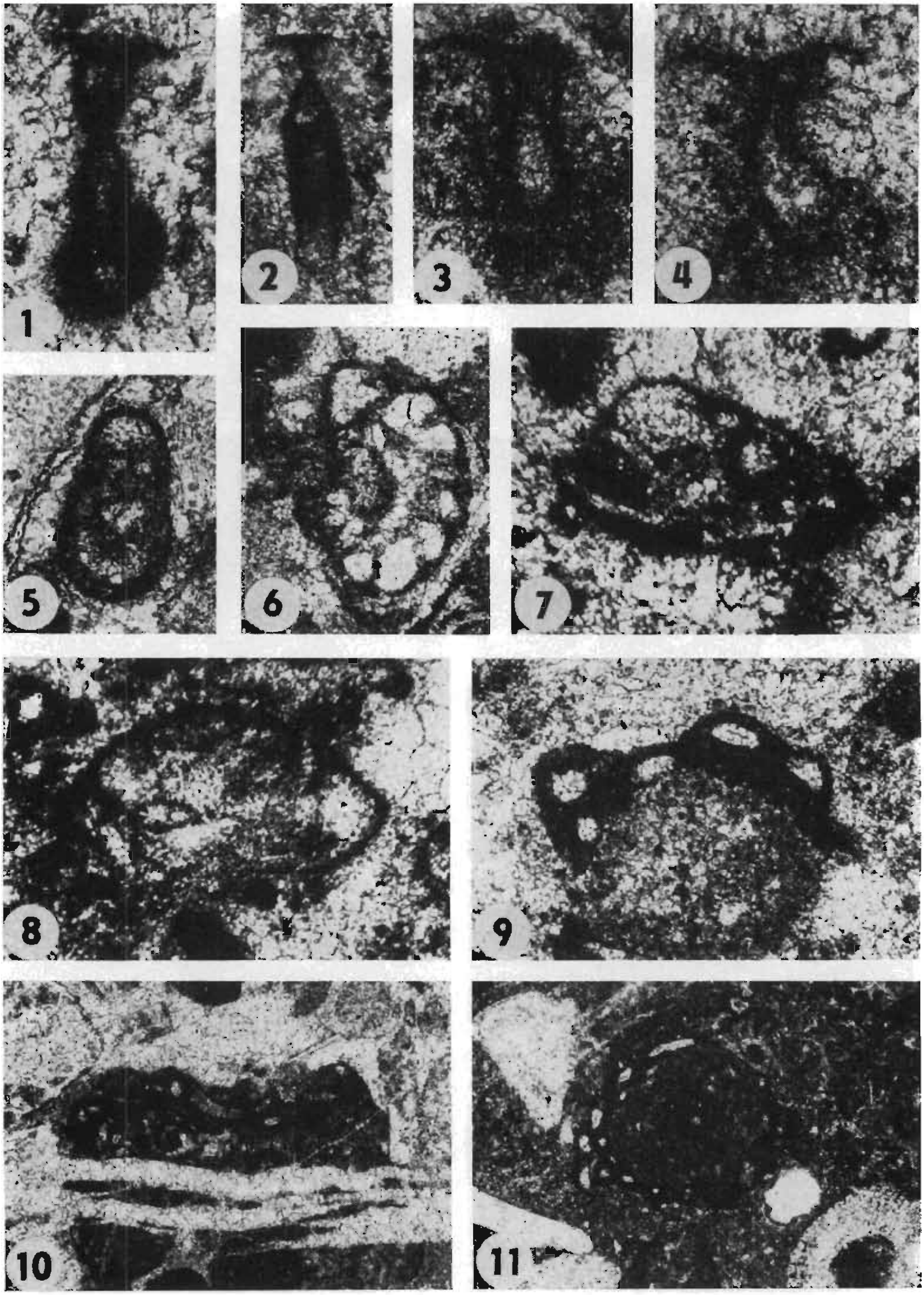
8—9. *Theelia immisorbicula* Mostler, *8* lower view, *9* side view, *8* × 150, *9* × 120; sample L_4, PFUK 356, 337.

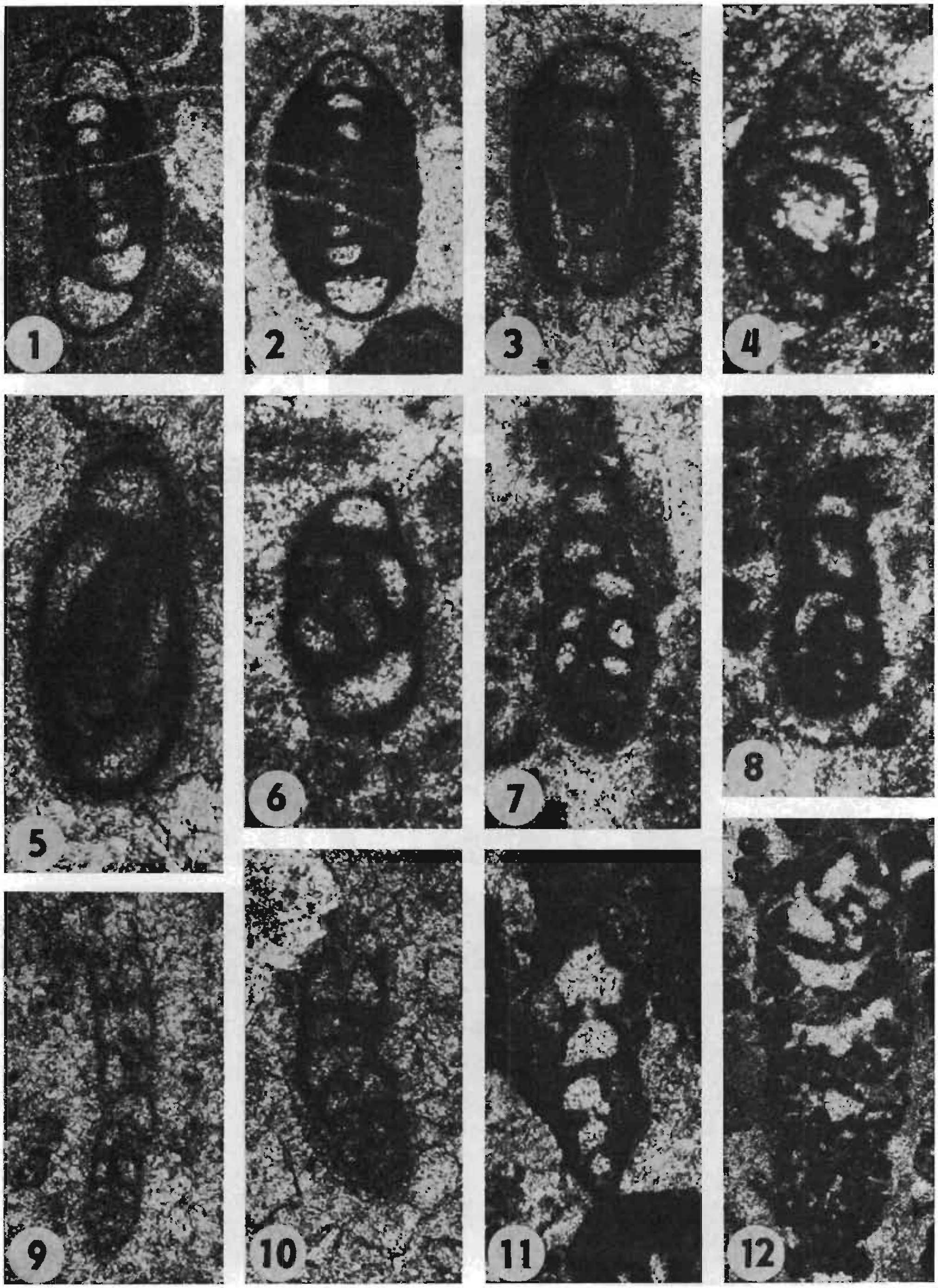

1a
1b
2a
2b
3a
3b

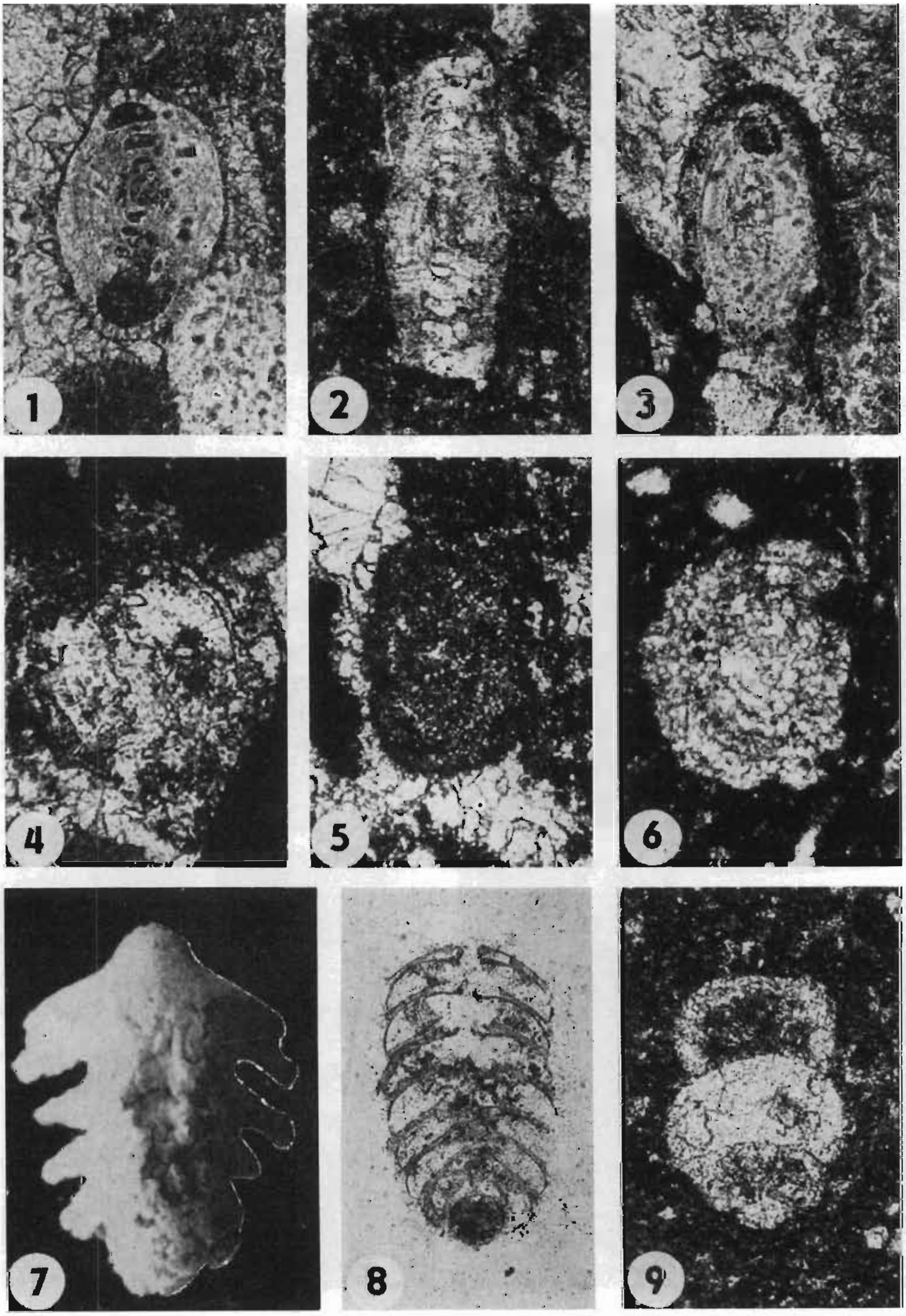

1
2
4a
3
4b
4c

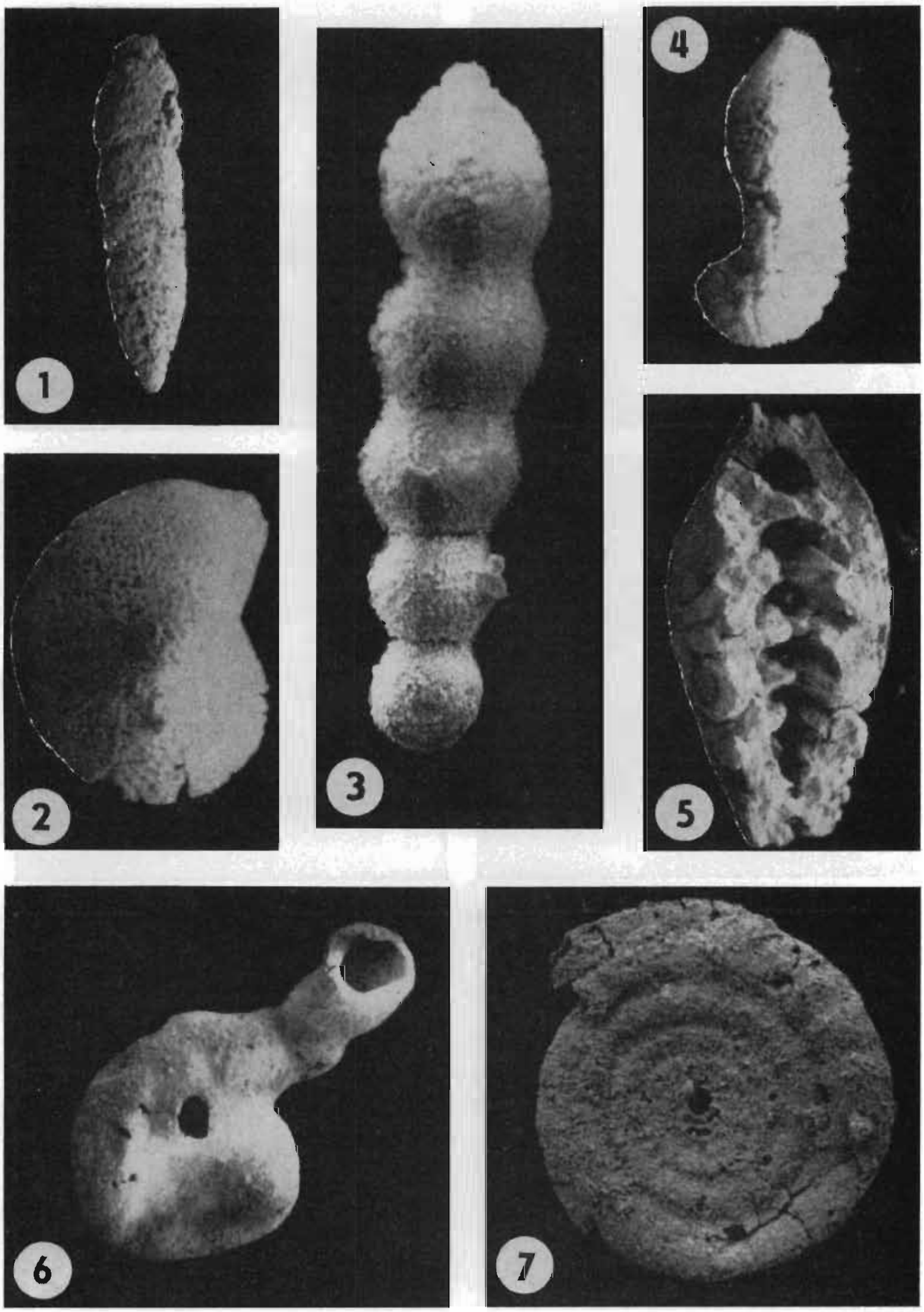

1a
1b
2a
2b
2c
3

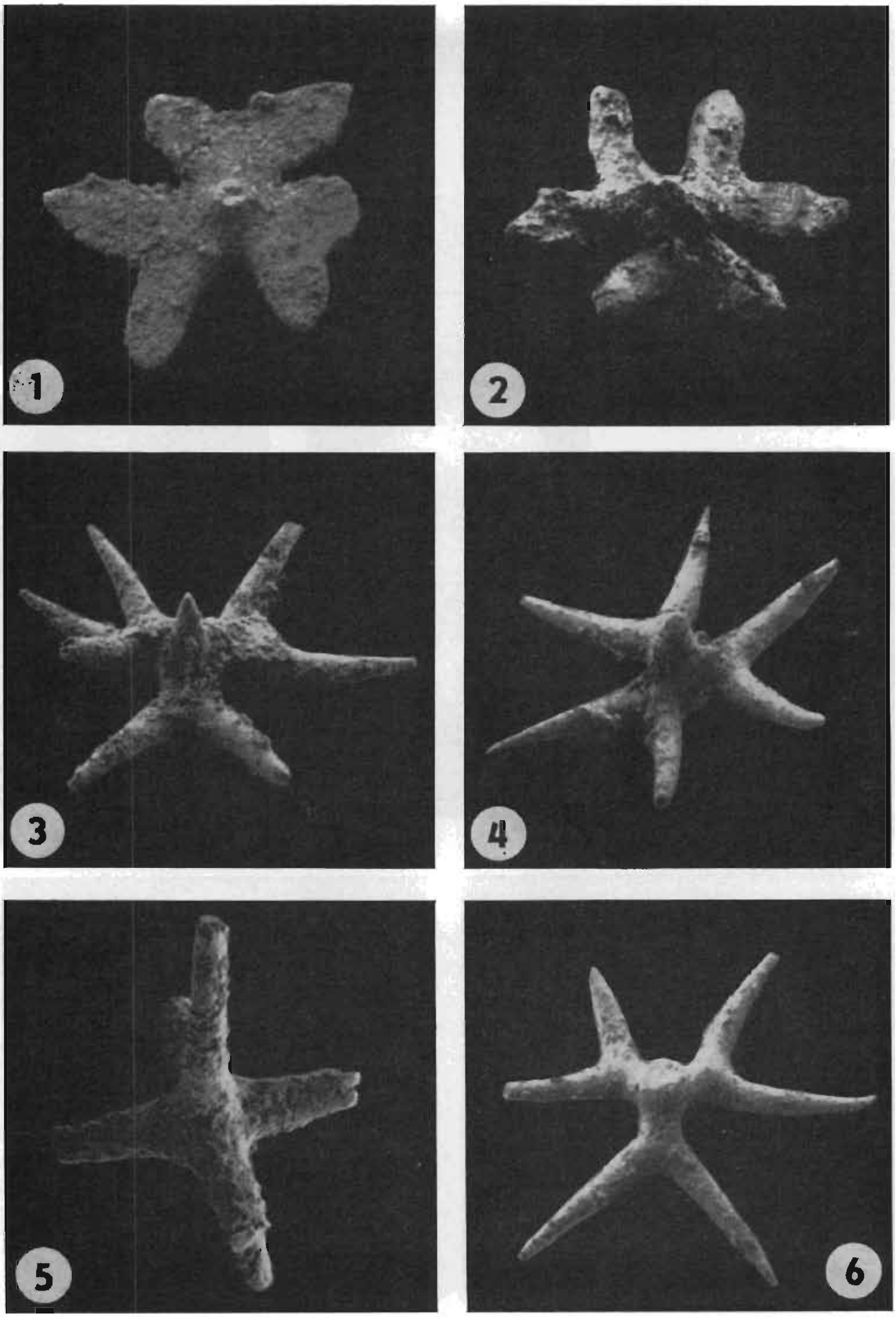

1
2
3
4
5
6

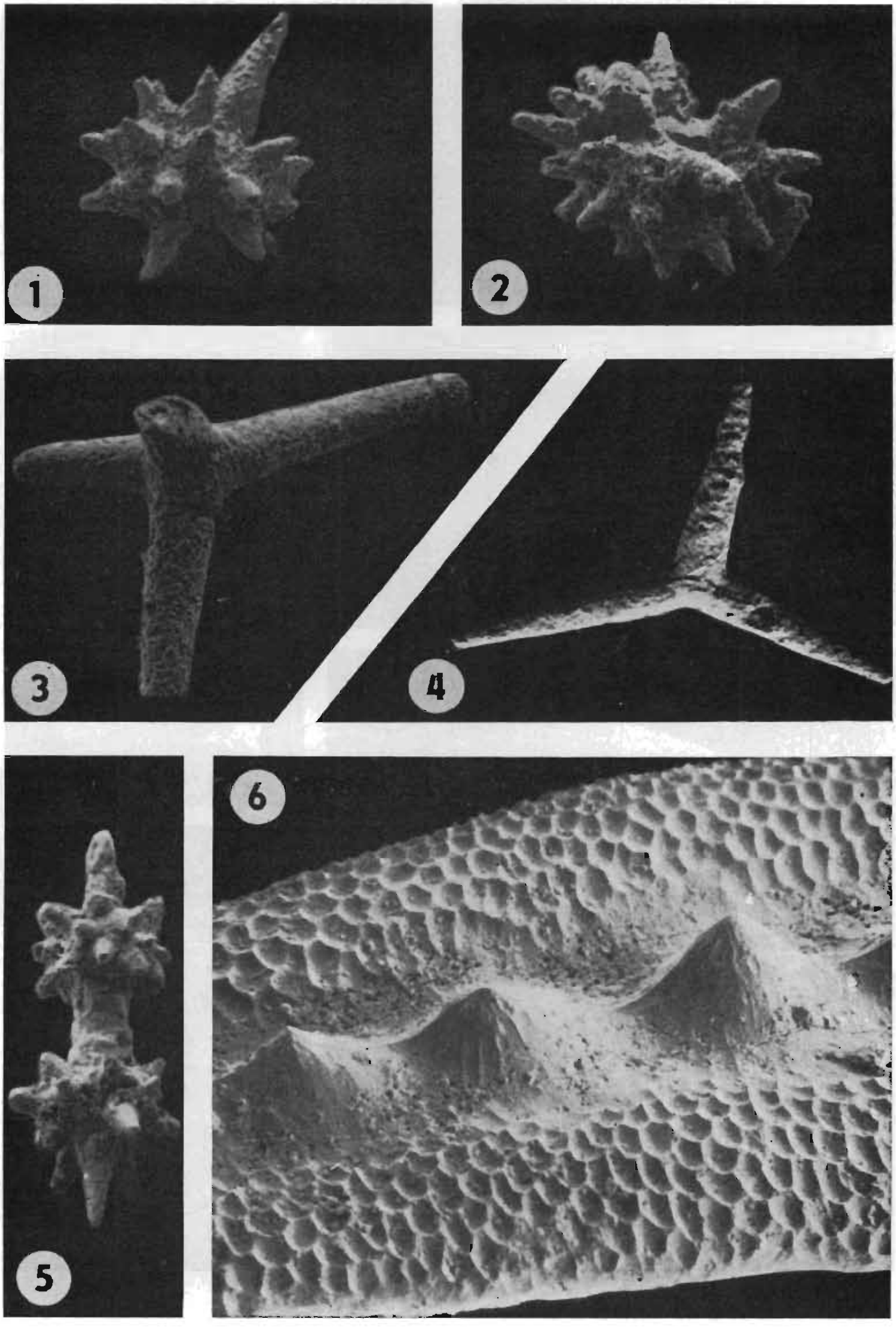

1
2
3
4
5
6
7
8
9
10
11

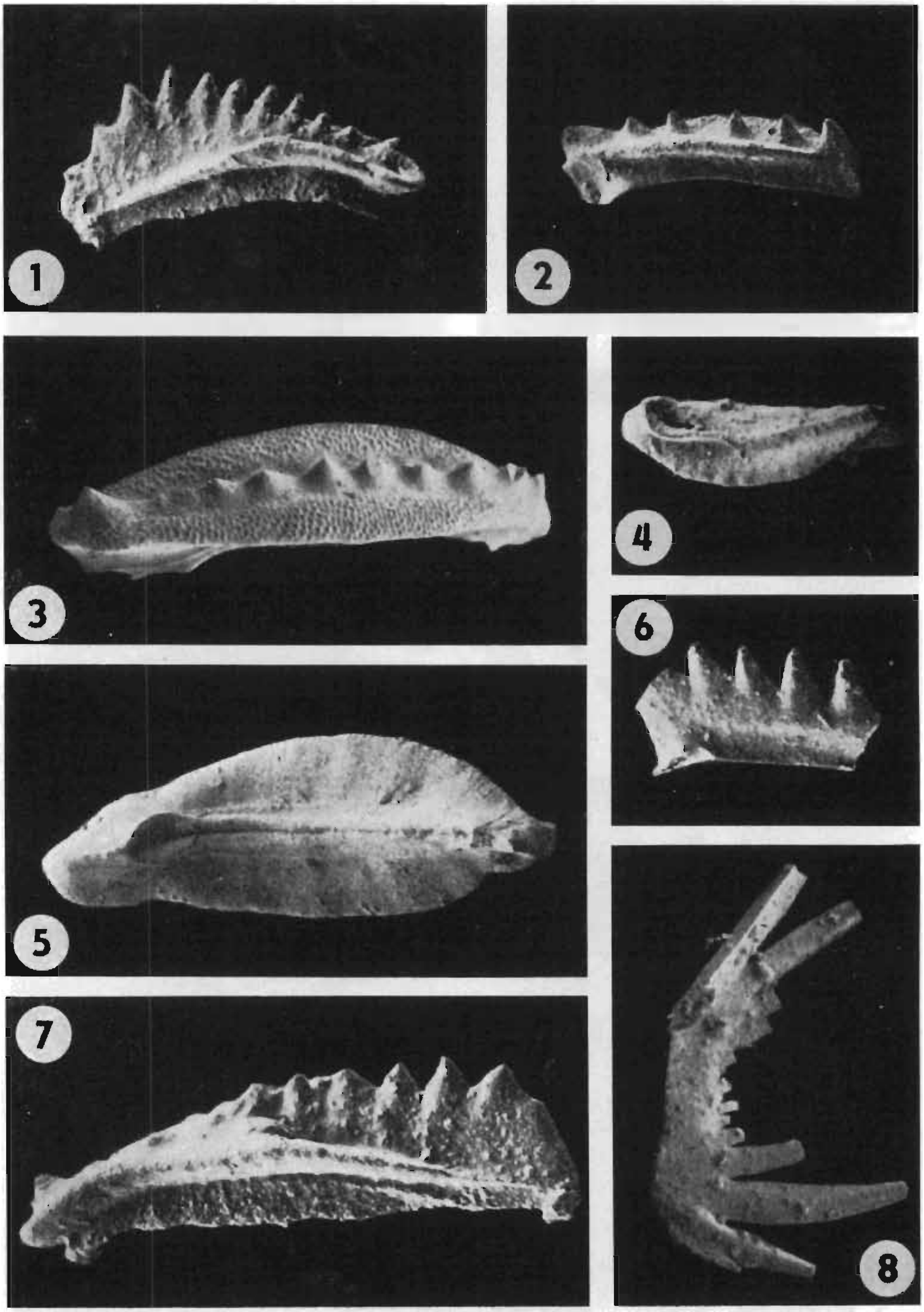

1
2
3
4
5
6
7
8
9
10
11
12

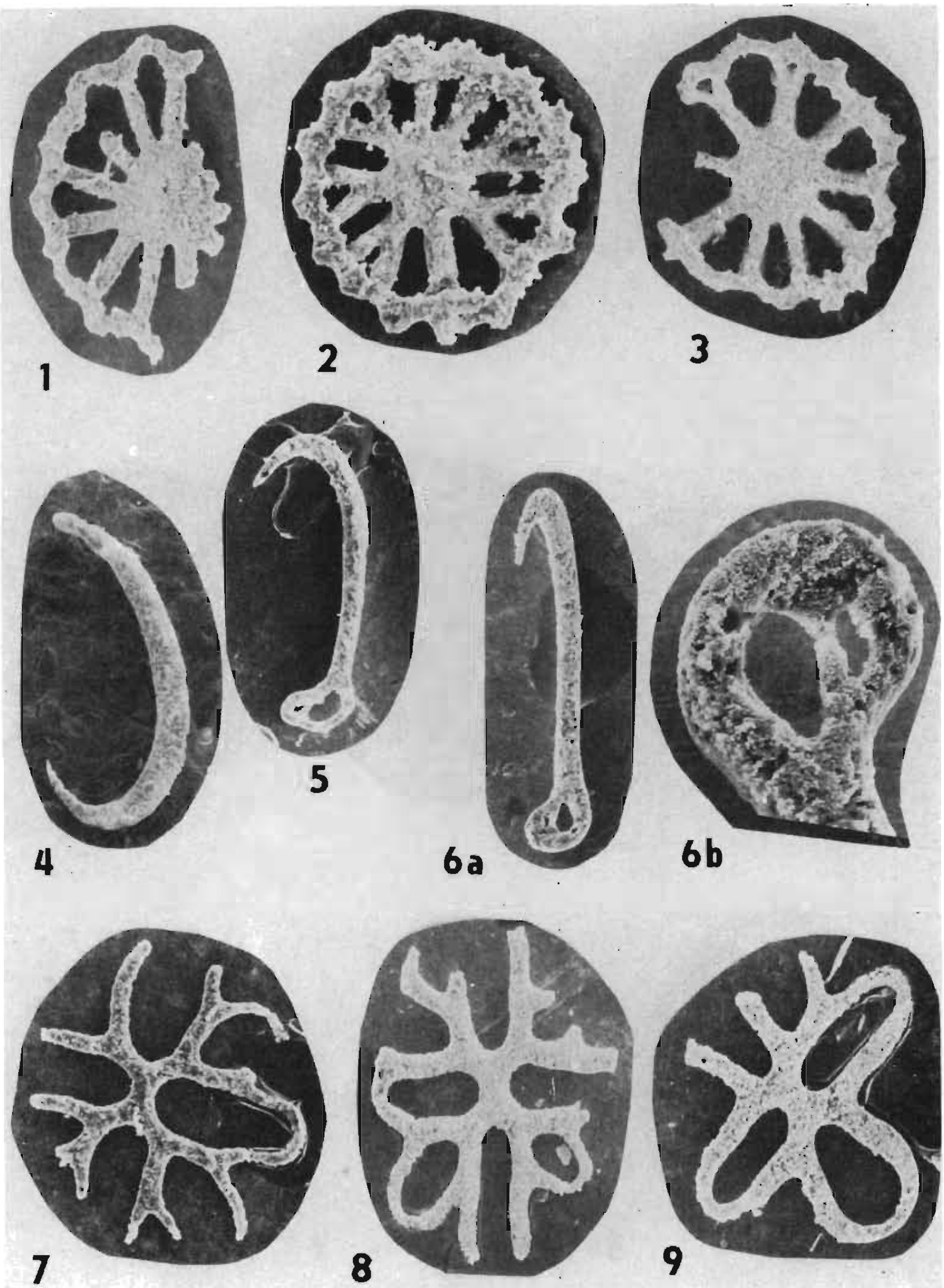

1
2
3
4
5
6
7
8
9

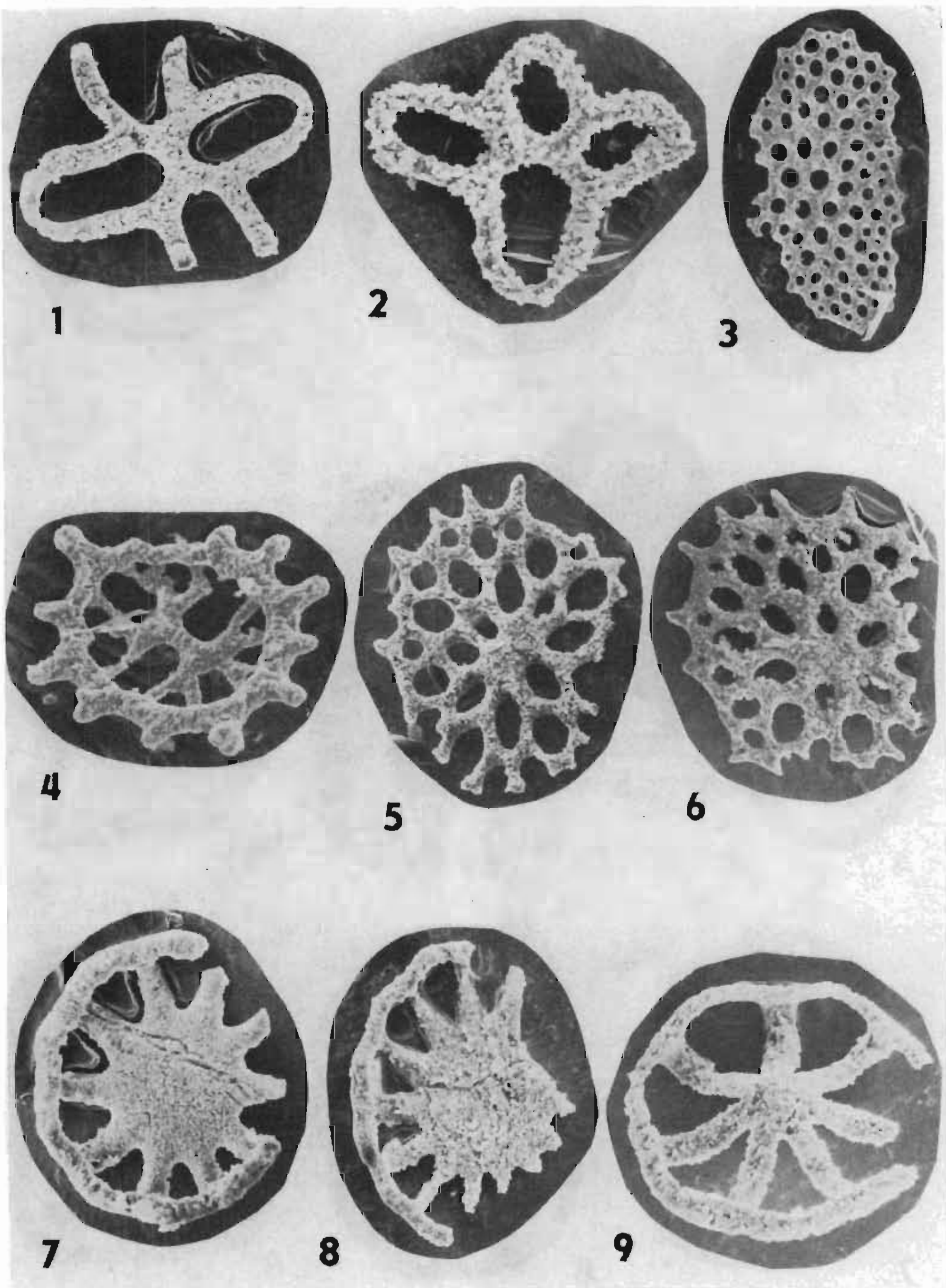

1
2
3
4
5
6
7

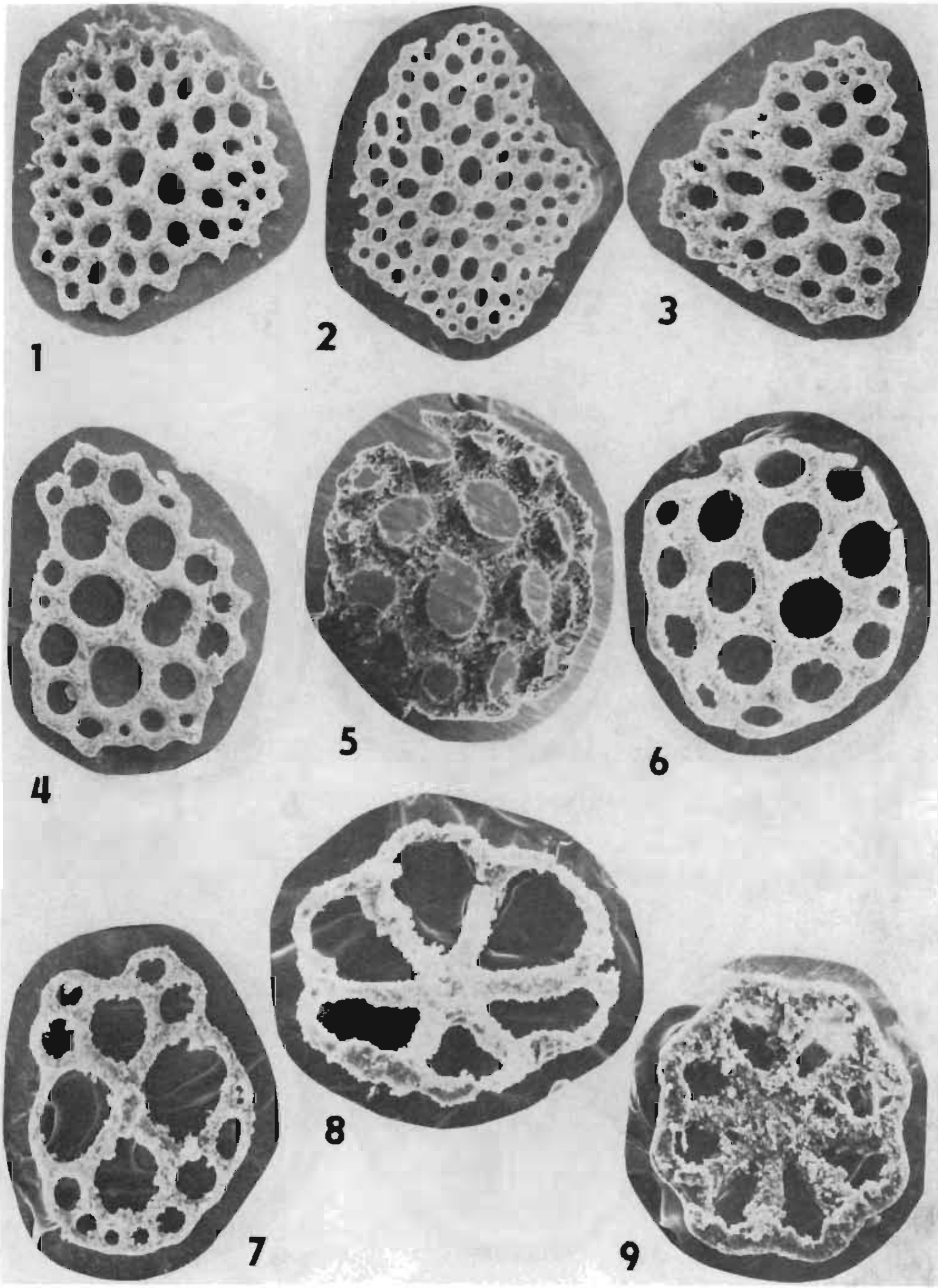

1
2
3
4
5
6

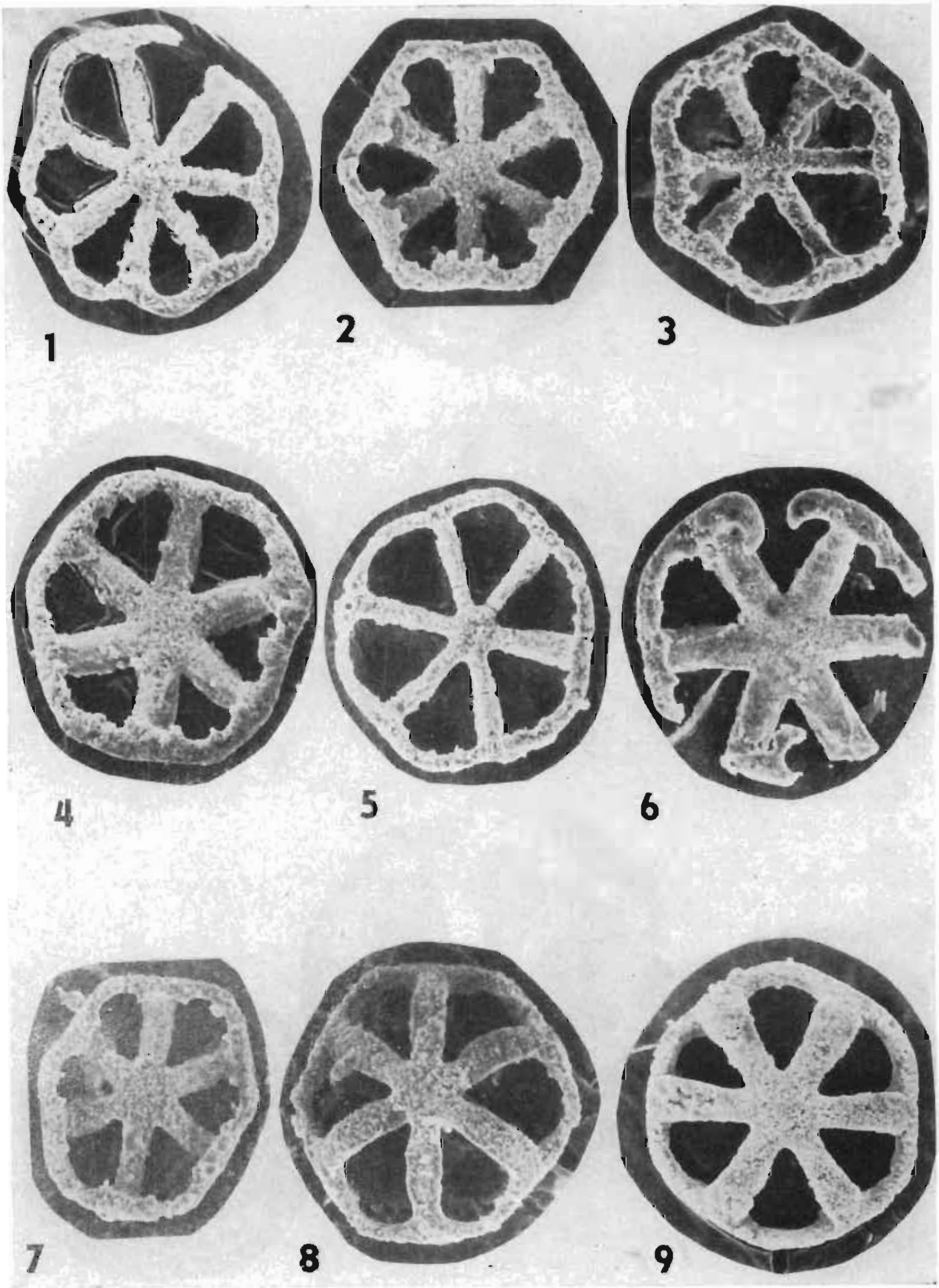

1
2
3
4
5
6

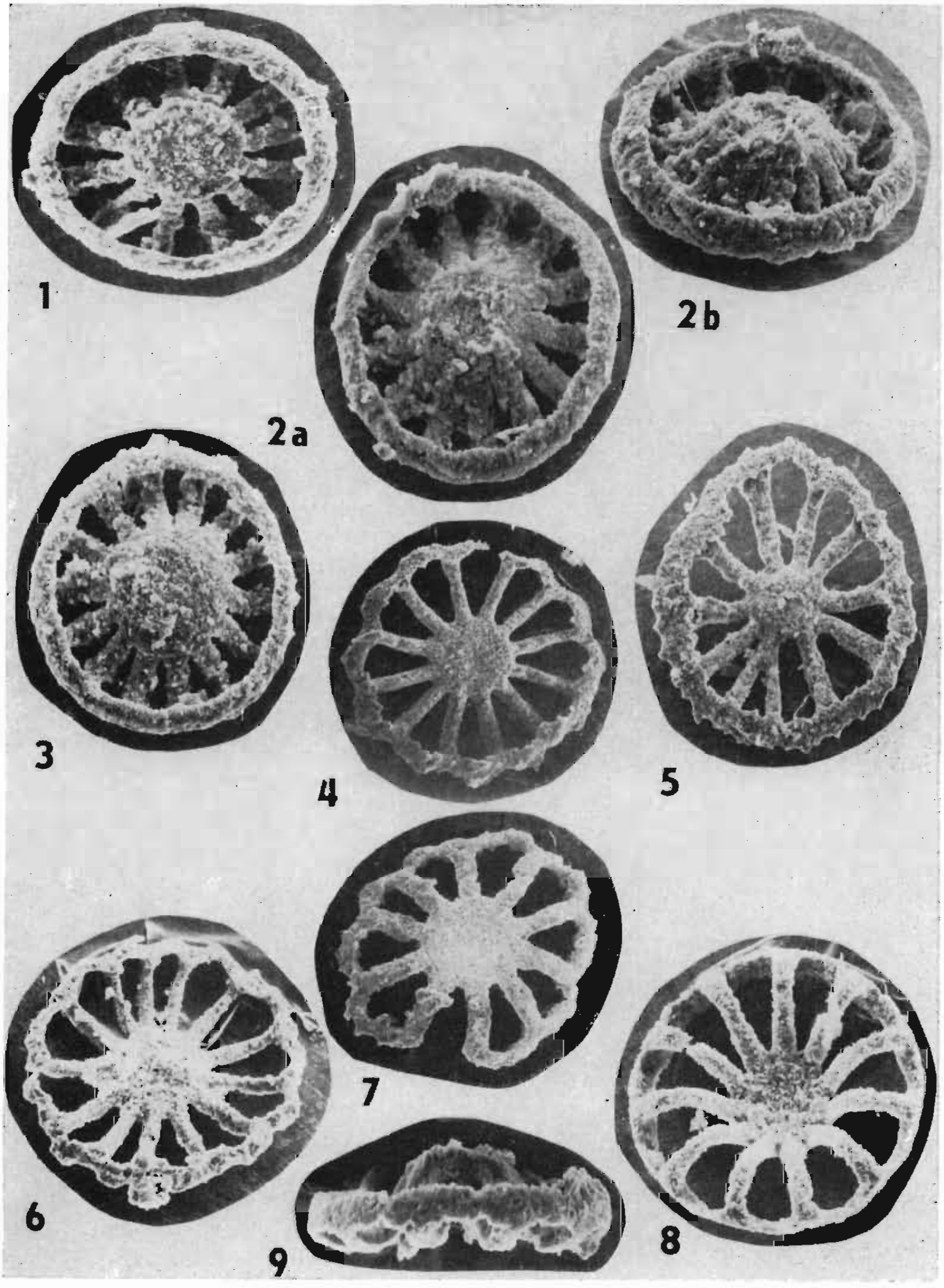

1
2
3
4
5
6
7
8


1
2
3
4
5
6a
6b
7
8
9


1
2
3
4
5
6
7
8
9


1
2
3
4
5
6
7
8
9


1
2
3
4
5
6
7
8
9


1
2a
2b
3
4
5
6
7
8
9