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PERMIAN DEEP-WATER OSTRACODS FROM SICILY (ITALY) PART 1 : TAXONOMY

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With 3 text-figures and 2 plates

Abstract:
Red, basal Upper Permian deep-water clays from Western Sicily with rich Circum-Pacific radiolarian faunas yielded also ostracods that belong exclusively to new species. One order, 2 families, 6 genera and 16 species are newly established, some other species are listed in open nomenclature.

Zusammenfassung:
Rote Tiefwassertone des tiefsten Oberperm von Westsizilien mit reichen zirkumpazifischen Radiolarienfaunen lieferten auch Ostracoden, die ausschließlich zu neuen Arten gehören. Eine Ordnung, 2 Familien, 6 Gattungen und 16 Arten werden neu aufgestellt, einige andere Arten werden in offener Nomenklatur aufgeführt.

1. INTRODUCTION

According to the present-day paleogeographic reconstructions, the Permian Western Tethys was a shallow-water gulf, extending from a pelagic, partly oceanic domain far in the east (western Iran or eastern Turkey) until the Dinarids, Southern Alps, Sicily and Tunisia in the west.

The finding of pelagic Lower and Middle Permian faunas, including Circum-Pacific Middle Permian radiolarians in the Phyllite Unit of Crete (Greece) by KOZUR & KRAHL (1987) considerably changed this view. The discovery of a pelagic Permian sequence from the Upper Artinskian up to Dzhulfian in the Sicanian paleogeographic domain of Western Sicily (CATALANO; DI STEFANO & KOZUR, 1988 a, b and in press) has than finally proven the existence of a pelagic, in large part oceanic Tethys immediately north of stable Gondwana at least since the Lower Permian. The Sicanian paleogeographic domain belongs to the passive margin of this Permian Tethys.

The here described Abadehian ostracod fauna from Western Sicily is the first Permian deep-water ostracod association from Italy and the whole Eurasiatic Tethys. No relations exist to contemporaneous shallow-water ostracod faunas of adjacent areas from the Western Tethys. Similar faunas, but of Lower Permian age, have been found only on Timor Island (GRÜNDEL & KOZUR, 1975, BLESS, 1987).

2. INVESTIGATED AREAS

Several sections and numerous single samples have been investigated in the Sosio Valley area near Palazzo Adriano and in the Lercara-Roccapalumba area (see text-fig. 1). Permian ostracods have been found in many localities, but rich and well preserved associations have been discovered only in the Torrente San Calogero section (locality 2 in text-fig. 1) near Pietra di Salomone (Sosio Valley area).

The geologic situation of this area is described by CATALANO; DI STEFANO & KOZUR (1988 b and in press). The Torrente San Calogero section belongs to a Upper Miocene nappe thrusted over Serravallian clays. Within this nappe, the section is part of the overturned limb of a large recumbent fold, sheared into tectonic slices during younger post-Miocene movements. Two of the slices (Units A and B in text-fig. 2) consist of pelagic Permian sediments, the other two slices (Units C and D) consist of pelagic Middle Triassic rocks.

The age of the here described ostracods can be determined by accompanying radiolarians (in the red clays) and conodonts (in the Jachtashian = Kungurian flysch and in the calcarenites intercalated into the red clays). Most of the here described ostracods have been collected from red, soft clays of Unit B (see text-fig. 2). These water-dispersible clays contain in general 1,000–10,000, but sometimes several 100,000 radiolarian specimens per kg sediment. This radiolarian fauna consists of Circum-Pacific species, mostly highly evolved Follicucullidae, like *Follicucucullus* ? cf. *charveti* CARIDROIT & DE WEVER and *Ishigaconus scholasticus* (ORMISTON & BABCOCK). Last few representatives of *Pseudoalbaillella eurasiatica* KOZUR; KRAHL & MOSTLER are also present.

Ishigaconus scholasticus has been originally described from the Lamar Limestone of Texas, mostly placed into the topmost Capitanian (uppermost Middle Permian), but regarded as post-Capitanian by FURNISH (in: LOGAN & HILLS, 1973). In Japan this species occurs both in the higher Capitanian and in the Upper Permian. *Pseudoalbaillella eurasiatica* has its main occurrence in the Middle Permian, but few specimens have been found also in the lower part of Upper Permian.

Highly evolved Follicucullidae of the *F.? charveti* group characterize the Lower and Middle Abadehian (basal Upper Permian). Therefore the sample 655, from which the *F. charveti* group and most of the here described ostracods derived, can be placed into the basal Upper Permian, but topmost Middle Permian age cannot be excluded. The possible maximum range of sample 655 is *Follicucullus ventricosus - Ishigaconus scholasticus* A.Z. to *Follicucullus ? charveti - Imotoella triangularis* A.Z. sensu KOZUR & MOSTLER (1989), that means topmost Middle Permian to basal Upper Permian.

A similar age can be assumed for sample 653 with *Ishigaconus scholasticus* and *Pseudoalbailella eurasiatica*, but without *Follicucullus* ? cf. *charveti*.

Thin calcarenites within the red clays of Unit B yielded many ostracods and different conodont faunas of Middle and Upper Permian age. Some of the ostracods in the red clays derived from the calcarenites or they were transported together with the calcarenites into the basin. These ostracods can be easily recognized by their white calcareous matrix.

Also the Jachtashian (Kungurian) flysch contains some ostracods. Resedimented limy sandstones and sandy limestones contain mostly shallow-water ostracods accompanied by other transported shallow-water faunas as well as by pelagic faunas with conodonts that allow an exact age determination.

Text-fig. 3 gives an overwiev on Permian-Triassic stratigraphy. (Text-figures 1–3 see pages 18–20).

3. TAXONOMIC PART

All described ostracods are deposited in the Dipartimento di Geologia e Geodesia, Università di Palermo, Italy.

Superorder Podocopamorphes KOZUR, 1972
Order Platycopida SARS, 1866
Suborder Platycopina SARS, 1866
Superfamily Cytherellacea SARS, 1866
Family Spinososioellidae n. fam.

Diagnosis: Carapax subrectangular, highest in the anterior third. RV larger than LV. Dorsal margin long, straight, ventral margin concave. Posterior swelling reticulated, remainig surface smooth. Both valves have a strong posteroventral backward and obliquely outward, often a little downward directed hollow spine. In the RV additionally a posterodorsal, obliquely backward, outward and somewhat upward directed spine is present.

Hinge undifferentiated with furrow in the RV and ridge in the LV. The furrow is distinct at the dorsal, posterior and ventral margin, but it was not yet observed at the anterior margin, where it is either missing or very indistinct. No calcified inner lamella.

Strong kloedenellid sexual dimorphism with well developed limen separating the brood pouch in the ♀♀.

Occurrence: Highest Middle Permian to basal Late Permian red deep-water clays of Western Sicily.

Remarks: According to the outline, hinge and strong kloedenellid sexual dimorphism *Spinososioella* is a typical representative of the Cytherellacea. The enigmatic spines and their arrangement is until now unknown from the Platycopina, but common among spined palaeopsychrospheric deep-water Podocopida. For instance, *Rectoplacera* BLUMENSTENGEL, 1965 has quite the same arrangement of the spines with posteroventral and posterodorsal spine in the larger valve and only posteroventral spine in the smaller valve. But in this genus the LV is the larger valve and the inner structure is typical for Pachydomellidae BERDAN & SOHN, 1961 (Bairdiocypridacea SHAVER; 1961). Kloedenellid sexual dimorphism is unknown in *Rectoplacera*.

Therefore the spinose palaeopsychrospheric ostracods have ecologically controlled similarities in their spine development and arrangement which should not be overestimated in the taxonomy of these ostracods. For this reason, the new familiy can be well placed into the Cytherellacea SARS, 1866.

The presence of a nearly uninterrupted hinge furrow in the RV (only on the anterior margin not yet observed, preservation reasons ?) speaks against the placement into the otherwise similar Kloedenellacea ULRICH & BASSLER; 1908.

Genus *Spinososioella* n. gen.

Derivatio nominis: According to occurrence in the Sosio Valley and the presence of spines.
Type species: *Spinososioella catalanoi* n. gen. n. sp.
Diagnosis and occurrence: See under the family.
Assigned species:
Spinososioella catalanoi n. gen. n. sp.
Remarks: *Cavellina* CORYELL, 1928 is distinguished by the absence of any spines.

Parahealdia CORYELL & CUSKLEY, 1934 has in both valves posteroventral and posterodosal spines with connecting vertical ridge, like in *Healdia*. Moreover, a distinct sulcus is present.

Spinososioella catalanoi n. gen. n. sp.
(Pl. 1, figs. 1, 2, 9)

Derivatio nominis: In honour of Prof.Dr. R. CATALANO, Palermo.
Holotype: The specimen on pl. 1, figs. 1, 9; rep. no CK/VII–2.
Locus typicus: Torrente San Calogero section SW of Pietra di Salomone, Sosio Valley, Western Sicily.
Stratum typicum: Red deep-water radiolarian clay, Abadehian, sample 655.
Material: 24 valves, 2 carapaces.
Diagnosis: RV larger than LV. Outline subrectangular in lateral view, highest in the anterior third. Anterior margin broadly rounded, in this lower part distinctly oblique. Posterior rounded margin lower than anterior one. Dorsal margin straight, in the LV a little convex, somewhat converging against the concave ventral margin.

Both valves with large, hollow posteroventral spine, which is backward and obliquely outward, in the RV also a little downward directed. In the RV additionally a large, hollow posterodorsal spine is present, which is obliquely backward, outward and upward directed. Lateral surface along the anterior and posteroventral margin flattened and in the posterior third with distinct, large, reticulated swelling. Remaining lateral surface smooth, rarely in the anterior third indistinctly reticulated. Mid-dorsally a short, low, narrow indistinct ridge is present. Ventrally a broad, narrow, low swelling is present, which continues into the posterior swelling. In ♀♀ also an indistinct anterior swelling is present. In ♂♂ this swelling is either quite indistinct or not present. In front of the posterior swelling and indistinct broad sulcus is present.

Hinge simple. The furrow in the RV is distinct and broad at the dorsal margin, but also dinstinct (somewhat narrower) at the posterior and ventral margins. At the anterior margin it was not yet clearly observed, but may be present as well. No calcified inner lamella.

Distinct kloedenellid sexual dimorphism. The posterior swelling is larger and nearly hemicircular in ♀♀.
Measurements:
l (without spines) = 407–620 µm
h = 241–322 µm
Occurrence and remarks: As for the genus and family.

Suborder Kloedenellocopina SCOTT, 1961
Superfamily Leperditellacea ULRICH & BASSLER, 1906
Genus *Primitiella* ULRICH, 1894
Primitiella ? sp.
(Pl. 1, fig. 28)

Remarks: This small form with very shallow sulcus S 2 and weak ventral ribs corresponds in its morphology to the genus *Primitiella*, but inner features are unknown.

Suborder inc.
Superfamily Scrobiculacea POZNER, 1951
Family Roundyellidae GRAMM, 1976

Remarks: Until now *Roundyella* BRADFIELD, 1935, *Scrobicula* POZNER, 1951 and similar other small subelliptical to subrectangular ostracods without or with indistinct "kirkbyan pit" (never with corresponding knob on the inner side) have been placed into the Scrobiculidae POZNER, 1951. This family has been mostly regarded as kirkbyid ostracods.

GRAMM (1976) separated *Scrobicula* and *Roundyella* not only in family, but also in superfamily level. This has been rejected by BECKER (1978), who placed *Roundyella* again into the Scrobiculidae and into the Kirkbyacea.

According to KOZUR (1972) the Scrobiculidae are doubtful Kirkbyacea and he placed this family into the Podocopida because of the muscle scar with frontal spot in *Scrobicula*. Meanwhile the muscle scar is known from *Scrobicula*, *Roundyella* and *Egorvitina* GRAMM, 1977. Mandibular spots are missing in all these forms. This speaks against a placement into the Podocopida.

GRAMM (1976) figured a photo of a mesoplate calcified inner lamella in *Roundyella*. Our material has, in agreement with the observation by SOHN (1954) not shown any duplicature. But the few single valves of *Roundyella* does not show excellent preservation, necessary to recognize the presence of mesoplate duplicature. Also the presence of a mesoplate duplicature would indicate that *Roundyella* does not belong to the Podocopida.

The adductor muscle scar of *Scrobicula* shows biserially or triserially arranged spots, like in many muscle scars of primitive Platycopida. The adductor muscle scar of *Roundyella* consists of 3-4 central spots, surrounded by a ring of spots. Also this type of muscle scar can be found in several primitive Platycopida (Kloedenellocopina). The muscle scar of *Egorovitina* consists of radially arranged elongated spots in a semicircle and an additional large spot (sometimes subdivided into two partial spots) on the concave side of the semicircle. This muscle scar is similar to recent Punciidae, but also the muscle scar of *Roundyella* is not basically different.

As mentioned above, such types of muscle scars, especially of *Roundyella*, are typical for some Kloedenellocopina. Other Kloedenellocopina have bi- or triserially arranged muscle scars (GRAMM, 1984), similar to *Scrobicula*. The two types, on the first sight quite different, seems to be near related each other. This is also indicated by the fact that juvenile *Scrobicula* have a muscle scar, quite similar to the muscle scar of *Egorovitina* and some muscle scars of adult *Scrobicula* are similar to the muscle scar in *Roundyella*.

Scrobicula has an oval to suboval lateral outline without or with quite indistinct, rounded cardinal angles, the anterior of which is larger. The straight dorsal margin is relatively short. Sometime the dorsal margin is even slightly convex. This outline is quite different from the typical kirkbyid outline that is very constant and even unchanged in their successors, the recent punciids (KOZUR, in press). On the other hand, the *Scrobicula* outline is typical for Platycopina. Also the strong overlap of the considerable larger RV over the LV remembers to Platycopina.

The lateral outline of *Roundyella* and *Egorovitina* is not very different from the *Scrobicula* outline and also in these genera the RV is somewhat larger than the LV. The dorsal margin is long and always straight, but shorter than in typical Punciocopina, where the dorsal margin is as long as the maximum length or only a little shorter. The cardinal angles are rounded and not so pronounced than in Punciocopina, but more distinct than in *Scrobicula*. Often the anterior cardinal angle is larger than the posterior one. In some *Roundyella* species a distinct smooth spot is present in the position of the kirkbyan pit, but it is never reflected as a knob on the inner side of the valve and it cannot be regarded therefore as a real kirkbyan pit or homologous structure. Often this smooth spot is also outside quite indistinct or missing. As a whole, *Roundyella* and *Egorovitina* are in their outline nearer related to *Scrobicula* than to typical kirkbyids (Punciocopina).

There are so much similarities between these 3 genera that they cannot be placed into 2 different superfamilies. Moreover, at least the Roundyellidae GRAMM, 1976 and the Egorovitidae GRAMM, 1977 are synonymous each other. Because of the differences in outline the Scrobiculidae POZNER, 1951 are regarded as independent family of the same superfamiliy (Scrobiculacea).

Maybe that also the Youngiellacea KELLETT, 1933 are related to this superfamily. But in the Youngiellacea the LV is somewhat larger than the RV and the hinge is taxodont. Moreover, the cardinal angles are more pronounced and mostly distinct lateral ribs are present, missing in the Scrobiuclacea. The adductor muscle scar consists only of 3-4 large spots. But this field could be near related to the muscle scar of *Roundyella* with 3-4 large inner spots surrounded by an outer ring of spots.

Both according to their morphology and to their muscle scars the Scrobiculacea are near related to the Platycopida, distinguished only by the missing sexual dimorphism that can be absent also in some Kloedenellocopina (Leperditellacea ULRICH & BASSLER, 1906).

Genus *Roundyella* BRADFIELD, 1935

Type species: *Amphissites simplicissimus* (KNIGHT, 1928)

Roundyella sp.

(Pl. 1, fig, 27)

Remarks: A few valves of a weakly sculpturated (pitted lateral surface with some papillae) species are present which is near related to Carboniferous, weakly sculpturated forms.

Order Podocopida SARS, 1866
Suborder Bairdiomorpha KOZUR, 1972
Superfamily Bairdiacea SARS, 1888
Family Bythocyprididae MADDOCKS, 1969
Genus *Praezabythocypris* KOZUR, 1985

Type species: *Praezabythocypris pulchra* KOZUR, 1985

***Praezabythocypris* sp. ex gr. *pulchra* KOZUR, 1985**
(Pl. 1, fig. 13)

Remarks: Only one carapace is present. The depression on the anterior margin is seemingly a preservation-controlled deformation.

Occurrence: Middle and Late Permian deep-water sediments of Sicily.
Remarks: *Bashkirina* sp. A. BECKER & SANCHEZ DE POSADA, 1977 from the Late Devonian is similar, but the posterior end is narrowly rounded.

The Later Permian *Bashkirina* species from shallow-water deposits have quite different outline, especially the l/h ratio is considerably smaller (1.43 - 1.8, mostly 1.45–1.6 against about 2 in *Bashkirina* ? *calogeroensis* n. sp.

The generic assignment of the new species is not sure, because no single valve have been found. Therefore the inner structures are unknown. *Spinocypris* KOZUR, 1971 has quite the same outline, but a broad duplicature with wide vestibulum, whereas *Bashkirina* has no or only a very narrow calcified inner lamella.

Suborder Cypridocopina JONES, 1901
emend. KOZUR, 1972
Superfamily Bairdiocypridacea SHAVER, 1961
Family Bairdiocyprididae SHAVER, 1961
Subfamily Praepilatininae KOZUR, 1985
Genus *Bashkirina* ROZDESTVENSKAJA, 1959

Type species: *Bashkirina memoarbilis* ROZDESTVENSKAJA, 1959

***Bashkirina* ? *calogeroensis* n. sp.**
(Pl. 2, fig. 7)

Derivatio nominis: According to its occurrence in the Torrente San Calogero section.
Holotype: The specimen on pl. 2, fig. 7; rep. no. CK/III-33
Locus typicus and stratum typicum: As for *Spinososioella catalanoi* n. gen. n. sp.
Material: 21 specimens.
Diagnosis: Lateral outline subtriangular. Anterior margin broadly rounded. Ventral margin straight. Dorsal margin also straight, in posterior direction strongly converging against the ventral margin. Posterior margin posteroventrally pointed, in the RV prolongated into a short spine. The transition between posterior and dorsal margin is gradual. Inner structures unknown.
Measurements:
l = 386–414 μm
h = 192–196 μm

Family Pachydomellidae BERDAN & SOHN, 1961
Genus *Microcheilinella* GEIS, 1933

Type species: *Microcheilus distortus* GEIS, 1932

***Microcheilinella* sp.**

Remarks: An uncharacteristic *Microcheilinella* species, similar to many other older and younger forms, is frequent in the Middle and Late Permian of Torrente San Calogero.

Genus *Spinomicrocheilinella* KOZUR, 1985

Type species: *Spinomicrocheilinella spinosa* n. gen. n.sp.

***Spinomicrocheilinella dargenioi* n. sp.**
(Pl. 1, figs. 11, 17)

Derivatio nominis: In honour of Prof.Dr. B. d'ARGENIO, Napoli.
Holotype: The specimen on pl. 1, fig. 11; rep. no. CK/V–42
Locus typicus: Torrente San Calogero section.

Stratum typicum: Red deep-water radiolarian clay of topmost Middle Permian to basal Late Permian age, sample 653.
Material: 12 specimens.
Dianosis: Carapace small, tumid, in lateral view elliptical, highest about in the midlength, widest about in the centre. Anterior margin a little higher than posterior one, both broadly rounded. Dorsal margin in both valves slightly convex. Ventral outline in the LV convex, in the RV straight. Inward-bent ventral margin also in the LV straight. The considerable larger LV strongly overlap the RV all around.

Surface smooth. Posteroventral a strong spine is present, obliquely backward and somewhat downward directed.

Hinge adont. Calcified inner lamella not observed.
Measurements:
l = 549–593 µm
h = 289–307 µm
Occurrence: Highest Middle Permian and basal Late Permian deep-water sediments of Western Sicily.
Remarks: Juvenile forms have the same outline than adults.

Contemporaneous or only a little younger *Spinomicrocheilinella* species from shallow-water deposits have an upward-bent posteroventral spine. Moreover, the outline is different (posterior margin more acutely rounded).

Similar spined forms from the Late Devonian and Lower Carboniferous paleopsychrospheric deep-water ostracod faunas have a dorsal shoulder (*Pachydomella* ULRICH, 1891).

Family Rectonariidae GRÜNDEL, 1962
Genus *Pseudospinella* n. gen.

Derivatio nominis: According to the sculpture similarities with *Spinella* BLUMENSTENGEL, 1965.
Type species: *Pseudospinella ruggierii* n. gen. n. sp.
Diagnosis: Carapace subtriangular to suboval, highest behind the midlength or in the posterior third. Larger LV overlaps the RV all around, but least strongly along the dorsal margin. Anterior margin lower than posterior one. Dorsal margin long, in the RV straight, in the LV straight to slightly convex.

In both valves a distinct, obliquely backward directed spine is present in the posterior third above the midline. In the LV additionally an anterodorsal, obliquely forward directed spine is present. Lateral surface smooth.

Hinge adont. Calcified inner lamella not observed.
Occurrence: Early to Late Permian paleopsychrospheric deep-water ostracod faunas from Timor Island and Western Sicily.
Assigned species:
Pseudospinella ruggierii n. gen. n. sp.
Spinella bitauniensis BLESS, 1987
Remarks: Sexualdimorphismus is seemingly present, indicated by slightly different outline of the sexes.

Spinella BLUMENSTENGEL, 1965 has similarly arranged spines, but it is equivalved and the maximum high is before the midlength. BLUMENSTENGEL (1965) placed this genus into the Tricorninidae BLUMENSTENGEL, 1965 and this taxonomic position seems to be correct.

As already mentioned by BECKER (1981), similar spine patterns occur in different taxonomic units among the Paleozoic deep-water ostracods. These spine patterns are environmental-controlled and should not be overestimated in the taxonomy. The present material has shown that similar and even the same spine patterns can occur not only in quite different podocopids, but even in platycopids (see under *Spinososioella* n. gen.). We find identical or very similar spine patterns in the following groups: Podocopida, Cypridocopina JONES, 1901 emend. KOZUR, 1972: Bairdiocypridacea SHAVER, 1961 (Pachydomellidae BERDAN & SOHN, 1961: *Rectoplacera* BLUMENSTENGEL, 1965, Rectonariidae GRÜNDEL, 1962: *Rectonaria* GRÜNDEL, 1961, *Orthonaria* BLUMENSTENGEL, 1965, pars, *Pseudospinella* n. gen.), Cypridacea BAIRD, 1845 (*Triplacera* GRÜNDEL, 1961), Healdiacea HARLTON, 1933 (e.g. *Timorhealdia* BLESS, 1987), Cytherocopina GRÜNDEL, 1967: Tricorninacea BLUMENSTENGEL, 1965 (Tricorninidae BLUMENSTENGEL, 1965: *Spinella* BLUMENSTENGEL; 1965), Bairdiomorpha KOZUR, 1972: Bairdiacea SARS, 1888 (*Processobairdia* BLUMENSTENGEL, 1965), Platycopida: Cytherellacea SARS, 1866 (Spinososioellidae n. fam.: *Spinososioella* n. gen.)

Pseudospinella ruggierii n. gen. n. sp.
(Pl. 2, figs. 1-5)

Derivatio nominis: In honour of Prof. G. RUGGIERI, Palermo.
Holotype: The specimen on pl. 5, fig. 1, rep. no CK/VII-5
Locus typicus and stratum typicum: As for *Spinososioella catalanoi* n. gen. n. sp.
Material: More than 50 specimens.

Diagnosis: Lateral outline subtriangular to suboval, with maximum height behind the midlength or in the posterior third of the carapace. In dorsal view the outline is elliptical with symmetrical convexity and largest width behind the midlength. Anterior margin in its upper part rounded, in its lower part slightly rounded. Posterior margin rounded, in its upper part at adults strongly oblique. It is mostly considerably higher, in juvenile forms only a little higher than anterior margin. Ventral margin slightly convex, obliquely, in juvenile forms more symmetrically rounded. Dorsal margin long, straight, anterodorsal in the RV rounded, in the LV with indistinct cardinal angle, posterodorsal in both valves with indistinct cardinal angles. The larger LV overlap the RV all around, but dorsally only a little.

In the posterior third of both valves a distinct, obliquely backward-directed spine is present somewhat above the midline. In the LV a further, but only short spine is present anterodorsally, which is obliquely foreward-directed. Lateral surface smooth.

Juvenile forms and one morphotype among the adults have a suboval lateral outline. The other morphotype is subtriangular. These differences in the outline ofthe adults indicate seemingly sexual dimorphism. During the ontogenesis in one morphotype both sculpture and outline remain constant, in the other morphotype the outline became increasingly subtriangular.

Measurements:
l = 418–470 µm
h = 263–278 µm

Occurrence: Frequent in highest Middle Permian to basal Late Permian deep-water clays of Western Sicily.

Remarks: *Pseudospinella bitauniensis* (BLESS, 1987) from the Lower Permian of Timor has a similar outline, but it is larger, the anterodorsal spine in the LV is considerably larger and the posterodorsal spine lies more near to the posterior, often also to the dorsal margin. Therefore fully preserved posterodorsal spines overreach in lateral view in general the posterior margin. Only in the specimen figured by BLESS (1987, fig. 3 K) the posterodorsal spine lies in the same position as in *P. ruggierii* n. sp., but it is obliquely downward directed, unlike to all other representatives of the new genus.

Superfamily Cypridacea BAIRD, 1845
Family Pontocyprididae MÜLLER, 1894
Genus *Haworthina* KELLETT, 1935
emend. KOZUR, 1985

Type species: *Bairdia bulleta* HARRIS & LALICKER, 1932

***Haworthina* spp.**
(Pl. 1, figs. 23, 24; pl. 2, fig, 8)

Remarks: Several *Haworthina* species are present in the Middle and Late Permian deep-water clays from Torrente San Calogero, which are very similar each other and show only minor differences in their outlines. The contemporaneous Late Permian *Haworthina* species from shallow-water sediments (described by KOZUR, 1985 a) have a quite different outline.

Suborder Cytherocopina GRÜNDEL, 1967
Superfamily Tricorninacea BLUMENSTENGEL, 1965
Family Tricorninidae BLUMENSTENGEL, 1965
Genus *Ovornina* GRÜNDEL, 1966
Subgenus *Tricornella* GRÜNDEL, 1966

Type species: *Tricornina sagittaformis* BLUMENSTENGEL, 1962

***Ovornina (Tricornella)* sp.**
(Pl. 1, fig. 30)

Remarks: Only some crushed or deformed valves have been found. The fit well into the subgenus *Tricornella* GRÜNDEL, 1966 of the genus *Ovornina* GRÜNDEL, 1966. But like in Tricorninacea from Triassic paleopsychrospheric ostracod faunas also the present Permian tricorninids have a fine reticulation arranged in delicate stripes.

Superfamily Bythocytheracea SARS, 1926
Family Bythocytheridae SARS, 1926
Subfamily Bythocytherinae SARS, 1926
Genus *Parabythocythere* KOZUR, 1981

Type species: *Parabythocythere permica* KOZUR, 1981

Parabythocythere siciliensis n. sp.
(Pl. 2, fig. 6)

Derivatio nominis: According to the occurrence in Sicily.
Holotype: The specimen on pl. 2, fig. 6; rep. no CK/III-5.
Locus typicus and stratum typicum: As for *Spinososioella catalanoi* n. gen. n. sp.
Material: 4 valves.
Diagnosis: Lateral outline elongated subrectangular. Anterior margin broadly rounded. Dorsal margin long, straight. Ventral outline slightly convex by overhanging parts of the midventral swelling. Posterior margin oblique, somewhat pointed a little below the dorsal line.

Lateral surface reticulated. Reticulum arranged in a stripe pattern, subparallel to the margin. On the distinct mid-ventral swelling, but partly also in the whole middle sector of the valve, the stripes are strengthened into densily spaced narrow ribs. The intermitted reticulum is here indistinct, on the mid-ventral swelling mostly totaly missing.

Hinge adont. Calcified inner lamella narrow, vestibulum present.
Measurements:
l = 297–330 μm
h = 141–163 μm
Occurrence: Highest Middle Permian to basal Late Permian of Western Sicily.
Remarks: Contemporaneous and a little younger *Parabythocythere* species from Middle and Late Permian shallow-water sediments of the Bükk Mts (Hungary) have a distinct caudal process and never a strong mid-ventral swelling. If swellings or nodes are present in these species, than they are situated in mid-posterior or posteromedian position. Moreover, the sculpture is in these species not so distinct, but in *Parabythocythere permica reticulata* KOZUR, 1985 the reticulum shows a similar pattern as in the new species. As a whole, *Parabythocythere siciliensis* n.sp. is by far more primitive than the Middle and Late Permian shallow-water species.

Subfamily Bythoceratininae GRÜNDEL & KOZUR, 1972
Genus *Paraberounella* BLUMENSTENGEL, 1965

Type species: *Paraberounella lobella* BLUMENSTENGEL, 1965

Paraberounella ? *laterospina* n. sp.
(Pl. 1, figs. 6?, 29)

Derivationominis: According to the posteromedian spine
Holotype: The specimen on pl. 1, fig. 29; rep. no. CK/III-40
Locus typicus and stratum typicum: As for *Spinososioella catalanoi* n. gen. n. sp.
Material: 11 valves.
Diagnosis: Lateral outline subtriangular, highest in the anterior third. Dorsal view suboval. Anterior margin broadly and symmetrically rounded. Dorsal margin long, straight, with anterodorsal cardinal angle. Ventral margin straight, converging against the dorsal margin in posterior direction. Posterior margin oblique, roundly pointed somewhat below the dorsal line.

Shallow sulcus S 2 reaches until the midline of the carapace or a little below it. Ventral lobus broad, semicircular. Its convex lower side reaches until the ventral margin, but it does not or only unsignificantly overhang on the central part of the ventral margin. A spine with narrow base is situated on the upper part of the posterior end of this ventral lobus. It lies here in or somewhat below the midheight of the carapace and it is obliquely backward, partly also a little downward directed.

Hinge adont. Duplicature and vestibulum narrow.
Measurements:
l = 297–317 μm
h = 147–163 μm
Occurrence: Middle and Late Permian deep-water deposits of Western Sicily.
Remarks: *Paraberounella laterospina* n. sp. is distinguished from the most Paleozoic species of this genus by its posterior end, acutely rounded somewhat below the dorsal line. In typical *Paraberounella* species the posterior end is pointed in prolongation of the dorsal margin. Only *Paraberounella saalfeldensis kahlleitensis* GRÜNDEL, 1973 from the Late Devonian is similar in the lateral outline and also in the position of the somewhat more backward directed spine, but this species has a spine on the anterior margin.

The new species shows similarities to the genus *Monoceratina* ROTH, 1928 in the development of its posterior margin, but the ventral swelling ist not overhanging and the spine is not situated ventrally, like in *Monoceratina*, in which the spine has, moreover, always a very broad base. The surface sculpture of *P.* ? *laterospina* n. sp., especially the position of the spine and its narrow base, is quite typical for *Paraberounella*. In one specimen of the Sicilian material the spine is situated in the posteromedian-ventromedian transitional field, but even this position ist still higher than in *Monoceratina*, which is also separated by the other above mentioned features. This specimen is here determined as *Paraberounella* ? cf. *laterospina* n.sp.

Order Reticulocopida n. ord.

Derivatio nominis: According to the nearly universally present internal reticulation of the valves.

Diagnosis: Almost exclusively non-dimorphic carapace with straight, very long dorsal margin, rounded, often nearly equal end margins and convex, straight or concave ventral margin. Anterior and posterior cardinal angles equal or subequal.

Along the free margin ribs, denticulations, hollow tubes, frill-like ("pseudofrill") and other sculptural elements are present. Lateral surface mostly strongly and coarsely reticulated ("internal reticulum", often with special fine sculpture). Kirkbyan pit or smooth field in position of the rosette-like or biserial adductor muscle scar often present. Subdorsal and central nodes or node-like elongated elements, rarely spines often present. Especially frequent are two subdorsal nodes, rarely elongated into spines. Lateral ribs and surface reticulations may be present.

Hinge adont, in stratigraphically younger forms often "bracket teeth" in the right valve are present that have not corresponding accomodation grooves or sockets in the left valve. Calcified inner lamella may be present in stratigraphically younger forms (since the Carboniferous, but especially since the Upper Permian). It is always of mesoplate type (almost the same width along the free margin, widest midventrally).

Soft parts of recent forms with distinctly podocopid character in the cephalic and thoracic elements (complete lack of respiratory elements) and with (more dominant) platycopid character in the abdominal region (abdominal segmentation and paired furcal lamellae).

Occurrence: Ordovician - Recent, frequent in the Paleozoic, since the Triassic very rare.

Assigned taxa:

Punciocopina SCHALLREUTER, 1968 (including kirkbyids)

Binodicopina SCHALLREUTER, 1972

Suborder inc., family Conodomyridae SCHALLREUTER, 1977

Discussions and remarks: The relations with other orders and within the new suborder, especially the derivation of the Punciacea HORNIBROOK, 1949 form the Kirkbyacea ULRICH & BASSLER, 1906, will be discussed in a separate paper (in press).

As shown by SCHALLREUTER (1968, 1978 a), the kirkbyids (and therefore also the here established Reticulocopida) derived from early Kloedenellocopina SCOTT, 1961 (primitive Platycopida SARS, 1866). But the derivation of the kirkbyids from early kloedenellids is no evidence that both groups belong to the same order, because in the Ordovician the basis differentation of the ostracods occurred. Moreover, from the Upper Ordovician until recent the development of the Platycopida and Reticulocopida was separate and strongly divergent with increasing differences in the overall shell morphology.

Platycopida have always two different cardinal angels that became during the evolution in several lines more and more indistinct. The straight, long dorsal margin became shorter or convex. Internal shell reticulation, well developed in many early Platycopida during the Ordovician occurred later only quite exceptionally. A kirkbyan pit (or homologous smooth field in the place of adductor muscle scar) occurs only in few Platycopida, but in many Reticulocopida. Kloedenellid sexual dimorphism, very characteristic for all Platycopida, was only observed in one genus of the Reticulocopida (*Manawa*). Moreover, the ventral margin is always concave in the Platycopida, whereas many Reticulocopida have a distinctly convex ventral margin (all Binodicopina, Coronakirkbyidae, Punciacea). The adventral sculptural elements (pseudofrill, pseudovelum, hollow tubes, denticles etc.), present in all typical Punciocopina with exception of the stratigraphically oldest forms and not so pronounced also in many Binodicopina, are quite missing in Platycopida.

The Podocopida SARS, 1866 have a mesostene calcified inner lamella, with exception of some primitive forms without calcified inner lamella. A long, straight margin occurs only in some Cytherocopina, but even in these forms the two cardinal angles are quite different each other. Internal shell reticulation is rare. The adventral sculpture elements are in general not so pronounced as in the Reticulocopida or quite missing. A kirkbyan pit or homologous smooth field is only quite exceptionally present in the Podocopida. The hinge is in many forms, especially in the Cytherocopina, highly differentiated.

The Beyrichiida are in their shell outline similar to many Reticulocopida, even to the recent ones, but convave ventral margin, frequent in the majority of kirkbyids is among the Beyrichiida quite exceptional (only 3 such species are known, see SCHALLREUTER, 1982). All Beyrichiida are clearly distinguished from the Reticulocopida by their specific sexual dimorphism (cruminal, antral and marginal dimorphism), never present in the Reticulocopida. Moreover, the lobation and sulcation ofthe most Beyrichiida is different from Reticulocopida, which are mostly non-sulcate (with exception of the early Binodicopina) and often non-lobate. A kirkbyan pit or homologous smooth field is rare in the Beyrichiida. Internal shell reticulation is only in the earlier Beyrichiida common, in later forms quite exceptionally and finally missing. The similar adventral sculptural elements are non-dimorphic in the Reticulocopida, but in general dimorphic in the Beyrichiida. Calcified inner lamella are never present in Beyrichiida.

Suborder Punciocopina SCHALLREUTER, 1968
Superfamily Kirkbyacea ULRICH & BASSLER, 1906
Family Kirkbyidae ULRICH & BASSLER, 1906

Synonym: Knightinidae SOHN, 1970

Genus *Kirkbya* JONES, 1859

Type species: *Dithyrocaris permiana* JONES, 1850

***Kirkbya* ? n. sp.**
(Pl. 1, fig. 26)

Remarks: Only one carapace of a small (l = 270 µm) resedimented new *Kirkbya* (?) species was found in sample 655. Like in *Kirkbya knuepferi* KOZUR, 1985 the carina is especially antero- and mid-ventral far away from the margin. But *K. knuepferi* is larger (l = 453 - 478 µm), has a distinct posterior shoulder and a pointed posterior end.

Quite interesting that all Kirkbyacea in the Sosio deep-water fauna are extraordinarily small, only 1/2 to 1/3 of the size of contemporaneous shallow-water Kirkbyacea (explanation see part 2 of this paper).

Genus *Knightina* KELLETT, 1933

Type species: *Amphissites allorismoides* KNIGHT, 1928

***Knightina* ? *multicarinata* n. sp.**
(Pl. 1, fig. 18)

Derivatio nominis: According to the presence of several marginal ridges.
Holotype: The specimen on pl. 1, fig. 18; rep. no. CK/V-4.
Locus typicus: Cozzo Intronata section between Lercara and Rocca Palumba, Western Sicily
Stratum typicum: Reddish silty micaceous siltstone of red Kungurian flysch.
Material: 3 carapaces.
Diagnosis: Carapace small, RV somewhat larger than LV. Outline in lateral view subtriangular, highest at the end of anterior third of carapace. Anterior margin broadly rounded, in the lower part obliquely rounded. Posterior margin considerably lower, narrowly rounded to almost straight. Dorsal margin straight, very long, only a little shorter than the maximum length of carapace. Ventral margin in its anterior half convex, in its posterior half straight to slightly convex and here strongly converging against the dorsal margin.

Along the free margin 3 marginal ribs are present, the middle one is weaker than the outer and inner ones. The outer rib continues at the dorsal margin as distinct dorsal rib. Posterior shoulder present. Whole lateral surface reticulated (fine pore-like internal shell reticulation and coarse surface reticulation). Kirkbyan pit distinct, situated a little above the valves centre.
Measurements:
l = 224–238 µm
h = 118–122 µm
Occurrence: Red Kungurian flysch ("Lecara Formation") from Western Sicily.
Remarks: The presence of 3 marginal ribs along the free margin is exceptional for the genus *Knightina*. Therefore the assignment to this genus is not quite sure. So long only one species shows this feature, it can be regarded as species character without supraspecific importance.

Genus *Nodokirkbya* n. gen.

Derivatio nominis: According to the posterodorsal conical node.
Type species: *Nodokirkbya striatoreticulata* n. gen. n. sp.
Diagnosis: Carapace small, RV a little larger than LV with slight overlap in the upper part of the anterior and posterior ends. Outline in lateral view rounded subtriangular, highest in the anterior third. Posterior shoulders in both valves elongated into long conical nodes. Lateral surface with small, pore-like internal shell reticulation and coarse, irregular surface reticulation, arranged in margin-parallel ribs. Kirkbyan pit indistinct or missing.
Occurrence: Middle and Late Permian red deep-water clay of Sicily.
Remarks: *Scutikirkbya* SHI, 1982 has additionally to the posterodorsal node also an anterodorsal node. Moreover, the lateral surface has not two different types of reticulation and the adventral rib is very pronounced.

Semipetasus SOHN, 1954 has also a strong posterodorsal node, but it continues in a broad swelling through the dorsomedian until the anterodorsal part of the valves. Its base reaches downward somewhat below the midline of the valve. Moreover, the outline of this genus is elongated subrectangular with concave ventral margin.

Inspite of the distinct posterodorsal node, *Nodokirkbya* is not related to the Kellettinidae SOHN, 1954. *Nodokirkbya* has evolved from *Knightina* KELLETT, 1933 by transformation of the posterior shoulder into a distinct node.

Nodokirkbya striatoreticulata n. gen. n. sp.
(Pl. 1, figs. 15, 19)

Derivatio nominis: Acccording to the sculpture.
Holotype: The specimen on pl. 1, fig. 19; rep. no. CK/III–18.
Locus typicus and stratum typicum: As for *Spinososioella catalanoi* n. gen. n. sp.
Material: 12 carapaces.
Diagnosis: Carapace small. Lateral outline rounded subtriangular, highest in the anterior third. Anterior margin broadly rounded, in its lower part obliquely rounded. Posterior end considerably lower than anterior one, in its upper part rounded, in its lower part obliquely rounded. Dorsal margin very long, straight, but distinctly shorter than maximum length of carapace. Both cardinal angels obtuse. Ventral margin straight to slightly convex, converging in posterior direction toward the dorsal margin.

Shoulders prolongated into long, conical nodes. Lateral surface, including the nodes, with complex sculpture. A very coarse, irregular outer reticulum is arranged in margin-parallel ribs. Towards the marginal parts of the shell, the rib-component becomes stronger. By this the adventral rib along the free margin is not much separated from the margin-parallel ribs of the lateral sculpture. Between the outer reticulum and the ribs the surface is densily covered with small, deep pits (internal shell reticulation), often closed by diagenetic processes. Small, smooth kirkbyan pit (rather smooth spot) indistinct, situated in the posterior part of the ventromedian sector. It is often quite missing.
Measurements:
l = 267–279 µm
h = 146–158 µm
Occurrence: Highest Middle Permian and basal Late Permian deep-water sediments of Western Sicily.
Remarks: See under the genus.

Family Amphissitidae KNIGHT, 1928
Genus *Amphissites* GIRTY, 1910

Type species: *Amphissites rugosus* GIRTY, 1910

Amphissites sosioensis n. sp.
(Pl. 1, fig. 16)

Derivatio nominis: According to its occurrence in the Sosio Valley
Holotype: The specimen on pl. 1, fig. 16; rep. no. CK/III–21.
Locus typicus and stratum typicum: As for *Spinososioella catalanoi* n. gen. n. sp.
Material: 3 valves.
Diagnosis: Lateral outline subrectangular. Anterior margin only a little higher than posterior one. Both end margins are rounded, but the posterior only considerably fewer than the anterior one. Dorsal margin long, straight. Cardinal angles distinct. Ventral margin straight.

Outer carina narrow, present along the whole free margin. Inner carina distinct, in the higher parts of the anterior and posterior margins indistinct or missing. Dorsal rib indistinct. Node large, situated entirely above the midline and reaching almost the dorsal margin. It has basally in its upper half a semicircular narrow rib. Its surface is reticulated. This reticulum is arranged into indistinct ribs. Kirkbyan pit indistinct, situated just below the node. Lateral surface reticulated and with irregularly distributed small papillae. No lateral shoulder with keel or vertical carinae. Posterodorsal shoulder distinct, anterodorsal shoulder indistinct.

Measurements:

l = 359–381 µm

h = 237–241 µm

Occurrence: Latest Middle Permian to basal Late Permian. *Amphissites sosioensis* n. sp. belongs to those rare species which are resedimented in the red clay. The valves are filled with white calcareous matrix. One specimen was found on the surface of a calcarenite.

Remarks: By the absence of vertical keels (carinae) on both side of the central node this species is quite distinctly separated from all other *Amphissites* species. In this feature it resembles *Neochilina* MATERN, 1929 and *Sinessites* BECKER, 1981 that are probably identical each other. But in these forms no dorsal shoulders are present. The new species is therefore rather an *Amphissites* with totally reduced vertical carinae.

Family Kellettinidae SOHN, 1954
Genus *Kellettina* SWARTZ, 1936

Type species: *Ulrichia robusta* KELLETT, 1933

Kellettina reticulata n. sp.
(Pl. 1, fig. 14)

Derivatio nominis: According to the coarse reticulation

Holotype: The specimen on pl. 1, fig. 14; rep. no. CK/III–16.

Locus typicus and stratum typicum: As for *Spinososioella catalanoi* n. gen. n. sp.

Material: 2 slightly damaged valves from the red clay and several specimens on the surface of the calcarenites.

Diagnosis: Small. Lateral outline subrectangular, maximum height in the anterior third of the valves. Anterior margin in the upper part almost straight, only slightly rounded, in its lower part obliquely rounded. Posterior margin somewhat lower than anterior one, otherwise similar. Dorsal margin straight, nearly as long as the maximum length of the valve. Both cardinal angles distinct and only a little larger than 90°. Ventral margin straight, only a little converging against the dorsal margin in posterior direction. Lateral surface heavily sculptured. Subdorsal nodes widely spaced, large. Anterior subdorsal node broadly wedge-like, beginning about in the midline and overreaching clearly the dorsal margin. Posterior node very large, elongated, subconinal with rounded top, strongly overreaching the dorsal margin. Its base lies also about in the midline of the valve. The whole lateral surface, including the nodes, is coarsely reticulated. Some narrow, keel-like ribs are superimposed on the reticulum. The most prominent of these ribs run from the tip of the anterior node obliquely downward, than below the midline backwards and it surrounds than the large kirkbyan pit as a ring-like rib. The kirkbyan pit is situated immediately in front of the base of the posterior node. "Velum" narrow, indistinct, in lateral view almost completely overreached by the distinct, obliquely outward directed narrow carina.

Measurements:

l about 450 µm

h (without nodes) = 181–203 µm

Occurrence: Very rarely reworked in the red clays, more frequent on the surface of the calcarenites. Highest Middle Permian to basal Late Permian.

Remarks: In spite of the fact that only two slightly damaged, but otherwise well preserved valves could be isolated, the new species can be clearly separated against other *Kellettina* species. It belongs to the *Kellettina ultima* group which is clearly different from the older *Kellettina* species by its coarse reticulation of the lateral surface (including the nodes) and by the widely spaced nodes. Moreover, both in *Kellettina reticulata* n. sp. and in *K. ultima* KOZUR, 1985 the kirkbyan pit is quite distinct.

In *Kellettina ultima* KOZUR, 1985 the nodes are not so extremely high as in *K. reticulata* n. sp. Keel-like narrow ribs, superimposed on the coarse reticulum are not present. The carina is broader.

Superfamily Punciacea HORNIBROOK, 1949
Family Coronakirkbyidae KOZUR, 1985

Remarks: KOZUR (1985 a) placed the Coronakirkbyinae into the Kirkbyidae, but the presence of two pseudofrills (large inner and smaller outer one) and the convex ventral margin are quite different from the Kirkbyidae. Moreover, in the stratigraphic younger Coronakirkbyidae, including also the nominate genus, a subcentral, mostly elongated node, like in the Amphissitidae and two subdorsal nodes have evolved. Bracket teeth in the RV are distinct. They have no corresponding sockets in the LV. Moreover, all

Coronakirkbyidae have distinct hollow antero- and posterodorsal spines in the antero- and posterodorsal corners or minimally below it. They are situated at the end ofthe inner pseudofrill. In their main features, the Coronakirkbyidae are more similar to the Createaceous to recent Punciacea than to the Kirkbyacea.

Primitive Coronakirkbyacea, to which belong also the species from the Permian of Sosio, are still similar to the Kirkbyacea, from which they hav evolved. The Coronakirkbyidae are here regarded as the missing link between the Kirkbyacea and the Punciacea.

Genus *Tubulikirkbya* KOZUR, 1985

Type species: *Coronakirkbya krecigrafi* BECKER, 1978

Tubulikirkbya ? oertlii n. sp.

(Pl. 1, figs. 20, 25)

Derivatio nominis: In honour of Prof.Dr. H.J. OERTLI, Pau.

Holotype: The specimen on pl. 1, fig. 20; rep. no. CK/III-51.

Locus typicus and stratum typicum: As for *Spinososioella catalanoi* n. gen. n. sp.

Material: 7 valves.

Diagnosis: Carapace small, in lateral view hemielliptical, highest before the midlength. Anterior margin somewhat higher than posterior one, both are obliquely rounded and have a quite gradual transition into the convex ventral margin. Dorsal margin about as long as the maximum length of carapace, straight, with sharp cardinal angles of about 90°, posterior cardinal angle often a little smaller than 90°. Anterodorsal spine small, erect or a little foreward inclined. Posterodorsal spine strong, obliquely upward and backward directed.

Outer and inner pseudofrill present along the whole free margin, consisting of widely spaced, hollow, relatively short tubuli, which are sometimes terminally connected. Thin lamella between the tubuli mostly not preserved. The low dorsal rib is distinct, but anterodorsally often indistinct and posterodorsally indistinct or even missing. Dorsomedian a distinct roundish or slightly elongated node is present. The whole lateral surface, including the node, is coarsely and irregularly reticulated, but the reticulation is sometimes for preservation reasons indistinct.

Measurements:
l = 266–300 µm
h = 141–147 µm

Occurrence: Highest Middle Permian to basal Late Permian deep-water sediments of Western Sicily.

Remarks: *Tubulikirkbya* KOZUR, 1985 is frequent in Middle and Late Carboniferous shallow-water sediments, but absent in Permian (at least Middle and Late Permian) shallow-water sediments. On the contrary, in Middle and Late Permian deep-water sediment this genus is more frequent than other Punciocopina. In contrary to the Carboniferous *Tubulikirkbya* species, the tubuli of the pseudofrills are widely spaced and the dorsomedian node is distinct. The Permian *Coronakirkbya* species have beside of a distinct subcentral node (always elongated) also two subdorsal nodes. The new species is transitional between these two genera. Compared with Carboniferous and Permian shallow-water species of *Tubulikirkbya* and *Coronakirkbya*, the deep-water species are very small (1/2 to 2/3 of the size of the shallow-water forms).

Suborder Binodicopina SCHALLREUTER, 1972
Superfamily Drepanellacea ULRICH & BASSLER, 1923
Family Bolliidae BOUCEK, 1936
Genus *Solleikope* BECKER, 1978

Type species: *Solleikope sollei* BECKER, 1978

Solleikope ? permica n. sp.

(Pl. 1, fig. 22)

Derivatio nominis: According to the occurrence in the Permian.

Holotype: The specimen on pl. 1, fig. 22; rep. no. CK/III-17.

Locus typicus and stratum typicum: As for *Spinososioella catalanoi* n. gen. n. sp.

Material: 2 valves.

Diagnosis: Carapace small, in lateral view semicircular. Dorsal margin straight, very long, only a little shorter than the maximum length of carapace. Cardinal angles distinct, a little larger than 90°. End margins only a little rounded, anterior margin somewhat oblique, a little lower than the almost straight posterior margin. Ventral margin convex. Dorsomedian 2 hemispherical nodes are present. The anterior (smaller one) does not reach the dorsal margin, whereas the posterior (very big one) reaches the dorsal margin. Between the 2 nodes a narrow sulcus is present which reaches from the dorsal margin until the midth of the valve.

Lateralsurfacegranulate. "Velate" ridge narrow, antero- and posterodorsal indistinct. Carina high, distinct.

Measures:
l = 315–331 µm
h = 201–219 µm

Occurrence: Highest Middle Permian or basal Late Permian deep-water sediments of Western Sicily.

Remarks: The until now monospecific Carboniferous genus *Solleikope* BECKER, 1978 has no carina and the dorsal margin is convex above the nodes. Otherwise *Solleikope sollei* BECKER, 1978 is similar (small size, outline, arrangement of nodes, sculpture). Like in the Triassic paleopsychrospheric ostracods (where several genera are present that can be found in Permian shallow-water deposits, but never in Triassic shallow-water ostracod faunas), also in the Permian paleopsychrospheric ostracods some taxa are present that are characteristal for Late Carboniferous shallow-water ostracod faunas, but not more present in Permian shallow-water ostracod faunas.

Solleikope ? permica n. sp. is very similar to the Silurian - Devonian genus *Ulrichia* JONES, 1890, which is distinguished by the mid-dorsal position of the smaller nodes and by a more distinct velum.

Lower Permian *Solleikope* from paleopsychrospheric ostracod faunas of Timor Island (BLESS, 1987, fig. 1 C-F) are very similar, but have, like the Carboniferous type species, no carina.

Superfamily and family inc.
Genus *Neofellerites* n. gen.

Derivatio nominis: According to the younger stratigraphic occurrence than the similar *Fellerites* GRÜNDEL, 1962.

Type species: *Neofellerites minimus* n. gen. n. sp.

Diagnosis: Carapace very small, symmetrically arched. Lateral outline semicircular, highest a little before the midlength. Dorsal margin straight, very long, only a little shorter than the maximum length. Cardinal angles well defined, both of equal size, shell in the anterodorsal and posterodorsal corners somewhat thickened. The free margin built up an almost symmetrical semicircle. Shell therefore relatively to the small length very high.

Lateral surface with coarse, but low reticulum. Along the whole free margin exist (as velar structure ?) a low, flattened zone, widest ventrally. Dorsal ridge distinct, at the anterior and posterior corner thickened.

No calcified inner lamella.

Occurrence: Highest Middle Permian or basal Late Permian deep-water sediments of Western Sicily.

Remarks: *Macronotella* ULRICH, 1894 has similar outline, sculpture and mode of carapace convexity. But this genus is about 5 x larger and has a smooth velar ridge, but no dorsal rib.

Fellerites GRÜNDEL, 1962 is about 2 x larger, its lateral outline is suboval and the lateral surface is smooth. Instead of thickenings at the antero- and posterodorsal corners short spines are present in these corners. The structure along the free margin is similar.

Neofellerites minimus n. gen. n. sp.
(Pl. 1, fig. 7)

Derivatio nominis: According to the small size.

Holotype: The specimen on pl. 1, fig. 7; rep. no. CK/III-55

Locus typicus and stratum typicum: As for *Spinososioella catalanoi* n. gen. n. sp.

Material: 3 specimens.

Diagnosis, occurrence and remarks: See under the genus.

Measurements:
l = 249–265 µm
h = 175–186 µm

Genus *Parvicyathus* n. gen.

Derivatio nominis: According the small size and the similarity with *Cyathus* ROTH & SKINNER, 1930.

Type species: *Parvicyathus semicircularis* n. gen. n. sp.

Diagnosis: Carapace very small, with semicircular outline. Dorsal margin very long, somewhat shorter than maximum length, straight, a little depressed. The dorsal outline is slightly convex. Lateral surface smooth, but with small central pit. Along the free margin an indistinct low ridge is present.

No calcified inner lamella.

Occurrence: Highest Middle Permian or basal Late Permian deep-water sediments of Western Sicily.

Remarks: *Cyathus* ROTH & SKINNER, 1930 is similar, but 2 x larger, the outline is more elongated and no central pit is present.

The central pit indicates perhaps relations to kirkbyids, but the semicircular outline cannot be found in any Punciocopina. Even if the ventral margin is convex, the outline is more elongated and therefore different.

Parvicyathus semicircularis n. gen. n. sp.
(Pl. 1, fig. 6)

Derivatio nominis: According to the semicircular lateral outline.
Holotype: The specimen on pl. 1, fig 6; rep. no. CK/III-54
Locus typicus and stratum typicum: As for *Spinososioella catalanoi* n. gen. n. sp.
Material: 4 specimens.
Diagnosis: Very small, lateral outline semicircular, highest in the middle part. Anterior margin broadly rounded. Ventral margin strongly convex. Posterior margin somewhat lower than anterior one and in its lower part somewhat obliquely rounded. Dorsal margin very long, a little shorter than maximum length of carapace, straight, somewhat depressed; dorsal outline in the middle part slightly convex. Anterior cardinal angle distinct. Posterior cardinal angle about of the same size, but more indistinct and rounded.

Lateral surface smooth, but with small central pit. Shell marginally somewhat flattened. Along the free margin a very indistinct low ridge is present.
Measurements:
l = 278–290 µm
h = 191–195 µm
Occurrence and remarks: See under the genus.

Order inc.
? Suborder Leiocopina SCHALLREUTER, 1973

? Synonym: Paraparchitocopa GRAMM, 1975
Remarks: SCHALLREUTER (1973) introduced for the Aparchitacea the suborder Leiocopa SCHALLREUTER, 1973 which he placed into the Beyrichiida (Palaeocopa). But he pointed out that the Leiocopina are basically different from the Beyrichiida by absence of antral- and cruminal dimorphism, by missing lobation and sulcation as well as by the unequivalved carapaces (mostly RV larger, rarely LV larger).

GRAMM (1975) introduced the suborder Paraparchitocopina for the Paraparchitacea SCOTT, 1959. They are morphologically similar to the Aparchitacea JONES, 1901, but the LV is larger than the RV and the l/h ratio is generally higher. According to the podocopid muscle scars in the Paraparchitacea (with adductor, frontal and mandibular fields) and an indistinct calcified inner lamella, the Paraparchitocopina were placed into the Podocopida by GRAMM (1975).

GRAMM (1984) stated that no calcified inner lamella is present in the Paraparchitocopina and he left now open the assignment of this suborder to any order. Well preserved material of Paraparchitacea shows marginal thickening at the free margin. The same thickening is known from the Aparchitacea as well. SCHALLREUTER (1973) regarded this thickening as possible calcified inner lamella or as an element preceeding a calcified inner lamella.

No definitive possibility for the recognition of two different suborders for the Aparchitacea and Paraparchitacea, both poor in characteristic morphologic features, can be found in the present stage of our knowledge about these two ostracod groups.

The systematic position of the Leicopina is not yet clear. If the thickening on the free margin is really a calcified inner lamella (or a structure, preceeding it), than the Leiocopina cannot be placed into the Podocopida, because this structure is vertically broadest or of nearly the same width throughout the free margin, like in *Dentoparaparchites* KOZUR, 1985 (mesoplate calcified inner lamella).

On the other hand, the well defined mandibular muscle spots in the Paraparchitacea excludes this group from the Platycopida and Beyrichiida, where mandicular muscle spots do not occur.

Ordovician, high-oval to almost circular representatives of the Aparchitacea with short, straight dorsal margin are similar to some Myodocopamorphes (Cladocopida). Morphologically similar are also the Leperditiida POKORNÝ, 1953, but both similarities may be homoeomorphies.

Most nearly related are perhaps the Binodicopina SCHALLREUTER, 1972, distinguished by the two subdorsal nodes in typical representatives (missing in some forms or only one node is present) and by the internal shell reticulation (but some forms are smooth as well). Most of the Leiocopina are smooth, but some have punctate surface. A posterodorsal node is often present in the Leiocopina (both in Aparchitacea and in Parapcharchitacea), in *Nodoparapachites* this node is even coarsely reticulated.

In stratigraphically younger Parapachitacea the cardinal angles, especially the anterior one, became more and more rounded and indistinct. Moreover, the anterior angle is in general larger than the posterior one. Even in the stratigraphically youngest Binodicopia, in turn, the straight dorsal margin is very long, the dorsal angles are always distinct and nearly of the same size.

Family Pseudoparaparchitidae SOHN, 1983
Genus *Nodoparaparchites* n. gen.

Derivatio nominis: According to the distinct posterodorsal node.
Type species: *Nodoparaparchites reticulonodosa* n. gen. n. sp.
Diagnosis: Lateral outline suboval. Anterior and posterior margins about of the same height, both broadly rounded. Ventral margin convex. Dorsal margin moderately long, straight, with obtuse, indistict cardinal angles. Lateral surface smooth, but with large posterodorsal reticulated node. No calcified inner lamella.
Occurrence: Highest Middle Permian to basal Late Permian of Western Sicily.
Assigned species:
Nodoparaparchites reticulonodosa n. gen. n. sp.
Remarks: *Pseudoparaparchites* KELLETT, 1933 and *Microparaparchites* CHRONEIS & GALE, 1939 have more pronounced cardinal angles and a posterodorsal spine is present instead of a reticulated node.

***Nodoparaparchites reticulonodosa* n. gen. n. sp.**
(Pl. 1, fig. 3)

Derivatio nominis: According to the reticulated node.
Holotype: The specimen on pl. 1, fig. 3; rep. no. CK/V-43
Locus typicus: Torrente San Calogero section near Pietra di Salomone.
Stratum typicum: Sample 653, red deep-water clay of highest Middle Permian to basal Late Permian age. The species is resedimented from shallower, but also pelagic environments.
Material: 2 specimens.
Diagnosis, occurrence and remarks: See under the genus.
Measurements:
l = 291–309 μm
h = 185–96 μm

Superorder, order, suborder, superfamily inc.
Family Sinocoelonellidae n. fam.

Diagnosis: Tumid to moderately convex equivalved carapaces. Outline in dorsal view broadly oval to oval, in lateral view suboval to elongated suboval. The carapace is highest in or behind the midlength and broadest in its middle part. Dorsal margin convex. Ventral margin mostly hidden by overhanging parts of the carapace, straight, but ventral outline in the middle part mostly slightly convex. End margins rounded.

Surface with numerous striae. Along the whole margin a narrow sharp ridge is present that is not much more pronounced than the striae. No calcified inner lamella could be observed.
Occurrence: Permian of China and Sicily.
Assigned genera:
Sinocoelonella GUAN, 1978
Remarks: Because of the nearly symmetric convexity of the carapace, the orientation is difficult. GUAN (1978) CHEN & SHI (1982), CHEN & BAO (1986) and SHI & CHEN (1987) regarded the strongly convex margin as ventral. The straight margin, mostly hidden in its middle part by overhanging parts of the carapace was regarded as dorsal margin by these authors. Here the convex margin is regarded as dorsal margin.

Independent from this orientation also the anterior - posterior orientation is difficult to decide, because the maximum width of the carapace is just in its centre.

CHEN & SHI (1982), CHEN & BAO (1986) and SHI & CHEN (1987) placed *Sinocoelonella* GUAN, 1978 into *Cyathus* ROTH & SKINNER, 1930. But this genus is unsculpturated and has a low velate structure along the free margin. Both genera are not related each other.

Seemingly, *Sinocoelonella* does not belong to the Beyrichiida. The outer morphology is similar to some groups of Podocopida. But there is also considerable similarity to some elongated Entomozocopina GRÜNDEL, 1969 (oder Cladocopida SARS, 1866 emend. KOZUR, 1972, superorder Myodocopamorphes KOZUR, 1972), espcecially *Richterina* GÜRICH, 1896. This genus has partly not only a similar outline, but also quite similar sculpture (striae) and along the whole margin a narrow rib may be present like in *Sinocoelonella* (compare OLEMPSKA, 1979, pl. 31, figs. 6 b, c). If *Sinocoelonella* would be an entomozoid ostracod, than the orientation used by the Chinese authors would be correct.

The oldest known (Lower Permian) representatives of the Sinocoelonellidae are short, high, tumid, and their ventral outline is rather strongly convex by overhanging mid-ventral parts of the carapace. Among the Podocopida these forms are most similar to Cypridocopina JONES, 1901 emend. KOZUR; 1972, but contemporaneous or older Paleozoic Cypridocopina have mostly a different outline and are mostly smooth. Above all, they are strongly inaequivalved with larger LV. Some Paleozoic Cypridocopina are striated. But none of these forms are really related to the Sinocoelonellidae.

Genus *Sinocoelonella* GUAN, 1978

Type species: *Sinocoelonella caperatus* GUAN, 1978

Sinocoelonella densistriata n. sp.
(Pl. 1, figs. 4, 5)

Derivatio nominis: According to the numerous, densely spaced striae.
Holotype: The specimen on pl. 1, fig. 5; rep. no. CK/III-20
Locus typicus and stratum typicum: As for *Spinososioella catalanoi* n. gen. n. sp.
Material: 28 specimens.
Diagnosis: Carapace equivalved. Outline in dorsal view oval, in lateral view elongated suboval, highest somewhat behind the midlength. Anterior margin somewhat lower than posterior one. Dorsal margin convex, with quite gradual transitions into the end margins. Ventral margin straight, but mid-ventral outline slightly convex because of overhanging parts of carapace.

Along the whole margin a marginal rib is present which is narrow, sharp-edged, and not much higher than the striae. 13-17 sharp, densily spaced striae are present. In the upper half of the valves they are convex (convex side above) and about parallel to the dorsal margin. In the median and ventromedian field the striae are in their middle parts more or less straight, and in the ventral part they are slightly concave (convex side below), about parallel to the ventral margin. In the upper half of the valves the striae reach in general from the anterior to the posterior margin. In the central and partly also in the ventral parts of the carapace they are shorter.
Measurements:
l = 293–328 µm
h = 148–163 µm
Occurrence: Higher Middle Permian and basal Late Permian of Western Sicily. Both in the red deep-water clays and in the pelagic calcarenites frequent.

Remarks: *Sinocoelonella caperata* GUAN, 1978 and *Sinocoelonella formosa* (SHI, 1982) from the higher Lower and Middle/Late Permian of China have strongly inflated shells and their ventral outline is more convex. Moreover, only the short innermost striae are straight, the others parallel to either the dorsal or ventral margins. *Sinocoelonella elliptica* (SHI, 1987) from the Changxingian stage has a similar outline as *S. densistriata* n. sp., but also in this species the valves are more inflated. Moreover, a flattened anterior part adjacent to the anterior margin is present in both valves. The striae are similar as in *S. densistriata* n. sp., but in the anterior and posterior parts of the valves the striae are enclosed into a reticulation.

Sinocoelonella n. sp.
(Pl. 1, fig. 8)

Remarks: Only one RV of a new, distinct *Sinocoelonella* species was found (sample 655), which has a quite straight ventral outline and fewer, in the lower half of the valve straight, striae.

References

KOZUR, H. (1990): Permian deep-water ostracods from Sicily (Italy). Part 2: Biofacial evaluation and remarks to the Silurian to Triassic paleopsychrospheric ostracods. - Geol.-Paläont. Mitt. Innsbruck, this volume.
The other references are listed in part 2.

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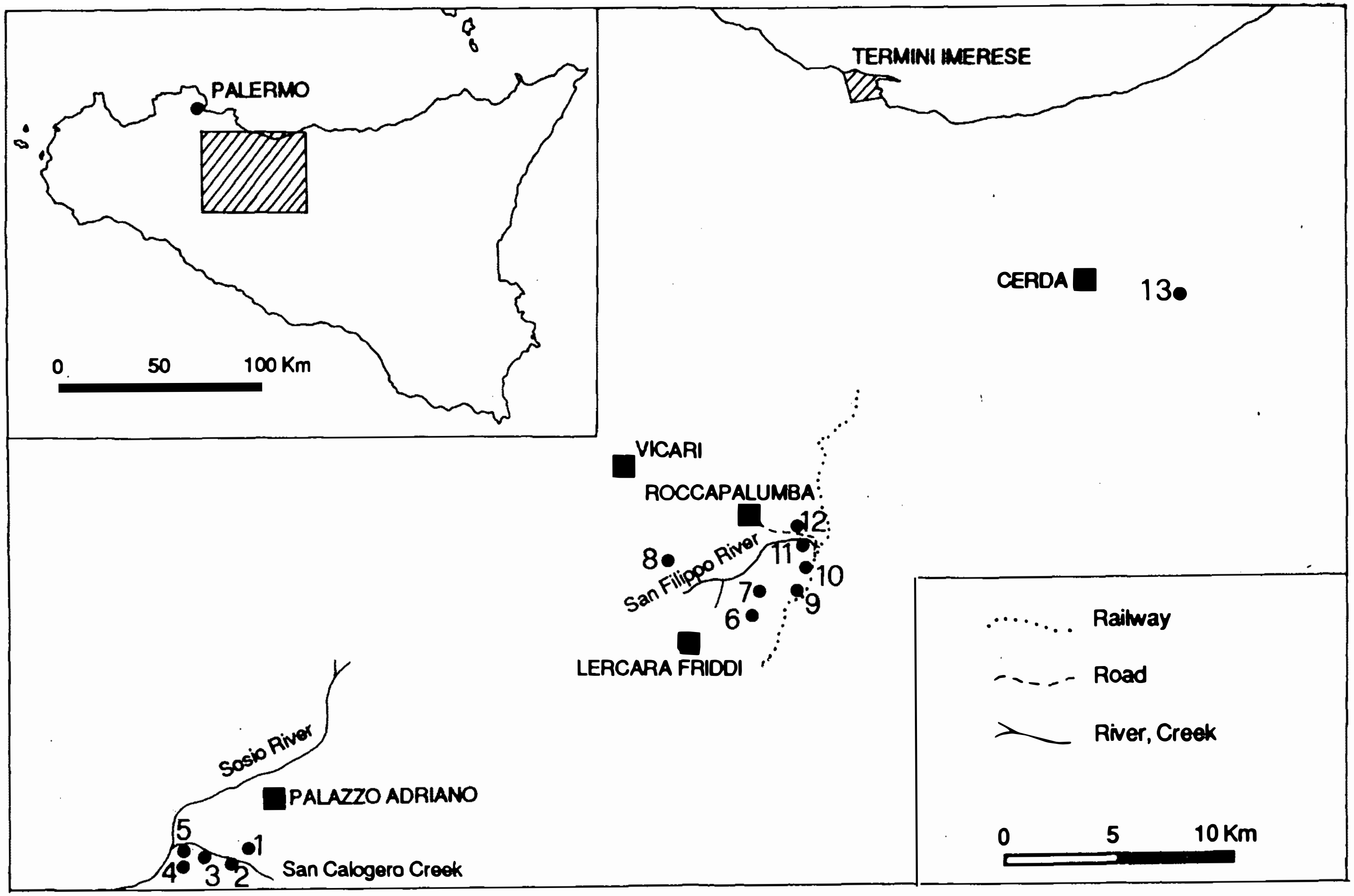
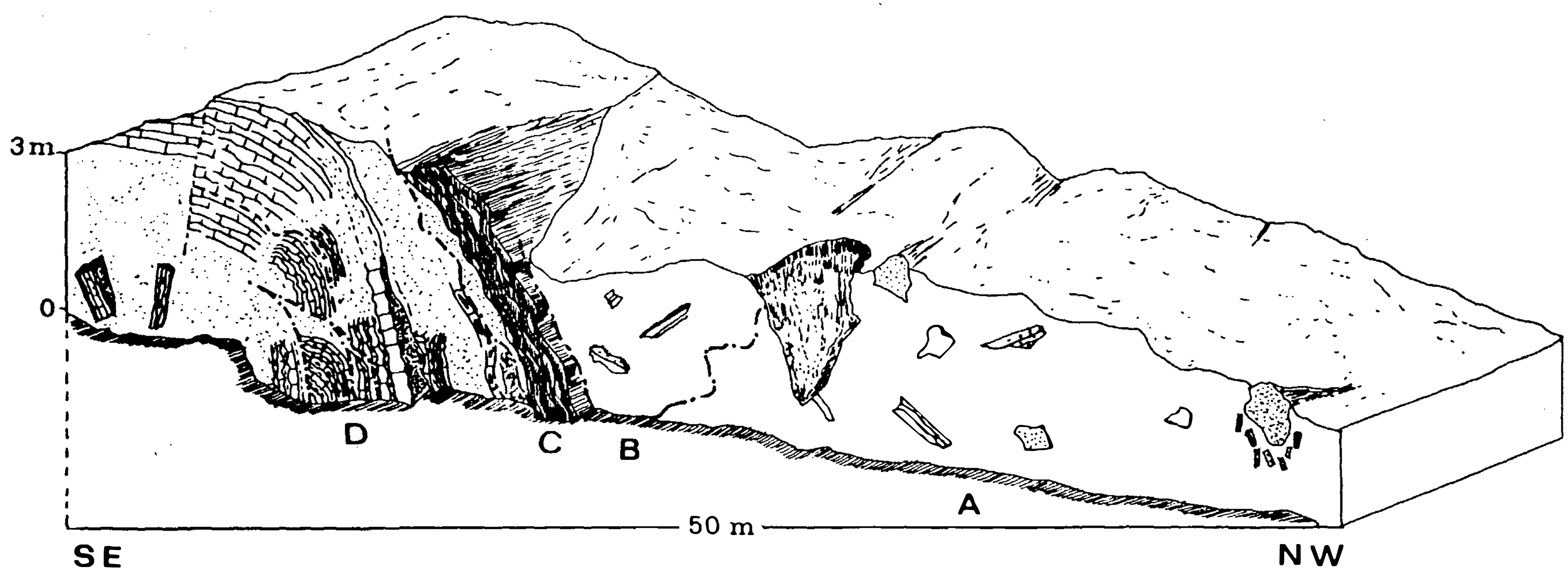


Text-fig. 1: Map of studied areas in Western Sicily (from CATALANO; DI STEFANO & KOZUR, in press).

1: Pietra di Salomone, 2: Torrente San Calogero section, 3: Rupe del Passo di Burgio, 4: Pietra dei Saracini, 5: Rupe di San Calogero, 6: Cozzo Intronata, 7: Contrada Balatelle, 8: La Montagnola, 9-10: Red flysch outcrops along the Roccapalumba railway, 11: San Filippo River section, 12: Red flysch outcrop along the road Roccapalumba-Alia, 13: Case Tabbarani outcrop, near Cerda. With exception of the last locality (Tertiary with olistoliths) in all other outcrops pelagic Permian or Permian and Triassic sequences are present.



Text-fig. 2: Geological sketch of the Torrente San Calogero section WSW of Pietra di Salomone, Sosio Valley area (from CATALANO; DI SETEFANO & KOZUR, 1988 b).

Unit A: Olistostrome Unit, gray, soft, sandy clays with olistoliths of rocks from the underlying Kungurian flysch and olistoliths of calcarenites, biogenic limestones, radiolarian marls or marly limestones, radiolarian-bearing slightly siliceous calcilutites. Lowermost Middle Permian (Kubergandinian) age of the matrix. Age of the olistoliths: topmost Artinskian, Kungurian and Chihsian.

Unit B: Soft, predominantly red, in the lower part also light-gray clays with some thin, broken calcarenites. Wordian - Dzhulfian.

Unit C: Greenish, siliceous marls, tuffites, gray, greenish-gray and red radiolarites, siliceous, partly cherty limestones. Lower Ladinian.

Unit D: Greenish-gray and reddish nodular limestones and clayey marls, clays, thin red radiolarites. Highest Lower Ladinian, Upper Ladinian, basal Cordevolian (basal Carnian).

SYSTEM		STAGE		LITHOLOGY - FOSSILS
TRIASSIC	Late	Rhaetian		Pelagic gray bedded cherty calcilutites with intercalations of calcarenites. *Halobia, Monotis*, ammonoids, conodonts, radiolarians.
		Norian		
		Carnian	Late	
			Middle	Pelagic gray cherty calcilutites with intercalations of brown calcarenites and, at places, calcirudites, gray shales. *Halobia*, conodonts, radiolarians, ostracods, trace fossils.
			Lower	
	Middle	Ladinian	Late	Pelagic greenish-gray to pink nodular cherty limestones, greenish-gray, red, rarely violet shales, subordinately thin red radiolarites. *Daonella, "Posidonia" wengensis*, ammonoids, conodonts, radiolarians, ostracods.
			Lower	Pelagic reddish to greenish gray nodular cherty or siliceous limestones, greenish tuffites, greenish to gray radiolarites. Conodonts, radiolarians.
		Anisian		Until now unknown.
	Early (Scythian)	Olenekian		
		Brahmanian		
PERMIAN	Late	Changxingian		
		Dzhulfian		Pelagic red soft shales. Radiolarians, ostracods, foraminifers, sponge spicules, conodonts. Pelagic red and light-gray soft shales and calcareous shales. Radiolarians, ostracods, foraminifers.
		Abadehian		
	Middle	Capitanian		
		Wordian		White reef and reef-slope biogenic limestones. Sponges, bryozoans, conodonts, holothurians, ammonoids, crinoids.
		Kubergandinian		Olistostrome unit: gray soft shales with reworked sand grains. Conodonts, ostracods, radiolarians, sporomorphs. Olistoliths from the underlying rocks.
	Lower	Chihsian		Dark gray conglomeratic limestones. Brachiopods, ammonoids, echinoderms, conodonts (rare), scolecodonts, radiolarians, sporomorphs. (Olistoliths). — Resedimented calcarenites and biogenic limestones. Conodonts, sponge spicules. (Olistoliths).
		Kungurian		Gray and red flysch: graded bedded sandstones, partly fine-conglomeratic, siltstone, shales. Echinoderms, agglutinated foraminifers, ostracods, conodonts, numerous trace fossils. (Olistoliths and sequences) — Gray micritic siliceous limestones, dark gray silty marls, marly limestones. Radiolarians, conodonts. (Mostly olistoliths).
		Artinskian		unknown
		Sakmarian		
		Asselian		

Text-fig. 3: Stratigraphic column of Permian and Triassic in the Sicanian paleogeographic domain (reconstructed from sequences and olistoliths). Vertical distances not time- or thickness-related. From CATALANO; DI STEFANO & KOZUR (in press).

Explanation of plates

Plate 1

If not otherwise indicated, the figured specimens are from the Torrente San Calogero section (see text-figs. 1, 2) WSW of Pietra di Salomone, Sosio Valley area, Western Sicily, taken from red, soft deep-waterclays with mass occurrences of Circum-Pacific radiolarians of basal Late Permian (or highest Middle Permian) age. Samples 655 (figs. 1, 2, 4–10, 12–30) and 653 (figs. 3, 11). Figs. 3, 14, 16, 26, 28 represent specimens transported into the basin from somewhat shallower, but also pelagic and rather deep-water environments.

Figs. 1, 2, 9: *Spinososioella catalanoi* n. gen. n sp., fig. 1: RV, ♂, holotype, rep.-no. CK/VII-2, a) outer view, x 85, b) inner view, x 78; fig. 2: LV, ♀, rep. no. CK/VII-4, a) outer view, x 90, b) inner view, x 40; fig. 9: detail of fig. 1 a, x 150

Fig. 3: *Nodoparaparchites reticulonodosa* n. gen. n sp., RV, holotype, x 160, rep. no. CK/V-43

Figs. 4, 5: *Sinocoelonella densistriata* n. sp., x 150, fig. 4: ventral view of carapace, rep. no. CK/III-37; fig. 5: holotype, right lateral view of carapace, rep. no. CK/III-20

Fig. 6: *arvicyathus semicircularis* n. gen. n. sp., LV, holotype, x 150, rep. no. CK/III-54

Fig. 7: *Neofellerites minimus* n. gen. n. sp., LV, holotype, x 150, rep. no. CK/III-55

Fig. 8: *Sinocoelonella* n. sp., RV, x 160, rep. no. CK/III-53

Fig. 10: Bairdiocypridacea or Bairdiacea, gen. et spec. indet., left lateral view of carapace, x 75, rep. no. CK/III-11

Figs. 11, 17: *Spinomicrocheilinella dargenioi* n. sp., fig. 11: holotype, right lateral view of carapace, x 85, rep. no. CK/V–42; fig. 17: juvenile carapace, x 80, rep. no. CK/VII-3, a) right lateral view, b) dorsal view

Fig. 12: *Paraberounella* ? cf. *laterospina* n. sp., RV, x 145, rep. no. CK/III-23

Fig. 13: *Praezabythocypris* sp. ex gr. *pulchra* KOZUR, 1985, left lateral view of carapace, x 150, rep. no. CK/III-79

Fig. 14: *Kellettina reticulata* n. sp., LV, holotype, x 80, rep. no. CK/III-16

Figs. 15, 19: *Nodokirkbya striatoreticulata* n. gen. n. sp., fig. 15: right lateral view of carapace, x 150, rep.-no. CK/III-8; fig. 19: holotype, left lateral view of carapace, x 145, rep. no. CK/III-18

Fig. 16: *Amphissites sosioensis* n. sp., LV, holotype, x 155, rep. no. CK/III-21

Fig. 18: *Knightina* ? *multicarinata* n. sp., holotype, left lateral view of carapace, x 150, rep. no. CK/V-4. Sample 574. Cozzo Intronata section between Lercara and Roccapalumba, red silty, micaceous shales, Kungurian flysch.

Figs. 20, 25: *Tubulikirkbya* ? *oertlii* n. sp., RV, x 160, fig. 20: holotype, rep. no. CK/III-51; fig. 25: rep. no. CK/III-30

Fig. 21: Kirkbyid ostracod, gen. et spec. indet., RV, x 160, rep. no. CK/III-48

Fig. 22: *Solleikope* ? *permica* n. sp., RV, holotype, x 150, rep. no. CK/III-17

Fig. 23: *Haworthina* ? sp. 3, left lateral view of carapace, x 150, rep. no. CK/III-38

Fig. 24: *Haworthina* ? sp. 2, right lateral view of carapace, x 150, rep. no. CK/III-36

Fig. 26: *Kirkbya* ? sp. 2, right lateral view of carapace, x 150, rep. no. CK/III-57

Fig 27: *Roundyella* sp., RV, x 150, rep. no. CK/III-56

Fig 28: *Primitiella* ? sp., RV, x 150, rep. no. CK/III-42

Fig. 29: *Paraberounella* ? *laterospina* n. sp., LV, holotype, x 150, rep. no. CK/III-40

Fig. 30: *Ovornina (Tricornella)* sp., x 80, rep. no. CK/III-25

Plate 2

All figured specimens are from sample 655 (see pl. 1). Fig. 6 is a resedimented specimen from shallower, but also pelagic and rather deep environment.

Figs. 1-5:	*Pseudospinella ruggierii* n. gen. n. sp., fig. 1: holotype, x 160, rep. no. CK/VII-5, a) right lateral view of carapace, b) dorsal view of carapace; fig. 2: x 160, rep. no. CK/VII-6, a) right lateral view of carapace, b) ventral view of carapace; fig. 3: subadult carapace, right lateral view, x 300, rep. no. CK/III-28; fig. 4: dorsal view of carapace, x 300, rep. no. CK/III-58; fig. 5: juvenile carapace, left lateral view, x 280, rep. no. CK/III-43
Fig. 6:	*Parabythocythere siciliensis* n. sp. RV, holotype, x 160, rep. no. CK/III-5
Fig. 7:	*Bashkirina ? calogeroensis* n. sp., holotype, right lateral view of carapace, x 160, rep. no. CK/III-33
Fig. 8:	*Haworthina* sp. 1, x 160, rep. no. CK/III-46

Plate 1

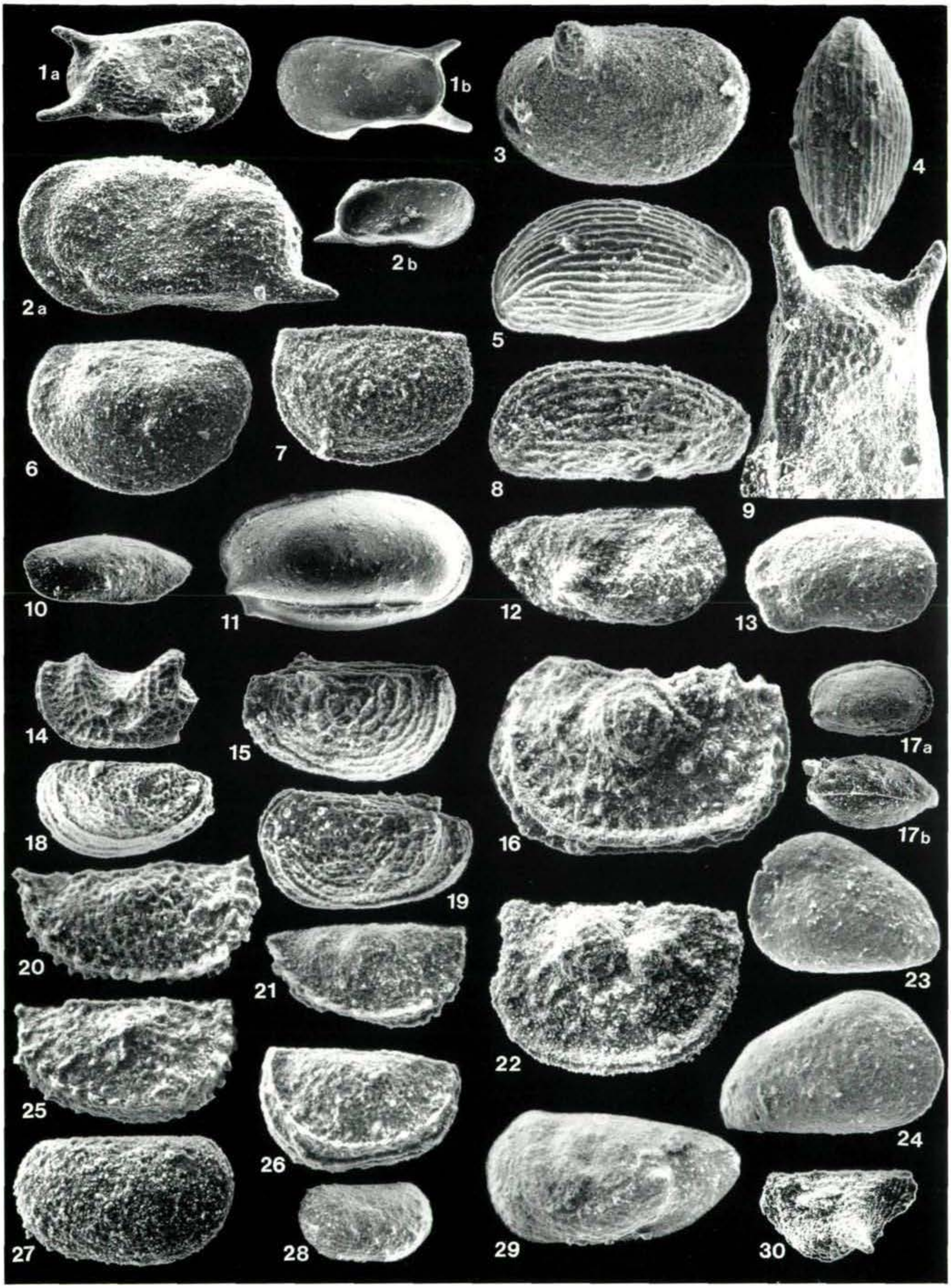

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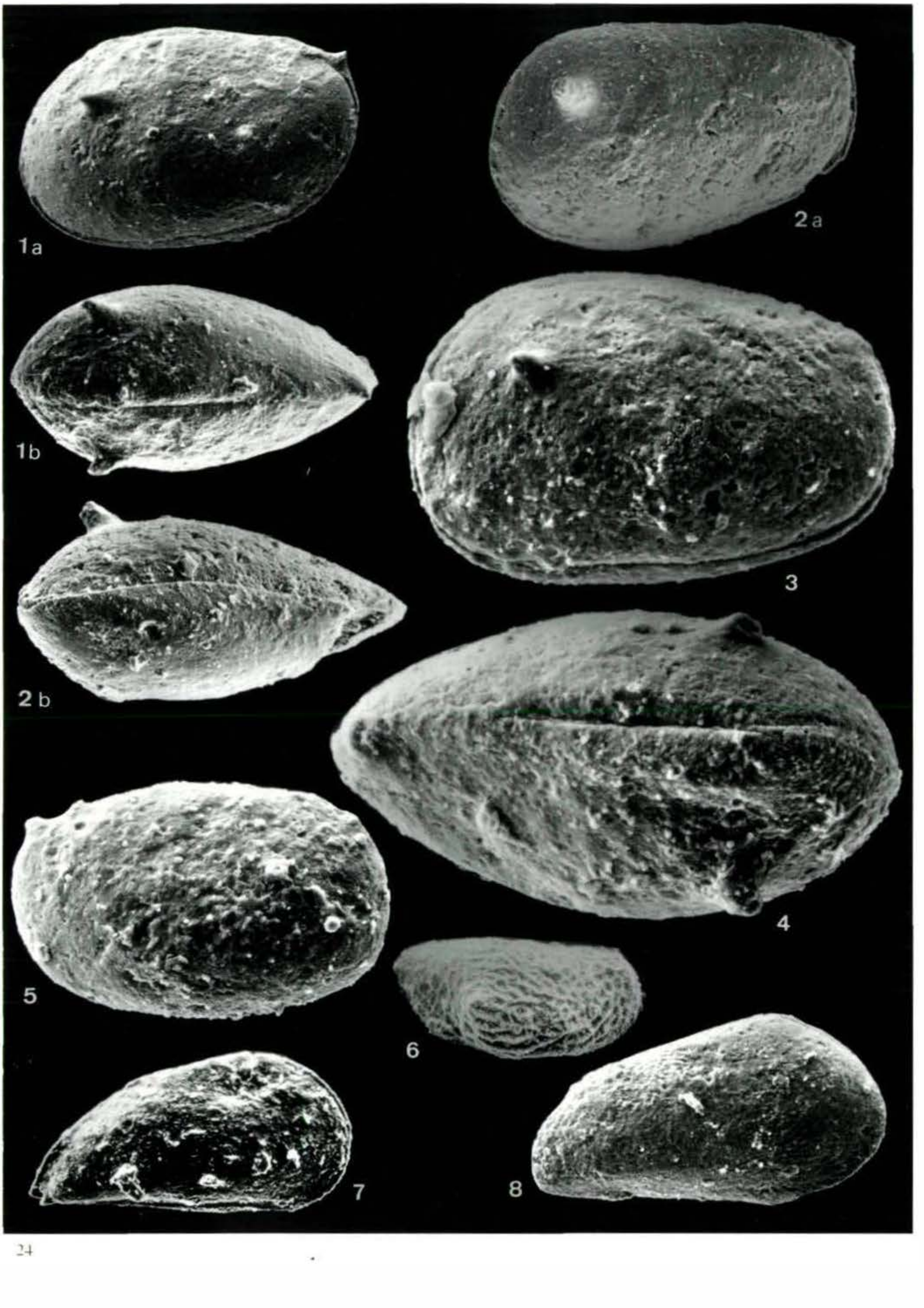
Plate 2



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PERMIAN DEEP-WATER OSTRACODS FROM SICILY (ITALY). PART 2: BIOFACIAL EVALUATION AND REMARKS TO THE SILURIAN TO TRIASSIC PALEOPSYCHROSPHERIC OSTRACODS

Heinz Kozur

Abstract:
The Permian sequence of the Sicanian paleogeographic domain in Western Sicily was deposited under continuous pelagic deep-water conditions with unrestricted connection to the Permian Pacific (Panthalassa). The ostracod faunas of these pelagic deposits indicate an ecotype that is common and characteristic for open pelagic conditions and water-depths below 200–500 m in Silurian to Triassic geosynclinal areas. Because of the very low evolutionary rates these cosmopolitic faunas contain during the Late Paleozoic and Triassic increasing percentages of archaic elements that disappeared suddenly during the Upper Liassic, when thermospheric conditions were established in the world oceans.

The term Thuringian for this ecotype cannot be used, because this term is preoccupied by the Thuringian stage (= Zechstein) of Upper Permian. The term paleopsychrospheric ostracod faunas is introduced here for these above mentioned Silurian to Triassic (Lower Liassic) ostracod faunas. General morphologic characters and distribution patterns of these paleopsychrospheric ostracod faunas show similarities to the Tertiary – Recent psychrospheric ostracod faunas (e.g. total lack of eye tubercles in such groups that have contemporaneous representatives with eye tubercles in shallow-water seas, dominance of smooth and spined forms by absence of the sculpture type with heavy broad ribs, very homogenous faunas over large distances, very high percentage of cosmopolitic species).

Zusammenfassung:
Die permischen Schichtenfolgen der Sicanischen paläogeographischen Einheit Westsiziliens wurden unter kontinuierlichen pelagischen Tiefwasserbedingungen bei uneingeschränkter Verbindung zum permischen Pazifik (Panthalassa) sedimentiert. Die Ostracodenfaunen dieser pelagischen Ablagerungen zeigen einen Ökotyp an, der in silurischen bis triassischen Geosynklinalgebieten weit verbreitet ist und offene pelagische Bedingungen bei Wassertiefen unter 200–500 m charakterisiert. Wegen der sehr geringen Evolutionsraten enthalten diese kosmopolitischen Faunen während des Jungpaläozoikums und der Trias wachsende Anteile von archaischen Elementen, die während des Oberlias plötzlich verschwanden, als sich thermosphärische Bedingungen in den Weltozeanen einstellten.

Die Bezeichnung "Thuringian" für diesen Ökotyp kann nicht verwendet werden, weil diese Bezeichnung für die Thuringian-Stufe (= Zechstein) des Oberperm präokkupiert ist. Die Bezeichnung paläopsychrosphärische Ostracodenfaunen wird hier für diese oben genannten silurischen bis triassischen (unterliassischen) Ostracodenfaunen eingeführt. Allgemeine morphologische Merkmale und Verbreitungsmuster dieser paläopsychrosphärischen Ostracodenfaunen zeigen Ähnlichkeiten mit den tertiären bis rezenten psychrosphärischen Ostracodenfaunen (z.B. totales Fehlen von Augenknoten in solchen Gruppen, die altersgleiche Vertreter mit Augenknoten in Flachmeeren besitzen, Dominanz von glatten und bestachelten Formen bei Abwesenheit des durch grobe, breite Rippen gekennzeichneten Skulpturtypus, sehr homogene Faunen über große Entfernungen, hoher Prozentsatz kosmopolitischer Arten).

1. INTRODUCTION

In part 1 of this paper (this volume) Permian deep-water ostracod faunas from pelagic sequences of the Sosio Valley area and the Lercara-Roccapalumba area (both Western Sicily) were described. The map of the investigated areas, the geological sketch of the Torrente San Calogero section WSW of Pietra die Salomone, where the richest ostracod faunas have been found, the composed stratigraphic column of pelagic Permian and Triassic in Western Sicily, and the ostracod plates have been presented in part 1 (text-figs. 1-3, pls. 1, 2).

In the present part 2 the paleoecologic importance of the rich deep-water ostracod faunas from the higher Middle Permian to basal Upper Permian and of similar faunas in the Paleozoic and in the Triassic is discussed.

2. REMARKS TO THE PERMIAN BASINAL SEQUENCE IN WESTERN SICILY

CATALANO; DI STEFANO & KOZUR (1988b) recognized for the first time a Permian pelagic deep-water sequence in the Sicanian paleogeographic domain of Western Sicily. According to these authors, it consists of Kungurian (Jachtashian) flysch, a Kubergandinian Olistostrome Unit and a Wordian to Dzhulfian Claystone Unit.

The Kungurian flysch is the oldest well exposed stratigraphic unit in the Sicanian paleogeographic domain. Several 100 m of this unit are exposed, but its thickness may be considerably larger, because its base is never exposed. The flysch consists of reddish or gray sandstones, siltstones and shales. Graded bedding, flut casts and other sedimentary marks are common in these rocks. Resedimented limy sandstones to sandy limestones occur subordinately in the reddish or reddish and gray part of the flysch, whereas in the gray part only few banks of carbonatic sandstones have been found.

Trace fossils of the *Nereites* ichnofacies are common. Especially frequent are *Paleodictyon* and feeding traces with meander patterns, but *Paleodictyon* seems to be restricted to the red flysch. This ichnofacies, especially the common occurrence of *Paleodictyon* (first evidence of this Silurian - Tertiary ichnogenus in the Permian) is known only from deep-water deposits, according to FREY & SEILACHER (1980) from the lower bathyal and abyssal zones in water-depths well below 1000 m.

Except of trace fossils only *Ammodiscus* sp. is frequent in the shales and siltstones, but neither ostracods nor other fossils with calcareous shells occur. Only in the gray flysch occasionally prints of very small (juvenile ?) bivalves and very few ostracods can be found. Conodonts are rare and represented by the pelagic *Mesogondolella intermedia* (IGO) and *M. idahoensis* (YOUNGQUIST; HAWLEY & MILLER) indicating a Jachtashian (Kungurian) age of the flysch. Plant detritus occurs in some layers of the gray flysch. Therefore the coast of a continental area or island arc was not far during the deposition of the flysch.

The few limy sandstones or sandy limestones are rich in resedimented shallow-water fossils (algae, bryozoans, few ostracods and fusulinids). They are often corroded or show other signs of resedimentations. Except of these fossils transported from adjacent shallow-water areals, some well preserved conodonts are present. Like in the shales and siltstones the pelagic *M. intermedia* and *M. idahoensis* occur, but additionally *Neostreptognathodus pequopensis* BEHNKEN and *Sweetognathus behnkeni* KOZUR are present indicating more marginal and shallower environments.

Quite characteristic for the limy sandstones and sandy limestones of the flysch unit are enigmatic, spine-like microproblematica. Like echinoderms, they consist of high-magnesium calcite, but all are tetraradiate with pores between the 4 ridges. Their paleoecologic significance is unknown, but because they are quite missing in the accompanying shales and siltstones with deep-water fossils, they are rather components transported into the basin together with the algae, bryozoans etc. On the other hand, these microproblematica are also unknown from typical shallow-water carbonates of Lower Permian age. Perhaps they indicate, as *N. pequopensis* and *S. behnkeni*, outer shelf conditions.

As a whole, the typical Kungurian flysch sequence is a deep-water deposit with strong influx of clastic material and partly also with resedimented shallow-water fossils. Strong terrigenous influx and layers with fine plant detritus indicate the vicinity of a land or island arc. The flysch may indicate last Hercynian compressive movements. The conodonts are slightly altered (CAI = 2), unlike the Chihsian to Rhaetian conodonts of the Sicanian paleogeographic domain that are quite unaltered (CAI = 1), if they are not thermally alterd along young faults.

The flysch sequence is overlain by the Olistostrome Unit (see part 1, Unit A in text-fig. 2) of several tens to more than 100 m thickness. Its matrix is a dark-gray, soft, often pyritic clay with sand grains, among it rose quartz. It contains only very few, but partly stratigraphically important fossils. The conodont association with *Mesogondolella phosphoriensis* (YOUNQUIST; HAWLEY & MILLER) and *Sweetognathus subsymmetricus* WANG; RITTER & CLARK indicates basal Middle Permian (Kubergandinian) age. Like in the flysch, also these condonts from the matrix of the Olistostrome Unit are typical Circum-Pacific species. Except of conodonts, only a few pyritized radiolarians (mainly Albaillellacea) and very few of the above mentioned microproblematica are present that may be reworked from the underlying flysch sequence. Spormorphs are common, but plant detritus cannot be observed.

The olistoliths consist largely of gray flysch sediments from the underlying sequence. Rocks unknown from sequences are also present among the olistoliths. They consist of dark-gray, hard radiolarian marls, somewhat siliceous, radiolarian-rich calcilutites, resedimented calcarenites, biogenic limestones and dark-gray, marly brachiopod-ammonoid limestones with light-gray limestone interclasts.

All these limestones and marls contain very rich pelagic Circum-Pacific faunas. The radiolarian-bearing olistoliths (marls, calcilutites, see above) contain typical Circum-Pacific Lower Permian *Pseudoalbaillella* associations, e.g. with *Pseudoalbaillella scalprata scalprata* HOLDSWORTH & JONES, P. *scalprata postscalprata* ISHIGA, P. (*Kitoconus*) *elongata* ISHIGA & IMOTO. These radiolarians indicate Jachtashian (Kungurian) age. For some faunas latest Artinskian age cannot be excluded. These rocks are therefore lateral equivalents of the flysch deposited in more distal parts of the basin without terrigenous influx.

The calcarenites and biogenic limestones contain very rich Chihsian pelagic conodont faunas with *Mesogondolella zsuzsannae* KOZUR, rare *M. slovenica* RAMOVŠ and some *Hindeodus* sp. In the biogenic limestones additionally reef-debris occur (reef-slope sediments).

The brachiopod- and ammonoid-bearing limestones contain few conodonts, *M. idahoensis* (YOUNGQUIST; HAWLEY & MILLER) and *Sweetognathus guizhouensis* BANDO et al. that indicate latest Jachtashian (latest Kungurian) to Chihsian age. Scolecodonts are common, indicating that these rocks were not deposited in water depth below 100 m, where scolecodonts are rare.

As a whole, the Chihsian olistoliths indicate a shallowing of the basin after the deposition of the flysch and contemporaneous radiolarian marls and radiolarian-bearing calcilutites during the Jachtashian (Kungurian). Seemingly carbonatic sedimentation prevailed during the Chihsian. Pelagic limestones prevail, but reefs were present adjacent to the basin.

The Olistostrome Unit indicates the onset of a new sedimentation cycle. During this time a deepening of the basin and a transgression on the foreland began. In the next higher unit, the Claystone Unit (see part 1, Unit B in text-fig. 2), predominantly red, in the lower part also light-gray clays without any sand content have been deposited. Partly they contain only siliceous microfossils (radiolarians, spicules of Silicospongea), partly also ostracods and foraminifers are present. These clays represent a strongly condensed sequence. In a few meter of these clays Wordian, Capitanian, Abadehian and Dzhulfian fossils can be found. The radiolarian fauna consists of Circum-Pacific species, dominated by highly evolved Follicucullidae, e.g. *Pseudoalbailella eurasiatica* KOZUR; KRAHL & MOSTLER, *Follicucullus monacanthus* ISHIGA & IMOTO, *F.* cf. *charveti* CARIDROIT & DE WEVER, *Ishigaconus scholasticus* (ORMISTON & BABCOCK). In some samples mass occurrences of radiolarians with several 100,000 specimens per kg material can be observed.

Conodonts are nearly absent in the clays, but extremely frequent in broken, thin beds of calcarenites that contain more than 1,000 conodonts per kg material. Except of conodonts these calcarenites contain sponge spicules and ostracods, but often also debris of phosphatic fossil remains (redeposited fish remains), partly with bonebed character.

Pelagic sedimentation continued during the Triassic (see part 1, text-figs. 2, 3). In the Lower Ladinian (Unit C in text-fig. 2) gray, greenish-gray and red radiolarites, greenish tuffites, siliceous, partly cherty limestones prevail, whereas the Upper Ladinian is built up by greenish-gray to pink nodular cherty limestones, somewhat marly shales and quite subordinately red radiolarites (Unit D in text-fig. 2). In the Middle Carnian dark-gray, marly, often cherty limestones and marly shales prevail and from the Upper Carnian to Rhaetian a monotonous sequence of bedded, light-gray cherty limestones is present.

3. PALEOECOLOGIC EVALUATION OF THE DEEP-WATER OSTRACOD FAUNAS FROM THE MIDDLE-UPPER PERMIAN CLAYSTONE UNIT OF THE SOSIO VALLEY AREA AND OF PALEOZOIC TO TRIASSIC OSTRACOD FAUNAS FROM SIMILAR ENVIRONMENTS

The ostracod faunas of the Middle-Upper Permian Claystone Unit, both from the red clays and from the calcarenites, are quite different from the well known and rich contemporaneous shallow-water ostracod faunas from the adjacent Western Tethyan shelf. In the red clays, even the genera are different except of some ubiquitous forms, like *Haworthina*, *Roundyella* and doubtful *Bashkirina*. In the calcarenites (reworked subordinately also in the red clays) several genera of kirkbyids are identical with the shallow-water ostracod faunas. *Bairdia* and *Cryptobairdia* are here common and *Parabythocythere* is present. But even in these faunas neither among the kirkbyids nor among *Bairidia*, *Cryptobaridia* and *Parabythocythere* identical species with the shallow-water faunas can be found. Whereas the shallow-water faunas from adjacent areas are quite different, similar ostracod faunas can be found in Lower Permian beds of Timor Island. Both these similarities and the difference against contemporaneous shallow-water faunas from the adjacent shelf are facies-controlled (see below).

The richest ostracod faunas have been found in sample 655 (1 kg red clay) of Upper Capitanian to Abadehian age. The clay disintegrated in cold water and was washed with a 0.063 mm sieve. The residues (72 g) consist exclusively of fossils. Except of some 100 ostracods, some foraminiferes and few siliceous sponge spicules, only radiolarians are present. They are quite identical with species from the highest Middle Permian to basal Upper Permian red deep-sea cherts from Japan and from Oman. They indicate pelagic conditions and a broad, open deep-water connection to the Permian Pacific (Panthalassa). The same is indicated by the pelagic conodont faunas from the calcarenites that consists likewise exclusively of Circum-Pacific species.

The calcarenites consist of biogenic calcareous sands without any terrigenous components. They are diagenetically not much changed and have still many open pores (poorly cemented). Between the biogenous calcareous sand grains many fossils, especially ostracods, sponge spicules and conodonts can be observed on the surface of these rocks. These calcarenites may have been the distal parts of fans of transported material from adjacent reefs. Only few such calcarenites are present. With exception of a more than 10 cm thick bank from the lower part of the sequence, they are only some mm thick. All these calcarenites are broken and randomly distributed in the strongly disturbed red clays.

No macrofossils can be found in these calcarenites (and in the red clays). So, seemingly the reefs were not immediately adjacent to the deposition area of the red clays with some calcarenites. Reef limestones are only known from tectonic blocks in the Sosio Valley.

The ostracods of the calcarenites are white and have white calcareous matrix. Some of so preserved ostracods can be found also quite subordinately in the red clays mostly adjacent to the calcarenites. They seemingly derived from these calcarenites, in which they can be easily moved from their surface. *Amphissites* ? *sosioensis*, *Kellettina reticulata*, *Kirkbya* ? n. sp., *Nodoparaparchites reticulonodosa* and *Parabythocythere siciliensis* could be found only in this preservation and have therefore originally not lived in the red clays, but they are all known from the calcarenites.

The ostracod fauna of the calcarenites consists of *Bairdia*/*Cryptobairdia* (only 2 species, but many specimens) and of some species that can be also found in the red clay. *Sinocoelonella densistriata* is frequent in both rocks and also *Spinomicrocheilinella dargenioi*, *Microcheilinella* sp., *Paraberounella laterospina* and the *Bashkirina, Haworthina* and *Roundyella* species can be found in both facies. On the other hand, *Pseudospinella ruggierii* and *Spinososioella catalanoi*, both frequent in the red clays, could not be found in the calcarenites. Kirkbyids, in turn, are here more frequent, especially *Kellettina reticulata* is common.

The kirkbyids of the calcarenites (and of the red clays) are all very small forms (mostly 200–300 μm long), in contrary to contemporaneous species (often of the same genera) from adjacent shallow-water seas that are in general 600–1,000 μm long. Part of these forms, especially from the red clays, are seemingly juvenile forms, but also the adults of the most species are very small. There is a possibility that these small forms lived interstitially, like the recent Punciidae.

Even the calcarenites have not yielded any real shallow-water fossil. Seemingly this fauna was transported from shallower, but not shallow seas adjacent to reefs into the deep water basin. From the geological situation can be concluded that the faunas of these calcarenites are mixed and they should contain faunal elements that lived originally in different water depth. But ostracods with eye tubercles and sculpturated bairdiids, frequent in contemporaneous shallow-water sediments of the Western Tethys shelf, are quite missing. The accompanying other faunal elements are pelagic. Therefore also this ostracod fauna is not a shallow-water fauna, but has lived in water depth below 300 m (missing eye tubercles !).

The red clays are real deep-water sediments, indicated by all, mainly siliceous faunal elements (CATALNO; DI STEFANO & KOZUR, 1988 a, b and in press). This is also indicated by the geological development of this area. Already the Kungurian flysch contains very rich deep-sea trace fossil associations with numerous *Paleodictyon*. In the Middle Permian in the whole southern and central part of the Western Tethys sinking tendencies and wide transgressions on the foreland can be observed (e.g. with more than 4,000 m Wordian and Capitanian shallow-water sediments in Tunisia). The time-equivalents of this thick sequence are few meters of red shales in the Sicanian paleogeographic realm of Western Sicily. The sedimentation rate was therefore very low. Input of terrigenous material, like in the Lower Permian cannot be observed anymore.

Some of the red clays contain only siliceous faunal elements (radiolarians, sponge spicules, agglutinated foraminifers), in others also calcareous microfossils (ostracods, calcareous foraminifers, but not fusulinids) occur. The red clays with some calcareous microfaunas beside dominating siliceous microfossils have been surely deposited above the CCD. Those red clay that contain only fossils with siliceous skeleton may indicate deposition below the CCD.

The evaluation of all geological and faunistical data shows that the ostracod-bearing red clays has been deposited above, but near the CCD. Their deposition depth was surely considerably deeper than 1000 m water-depth. The deep-water connection to the Permian Pacific was broad and unrestricted, because the radiolarian and conodont faunas are even in specific level identical with the Circum-Pacific faunas.

The climate during the Middle and Late Permian was in the Western Tethys area subtropical/tropical (reefs in shallow-water blocks in Sicily, fusulinid-algal limestones on the Western Tethys shallow-water shelves). But in Gondwana and in the Angaride Province cold-water faunas are known throughout the Permian and in the deeper Lower Permian glacial sediments are widespread in Gondwana and some glaciomarine sediments were reported from the higher Permian of northern Siberia. Therefore we can await psychrospheric conditions in the world oceans during the Permian.

The extreme differences between the shallow-water and deep water ostracods in the Western Tethys confirms this opinion. Seemingly a distinct thermocline between the warm surface water and the colder deeper water was present that acted as faunal barrier. Quite the same strong differences between shallow-and deep-water faunas were present during the Triassic. Deeper water faunas from pelagic sediments of areas with free connection to the world ocean contain an archaic ostracod fauna with *Acanthoscapha*, Tricorninacea, strongly spined primitve Bythocytheracea, Healdiacea and other Paleozoic elements. This fauna has a distinct Paleozoic aspect. Contemporaneous shallow-water ostracod faunas have, in turn, typical Meso-/Cenozoic character with many sculpturated bairdiids, heavily sculpturated Cytherocopina etc. Also here no common species can be found between the shallow-water and the open-sea deep-water ostracod faunas and the transition between these faunas is rather fast. In an estimated depth interval from about 100 m to about 500 m the ostracod fauna changed nearly totally.

This situation continued until the lowermost Jurassic. In the Toarcian a drastic world-wide change occur. In deep water sediments, without any change of facies, suddenly all Paleozoic elements (*Acanthoscapha*, Tricornidae, Healdiacea), still dominant before, disappeared. In the same time a drastic change in the radiolarian faunas can be observed, where nearly all Triassic elements suddenly disappeared and the fauna became dominated by very small forms, especially williriedellids. From this moment the dominance of Entactinaria and Spumellaria against the Nassellaria changed into absolute dominance of Nassellaria. Also among the brachiopd faunas in this level many archaic elements disappeared.

After this faunal event in the deep-water associations, not related to a comparably strong event in the shallow-water faunas, quite transitional changes from the shallow-water into deep-water ostracod assemblages can be observed. Mostly the same groups occur in the shallow- and deep-water, only with other species or partly genera. The morphologic differences between the shallow- and deep-water ostracod faunas are from this time the same as indicated by BENSON (1984) for thermospheric Cretaceous deep-water ostracods against contemporaneous shallow-water ostracods. This situation continued from the Toarcian up to the Late Cretaceous or even Paleocene.

In this time the world oceans were really thermospheric. Because of the missing thermocline, the differences between the shallow-water and deep-water ostracods were not so great and the changes were gradual over a longer depth interval. Moreover, the Jurassic and Cretaceous deep water ostracods were not so cosmopolitic than the Eocene to recent psychrospheric ostracods and the Silurian to basal Jurassic paleopsychrospheric (term explained later) ostracods.

Except of the archaic paleopsychrospheric deep-water ostracods from pelagic sediments with unrestricted broad connection to the world ocean we find in the Triassic (and before) also deep-water ostracod faunas that are not archaic and therefore not so different from the shallow-water associations. In contrary to the shallow-water faunas they do not contain any taxa with eye tubercles, and species with more delicate sculpture and broad ventral wings are more frequent than in shallow-water associations. Almost all typical Paleozoic elements, like *Acanthoscapha*, Tricorninacea, are absent. Only Healdiacea are frequent, but they are not restricted to deep-water environments and common also in shallow-water sediments below the wave-base.

These ostracod faunas occur in restricted basins inside or behind carbonate platforms, which have no open deep-water connection with the world ocean. These are ostracod faunas of low energy environments in water-depths of more than 200 m indicated by microfacial investigations. From the geological situation and the subtropical/tropical warm climate during the Triassic can be concluded that these basins were thermospheric deeper water areas. There are some evidences that at least the westernmost part of the southern branch of Triassic Tethys had also thermospheric conditions, whereas the northern branch was two-layered with distinct thermocline. These two branches were separated by the Kreios Plate sensu TOLLMANN (compare TOLLMANN & KRISTAN-TOLLMANN, 1985) which could be a barrier for cooler bottom water. The investigations to this problematic are still in progress.

The archaic character of the Triassic (and Permian) deep-water ostracods from areas with open deep-water connection to the world ocean indicates that these ostracods lived in a very stable biotope that has not significantly changed since the latest Ordovician/earliest Silurian. In this very long time interval the oceans were surely psychrospheric during the Late Ordovician and the Late Carboniferous/Early Permian glaciations. No changes in the basic character of the Silurian to Lower Carboniferous open pelagic deep water faunas against Lower Permian or even Late Permian ones can be observed.

If in this long time interval several times thermospheric and psychrospheric conditions had changed in the world oceans, than the observed constancy of the here discussed deep water ostracod faunas would be unexplainable. As clearly observable in recent psychrospheric and thermospheric deep-water ostracod faunas (e.g. from the Atlantic Ocean and from the Mediterranean Sea) the differences between these faunas are drastical. The changes between psychrospheric and thermospheric ostracod faunas in the present day Mediterranean Sea from the Tertiary to recent are likewise drastical. The above mentioned Toarcian break in the deep water ostracod faunas was likewise very strong.

This latter event is especially important for the explanation of the conditions before this event. The Jurassic/Cretacrous oceans were surely thermospheric. The only explanation for the sudden disappearence of all the Paleozoic elements (that had survived in deep water environments even such global events, like the Permian-Triassic boundary) is, that the pre-Toarcian oceans were not thermospheric.

Because no stronger climatic changes can be observed during the higher Liassic, the change from a two-layered psychrospheric world ocean into a thermospheric ocean must be caused by changes in the paleogeography that have changed the oceanic circulation. If, for instance, the transport of warm surface water into polar regions was interrupted, the outflow of cold bottom water from these regions into low latitude oceans would end.

If we trace back the archaic Permian and Triassic deep-water faunas into the Lower Paleozoic then we find this fauna exclusively in such pelagic sediments, for which facial, faunal and geological data indicate free deep water connections to the world ocean or the depositional areas of these sediments werde situated on the margin of oceans, e.g. Devonian to Lower Carboniferous Hercynian geosyncline of Europe, Asia and North Africa, Permian Tethys ("Paleotethys") north of Gondwana, Timor Island.

BECKER (in BANDEL & BECKER, 1975) named the here discussed deep water ostracod faunas as "Thuringian Ecotype" following ZAGORA (1968) who discriminated a "Thuringian typus" for these faunas. BECKER regarded this fauna in contrary to the "Eifelian Ecotype" (shallow-water ostracods) as fauna of deeper water. Unfortunately, both Eifelian and Thuringian are stratigraphic stages, so both terms can be misinterpreted. Especially in the Permian, "Thuringian Ecotype" would mean Zechstein ecotype (Thuringian stage = Zechstein).

KOZUR (1972) prefered a genetic designation and he regarded these faunas as psychrospheric faunas, because of their outstanding similarities (both in the mode of distribution, morphology and sharp differences to the shallow-water faunas) to Tertiary - recent psychrospheric ostracods. However, because the Jurassic/Cretaceous oceans were surely thermospheric, it is better to name this fauna paleopsychrospheric, a term introduced here.

According to KOZUR (1972) this fauna is restricted to environments with open deep water connection to the world ocean and water depth below 200–500 m (upper depth boundary of this fauna minimum 150–200 m, maximum 500 m). As pointed out by KOZUR (1972) these data are well established not (only) by comparisons with Tertiary to recent psychrospheric ostracod faunas, but above all by microfacial data that are quite independent from the ostracod data.

According to KOZUR (1972) there are no data to recognize, which water depth below the above mentioned upper limit of the paleopsychrospheric fauna can be attributed to these faunas, but, of course, these faunas have lived in water depth well above the CCD, because they have been solved from pelagic limestones. Most of the paleopsychrospheric ostracod faunas have lived in water depth between 200 and 1,000–2,000 m. Faunas from still greater water depth should be expected from sediments deposited near the CCD. As mentioned above, the Middle/Late Permian red deep water clay from Western Sicily with the ostracod fauna described in part 1 of the present paper may belong to this type of sediments.

Bairdia s.l. (including *Cryptobairdia* SOHN) is missing or extremely rare in this fauna. Quite in the contrary, the ostracod faunas from the few intercalated thin calcarenites yielded many bairdiid specimens (but only one or two species unlike the shallow-water faunas with many specimens and species). This fauna has several species in common with the red deep-water clays, others are missing (see above) and the frequency of common species is partly different. Also this fauna has no representatives of the contemporaneous shallow-water faunas from the Western Tethyan shelfs. If this fauna is composed of ostracods from different water depth, transported into the deep basin, so even the ostracods from the shallowest involved environment have lived below the environment of the Western Tethyan shallow-water faunas.

The absence or extreme scarcity of *Bairdia* s.l. in the red clays is surely not caused by different substrates, because bairdiids are frequent in shallow-water clays or micritic limestones. Seemingly paleopsychrospheric ostracod faunas rich in *Bairdia* s.l., represent the upper (depth) fauna of these associations, whereas the fauna without or with quite subordinate *Bairdia* s.l. represent the deeper (depth) fauna of these associations. In the Devonian the "Cypridine Shales" would represent the latter deeper faunas, as already assumed by KOZUR (1972). In the Permian, the ostracod fauna of the Sicilian red deep-water clays would belong to the deeper, the fauna of the Lower Permian "flysch" of Timor to the shallower paleopsychrospheric ostracod faunas. However, also the latter fauna was not a shallow-water fauna, but has lived below 200 m water depth.

A confirmation of the above considerations yielded Triassic ostracod faunas from sediments deposited near the CCD (cherts/cherty limestones above oceanic pillow lavas). These sediments yielded ostracod faunas very poor in species and specimens that have not yielded so far any bairdiids.

The following characteristics for the Triassic paleopsychrospheric ostracods can be established (KOZUR, 1972, p. 633):

(1) Large part of the fauna is archaic (before only known up to the Lower Carboniferous or even Late Devonian), like Tricorninacea, primitive, heavily spined Bythocytheracea (*Paraberounella, Nemoceratina, Tuberoceratina*), *Acanthoscapha, Acratia, Healdia, Cavellina, Sulcella, Discoidella.*
(2) Compared with Triassic shallow-waterfaunas, butalso compared with Triassic thermospheric deep-water faunas from restricted basins, the phylomorphogenetic changes within the Triassic paleopsychrospheric faunas during the Triassic were only very slow.
(3) The faunas were homogenous over huge distances (very high percentage of cosmopolitic species).
(4) The most species are thin-shelled.
(5) Some of the species are larger than Triassic shallow-water ostracods, e.g. *Acanthoscapha* with more than 2 mm length.
(6) The surface/volume ratio is in general high.
(7) Many ostracods are smooth or strongly spined. The sculpture type of strong broad ribs, quite frequent in the contemporaneous shallow-water faunas, is missing.
(8) Eye tubercles, present among many Triassic shallow-water ostracods, are quite missing.
(9) The number of species is low.
(10) The hinges are primitive, mostly adont, rarely lophodont.

As already pointed out by KOZUR (1972) these characters can be only used for recognition of a paleopsychrospheric ostracod fauna, if the whole ostracod fauna of rich associations will be evaluated and if all these characters are regarded together. The characters 4–10 alone can be also found among shallow-water ostracods. For instance, strongly spined species can be also found in some fresh-water ostracod faunas. The deep-water ostracods are in general more thin-shelled, but Cytherellacea are also in paleopsychrospheric deep water ostracod faunas thick-shelled. On the other hand, fresh-water ostracod faunas are generally more thin-shelled than even deep-water faunas. In the case of eye tubercles, only the total absence of this feature in all ostracods of a rich fauna is important, because many ostracods, like Platycopina, Cladocopida and Healdiacea have never eye tubercles, neither in deep-water nor in shallow-water environments.

The number of species is related to all paleopsychrospheric deep-water associations from different parts of the world against all different shallow-water associations. In a single shallow-water association the number of species is often lower than in a single paleopsychrospheric association. But because of the high facial differentation in the shallow-water against a rather uniform paleopsychrospheric environment, the shallow-water faunas are by far more differentated and they comprise about 70% of the known Triassic ostracod species.

With exception of the points 1, 2 the above mentioned characters of the paleopsychrospheric ostracods are the same as BENSON & SYLVESTER-BRADLEY (1971) described for recent psychrospheric ostracods. If we include into the considerations also the Tertiary psychrospheric ostracods, than we can also point 2 recognize in recent psychrospheric ostracods. But even the archaic character for some recent psychrospheric ostracods can be proven. Paleozoic elements are, of course, in general not more present, because they disappeared with the beginning of thermospheric oceans during the Lower Jurassic.

Inspite of these obvious similarities between the recent psychrospheric and the Silurian to basal Liassic paleopsychrospheric ostracod faunas, the term paleopsychrospheric refers rather to the existence of a two-layered ocean with distinct thermocline than to the absolute temperature of the lower layer. Of course, this lower layer was relatively considerably cooler than the upper layer, but the temperature must not have been so low than in present day psychrospheric oceans. However, because of the quite different character of the paleopsychrospheric ostracods from the contemporaneous shallow-water (and also from contemporaneous thermospheric deep water) ostracods and because of the cosmopolitic distribution of the paleopsychrospheric ostracods, these differences can be only explained by the presence of a distinct thermocline. Moreover, below this thermocline the temperature of the lower layer must be both regionally and seasonally constant and not regionally and seasonally changing.

The paleopsychrospheric ostracods from the Silurian up to the Permian do not show decisive differences against the Triassic ones, but not all 10 points listed above, can be used for recognition of these faunas. So, the hinge is also among the most shallow-water ostracods primitive and not only among the paleopsychrospheric ostracods. Many shallow-water ostracods are in the Paleozoic very big forms, so that we cannot find real general size differences between shallow-water and paleopsychrospheric ostracods. Rather the paleopsychrospheric ostracods are often smaller than the contemporaneous shallow-water ostracods. Such small forms are also present among the Triassic paleopsychrospheric ostracods, but because here the majority of the shallow-water ostracods is small, the very large representatives of the paleopsychrospheric ostracod faunas are more striking. Eye tubercles arealso in Paleozoic paleopsychrospheric ostracod faunas quite missing, but with exception of the Permian shallow-water faunas and the few Silurian/Devonian shallow-water faunas with many Leperditida also in the shallow-water mostly such ostracods occur that have no eye tubercles, because only such groups are present that have never eye tubercles (also not in shallow-water environments).

All these differences show the historical aspects in the development of the paleopsychrospheric faunas. Especially distinct is this aspect regarding the archaic character of the Triassic paleopsychrospheric ostracod faunas. This feature is caused by the slow evolutionary rates in an environment that was nearly stable over the long time span of more than 200 my. In the latest Ordovician, where during the glaciation psychrospheric conditions has been established in the world oceans, the new environment was populated mainly by the more modern podocopids. Therefore the Silurian paleopsychrospheric ostracod faunas are not archaic, but more "modern" (dominated by podocopids) than the contemporaneous shallow-water faunas, dominated by the more primitive Beyrichiida and Leperditiida. In the Late Paleozoic, where the paleopsychrospheric ostracod faunas contain the same groups, often the same families and genera than the Silurian and Devonian ones, the archaic aspect of these faunas is already distinct, because the shallow-waterfaunas contain in this time already many higher evolved Podocopida, Platycopida and Reticulocopida. On the other hand, among the Metacopina, Punciocopina, Binodicopina and the few Beyrichiida that can be found in Late Paleozoic paleopsychrospheric ostracod faunas, especially such primitive forms can be observed that were not more present in contemporaneous shallow-water faunas.

Inspite of the fact that the paleopsychrospheric ostracod faunas have evolved more than 200 my in a very stable environment as discussed above, they cannot be regarded as abyssal faunal elements from ancient oceanic plains that should have had especially stable environments. Rocks from these ancient oceans are today mostly not preserved or they consist of often metamorphic remnants of oceanic crust covered by cherts and deep-sea clays deposited below the CCD. They do not contain any ostracods, because microfossils with calcareous shells cannot be preserved there.

Preserved non-metamorphic ostracod-bearing deep-water sediments are in general limestones from the continental slope or from non-oceanic basins deposited under water-depths of 200 m to 1,000– 2,000 m. In these sedimentation areas the nutrient supply, but also the sedimentation rate was surely higher than in oceanic abyssal plains. Therefore the diversity of these ostracod faunas will be surely higher than in abyssal plains.

Compared with the most paleopsychrospheric ostracod faunas that derived from epibathyal (subbathyal) sediments, the few known ostracod faunas of real deep-sea sediments are very poor. In the Meliata-Hallstatt rift, the Middle Triassic suboceanic pillow lavas are overlain by red radiolarites, higher up radiolarites and cherty limestones. The first sediments have been deposited below, the latter one a little above the CCD in water depth probably below 2–3,000 m. Here a very poor ostracod fauna was found, consisting of 2 species of healdiids. Neither spined Cytherocopina nor *Acanthoscapha*, both very typical for Triassic paleopsychorspheric ostracod faunas have been found. These latter typical paleopsychrospheric faunas are widely distributed in distal slope sediments of the Meliata-Hallstatt rift (e.g. in cherty limestones, Hallstatt Limestones). If the scarcity of ostracods in the pillow lava-chert-cherty limestone sequence from central parts of the suboceanic (about 1,000 km wide) Meliata-Hallstatt rift is not preservation controlled, than the fossil abyssal ostracod fauna were at least during the Triassic extraordinary poor and not characterized by the most typical elements of the paleopsychrospheric ostracod fauna.

According to KOZUR (1972) the paleopsychrospheric ostracod faunas can be subdivided into 4 groups, recognizable also in the paleopsychrospheric fauna from the Middle/Late Permian of Western Sicily:

(a) Genera that are known since the Devonian or still earlier from paleopsychrospheric ostracod faunas ("Thuringian Ecotype") or near related forms that have not changed much since this time, e.g. Tricorninidae, *Nemoceratina, Paraberounella, Acanthoscapha, Bohlenatia* etc. In the Permian except of these forms also the Rectonariidae belong to this group.

(b) Generathat lived formerly in shallow-water or in shallow and deep water, later only in paleopsychrospheric deeper water, in the Triassic, e.g. *Microcheilinella, Acratina*, in the Permian, for instance, *Solleikope*.

(c) shallow-water faunal elements that immigrated into the paleopsychrospheric faunas, if the population pressure in the shallow-water populations was very high. These elements disappeared, if their frequency in the shallow-water faunas decreased. In the Triassic, for instance, some sculpturated Bairdiidae immigrated into the paleopsychrospheric faunas. They became there strongly spined forms. But with the decline of the sculpturated bairdiids in post-Triassic shallow-water sediments, no sculpturated bairdiids can be observed in post-Triassic deep-water sediments. In the Paleozoic the likewise subordinate paleopsychrospheric Beyrichiida (often spined forms) belong to this group.

(d) Genera that are both in shallow-water and in deep-water sediments present, but mostly represented by different species, e.g. *Cryptobairdia, Cavellina, Cytherella, Hungarella.* The latter genus is in the Triassic not present in water depth above 30–50 m, but below it is frequent in all water depths.

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Appendix

The data of part 2 of the present paper were presented together with the text-figs. and plates of part 1 in a lecture on the 1st European Ostracodologists' Meeting (EOM '89) at 4.8.1989 in Frankfurt a.M.

Two comments were made by Prof.Dr.G. BECKER, Frankfurt, and Prof.Dr.K.G. McKENZIE, Melbourne. These comments were presented once more after the lecture in written form to the author for publishing together with the replies by the author. Here the comments and the replies are presented.

Prof. Dr. Becker:

You and Dr. GRÜNDEL are equating faunas of the Hercynian geosyncline (faunas of the Thuringian Ecotype) with modern deep-sea faunas. Allow me to point to three backs:

First, the Thuringian Ecotype (in my delimition) does not mean automatically deep-sea. It indicates generally low-energy environments.

Second, the Devonian Sea was warm ("Klima stellenweise sogar warm", KLULTAE & KRS, 1967). There were at this time no connections to the polar regions. There were no cold bottom currents. The sea was thermospheric. There were no psychrospheric (ostracod) faunas in the Hercynian Geosyncline.

Third, modern deep-sea faunas are rather unknown (letter of Prof. WHATLEY), only 65–70% of the species have been described. There are, however, at least more differences than similarities between the Thuringian Ecotype and modern deep-sea faunas.

Reply Kozur:

Your discussion does not refer to my present paper, but to publications by KOZUR (1972) and GRÜNDEL & KOZUR (1975). We have not published in these papers that the ostracod faunas of the Hercynian geosyncline (your "Thuringian Ecotype") are deep-sea faunas, but we have regarded these faunas as psychrospheric faunas. According to KOZUR (1972) these faunas indicate a minimum water depth of 150–200 m, for the Triassic psychrospheric faunas of Felsöörs water depth of more than 500 m were assumed. This has nothing to do with modern deep-sea faunas that live on abyssal plains in generally 4–6,000 m water depth. GRÜNDEL & KOZUR (1975) referred to the data given by KOZUR (1972).

To your 3 points the following answers:

(1) Your "Thuringian Ecotype" does not only indicate low-energy environmentsboth in shallow-marine and in deep-water areas. Many ostracod faunas are known from low-energy environments in the Triassic and Paleozoic that have not yield the "Thuringian Ecotype" ostracods. Restricted basins are in general characterized by low-energy environments, but independent from their water depth, both the shallower and the deeper restricted basins (the latter below 200 m water-depth) never yielded the ostracod faunas of the "Thuringian Ecotype". These ostracod faunas can be only found, if free unrestricted deep-water connections to the world oceans are present in the time intervals from the Late Ordovician to basal Jurassic and from the Eocene to recent.

I do not know any shallow-water low-energy ostracod assemblage (e.g. back-reef seas) that have yielded during the Paleozoic and Triassic ostracods of the "Thuringian Ecotype". For instance, the Peştiş Shale of the Apuseni Mountains in Romania, a time- and facies-equivalent of the "Grenzbitumenzone" in the Tessin Alps, has yielded a very rich typical shallow-water ostracod fauna with several species possessing eye tubercles, like in other shallow-water faunas. The Peştiş Shale is an extremely low-energy environment, in which even prints of the soft bodies of many animals are preserved.

There is surely a general agreement between the ostracodologists that the persistance of morphologically highly specialized forms, like Tricorninidae, Rectonariidae, *Acanthoscapha* and many others from the Devonian or even Silurian up to the Late Permian and partly even into the Triassic requires an extremely stable environment during these very long time intervals. Shallow-water low-energy environments are very unstable environments, even with strong seasonal temperature differences, but also in time (geologically only shortly existing environments). These unstable environments are quite unsuitable for extremely long persisting faunas with very low evolutionary rate. Moreover, the most important elements of the "Thuringian Ecotype" have even crossed the P/T boundary, the strongest caesure in shallow-marine biota in the whole Phanerozoic time. The "Thuringian Ecotype" persisted across the P/T boundary.

Moreover, in all Paleozoic and Triassic ostracod associations of the "Thuringian Ecotype" never a specimen with eye tubercles was found. Referring to the discussion of McKenzie, we should therefore await water depth below 280 m, what excludes shallow-marine low-energy environments.

(2) There is no evidence for thermospheric Devonian ocean. Warm climate ("Klima stellenweise sogar warm") in the Devonian does not exclude a two-layered oceanic model with a cooler lower layer permanently separated by a thermocline from the upper warmer layer, like in the present day tropical regions of the world oceans. According to all paleogeographic reconstructions the Devonian oceans had broad connections to the Polar regions (compare McKERROW & SCOTESE, 1989). Therefore I do not know the base for your paleogeographic considerations.

If the Devonian oceans were thermospheric, then it cannot be explained, why in the surely psychrospheric oceans during the Pennsylvanian/Lower Permian Gondwana glaciation the "Thuringian Ecotype" persisted without any significant change in its character and even in the main generic composition, whereas in the same time-interval the shallow-marine ostracod faunas changed very much. As we know from the Tertiary, the changes between thermospheric and psychrospheric ostracod faunas were drastical. Recent thermopsheric and psychrospheric ostracod fauns are different each other, even if a connection between both areas exists (e.g. Atlantic - Mediterranean Sea).

Moreover, the differences between the "Eifelian Ecotype" (shallow-water ostracods) and the "Thuringian Ecotype" (psychrospheric ostracods) were very big, indicating a faunal barrier in form of a thermocline. In the Jurassic and Cretaceous thermospheric oceans the differences between the shallow-water and the deep-water faunas were not so big. The thermospheric deep water ostracods were not basically different from time-equivalent shallow-water ostracod faunas except that they are always blind (no eye tubercle) and some morphological differences can be recognized. But they consist of the same ostracod groups, partly also the same genera with different species. Compared with the shallow-water faunas, they have no archaic character. Quite on the contrary the Triassic psychrospheric faunas have distinct Paleozoic character, whereas the contemporaneous shallow-water faunas have distinct Mesozoic character.

Finally, the Jurassic and Cretaceous thermospheric deep water ostracod faunas are not cosmopolitic, like the "Thuringian Ecotype" (e.g. Devonian psychrospheric ostracods from Europe, North Africa and China have a high percentage of cosmopolitic common species). The high vertical exchange of water masses in thermospheric oceans causes regional differences in the temperature of the oceanic deep water. Therefore the thermospheric deep-water fauna cannot be cosmopolitic.

All these discussed data indicate that the Devonian ocean was not thermally unlayered (thermospheric), but thermally two-layered, like during the whole time-interval, in which the "Thuringian Ecotype" existed. This is confirmed by the fact that the "Thuringian Ecotype" suddenly disappeared with the beginning of the Jurassic/Cretaceous thermospheric ocean. In the Toarcian all archaic elements in open deep water faunas, that have survived from the Devonian (or even earlier) without significant changes until the basal Jurassic, suddenly disappeared. To these faunal elements belong *Acanthoscapha*, Tricorninacea, Healdiacea. This drastic changes in the deep water faunas, not accompanied by likewise drastic changes in the shallow-water faunas, is the normal effect that can be awaited, if the long existing psychrospheric ocean changed into a thermospheric ocean. Because the Jurassic/Cretaceous oceans were surely thermospheric, the pre-Toarcian oceans were surely not thermospheric (down until the latest Ordovician, where the "Thuringian Ecotype" began).

(3) If 65-70 % of the species of modern deep-sea faunas have been described, than this fauna is by far better known than any fossil fauna and compared with the fossil faunas not "relatively unknown". Therefore we can compare these faunas with fossil assemblages at least so good, like Devonian, Carboniferous, Permian and Triassic faunas of the "Thuringian Ecotype".

It is quite understandable that between the "Thuringian Ecotype" (Silurian or latest Ordovician to Lower Liassic) and the 200 my later existing recent psychrospheric ostracod faunas more differences than similarities can be found. During this long time interval two strong changes in the oceanic deep water faunas can be observed: Within the Liassic the thermospheric ocean began and by this all the long existing archaic (Paleozoic) elements of the pre-Jurassic psychrospheric ostracod faunas ("Thuringian Ecotype") disappeared. During the Eocene, where psychrospheric conditions were re-established in the world oceans, distinct changes in the deep water ostracod faunas were caused again. For this reason, the recent psychrospheric ostracod fauna cannot be so archaic, like the Triassic one, because this archaic character depends on the length of the time-interval, in which psychrospheric conditions existed (Silurian to Triassic against Eocene to recent). For this reason, the Silurian psychrospheric ostracod fauna are not archaic, but rather modern, compared with contemporaneous shallow-water faunas.

The basic morphological and especially also distribution characters between recent psychrospheric ostracod faunas and the "Thuringian Ecotype" are the same as already pointed out by KOZUR (1972): Cosmopolitic distribution, very strong differences against the shallow-water faunas that indicate the presence of an effective ecologic barrier (thermocline), high percentage of smooth and ornate (spined) forms, sculpture more delicate, no forms with broad, heavy ribs or with eye tubercles are present, very slow evolutionary rate indicating a very stable biotope without seasonal and regional temperature differences etc.

Additional reference for the reply, not quoted in the present paper

McKERROW; W.S. & SCOTESE, C.R. (eds.)(1989): Atlas of Paleozoic basemaps. In: Paleozoic paleogeography and biogeography. – Geol. Soc. London, Spec. Publ. (pre-print).

Prof. Dr. McKenzie:

Although a depth of around 500 m (mesobathyal) may seem sufficient for a psychrospheric fauna most workers understand the word "psychrospheric" to define greater than 1,000 m depths and cold temperatures - as in modern oceans. Further, the loss of an eye tubercle in physical terms – cf. recent work by KONTROVITZ – may only require depths greater than 285 m.

I believe that Dr. KOZUR needs to define his interpretation of the term psychrospheric more precisely in the sense in which most workers understand the term (cold not relatively cool; more than 1000 m deep; like modern deep oceans). I feel that the onus of proof still rests with Dr. KOZUR to establish credibly that his Sicilian and Timor faunas are psychrospheric.

Reply Kozur:

In 1972 I have defined the Triassic psychrospheric ostracods in detail. In this paper I have pointed out that the upper limit of this fauna was between 200 and 500 m. These data are confirmed by microfacies data (quite independently from the ostracod data) that indicate for sediments with Triassic psychrospheric ostracods always depositional water depth from more than 200 m (upper limit 200 m, maybe considerably deeper). Maybe that some people have defined psychrospheric ostracods as living in more than 1,000 m water depth, but BENSON & SYLVESTER-BRADLEY (1971) pointed out that recent psychrospheric ostracods live in water depth below 500 m in two-layered oceans and their margins. In uplifted areas within the oceans and in polar regions psychrospheric ostracods begins already well above 500 m, about in 200–300 m water depth, according to BENSON (1988) the strongest changes are at about 400 m water depth. I do not see any reason that the upper limit of fossil psychrospheric faunas has been lower than today.

The deep water character of the red Middle/Late Permian clays of the Sicanian paleogeographic realm in Western Sicily lies beyond any doubt, because all faunal elements indicate not only deep water, but also unrestricted broad deep water connections to the Permian Pacific, where even the same radiolarian and conodont species occur.

Because of cold climates in the boreal and notal seas, the Permian oceans were surely two-layered with lower psychrospheric layer that should be spearated from the upper warm layer in subtropical/tropical areas by a distinct thermocline. The very sharp differences in the contemporaneous Permian shallow and deep water faunas indicate the presence of a thermocline.

The Lower Permian ostracod faunas of Timor Island were regarded by GRÜNDEL & KOZUR (1975) as psychrospheric. Acccording to BLESS (1987), referring to AUDLEY-CHARLES (1965, 1968) these ostracods derived from a shallow-marin flysch that contains dominantly cephalopods, trilobites, conodonts, foraminifers (ammodiscids, attached forms, simple endothyrids). According to AUDLEY-CHARLES (1965, 1968) this "shallow-marine flysch" was deposited immediately adjacent to an ocean in the N. If these sediments are really flysch, than shallow-water deposition can be excluded. Flysch contains often shallow-waterfossils and even land-plant detritus, but these fossils are transported from adjacent cordilleras or shallow-water areas.

In the faunal list by BLESS (1987) and van den BOOGAARD (1987) even such resedimented shallow-water fossils are not mentioned. The conodont fauna consists almost exclusively of *Mesogondolella* and *Vjalovognathus*, two typical pelagic conodonts of deeper water. No indicative shallow-water conodonts, like *Stepanovites*, are present. Even *Neostreptognathodus*, dominant in shallow basinal facies of this time, is quite missing, so that the conodont fauna indicate pelagic deeper water facies.

The same is indicated by the foraminifers. Fusulinids, dominating in all Permian shallow-water limestones, are quite missing. Also calcareous algae, very frequent in Permian shallow-water limestones, were not reported. Ostracods with eye tubercles, typical for Permian shallow-water sediments, are likewise missing. On the contrary, *Pseudospinella*, quite characteristical for the Sicilian deep water ostracod fauna, is also in the ostracod faunas of Timor Island frequent.

Even, if the sediments would be to a large part shallow-water sediments (of course, in this case not a flysch), than psychrospheric ostracods could occur in all beds deposited below 200 m water depth. Timor Island is situated near to the margin of Gondwana, where from the Lower Permian cold water shallow-marine faunas are known. Because the depositional area was immediately at the margin of an ocean, under such climatic conditions already at 200 m water depth psychrospheric conditions would be established. There are no paleontological data that indicate water depth of fewer than 200 m for the ostracod-bearing limestones.

The data of KONTROVITZ & MYERS (1988) that ostracods can use sunlight only to a maximum depth of about 280 m are very important and they fit very well with my opinion about the upper depth limit of the (paleo)psychrospheric ostracods. But – as you have pointed out – this is a boundary in physical terms and the live does not always exactly follow such terms. According to BENSON (1984), ostracods with eye tubercles are present among recent living faunas in some places as low as 600 m water depth, exceptionally even down until 900 m water depth. In any case, ostracod faunas, in which forms with eye tubercles are regularly present, should indicate water depth above 200 m. In those geological times, where in the shallow-water ostracods with eye tubercles are frequent (Permian to recent), rich faunas without representatives with eye tubercles that show also the other character of (paleo)psychrospheric ostracod faunas, indicate water depth below 200 m or even below 300–500 m.

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ANISIAN TO MIDDLE CARNIAN RADIOLARIAN ZONATION AND DESCRIPTION OF SOME STRATIGRAPHICALLY IMPORTANT RADIOLARIANS

Heinz Kozur and Helfried Mostler

With 10 figures and 51 plates

Abstract:

Triassic radiolarian faunas have been investigated in several sections in Hungary (Balaton Highland: Felsöörs, Köveskál; Darnóhegy area between Mátra Mts. and Bükk Mts.), Italy (Passo della Gabiola, road cut between Mte. Spitz and Mte. Fallison, San Ulderico, all Vicentinian Alps; and Sosio Valley, Sicily) and Austria (Großreifling, Göstling, Öfenbachgraben). Additionally, several single samples have been investigated. They have been derived from China, Turkey, Greece, Italy, Austria, Hungary, Yugoslavia. 4 families, 14 genera, 141 species and 23 subspecies have been newly established.

The biostratigraphic investigations have been concentrated on the Anisian to Early Ladinian, Early Longobardian to Julian, and Norian to Hettangian time intervals. The development of the radiolarian faunas from the Upper Anisian and Lower Ladinian is discussed in detail. The following radiolarian zones have been established: *Parasepsagon robustum* Zone (Upper Pelsonian), *Tetraspinocyrtis laevis* Zone (Illyrian sensu *P. trinodosus* Zone), *Spongosilicarmiger italicus* Zone (Lower Fassanian sensu '*X.*' *reitzi* Oppel Zone, *Ladinocampe multiperforata* Zone (Middle Fassian, ? lower part of Upper Fassanian), *Muelleritortis cochleata* Zone (Middle and Upper Longobardian), *Tritortis kretaensis* Zone (Cordevolian, including *Frankites sutherlandi* Zone), *Pseudosaturniforma carnica* Zone (Julian), *Nakasekoellus inkensis Zone* (Tuvalian), *Capnodoce ruesti* Zone (Lower Norian), *Livarella densiporata* Zone (Rhaetian).

Very distinct changes in the radiolarian faunas occur at the base of the '*X.*' *reitzi* Oppel Zone, within and at the top of the *Kellnerites* faunas of the lower '*X.*' *reitzi* Oppel Zone. These fundamental changes in the radiolarian faunas support the original position of the Anisian-Ladinian boundary at the base of the '*X.*' *reitzi* Oppel Zone or at the base of the '*X.*' *reitzi* Range Zone (= base of the *A. avisianum* Subzone). According to the radiolarian faunas, the *A. avisianum* 'Zone' is not older than the '*X.*' *reitzi* Oppel Zone, but contemporaneous with the upper half of the '*X.*' *reitzi* Oppel Zone. Very distinct changes in the radiolarian faunas occur also at the base of the *Trachyceras archelaus* Zone, at the base of the Cordevolian (including the *Frankites sutherlandi* Zone), near the Lower/Middle Carnian boundary and at the base of the Sevatian (including the *Halorites macer* Zone).

Zusammenfassung:

Triassische Radiolarienfaunen wurden von mehreren Profilen in Ungarn (Balaton-Hochland: Felsöörs, Köveskál; Darnóhegy-Gebiet zwischen Mátra- und Bükk-Gebirge), Italien (Passo della Gabiola, Straßeneinschnitt zwischen Mte. Spitz und Mte. Fallison, San Ulderico, alles Vicentinische Alpen ; Sosio-Tal, Sizilien) und Österreich (Großreifling, Göstling, Öfenbachgraben) untersucht. Zusätzlich wurden mehrere Einzelproben aus China, der Türkei, Griechenland, Italien, Österreich, Ungarn und Jugoslawien untersucht. 4 Familien, 14 Gattungen, 141 Arten, und 23 Unterarten werden beschrieben.

Die biostratigraphischen Untersuchungen konzentrierten sich auf die Bereiche Anis bis Unterladin, Oberlongobard bis Jul und Nor bis Hettang. Die Entwicklung der Radiolarian-Faunen vom Oberanis bisUnterladin wird im Detail diskutiert.Die folgenden Radiolarienzonen werden ausgeschieden: *Parasepsagon robustum*-Zone (Oberpelson), *Tetraspinocyrtis laevis*-Zone (Illyr, im Sinne der *P. trinodosus*-Zone), *Spongosilicarmiger italicus*-Zone (Unterfassan, im Sinne der „*X.*"*reitzi* Oppel-Zone), *Ladinocampe multiperforata*-Zone (Mittelfassan, ? unteres Oberfassan), *Muelleritortis cochleata*-Zone (Mittel- und Ober Longobard), *Tritortis kretaensis*-Zone (Cordevol, einschließlich der *Frankites sutherlandi*-Zone, *Pseudosaturniforma carnica* (Jul), *Nakasekoellus inkensis*-Zone (Tuval), *Capnodoce ruesti*-Zone (Unternor), *Livarella densiporata*-Zone (Rhät). Sehr deutliche Änderungen in den Radiolarienfaunen kommen an der Basis der „*X.*"*reitzi* Oppel-Zone sowie innerhalb und an der Obergrenze der *Kellnerites*-Faunen der unteren „*X.*"*reitzi* Oppel-Zone vor. Diese fundamentalen Änderungen in den Radiolarenfaunen bekräftigen die Lage der Anis/Ladin-Grenze an der Basis der „*X.*"*reitzi* Oppel-Zone oder an der Basis der „*X.*"*reitzi* range-Zone(=Basis der *A. avisianum*-Subzone). Diese Grenze entspricht der Originaldefinition der Ladin-Basis. Nach den Radiolarienfaunen ist die A. avisianum-„Zone" nicht älter als die „*X.*"*reitzi*-Zone, sondern gleichaltrig mit der oberen Hälfte der „*X.*"*reitzi* Oppel-Zone. Sehr deutliche Änderungen in den Radiolarienfaunen kommen auch an der Basis der *Trachyceras archelaus*-Zone, an der Basis des Cordevols (einschließich der *Frankites sutherlandi*-Zone, nahe der Unter-/Mittelkarn-Grenze und an der Basis des Sevats (einschließlich der oberen *Halorites macer*-Zone) vor.

I. Introduction

Among the stratigraphically important Triassic fossils, the radiolarians have the highest potential for detailed stratigraphic subdivions. Ammonoids and conodonts show similar evolutionary rates as the most rapidely evolving radiolarian groups. However, the diversity in species and genus level is considerably larger in radiolarians than in ammonoids and conodonts. Rich radiolarian samples have generally more than 100 species, sometimes more than 200 species. Among them are always species that are in a stage of rapid evolution in the transitional field between 2 species. For this reason nearly in every bed new taxa appear within phylomorphogenetic lines.

In the past 10 years 17 Triassic radiolarian zonations have been published (BLOME, 1984, 1987, BLOME et al. 1987, 1988, CHENG, 1989, IGO & NISHIMURA, 1984, ISHIDA, 1984, KISHIDA & HISHIDA, 1985, 1986, KISHIDA & SUGANO, 1982, NAKASEKO & NISHIMURA, 1979, NISHIZONO & MURHIH, 1984, SAHIDA, 1984, SATO & MURATA, 1982, SATO et al. 1986, YAO MATSUDA & ISOZAKI, 1980, YAO, MATSUOKA & NAKATANI, 1982, YEH, 1989, YOSHIDA, 1986). However, in the Middle Triassic most of these zonations are based on single or few samples with well preserved rich radiolarian faunas.

Real successions have been investigated only by few authors, because it is difficult to find rich and well preserved radiolarians in one section from continuous rock sequences representing a longer time interval.

The present paper is based on more than 200 radiolarian-rich samples from several sections in Austria, Hungary and Italy.

II. Investigated sections

1. Göstling and Großreifling, Austria (Figs. 1, 2)

The section Göstling and Großreifling yielded the richest Triassic radiolarian faunas of the world mostly described by KOZUR & MOSTLER (1982, 1978, 1979, 1981). The richest radiolarian faunas derived from limestones 0,5–5,0 m below Middle Carnian shales. These beds were placed by KOZUR & MOSTLER and LAHM (1984) in the Upper Cordevolian because of the occurrence of *Trachyceras aonoides* near the boundary between the radiolarian-bearing limestones and the overlying shales (MOSTLER & SCHEURING, 1974). However, according to KRYSTYN (pers. comm.) in this level already *Austrotrachyceras* is present. For this reason, the radiolarian-bearing samples cannot be older than the lower part of Julian substage, indicated also by a conodont fauna with *Gladigondolella tethydis* (HUCKRIEDE) and *Paragondolella polygnathiformis* (BUDUROV & STEFANOV). Also the Cordevolian holothurian fauna with *Fissobractites inusitata* KOZUR & MOSTLER and *Theelia koeveskalensis* KOZUR & MOSTLER disappeared below the radiolarian-bearing level.

2. Felsöörs, Hungary (Fig. 3)

The famous section at Forráshegy in the Malomvölgy (Mill Valley) has yielded rich Illyrian and Fassanian radiolarian faunas. In this section good correlations between the radiolarian-, ammonoid-, and conodont faunas are possible. The oldest rich fauna is known from bed Fö 87, a limestone within a tuffit layer in the horizon with *Paraceratites trinodosus*. Up to bed 90 *Paraceratites trinodosus* occurs. The level from bed 91 - bed 99C corresponds to the horizon with *Longobardites, Parakellnerites ? meriani* and *'Reiflingites' ? camunus* at the Anisian-Ladinian boundary.

Beds 100 E - 110 represent the *'Xenoprotrachyceras' reitzi* Oppel Zone of the Balaton Highland. Its lower part is characterized by *'Parakellnerites' hungaricus, Kellnerites felsöörsensis* and *Hungarites* spp., the upper part by *Halilucites, Hungarites* and *'X.' reitzi*. The typical spined *Xenoprotrachyceras reitzi* is restricted – like in other occurrences at this Oppel Zone – to a short interval from beds 100 (?), 104–105.

According to the priority both the *A. avisianum* Zone and the *'X.' reitzi* Zone have been placed into the Ladinian. In contrast to this clearest priority of any Triassic stage boundary, recently the Anisian/Ladinian boundary was often placed above the *'X.' reitzi* Oppel Zone. In North America and in the Arctic even time-equivalents of the *Eoprotrachyceras curionii* Zone have been placed at the base of the Ladinian.

The radiolarian distribution confirms the traditional Anisian-Ladinian boundary. At the base of the *'X.' reitzi* Oppel Zone (base of the *Kellnerites felsoeoersensis* subzone) *Triassocampe scalaris* DUMITRICĂ, KOZUR & MOSTLER appears that is the most frequent and typical species of the Lower Ladinian. In the same level the genera *Oertlispongus* DUMITRICĂ, KOZUR & MOSTLER and *Yeharaia* NAKASEKO & NISHIMURA begin that are worldwide distributed guide-forms of the Lower Ladinian. Furthermore several Ladinian *Triassocampe* species and *Spongosilicarmiger italicus*, a typical species of the whole '*X.*' *reitzi* Oppel Zone makes its first appearence.

3. Köveskál, Hungary (Fig. 4)

At the cemetery of Köveskál (Baleton Highland) an Upper Fassanian to Cordevolian sequence is exposed that yielded rich radiolarian faunas from the Upper Fassanian up to the Upper Longobardian. In this section the radiolarian faunas can be well correlated with the conodont zonation of the *Budurovignathus truempyi-*, *B. hungaricus-*, and *B. mungoensis* Assemblage Zones that have all yielded both the conodont index species and rich radiolarian faunas.

4. Dallapuszta (Darnó Hill, northern Hungary)

This section, located near the road between Recsk and Sirok at the southern flank of the Darnó Hill, NE of Mátra Mts., consists of red bedded cherts. It is a block of Triassic rocks surrounded by other blocks of Triassic rocks (red cherts, pillow lava) and Jurassic manganese shales and turbidites in the Darnó Melange Nappe (KOZUR & MOCK, 1988).

Radiolarians from this section have been investigated by DE WEVER (1984), KOZUR & KRAHL (1984), KOZUR (1988 a, b) and DOSZTÁLY (1989). DE WEVER (1984) found only 3 radiolarian-bearing samples with determinable radiolarian among 13 investigated samples. DOSZTÁLY (1989) investigated 24 samples from which 22 ones yielded radiolarians. KOZUR (1988 a, b), KOZUR & KRAHL (1984) and KOZUR & MOCK (1988) investigated 30 samples, all of them have radiolarians and partly also conodonts. The preservation of the radiolarians is mostly bad, but the succession is very important because it crosses the Ladinian-Carnian boundary and the Cordevolian part is rather rich in conodonts.

The different results of the investigations have been already discussed by DOSZTÁLY (1989). DE WEVER found in one sample (H198) a lot of Oertlispongidae, among them both Lower Ladinian forms (*Oertlispongus inaequispinosus* DUMITRICĂ, KOZUR & MOSTLER, *Falcispongus falciformis* DUMITRICĂ and Longobardian forms or forms that occur both in the Fassanian and Longobardian (*Baumgartneria curvispina* DUMITRICĂ, DUMITRICĂ, *Falcispongus hamatus* DUMITRICĂ, *F. rostratus* DUMITRICĂ, *Spongoserrula raraurana* DUMITRICĂ). The latter species was indicated by DUMITRICĂ (1982) from the Longobardian up to Tuvalian, but the Tuvalian specimens (sample R106) are derived from a megabreccia in which the radiolarian fauna is dominated by *Muelleritortis cochleata* (NAKASEKO & NISHIMURA), a Longobardian guide-form. The 'Carnian' red chert-diabase sample R88 is likewise either upper Ladinian or Cordevolian. So, *S. raraurana* is a Longobardian form that ranges up to the Cordevolian.

The figured material from sample H198 contains typical *Tritortis kretaensis* (KOZUR & KRAHL), determined by DE WEVER (1984) as *Sepsagon longispinosus* or *Eptingium manfredi*. The specimen determined as *Falcispongus calcaneum* DUMITRICĂ is *Falcispongus hamatus* DUMITRICĂ, a Longobardian-Cordevolian species. *Falcispongus falciformis* is an undeterminated oertlispongid Radiolaria. Also a broken *Palaeosaturnalis* was figured by DE WEVER (1984) from this sample that contains also *Muelleritortis cochleata* (NAKASEKO & NISHIMURA).

Our data from Dallapuszta are in good agreement with the data by DOSZTÁLY (1989), but our fauna is by far richer and the upper fauna (dominated by *Tritortis kretaensis*) is here placed into the Cordevolian and not into the Longobardian. This is supported also by a conodont fauna with *Paragondolella foliata foliata* BUDUROV, transitional to *P. tadpole* (HAYASHI), *P. polygnathiformis* (BUDUROV & STEFANOV) and *Budurovignathus mirautae* KOVÁCS & KOZUR.

5. San Ulderico (Southern Alps, Italy) (Fig. 5)

The profile is published by MIETTO & PETRONI (1979). According the MIETTO & PETRONI (1979) the '*X.*' *reitzi* zone above the *A. avisianum* zone begins in the level of the first limestone bank above the tuffites. From this bed (sample TT1) MIETTO provided one of the authors (H. KOZUR) with a rich radiolarian fauna that corresponds to the highest part of the Lower Fassanian *Spongosilicarmiger italicus* Zone. This level lies in the Felsöörs section (type locality at the *X. reitzi* Oppel Zone) above the *X. reitzi* Zone. This interval is younger than the *reitzi* Zone and older than the *curionii* Zone. This interval is not documented in the ammonoid zonation. Even the highest level of the profile, placed into the *Eoprotrachyceras cu-*

rionii Zone, is according to the radiolarians older than the *E. curionii* Zone.

These data are well supported by the conodont data published by MIETTO & PETRONI (1979). *Paragondolella trammeri* (KOZUR) begins in the Balaton Highland always clearly above the "*X.*" *reitzi* Zone, but well below the *E. curionii* Zone. The view of KOVÁCS (in KOVÁCS & NICORA, 1990) that this species begins in the Balaton Highland at the base of the *Nevadites* fauna is unsubstantiated (see chapter V).

According to the figured conodont fauna, the „*X.*" *reitzi* Oppel Zone is present in the "*A. avisianum* Zone" sensu MIETTO & PETRONI (1979). This is fully confirmed by radiolarian faunas in other sections.

The best outcrop of the upper part of the *Nodosus* Formation (= Buchenstein Formation) is shown along the road starting north of San Ulderico, leading to the village Pallé.

The approximately 5 m thick section (section TT) consists of a sequence of nodular limestone, alternating with layers of clayish siltstones. The radiolarian-rich nodular limestone was sampled in summer 1978, together with Dr.DONOFRIO, University of Innsbruck (see also the upper part of the section, published by MIETTO & PETRONI, 1979).

6. Passo della Gabiola (Figs. 6, 7)

The best section within the Recoaro area is exposed near Passo della Gabiola in the western part of Val di Creme. The whole thickness of this profile is about 5 m, consisting of limestones of the Buchenstein Formation, partly of nodular texture. Only some limestone beds are cherty. They are intercalated by greenish siltstones. At the base of the section below the road, the Spitz limestone is exposed without contact to the Buchenstein Formation. This is one of the best radiolarian-bearing sections in the area around Recoaro.

A second section is exposed 200 m above the same road in eastern direction. It shows a short profile with a direct contact to the Monte-Spitz-Kalk Formation. This outcrop consists of the same nodular limestone of the Buchenstein Formation but the topmost part consists of a thick limestone with graded bedding. The debris components are from the carbonate platform.

III. Taxonomic part

Only such new taxa are described that are stratigraphically important.

Suborder Entactinaria KOZUR & MOSTLER, 1982
Superfamily Hexastylacea HAECKEL, 1882
emend. PETRUSEVSKAJA, 1979
Family Eptingiidae DUMITRICĂ, 1978
Genus *Eptingium* DUMITRICĂ, 1978

Type species: *Eptingium manfredi* **DUMITRICĂ**, 1978

Eptingium manfredi manfredi **DUMITRICĂ, 1978**
(Pl. 1, fig. 3)

1978 *Eptingium manfredi* n. sp. pars – DUMITRICĂ, pp. 33–34, pl. 3, figs. 3, 4; pl. 4, figs. 1, 2, 3, 6, non! figs. 5, 7

Occurrence: Lower and Middle Fassanian of the Tethys.

Eptingium manfredi robustum **KOZUR & MOSTLER, 1980**
(Pl. 1, figs. 1-2)

1980 *Eptingium manfredi robustum* KOZUR & MOSTLER n. subsp. – DUMITRICĂ, KOZUR & MOSTLER, p. 20, pl. 6, figs. 1–4, 8

Occurrence: Upper subzone at Lower Fassanian *Spongosilicarmiger italicus* A.Z. to Middle Fassanian *Ladinocampe multiperforata* A.Z.

Eptingium manfredi japonicum **(NAKASEKO & NISHIMURA, 1979)**
(Pl. 1, fig. 4)

1979 *Tripocylia japonica* NAKASEKO & NISHIMURA, n. sp., pars – NAKASEKO & NISHIMURA, p. 73, pl. 4, Figs. 4–6

Occurrence: Illyrian (*Paraceratites trinodosus*-Zone) of Japan and Hungary.

Remarks: The specimen figured by NAKASEKO & NISHIMURA (1979, pl. 4, Fig. 6) with strong torsion of the tricarinate spines corresponds well to our material. The other 2 specimens, including the holotype, have only a slight torsion of the 3 main spines. Maybe that this is a taxonomic difference, but we have not enough material to study the intraspecific variability that is regarding the torsion also high in *E. manfredi manfredi* DUMITRICĂ, 1978.

The entactiniid spicular system is characteristic of the genus *Eptingium* DUMITRICĂ, 1978. *E. manfredi manfredi* DUMITRICĂ, 1978 is very similar, but the ridges of the spines have a distinct central furrow in their proximal half.

Eptingium nakasekoi n. sp.
(Pl. 1, fig. 5)

1979 *Tripocyclia* cf. *acythus* DE WEVER – NAKASEKO & NISHIMURA, pp. 72–73, pl. 4, figs. 1 (?), 2, 3 (?)

Derivatio nominis: In honour of Prof.Dr.K. NAKASEKO, Osaka

Holotypus: The specimen on pl. 1, fig. 5, rep.-no. KoMo 1980 I -138.

Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section.

Stratum typicum: Limestone bed 87 within greenish tuffits. *Paraceratites trinodosus* Zone (Illyrian).

Material: 19 specimens.

Diagnosis: Cortical shell in lateral view with rounded subtriangular equatorial outline with pylom between 2 main spines, partly replaced by an area with different sculpture. Surface two-layered; inner pore frames with small roundish pores; outer pore frames larger, irregular. 3 tricarinate main spines, with high, but relatively narrow, rounded ridges that display mostly no central furrow. If present, this furrow is restricted to the basal part up to proximal third of the ridges. Furrows between the ridges broad and deep. Distal part of the spines needle-shaped. No torsion of spines. Entactinariid inner structure as for the genus (see DUMITRICĂ, 1978 and pl. 1 fig. 4)

Dimensions:

Diameter of shell = 139–161 μm

Length of spines = 133–167 μm

Occurrence: Rare in the Illyrian (*Paraceratites trinodosus* Zone) of Balaton Highland (Hungary). Frequent in the Illyrian and basal Fassanian (?) in Japan and Philippines.

Remarks: In *Eptingium manfredi manfredi* DUMITRICĂ, 1978 the spines display different degree of torsion, the ridges are broader and display always a central furrrow of different length, and are connected by some transverse bars.

Genus _Polystephanidium_ DUMITRICĂ, 1978

Type species: *Polystephanidium clavator* DUMITRICĂ, 1978

Polystephanidium clavator DUMITRICĂ, 1978
(Pl. 1, fig. 6)

1978 *Polystephanidium clavator* n. sp. – DUMITRICĂ, pp. 34–35, pl. 2, figs. 6,7

Occurrence: Middle and Upper Fassanian of the Tethys, rare.

Superfamily Palaeoscenidiacea RIEDEL, 1967 emend. KOZUR & MOSTLER, 1982
Family Hindeosphaeridae KOZUR & MOSTLER, 1981
Genus _Hindeosphaera_ KOZUR & MOSTLER, 1979

Type species: *Hindeosphaera foremanae* KOZUR & MOSTLER, 1979

***Hindeosphaera ? balatonica* n.sp.**
(Pl. 1, fig. 7)

Derivatio nominis: According to the occurrence in the Balaton Highland.

Holotypus: The specimen on pl. 1, fig. 7; rep.-no KoMo 1980 I-112.

Locus typicus: Felsööрs (Balaton Highland, Hungary) Forráshegy section.

Stratum typicum: Limestone bed 87 within greenish tuffits, *Paraceratites trinodosus* Zone (Illyrian).

Material: 4 specimens.

Diagnosis: Cortical shell subspherical, with coarse pore frames displaying large tetragonal to hexagonal pores. Inner pore frames fragile, only same bars are preserved (or present?) that do not connect each other to build an inner layer.

Main cusp very large with 3 high, narrow ridges and deep and broad furrows. On the opposite side several (mostly 3–4) small carinate, distal round spines are present.

Character of medullary shell not clear, because no broken specimens are known. It is connected by several spines with the cortical shell. Most of them do not continue beyond the cortical shell.

Dimensions:

Diameter of cortical shell = 117–140 µm
Length of the main spine = 110–116 µm
Length of the small spine = 23–30 µm

Occurrence: *Paraceratites trinodosus* Zone (Illyrian) of Balaton Highland.

Remarks: *Hindeosphaera ? balatonica* n. sp. belongs to the *Hindeosphaera ? spinulosa* group. *H. ? spinulosa* (NAKASEKO & NISHIMURA, 1979) displays an inner layer with small penta- to hexagonal pores. The outer layer is fragile and consists mainly of distinct spines on the pore frame joints. Often a larger spine is present opposite to the main spine indicating transitional character to *Pseudostylosphaera* KOZUR & MOSTLER, 1981.

Genus *Pseudostylosphaera* KOZUR & MOSTLER 1982

Type species: *Pseudostylosphaera gracilis* KOZUR & MOSTLER, 1981

Pseudostylosphaera coccostyla (RÜST, 1892)

1892 *Spongatractus coccostylus* n. sp. – RÜST, p. 161, pl. 21, fig. 8
1979 *Archaeospongoprunum compactum* NAKASEKO & NISHIMURA n. sp. – NAKASEKO & NISHIMURA, p. 68, pl. 1, figs. 3, 7
1981 *Pseudostylosphaera coccostyla* (RÜST, 1892) – KOZUR & MOSTLER, pp. 31–32, pl. 15, fig. 3, pl. 46, fig. 5

Occurrence: Illyrian to Longobardian of Tethys.

Pseudostylosphaera coccostyla coccostyla (RÜST, 1892)

1892 *Spongatractus coccostylus* n.sp. - RÜST, p. 161, pl. 21, fig. 8
1981 *Pseudostylosphaera coccostyla* (RÜST, 1892) - KOZUR & MOSTLER, pp. 31-32, pl. 15, fig. 3; pl. 46, fig. 5

Occurrence: Ladinian of Tethys.

Remarks: The Illyrian *Pseudostylosphaera coccostyla compacta* (NAKASEKO & NISHIMURA, 1979) has a more globular cortical shell and broad ridges on the very big polar spines are not yet subdivided by a central furrow.

Pseudostylosphaera coccostyla compacta (NAKASEKO & NISHIMURA, 1979)
(Pl. 1, fig. 8)

1979 *Archaeospongoprunum compactum* NAKASEKO & NISHIMURA, n. sp. – NAKASEKO & NISHIMURA, p. 1, figs. 3, 7

Occurrence: Illyrian, rarely Lower Fassanian of Balaton Highland (*Paraceratites trinodosus* Zone), Italy (Lagonegro Basin) and Japan, there erroneously placed into the Upper Triassic.

Remarks: In the Ladinian *Pseudostylosphaera coccostyla coccostyla* (RÜST, 1898) the broad ridges of the very big polar spine are subdivided by a central furrow. Moreover, the cortical shell is more ellipsoidal.

Pseudostylosphaera postjaponica n.sp.
(Pl. 1, figs. 9–10)

1984 *Pseudostylosphaera japonica* (NAKASEKO & NISHIMURA, 1979) – LAHM, p. 34, pl. 4, figs. 9, 10

Derivatio nominis: According to the assumed phylogenetic sequence.

Holotypus: The specimen on pl. 1, fig. 9; rep.-no. KoMo 1980 I-588.

Locus typicus: Passo della Gabiola near Recoaro, Vicentinian Alps (Italy).

Stratum typicum: Sample MD 18, upper *Oertlispongus primitivus* Subzone of *Spongosilicarmiger italicus* Zone, upper part of Lower Fassanian.

Material: 59 specimens.

Diagnosis: Cortical shell slightly ellipsoidal, two-layered, long axis distinctly shorter than length of spines. The inner layer displays small, irregularly spaced roundish pores.

Pore frames of the outer layer with nodes on the joints, from which narrow bars radiate. Near the poles the pore frames are often arranged in irregular longitudinal ribs. Outer pores of different size, triangular to pentagonal and oval, larger than inner pores. Medullary shell part of a modified pentactine spicular system.

Polar spines distinctly longer than long axis of cortical shell, broadest about in the midlength, tricarinate with deep, wide furrows.

Measurements:

Diameter of cortical shell (long axis): 116–133 µm
Diameter of cortical shell (short axis): 107–113 µm
Length of polar spines: 187–215 µm

Occurrence: Middle *Spongosilicarmiger italicus* Zone to lower *Ladinocampe multiperforata* Zone (upper part of Lower Fassanian to lower part of Middle Fassanian).

Remarks: *Pseudostylosphaera japonica* (NAKASEKO & NISHIMURA, 1979) from the Lower Fassanian (? and Illyrian) displays shorter spines compared with the length of the cortical shell (spines as long as cortical shell or somewhat shorter).

Family Parentactiniidae KOZUR & MOSTLER, 1981
Genus *Parentacitinia* DUMITRICĂ, 1978

Type species: *Parentactinia pugnax* DUMITRICĂ, 1978

Parentactinia pugnax DUMITRICĂ, 1978
(Pl. 1, figs. 11–12)

1978 *Parentactinia pugnax* n. sp. - DUMITRICĂ, pp. 50–51, pl. 4, figs. 4?, 5; pl. 5, figs. 1–3

Occurrence: Upper Anisian *Paraceratites trinodosus* Zone up to Lower Ladinian.

Parentactinia lata n. sp.
(Pl. 2, fig. 1)

Derivatio nominis: According to the wide shell.

Holotypus: The specimen on pl. 2, fig. 1, rep.-no. KoMo 1980 I-104.

Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section.

Stratum typicum: Limestone bed 87 within greenish tuffits, *Paraceratites trinodosus* Zone (Illyrian).

Material: 12 specimens.

Diagnosis: Test very small. Modified pentactine spicular system very robust. On both sides of a median bar 2 free, round, straight, apical spines and 2 curved, cyclindrical very strong descending spines are present. The descending spines are connected by strong arches and bars that form at least distally a loose, short, broad subglobular shell, that is somewhat broader than long.

Dimensions:

Length of apical spines: 43–48 µm
Height of shell: 81–86 µm
Width of shell: 90–96 µm

Occurrence: *Paraceratites trinodosus*-Zone (Illyrian) of Balaton Highland.

Remarks: *Parentactinia pygnax* DUMITRICĂ, 1978 has 4 spines in prolongation of the 4 descending (basal) spines.

Parentactinia inerme DUMITRICĂ, 1978 has also a loose shell without basal spines, but the shell is always elongated (ellipsoidal), somewhat longer than broad. Moreover, Mb is seemingly shorter.

Family Pentactinocarpidae DUMITRICĂ, 1978
Genus *Pentactinocapsa* DUMITRICĂ, 1978

Type species: *Pentactinocapsa quadripes* DUMITRICĂ, 1978

Pentactinocapsa quadripes DUMITRICĂ, 1978
(Pl. 2, fig. 2)

1978 *Pentactinocapsa quadripes* n. sp. - DUMITRICĂ, p. 45-46, pl. 1, figs. 2–4

Occurrence: Characteristical, but very rare species in the middle part of Lower Ladinian of the Southern Alps.

Pentactinocapsa awaensis (NAKASEKO & NISHIMURA, 1979)
(Pl. 2, figs. 10–11)

1979 *Acanthosphaera awaensis* NAKASEKO & NISHIMURA, n. sp. – NAKASEKO & NISHIMURA, p. 67, pl. 1, figs: 1, 5, 6

Emended diagnosis: Cortical shell subcylindrical with low-conical apical and distal sector, with very large round to oval pores. Pentactine spicular system partly within the cortical shell, partly free. Apical spine entirely outside the shell. The 4 basal spines built up in the apical part of the test a shallow cone, in which they are connected by 3 short pairs of vertices with the shell in 2 of the basal spines. In the alternating other 2 basal spines they are directly part of the wall of the cortical shell, because the 3 vertices pairs branch in these basal spines laterally from the spines. The then following vertical to slightly outward-directed part of the 4 basal spines is clearly separated from the shell wall. Theendofthis partjoinsthedistal shell wall and continues beyond it as round spines. Beside these 4 spines and the apical spine still other 4 round spines arepresent at the transition from the apical conical to the central subcylindrical part. These spines originate from joints of the pore frames between the 4 basal spines.

Dimensions:

Diameter of shell (long axis): 195–206 µm

Diameter of shell (short axis): 160–173 µm

Occurrence: Illyrian of Japan. *Paraceratites trinodosus* Zone (Illyrian) of Balaton Highland (Hungary).

Remarks: The Lower Ladinian *Pentactinocapsa quadripes* DUMITRICĂ, 1978 has smaller pores and all 4 basal spines are in the apical part situated within the shell wall.

In the Illyrian *Pentactinorbis dumitricai* n. sp. the apical branching point of the basal spines and the apical spines are inside the shell and the pyramidal apical part of the basal spines is not connected with the cortical shell.

Pentactinocapsa awaensis (NAKASEKO & NISHIMURA, 1979), is a transitional form between the genera *Pentactinocapsa* DUMITRICĂ, 1978 (apical spine entirely above the cortical shell, branching point of the basal spines in the shell wall) and *Pentactinorbis* DUMITRICA, 1978 (apical part of basal spines partly inside the wall of the cortical shell). The connection with *Pentactinocapsa* are closer. Seemingly *Pentactinocapsa awaensis* (NAKASEKO & NISHIMURA) is the oldest and most primitive species of this genus that has appearently evolved from *Pentactinorbis.*

Genus *Pentactinocarpus* DUMITRICĂ, 1978

Type species: *Pentactinocarpus fusiformis* DUMITRICĂ, 1978

Pentactinocarpus fusiformis DUMITRICĂ, 1978
(Pl. 2, fig. 4)

1978 *Pentactinocarpus fusiformis* n. sp. – DUMITRICĂ, p. 44, pl. 2, fig. 2

Occurrence: Lower Ladinian. Not yet found until the Lower part of the *Spongosilicarmiger italicus* Zone („*Xenoprotrachyceras*“ *reitzi* Oppel Zone).

Remarks: The figured specimen has tiny spines on the joints of the pore frames, otherwise it is identical with the type material from which DUM DUMITRICĂ ITRICA (1978) has only given a drawing. Small cones on the joints of the pore frames have been also indicated on this drawing.

Pentactinocarpus acanthicus DUMITRICĂ, 1978
(Pl. 2, figs. 3, 5)

1978 *Pentactinocarpus acanthicus* n. sp. – DUMITRICĂ, pp. 44–45, pl. 3, fig. 3

Occurrence: Ladinian, to but not yet lowermost Ladinian, ? Carnian. Tethys.

Remarks: *Pentactinocarpus illyricus* n. sp. is distinguished by the apical flat and broad shell.

According to DUMITRICĂ (1978) this species is the least frequent one of the genus. However, in our material it is the most frequent one, whereas *P. fusiformis* DUMITRICĂ, 1978 and *P. tetracanthus* DUMITRICĂ, 1978 are rare. LAHM (1984), in turn, found most frequent *P. tetracanthus* and considerably fewer *P. fusiformis* and *P. acanthicus.* All investigations have been carried out above all in the Ladinian of the Vicentinian Alps. Seemingly the frequency of these species varies from sample to sample without stratigraphic meaning.

Pentactinocarpus illyricus n. sp.
(Pl. 3, figs. 1–2)

Derivatio nominis: According to the occurrence in the Illyrian.

Holotypus: The specimen on pl. 3, figs. 1-2; rep.-no. Ko-Mo I-557.
Lower typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section.
Stratum typicum: Limestone sample 87 within a greenish tuffit, *Paraceratites trinodosus* Zone (Illyrian)
Material: 3 specimens.
Diagnosis: The 4 basal spines are in their free part not or almost not downward directed. Shell globular with pores of irregular size (from small to very large in one specimen). 2 of the descending (basal) spines end at the beginning of the shell without prolongation in a spine. The other 2 are also in their distal part only a little downward directed and end immediately below the irregular proximal ring at the beginning of the shell. One or both are prolongated in a spine. 4 further spines are situated in the upper to middle part of the shell and 2 may be present in the lower part of the shell. Apical and antapical spine not observed (broken away?)
Occurrence: Very rare and only species of *Pentactinocarpus* in the very rich Illyrian to radiolarian fauna of the Balaton Highland (Hungary).
Remarks: In *Pentactinocarpus acanthicus* DUMITRICĂ, 1978 and all other Ladinian to Upper Triassic *Pentactinocarpus* species the upper (free) part of the basal spines is conical because the descending spines are strongly downward directed. Moreover, no basal spine ends at the beginning of the shell as 2 basal spines do in *P. illyricus* n. sp. and also not immediately below the upper margin of the shell as the 2 other basal spines do. Moreover, all 4 basal spines are prolongated into spines on the shell and not only 2 as in *P. illyricus* n. sp.

Pentactinocarpus tetracanthus DUMITRICĂ, 1978
(Pl. 2, figs. 6–7)

1978 *Pentactinocarpus tetracanthus* n. sp. – DUMITRICĂ, p. 44, pl. 2, fig. 1
Occurrence: Lower Ladinian of the Tethys.

Genus *Pentactinorbis* DUMITRICĂ, 1978

Type species: *Pentactinorbis kozuri* DUMITRICĂ, 1978

Pentactinorbis kozuri DUMITRICĂ, 1978

1978 *Pentactinorbis kozuri* n. sp. – DUMITRICĂ, pp. 46–47, pl. 3, figs. 4, 5
Occurrence: Frequent in the upper part of Lower Fassanian and in the Middle Fassanian of the Tethys.

Pentactinorbis dumitricai n. sp.
(Pl. 3, figs. 4–7; pl. 4, figs. 1–2)

Derivatio nominis: In honour of Dr. P. DUMITRICĂ who has excellently investigated this genus.
Holotypus: The specimen on pl. 3, figs. 4–7; rep.no. Ko-Mo 1980 I-99.
Lower typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section.
Stratum typicum: Limestone bed 87 within greenish tuffits, *Paraceratites trinodosus* Zone (Illyrian).
Material: More than 100 specimens. Cortical shell globular, consisting of few thick bars including very large pores. Inner pentactine spicular system similar as in the type species. Short apical spine mostly dibranching before reaching the cortical shell; outside indicated by 2 small spines that may be also missing. The 4 basal spines build up a apical pyramid. They are strongly spinose. About in the equator or somewhat above it, the pentactine spinular system is connected by 2 vertices with the cortical shell. The vertices continue outside into 8 spines. The 4 basal spines are there connected by a ring. From there the 4 basal spines continue vertically downward and are in the distal third again connected by a ring. 2 of the basal spines are here directly connected with the cortical shell by a spine that continues as outer spine. The 2 other basal spines are once more connected by vertices that continue also as spines beyond the cortical shell. The distal region has therefore 6 spines.
Dimensions:
Diameter of cortical shell: 190–210 µm
Occurrence: Frequent in the *Paraceratites trinodosus* Zone (Illyrian) of the Balaton Highland (Hungary).
Remarks: The general structure of *Pentactinorbis dumitricai* is similar to *P. kozuri* DUMITRICĂ, 1978. However, in this species the basal spines are smooth or only very slightly spined in the pyramdial upper part. The continuation of the basal spines between the proximal and distal rings is not in form of an inverted frustum of pyramid, but rectangular. The pores of cortical shell are considerably larger in *P. dumitricai* n. sp. than in *P. kozuri* DUMITRICĂ, 1978.

Pentactinorbis mostleri DUMITRICĂ, 1978 has also distinctly spined upper basal spines, but the pentactine spicular system has an other form and the pores of the cortical shell are considerably smaller.

Pentactinorbis pessagnoi n. sp.
(Pl. 4, figs. 3–4)

Derivatio nominis: In honour of Prof. Dr. E. H. PESSAGNO, Dallas, for his outstanding papers on Mesozoic radiolarians.
Holotypus: The specimen on pl. 4, figs. 3-4; rep.-no. KoMo 1980 I-104.
Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section.
Stratum typicum: Limestone bed 87 within greenish tuffite, *Paraceratites trinodosus* Zone (Illyrian).
Material: 15 specimens.
Diagnosis: Cortical shell sphaerical, with very big round, oval, and intermediate moderately large round to triangular pores. Apical spine cylindric, relatively large, smooth. The 4 basal feet built up an apical pyramid. In this part they are clearly spined. At the end of the pyramid they are connected by a ring. After the ring they are smooth, vertical, bordering with the apical and distal ring 4 rectangles. From each upper corner of these rectangles 2 vertices join the cortical shell, but do not continue as spine beyond it. Maximally very short, pyramidal spines to nodes may be present. From each lower corner of the rectangles one obliquely downward directed bar connects the pentactine spicular system with the cortical shell. Also on this joints maximally very short spines are present. The third connection between the cortical shell and the large pentactine spicular system is at the apical spine. Also the apical spine does not continue as spine beyond the joint with the cortical shell.
Dimensions:
Diameter of shell: 172–178 μm
Occurrence: Illyrian (*P. trinodosus* Zone) of the Balaton Highland.
Remarks: *Pentactinorbis pessagnoi* n. sp. is clearly distinguished from all other *Pentactinorbis* species by the missing spines at the joints between the pentactine spicular system and the cortical shell.

Family Sepsagonidae KOZUR & MOSTLER, 1981
Genus *Sepsagon* DUMITRICA, KOZUR & MOSTLER, 1980

Type species: *Triactoma longispinosum* KOZUR & MOSTLER, 1979

Sepsagon ladinicus n. sp.
(Pl. 4, figs. 5–9)

1980 *Sepsagon longispinosus* (KOZUR & MOSTLER, 1979) – DUMITRICĂ, KOZUR & MOSTLER, p. 15, pl. 5, figs. ?1, ?2, 5, 6; pl. 15, fig. 1
1984 *Sepsagon longispinosus longispinosus* (KOZUR & MOSTLER, 1979), pars – LAHM, p. 39, pl. 6, fig. 5, non! figs. 3, 4
1984 *Sepsagon* cf. *longispinosus longispinosus* (KOZUR & MOSTLER, 1979) – LAHM, p. 39, pl. 6, figs. 6, 7

Derivatio nominis: According to the occurrence in the Lower Ladinian.
Holotypus: The specimen on pl. 4, fig 9; rep.-no. KoMo 1980/I-555.
Locus typicus: Val di Creme section near Recoaro, Italy
Stratum typicum: Sample VCB, limestone from the upper part of the Lower Fassanian *Spongosilicarmiger italicus* A.Z.
Material: More than 100 specimens.
Diagnosis: Cortical shell subspherical, consisting of 2 layers. Inner layer with small pore frames with triangular, rarely tetragonal, polygonal or oval pores. Outer layer with large pore frames and distinct rounded nodes on the joints. 3 tricarinate, slender, long spines of distinctly different length are arranged under distinctly different angles. They are situated in one plane.

Palaesoceniid inner structure. Medullary shell ellipsoidal, latticed, long axis in the plane of the spines. The medullary shell includes a modified pentactine spicular system. 3 apical spines are free and join mostly the cortical shell. This apical side corresponds to the side with the larger angle between the long spine and one of the shorter spine. The 4 descending spines are included into the wall of the medullary shell and are connected at some distance from the apical end by a ring somewhat above the midlength of the medullary shell. 2 of them stop in the proximal ring. The other 2 extend into 2 of the outer radial spines. The third radial spine, opposite to the largest angle, originate in the antapical end of the internal shell. It is connected by a vertical ring with the base of the apical spines.

Dimensions:
Diameter of cortical shell: 160–190 μm
Length of the longest spine: 290–330 μm
Length of the shortest spine: 180–220 μm
Occurrence: Fassanian. Not yet observed in the lower and middle part of the *Spongosilicarmiger italicus* Zone.
Remarks: *Sepsagon longispinosus* (KOZUR & MOSTLER, 1979) from the Upper Triassic has somewhat more slender spines, the differences in the length of the spines are not so pronounced (photos of this species with appearently distinctly different spines have not been taken in the plane of the spines), the angles between the spines are not so different. The inner pore frames of *S. longispinosus* have predominantly round small pores. The nodes on the joints of the outer pore frames are pointed (often they are small spines), never broadly rounded as in the new species.

Sepsagon longispinosus (KOZUR & MOSTLER, 1979)
(Pl. 5, fig. 2)

1979 *Triactoma longospinosum* n. sp. – KOZUR & MOSTLER, p. 59, pl. 1, fig. 6; pl. 11, figs. 3, 8; pl. 12, fig. 6; pl. 13, fig. 1
1980 *Sepsagon longispinosus* (KOZUR & MOSTLER, 1979) –DUMITRICĂ, KOZUR & MOSTLER, p 15, the figured specimens belong to *Sepsagon ladinicus* n. sp.
1983 *Sarla longispinosum* (KOZUR & MOSTLER) - BLOME, pp. 19-20, figured Norian form belongs to a different taxon
1984 *Sarla longispinosa* (KOZUR & MOSTLER, 1979) (emend. BLOME, 1983) - BLOME, p. 31, the figured Norian specimen belongs to a different taxon
Occurrence: Carnian, worldwide.
Remarks: The Ladinian forms, assigned to this species, belong to *Sepsagon ladinicus* (differences see under this species).

The Norian specimen, figured by BLOME (1983, 1984) as *Sarla longispinosa* belongs to an other taxon. The spines are about twice so broad compared with the outer diameter of the shell. The pore frames of the outer layer are different.

Sepsagon robustus LAHM, 1984
(Pl. 4, fig. 10; pl. 5, figs. 1, 6)

1984 *Sepsagon ? robustus* n. sp. – LAHM, pp. 40–41, pl. 6, fig. 10
Occurrence: Middle and upper part of Lower Fassanian *Spongosilicarmiger italicus* Zone of Southern Alps.
Remarks: The inner structure confirms the assignment to *Sepsagon*. The palaeoscenidiid spicular system displays 4 apical spines.

Genus *Parasepsagon* DUMITRICĂ, KOZUR & MOSTLER, 1980

Type species: *Parasepsagon tetracanthus* DUMITRICĂ, KOZUR & MOSTLER, 1980

Parasepsagon asymmetricus asymmetricus KOZUR & MOSTLER, 1981

1981 *Parasepsagon asymmetricus* n. sp. – KOZUR & MOSTLER, p. 35, pl. 5, figs. 2–4
Occurrence: Pelsonian of Großreifling, Austria, *Bulogites zoldianus* beds of Aszofö (Balaton Highland, Hungary).
Remarks: In *Parasepsagon asymmetricus praetetraacanthus* n.sp. from the *Paraceratits trinodosus* Zone (Illyrian) the axes of spines deviates only slightly from the rectangular position as in *P. tetracanthus* DUMITRICĂ, KOZUR & MOSTLER 1980 from the Lower Ladinian.

Parasepsagon asymmetricus praetetracanthus n.subsp.
(Pl. 5, fig. 3)

Derivatio nominis: According to the transitional character between *P. asymmetricus asymmetricus* KOZUR & MOSTLER and *P. tetracanthus* DUMITRICĂ, KOZUR & MOSTLER.
Holotypus: The specimen on pl. 5, fig. 3; rep.-no. KoMo 1980/I-137.
Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section.

Stratum typicum: Limestone sample 87 within greenish tuffites, *Paraceratites trinodosus* Zone (Illyrian)
Material: 23 specimens.
Diagnosis: Cortical shell globular, two-layered. Inner layer with small, round, oval or rounded triangular pores, outer layer with coarser pore frames, displaying rounded conical nodes on the joints. All 4 spines have the same size and are situated in one plane. Their axes deviate only a little from perpendicular. The spines become continuously narrower from their relatively broad basis toward the tips. They are tricarinate with broad ridges and deep furrows. Their terminal part is round and needle-like.
Inner structure not observed.
Dimensions:
Diameter of cortical shell: 152–166 μm .
Length of spines: 207–240 μm
Occurrence: Illyrian (*Paraceratites trinodosus* Zone) of Balaton Highland.
Remarks: Transitional form between *Parasepsagon asymmetricus asymmetricus* KOZUR & MOSTLER, 1981 and P. *tetracanthus* DUMITRICĂ, KOZUR & MOSTLER, 1980. The spines are still of equal length as in *P. asymmetricus asymmetricus*, but their arrangement is almost rectangular as in Lower Ladinian *P. tetracanthus* in which the spines in one axis are distinctly shorter than in the other axis.

Parasepsagon tetracanthus DUMITRICĂ, KOZUR & MOSTLER, 1980
(Pl. 5, figs. 4, 5)

1980 *Parasepsagon tetracanthus* n. gen. n. sp. – DUMITRICĂ, KOZUR & MOSTLER, p. 13, pl. 1, fig. 8; pl. 2, fig. 7
Occurrence: Frequent in the Tethyan Lower Ladinian.

Genus *Pseudosepsagon* n. gen.

Derivatio nominis: According to the similarity with *Sepsagon* DUMITRICĂ, KOZUR & MOSTLER, 1980
Type species: *Pseudosepsagon pentaspinosus* n. gen. n. sp.
Diagnosis: Cortical shell subglobular, two-layered. Outer layer with coarse, high tetragonal to hexagonal pore frames with very short spines or nodes on the joints. Inner layer with small pores, sometimes delicate pore frames. 3 radial spines of different length and under different angles, proximal part displaying slight to moderate torsion. Distal part long, needle-like, round. One or two needle-like spines outside the plane of the 3 main spines are present.

Medullary shell part of a palaeoscenidiid spicular system. 3 needle-like, narrowly spaced apical spines are situated at the side with the widest spines between the 3 main spines. One of these spines continues beyond the cortical shell as the needle-like spine at the side of biggest angle between the 3 main spine. This spine is situated out of the plane of the main spines. The other 2 apical spines join the cortical shell, but do not reach beyond it.

3 of the 4 descending spines continue beyond the cortical shell as the 3 main spines. The fourth may continue in a spine out of the plane of the main spines on the side with the second largest angle between the main spines.
Occurrence: Illyrian (*Paraceratites trinodosus* Zone) of Balaton Highland (Hungary).
Assigned species:
Pseudosepsagon pentaspinosus n. gen. n. sp.
Pseudosepsagon illyricus n. sp.
Remarks: In *Sepsagon* DUMITRICĂ, KOZUR & MOSTLER, 1980 mostly only the 3 main spines are present that are situated in continuation of 2 descending spines and of the antapical spine of the pentactine spicular system. Very rarely a fourth spine in continuation of one of the apical spines (?) is present (*Sepsagon recoaroensis* LAHM, 1984), but it is situated in the plane of the 3 main spines opposite to one of the spines, seemingly with all transitions to the genus *Parasepsagon* DUMITRICĂ, KOZUR & MOSTLER, 1980. In this genus all 4 spines are nearly cross-like arranged, quite different from *Pseudosepsagon*, but they are all prolongations of the descending spines as in *Pseudosepsagon.*

Pseudosepsagon pentaspinosus n. gen. n. sp.
(Pl. 5, figs. 7–9)

Derivatio nominis: According to the presence of 5 spines.
Holotypus: The specimen on pl. 5, figs. 7-9; rep.-mo. KoMo 1980/5-108.
Locus typicus: Felsöörs (Balaton Highland, Hungary) Forráshegy section.
Stratum typicum: Limestone bed 87 within greenish tuffites, *Paraceratites trinodosus* Zone (Illyrian).
Material: 16 specimens.
Diagnosis: With the character of the genus. The proximal part of all 3 main spines displays a strong torsion of the 3 ridges. The distal part is long, needle-like, with round cross

section. In prolongation of one apical spine of the modified pentactine spicular system a short spine outside the plane of the main spines is present on the side with the largest angle between the 3 main spines. The fifth spine, a little larger than the apical one, lies on the side of the next smaller angle between the main-spines. It lies also outside the plane of the main spine in prolongation of the fourth descending spine of the spicular system.

Outer pore frame of the outer layer very robust, high, mostly pentagonal to hexagonal. Inner layer consists of fragile pore frames with small pores at the inner side of the outer layer. It is only present in well preserved material, but even in this material broken anway in many places of the shell.

Dimensions:
Diameter of cortical shell = 100–120 μm
Length of the largest spine = 200–218 μm
Length of the shortest spine = 140–160 μm
Occurrence: Illyrian of Balaton-Highland.
Remarks: In *Pseudosepsagon illyricus* n. sp. 2 of the 3 main spines are considerably stronger than the third one. Only a needle-shaped, rather long, delicate spine in prolongation of one apical spine is present. The inner pore frames with mainly small pores are robust.

Pseudosepsagon illyricus n. sp.
(Pl. 6, fig. 1)

Derivatio nominis: According to the occurrence in the Illyrian.
Holotypus: The specimen on pl. 6, fig. 1; rep.-no. KoMo 1980 I-109.
Lower typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section.
Stratum typicum: Limestone bed 87 within greenish tuffites, *Paraceratites trinodosus* Zone (Illyrian).
Material: 7 specimens.
Diagnosis: With the character of the genus. 2 of the 3 main spines are very strong, broad, in the proximal half with 3 ridges and deep furrows, displaying slight torsion. Distal half needle-like, with round cross section. The third main spine is only basally carinate, in the remaining part needle-like, round. It is much smaller and narrower than the other 2 spines that lie almost opposite to each other. At the side with the larger angle between the 3 main spines, a fourth spine lies in prolongation of one of the 3 apical spines. This spine is basally carinate, otherwise needle-like with round cross section. Outer pore frames robust, high, mostly pentagonal to heyagonal, but also trigonal, tetragonal, hexagonal. Inner pore frames robust, including numerous small pores.
Dimensions:
Diameter of cortical shell = 120–130 μm
Length of the longest spines = 170–210 μm
Shortest spine not fully preserved in our material.
Occurrence: Illyrian (*P. trinodosus* Zone) of the Balaton Highland.
Remarks: *Pseudosepsagon pentaspinosus* n. gen. n. sp. has main spines undifferentiated in size and shape. Outer spines are present in prolongation of all 4 descending spines. The inner pore frames are very fragil and often not preserved.

Family Tiborellidae n. fam.

Diagnosis: Shell subspherical, slightly flattened, in lateral view with rounded subquadratic outline. Very big hexagonal to pentagonal pore frames. Pores closed by fragile inner pore frames (often broken away) with small pores. 4 main spines cross-like arranged, tricarinate, often with torsion.

Medullary shell latticed. Entactinaria spicular system with median bar and 3 spicules on each end of Mb.
Occurrence: Tethyan Middle Triassic.
Assigned genus: *Tiborella* DUMITRICĂ, KOZUR & MOSTLER, 1980
Remarks: The Muelleritortiidae KOZUR, 1988 have often also 4 main spines in cross-like position and their wall structure and pore frames are identical with those of the Tiborellidae. However, there is a modified pentactine spicular system and the spines are situated in prolongation of the basal spines.

Other Mesozoic to Recent forms with 4 cross-like arranged spines have no internal spicular system.

The Austrosaturnalidae KOZUR & MOSTLER, 1983 have the same pore frames on the cortical shell and the same internal spicular system, but the 4 cross-like arranged spines are situated totally inside the shell that is surrounded by a saturnalid ring.

Genus *Tiborella* DUMITRICĂ, KOZUR & MOSTLER, 1980

Type species: *Tiborella magnidentata* DUMITRICĂ, KOZUR & MOSTLER, 1980

Tiborella magnidentata DUMITRICĂ, KOZUR & MOSTLER, 1980

1980 *Tiborella magnidentata* n. sp. DUMITRICĂ, KOZUR & MOSTLER, p. 18, pl. 11, figs. 2, 6; pl. 11, figs. ? 2, 3, 4; pl. 12, fig. 4

Tiborella anisica n.sp.

(Pl. 6, figs. 3, ? 5, 6–8)

Derivatio nominis: According to the occurrence in the upper Anisian (Illyrian).
Holotypus: The specimen on pl. 6, figs. 7-8; rep.-no. KoMo 1980 I-86
Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section
Stratum typicum: Limestone bed 87 within greenish tuffites, *Paraceratites trinodosus* Zone (Illyrian)
Material: 56 specimens.
Diagnosis: Cortical shell subspherical, in lateral view with subquadratic equatorial outline. Outer pore frames very high, very large, tetragonal to heptagonal. Inner pore frames fragile, with small pores. 4 tricarinate main spines in one plane cross-like arranged. One spine longer than the other 3 and displaying distinct torsion. Other spines short to moderately long, stout, without torsion, in near related forms with slight torsion. Medullary shell latticed. Central spicular system fragile, consisting of a median bar with 3 spines on both ends.
Dimensions:
Diameter of cortical shell = 100–130 µm
Length of the longest spine = 80–100 µm
Length of the other spines = 40–60 µm
Occurrence: Frequent in the Illyrian of Balaton Highland, Hungary.
Remarks: In the Lower Ladinian *Tiborella magnidentata* DUMITRICĂ, KOZUR & MOSTLER, 1980 all spines have the same strong torsion and there are distinct nodes on the joints of the outer pore frames.

The holotype of *Tiborella florida* (NAKASEKO & NISHIMURA, 1979) from the Lower Fassanian of Japan displays in the longer spine the same slight torsion than in the shorter spines. Moreover, the outer pore frames weaken considerably on the solid equatorial ring that connect the spines. This ring is therefore in upper view well visible. The latter is also the case in the paratype that is otherwise more similar to *Tiborella anisica* n. sp.. It is here determined as *Tiborella* cf. *florida* (NAKASEKO & NISHIMURA, 1979). Its age is probably Illyrian (it has derived from sample 1707-2; the sample 1707-1 is Illyrian)

Tiborella florida tortilis n. subsp.

(Pl. 6, figs. 2, 4)

Derivatio nominis: According to stronger torsion of the 4 spines compared with *T. florida* (NAKASEKO & NISHIMURA)
Holotypus: The specimen on pl. 6, figs. 2, 4 ; rep.-no. KoMo 1980 I-609.
Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vincentinian Alps, Italy)
Stratum typicum: Sample TT 13, upper subzone of Middle Fassanian *Ladinocampe multiperforata* Zone
Material: 4 specimens.
Diagnosis: Cortical shell in upper view subquadratic, with 4 strong, tricarinate spines in the corners, situated in one plane. The distal half of the spines displays strong torsion, the proximal half (or a little shorter part) displays no torsion. One spine is distinctly longer than the other three ones. Outer pore frame of the cortical shell penta- to heptagonal, very high, coarse, thickened at the joints. The pore frames become low on the equatorial ring (that connects the spines) and contain here only radial elements. Therefore the ring is well visible in upper and lower view. Outer pores very large, mostly oval. Inner pore frames very delicate, mostly broken away, with small pores.

Medullary shell latticed. Inner structure not observed.
Dimensions:
Diameter of cortical shell = 127–135 µm
Length of longest spine = 127–131 µm
Length of other 3 spines = 88–96 µm
Occurrence: Higher part of middle Fassanian *Ladinocampe multiperforata* Zone. Italy.
Remarks: *Tiborella florida florida* (NAKASEKO & NISHIMURA, 1979) from the Lower Fasanian of Japan and Philippines (= *Tiborella* sp. sensu CHENG, 1989) displays only a slight torsion of the spines and has fewer pores on the cortical shell.

Tiborella magnidentata DUMITRICĂ, KOZUR & MOSTLER, 1980 from the upper subzone of the Lower Fassanian *S. italicus* Zone displays still stronger torsion of the spines and the untwisted proximal part of the spines is shorter. The outer pore frames totally overgrow the equatorial ring between the spines that is therefore not visible in upper view that shows a roundish equatorial outline.

Superfamily Sponguracea HAECKEL, 1862 emend. KOZUR & MOSTLER, 1981
Family Archaeospongoprunidae PESSAGNO, 1973 emend. KOZUR & MOSTLER, 1981
Genus *Archaeospongoprunum* PESSAGNO, 1973 emend. KOZUR & MOSTLER, 1981

Type species: *Archaeospongoprunum venadoense* PESSAGNO, 1973

***Archaeospongoprunum bispinosum* KOZUR & MOSTLER, 1981**
(Pl. 7, figs. 1–2)

1981 *Archaeospongoprunum bispinosum* n. sp. – KOZUR & MOSTLER, pp. 41–42, pl. 43, fig. 2
Occurrence: *Paraceratites trinodosus* Zone (Illyrian) of Balaton Highland.

***Archaeospongoprunum brevispinosum* n. sp.**
(Pl. 7, fig. 5)

Derivatio nominis: According to the short spines
Holotypus: The specimen on pl. 7, fig. 5; rep.-no. KoMo 1980 I-89
Locus typicus: Felsöörs (Balaton, Highland, Hungary), Forráshegy section
Stratum typicum: Limestone bed 110 about 3 m below the upper boundary of the pietra verde, uppermost part of the '*Xenoprotrachyceras*' *reitzi* Oppel Zone above the range of *X. reitzi*. Upper part of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Material: 3 specimens.
Diagnosis: Shell asymmetrically spindle-shaped consisting of several layers of a fine-spongy meshwork. Axial spines on a somewhat arched axis broad; one is moderately long, the opposite one short. Periaxial spine (situated under acute angle to the short of the axial spines) likewise broad, short. All spines are tricarinate.
Dimensions:
Length of outer shell = 221–230 µm
Maximum width of outer shell = 106–115 µm
Length of short spines = 52–58 µm
Occurrence: Upper part of '*Xenoprotrachyceras*' *reitzi* Oppel Zone somewhat above the last occurrence of "X." *reitzi*. Balaton Highland, Hungary.
Remarks: In the similar Illyrian *Archaeospongoprunum bispinosum* KOZUR & MOSTLER, 1981 also the 2 spines that enclose an acute angle are large, even if they are generally somewhat shorter than the opposite axial spine.

***Archaeospongoprunum mesotriassicum mesotriassicum* KOZUR & MOSTLER, 1981**
(Pl. 7, fig. 3)

1981 *Archaeospongoprunum* mesotriassicum mesotriassicum n.sp. - KOZUR & MOSTLER, p. 41, pl. 42, fig. 4
Occurrence: *Paraceratites trinodosus* Zone (Illyrian) of Balaton Highland (Hungary).

***Archaeospongoprunum mesotriassicum asymmetricum* KOZUR & MOSTLER, 1981**
(Pl. 7, fig. 4)

1981 *Archaeospongoprunum mesotriassicum asymmetricum* n. subsp. - KOZUR & MOSTLER, p. 41, pl. 42, fig. 3
Occurrence: *Paraceratites trinodosus* Zone (Illyrian) of Balaton Highland (Hungary).

***Archaeospongoprunum tetraspinosum* n. sp.**
(Pl. 7, fig. 6)

Derivatio nominis: According to the 4 spines.
Holotypus: The specimen on pl. 7, fig. 6; rep.-no. KoMo 1980 I-93.
Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section.
Stratum typicum: Limestone bed 87 within greenish tuffites, *Paraceratites trinodosus* Zone (Illyrian)

Material: 9 specimens.

Diagnosis: Spongy shell, in lateral view with wedge-shaped equatorial outline, consisting of several layers of dense spongy network.

Axis of the 2 polar spines slightly arched. Third spine (lateral spine) nearly perpendicular to one of the polar spines and more oblique to the other one. The 2 polar spines and the lateral spine have about the same size. They are tricarinate, in the proximal part the ridges are subdivided by a central furrow.

The fourth spine is also tricarinate, but somewhat smaller and the ridges are not subdivided by a central furrow. This spine lies on the opposite side of the lateral spine near to one of the polar spines to which it runs under small acute angle.

Measurements:

Length of the shell (in direction of the polar axis) = 149–158 μm

Width of the shell (in direction of the lateral spine) = 100–115 μm

Length of polar and lateral spines = 81–100 μm

Length of the fourth spine = 75–79 μm

Occurrence: *Paraceratites trinodosus* Zone (Illyrian) of Balaton Highland (Hungary).

Remarks: The Illyrian *Archaeospongoprunum bispinosum* KOZUR & MOSTLER, 1981 has no mid-lateral spine and an asymmetric spindle shape test.

The Illyrian *Archaeospongoprunum trispinosum* n. sp. has a mid-lateral spine, but no side-spine near to the polar spine.

Archaeospongoprunum trispinosum n. sp.
(Pl. 7, figs. 7, 8)

Derivatio nominis: According to the 3 main spines.

Holotypus: The specimen on pl. 7, fig. 7; rep.-no. KoMo 1980 I-91.

Locus typicus: Felsöörs (Balaton Highland), Forráshegy section.

Stratum typicum: Limestone bed 87 within greenish tuffites, *Paraceratites trinodosus* Zone (Illyrian).

Material: 32 specimens.

Diagnosis: Shell densely spongy, consisting of several concentric layers. Equatorial outline rounded subtriangular, rounded part opposite to the lateral spine. 2 polar spines and a third spine, perpendicular or nearly perpendicular to the polar spines, are present. All spines have about the same size, are tricarinate, often slightly twisted. Ridges mostly with central furrow. Furrows between the ridges deep, in the proximal half crossed by bars that connect adjacent ridges.

Dimensions:

Length of shell (in direction of polar spines) = 110–173 μm

Width of shell (in direction of lateral) shell = 90–123 μm

Length of spines = 80–100 μm

Occurrence: *Paraceratites trinodosus* Zone (Illyrian) of Balaton Highland, Hungary.

Remarks: In *Archaeospongoprunum bispinosum* KOZUR & MOSTLER, 1981 the third spine lies in small acute angle to the polar spines, sometimes almost parallel to them. The shell is asymmetrically spindle shaped.

In the Illyrian *Archaeospongoprunum tetraspinosum* n. sp. additionally to the third spine of similar position as in *A. trispinosum* n. sp. on the opposite side a spine under acute angle to the polar axis is present.

Subfamily Tamonellinae
KOZUR & MOSTLER, 1981
Genus *Tamonella* DUMITRICĂ, KOZUR & MOSTLER, 1980

Type species: *Tamonella multispinosa* DUMITRICĂ, KOZUR & MOSTLER, 1980

Tamonella rarispinosa n. sp.
(Pl. 7, fig. 9)

Derivatio nominis: According to the few spines, present only on one polar region.

Holotypus: The specimen on pl. 7, fig. 9; rep.-no. KoMo 1980 I-325.

Locus typicus: Passo della Gabiola section, Vicentinian Alps (Italy).

Stratum typicum: Sample MD 22, Upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.

Material: 34 specimens.

Diagnosis: Shell elongated-ellipsoidal, consisting of numerous spongy shells around a microsphere. The 4–7 spines are carinate and all concentrated around one pole. Opposite polar region without spines.

Dimensions:

Long axis of shell = 290–311 μm

Short axis of shell = 173–180 μm

Length of spines = 8–31 μm

Occurrence: Upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Remarks: *Tamonella multispinosa* DUMITRICĂ, KOZUR & MOSTLER, 1981 from the highest Lower Fassanian displays numerous spines in the polar regions of both poles.

Family Gomberellidae KOZUR & MOSTLER, 1981

Remarks: This family was originally placed as subfamily into the Oertlispongidae KOZUR & MOSTLER, 1980. The genus *Katorella* KOZUR & MOSTLER, 1981 is related to this family in its original wide scope. However, the genus *Gomberellus* DUMITRICA, KOZUR & MOSTLER, 1980 with carinate main spines, arranged around one pole, is the forerunner of the genus *Karnospongella* KOZUR & MOSTLER, 1981 that was placed into the Archaeospongoprunidae by KOZUR & MOSTLER, 1981.

Both *Gomberellus* and *Karnospongella* are nearer related to the Archaeospongoprunidae PESSAGNO, 1973 than to the Oertlispongidae KOZUR & MOSTLER, 1980. By the arrangement of the polar spines the Gomberellidae are distinctly different from the Archaeospongoprunidae. They are here regarded as independent family.

Genus *Gomberellus* DUMITRICĂ, KOZUR & MOSTLER, 1981

Type species: *Gomberellus hircicornus* DUMITRICĂ, KOZUR & MOSTLER, 1980
Remarks: New material has shown that *Gomberellus* comprises forms with one, two or three main spines with twisted ridges around one pole. Forms without twisted spines are placed into *Praegomberellus* n. gen.

The genus *Karnospongella* KOZUR & MOSTLER, 1981 has evolved from *Gomberellus* species with two twisted main spines by lost of the by-spines.

***Gomberellus hircicornus* DUMITRICĂ, KOZUR & MOSTLER, 1980**
(Pl. 7, figs. 12–14)

1980 *Gomberellus hircicornus* n. gen. n. sp. – DUMITRICĂ, KOZUR & MOSTLER, pl. 10, fig. 6; pl. 14, fig. 3.

Occurrence: upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone of Hungary, Italy and Yugoslavia.
Remarks: The two main spines with twisted ridges are basally connected with ridges.

***Gomberellus fissus* n. sp.**
(Pl. 8, figs. 8–10)

Derivatio nominis: According to the side-branches on two of the 3 main spines.
Holotypus: The specimen on pl. 8, figs. 8-10; rep.-no. KoMo 1980 I-296.
Locus typicus: Passo della Gabiola (Vicentinian Alps, Italy).
Stratum typicum: Sample MD 9, middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Material: 3 specimens.
Diagnosis: Shell slightly ellipsoidal, spongy. At one pole area 3 tricarinate, robust main spines are present. At the base the ridges are subdivided by a central furrow. From two main spines one or two side spines branch off (from one or two ridges) that are also carinate. The ridges of the main spines are only a little twisted or even straight.

On the opposite polar area 1-3 slender, often long, basally tricarinate, distally round spines are present.
Dimensions:
Long axis of shell = 163–175 μm
Short axis of shell = 150–159 μm
Length of the main spines = 105–120μm
Maximum length of the spines around the opposite pole = 148 μm
Occurrence: Middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Remarks: In the Lower to Middle Fassanian *Gomberellus trispinosus* n. sp. the 3 main spines are strongly twisted and undivided.

***Gomberellus longobardicus* n. sp.**
(Pl. 7, fig. 10; pl. 8, figs. 1, 3, 6)

Derivatio nominis: According to the occurrence in the Longobardian.
Holotypus: The specimen on pl. 8, fig. 6; rep.-no. CK 1 88 VII-65.
Locus typicus: Köveskál (Balaton Highland, Hungary), section at the cemetery.

Stratum typicum: Sample 7/29/12/87, Middle Longobardian *Budurovignathus mungoensis* A.Z.
Material: 53 specimens.
Diagnosis: Shell globular, spongy. Only one polar spine present. In 3 ridges are twisted and subdivided by a distinct central furrow that is considerably shallower than the furrows between the ridges. Other 7–9 spines tricarinate, distally round, long and proximally rather robust.
Measurements:
Diameter of shell = 130–148 μm
Length of main spine (polar spine) = 94–140 μm
Length of other spines = 60–120 μm
Occurrence: Longobardian of Köveskál (Hungary).
Remarks: In the Lower Fassanian *Gomberellus unispinosus* n.sp. the shell is more elongated and the spines are concentrated to both pole areas.

Gomberellus trispinosus **n.sp.**
(Pl. 8, figs. 2, 4, 5, 7)

Derivatio nominis: According to the 3 twisted main spines at one pole
Holotypus: The specimen no pl. 8, figs. 4, 5, 7; rep.-no. KoMo 1980 I-300
Locus typicus: Passo della Gabiola section, Vicentinian Alps (Italy).
Stratum typicum: Sample MD 11, middle subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone.
Material: 31 specimens.
Diagnosis: Shell ellipsoidal, spongy. 3 twisted, tricarinate, robust main spines with strong, rounded ridges are situated at one pole. Near the opposite pole 2–4 robust or needle-like spines are present. A further additional spine may be present in the equatorial region.
Dimensions: See under the subspecies.
Occurrence: Middle subzone of the Lower Fassanian *Spongosilicarmiger italicus*-Zone up to Middle Fassanian *Ladinocampe multiperforata* Zone of European Tethys.
Remarks: In *Gomberellus fissus* n. sp. one or two main spines are branched.

Gomberellus trispinosus trispinosus **n. subsp.**
(Pl. 8, figs. 4, 5, 7)

Holotypus, locus typicus and stratum typicum: as for the species.
Material: 25 specimens.
Diagnosis: As for the species. The 3 main spines are widely separated, the 2-4 spines at the opposite side are robust and tricarinate. No additional spines are present.
Dimensions:
Long axis of the shell = 165–200 μm
Short axis of the shell = 140–165 μm
Length of the main spines = 100–120 μm
Length of spines on the opposite polar area = 80–100 μm
Occurrence: Middle and upper, probably not uppermost Lower Fassanian *Spongosilicarmiger italicus* Zone of the Southern Alps.
Remarks: *Gomberellus trispinosus posterus* displays slender, to a longer part roundish spines on the lower pole. The main spines are closely spaced.

Gomberellus trispinosus posterus **n. subsp.**
(Pl. 8, fig. 2)

Derivatio nominis: successor of *Gomberellus trispinosus trispinosus.*
Holotypus: The specimen on pl. 8, fig. 2; rep.-no. KoMo 1980 I-731.
Locus typicus: Road cut San Ulderico-Pallé, Vicentinian Alps (Italy).
Stratum typicum: Sample TT 7, upper subzone of Middle Fassanian *Ladinocampe multiperforatus* Zone.
Material: 6 specimens.
Diagnosis: With the character of the genus. The 3 main spines are densily spaced around the upper pole. In the equatorial area one or two additional tricarinate spines are present.
Measurements:
Long axis of shell = 179–193 μm
Short axis of shell = 144–149 μm
Length of main spines from the upper polar area = 98–113 μm
Length of spines on the lower polar area = 74–78 μm
Occurrence: Upper subzone of Middle Fassanian *Ladinocampe multiperforata* zone. Southern Alps.
Remarks: *Gomberellus trispinosus trispinosus* n. subsp. from the middle and upper part of Lower Fassanian has no spines in the equatorial area. Moreover, the main spines around the upper pole are wider spaced.

***Gomberellus unispinosus* n. sp.**
(Pl. 7, fig. 11)

Derivatio nominis: According to the single stout main spine
Holotypus: The specimen on pl. 7, fig. 11; rep.-no. KoMo 1980.
Locus typicus: Section at the road between Mte. Spitz and Mte. Fallison, Vicentinian Alps (Italy).
Stratum typicum: Sample FD 6, Fassanian.
Material: 4 specimens.
Diagnosis: Shell ellipsoidal, spongy. Single main polar spine at the upper pole stout, tricarinate, twisted. The high ridges are in their proximal part subdivided by a basally deep, then shallow median furrow. Opposite pole with 3-4 tricarinate, distally needle-like, round spines. Their proximal part is rather braod.
Dimensions:
Long axis of shell = 142–148 µm
Short axis of shell = 115–119 µm
Length of the main polar spine = 100–112µm
Length of the opposite spines = 45–62 µm
Occurrence: Fassanian of the locus typicus.
Remarks: The other *Gombarellus* species with a single main spine, the Longobardian *G. longobardicus* n.sp. is clearly distinguished by the distribution of the spines that are not concentrated to the polar areas. Moreover, the spongy meshwork is considerably coarser.

Genus *Karnospongella* KOZUR & MOSTLER, 1981

Type species: *Karnospongella bispinosa* KOZUR & MOSTLER, 1981
Remarks: GORIČAN (1990) placed *Karnospongella* KOZUR & MOSTLER (1981) into synonymy of *Gomberellus* DUMITRICĂ, KOZUR & MOSTLER, 1980. She pointed out, that both genera display two twisted main spines at the upper pole and some additional spines at the lower pole. However, this view is only based on the comparison of *Gomberellus hircicornus* DUMITRICĂ, KOZUR & MOSTLER, 1980 and *Karnospongella trispinosa* LAHM, 1984 erroneously determined as *Gomberellus bispinosus* (KOZUR & MOSTLER) by GORIČAN (1990). *Karnispongella bispinosa* KOZUR & MOSTLER, the type species of *Karnospongella*, displays no spines on the lower pole. Typical Carnian *Karnospongella* display a subcylindrical or very elongated subellipsoidal shell, 2 strongly twisted main spines on the upper pole and no or few needle-like spines around the lower pole, were is an area with loose spongy shell or even a pylom-like opening.

Typical Fassanian *Gomberellus* have an ellipsoidal to slightly elongated subglobular shell and 1-3 slightly to moderately twisted main spines. The spines around the lower pole are either robust or needle-like, but in the latter case always with broader, tricarinate base, never present in these spines (if present) in *Karnospongella.*

Transitional forms between both genera are known from the upper part of Lower Fassanian up to the upper Fassanian. In these forms the 2 main spines are only a little to moderately twisted and the shell is ellipsoidal. Needle-like spines on the lower polar area may be present or missing.

Regarding all known *Gomberellus* species this genus is clearly distinct from *Karnospongella* and transitional forms occur in stratigraphic order. Below the upper subzone of Lower Fassanian *S. italicus* Zone *Gomberellus* is well documented, but *Karnospongella* is missing. In the Carnian *Karnospongella* is frequent, but *Gomberellus* is missing. In the Longobardian *Gomberellus* is only represented by one species with one main spine on the upper pole, different from the contemporaneous *Karnospongella* species with a subcylindrical shell.

***Karnospongella transita* n.sp.**
(Pl. 9, figs. 1–2)

Derivatio nominis: According to the transitional character between the genera *Gomberellus* DUMITRICĂ, KOZUR & MOSTLER and *Karnospongella* KOZUR & MOSTLER.
Holotypus: The specimen on pl. 9, fig. 1; rep.-no. KoMo 1980 I-263
Locus typicus: Road cut San Ulderico-Pallé, Vicentinian Alps (Italy).
Stratum typicum: Sample TT 7, lower subzone of Middle Fasanian, *Ladinocampe multiperforata* Zone.
Material: 17 specimens.
Diagnosis: Shell ellipsoidal, spongy, at the lower pole often somewhat looser meshwork than in the remaining shell. The 2 main spines at the upper pole are stout, tricarinate, slightly to moderately strongly twisted. Terminal a needle-like spine is present. Lower pole without spines.
Dimensions:
Long axis of shell = 154–166 µm
Short axis of shell = 112–134 µm
Length of polar spines = 96–100 µm

Occurrence: Upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone to lower subzone of the *Ladinocampe multiperforata* Zone.
Remarks: Most primitive *Karnospongella* species. The higher evolved *Karnospongella* species from the Longobardian and Carnian display a very elongated ellipsoidal or subcylindrical shell and the main spines are stronger twisted.

Gomberellus species with 2 main spines display a fewer elongated shell with distinct spines around the lower pole.

Genus *Kulacella* KOZUR & MOSTLER, 1981

Type species: *Kulacella recoaroensis* KOZUR & MOSTLER, 1981
Remarks: The type species with a subcylindrical shell, 3 polar spines and few needle-shaped spines on the opposite pole is near related to the Gomberellidae. However, *Paurinella ? longispinosa* n. sp. with subglobular shell and 3 main spines situated somewhat below the equator is also very similar to *Kulacella*. Maybe that Kulacella is an aberrant representative of the Intermediellidae LAHM, 1984 that display a similar shell structure, round main spines, but their main spines are arranged in the equatorial plane. Only in *Katorella* KOZUR & MOSTLER, 1981 the spines are irregularly distributed on the whole shell surface.

Paurinella ? longispinosa n. sp. is seemingly a transitional form between *Paurinella* KOZUR & MOSTLER, 1981 (typical Intermediellidae) and *Kulacella* KOZUR & MOSTLER, 1981.

Kulacella recoaroensis KOZUR & MOSTLER, 1981
(Pl. 9, fig. 3)

1981 *Kulacella recoaroensis* n. gen. n. sp. - KOZUR & MOSTLER, p. 45, pl. 43, fig. 3.
Occurrence: Rare species from the upper subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone of Southern Italy.

Genus *Praegomberellus* n. gen.

Type species: *Praegomberellus pulcher* n. gen. n. sp.
Diagnosis: Subglobular spongy shell. Spines large, tricarinate. 3 spines are closely spaced around one pole. The other 5–8 spines are irregularly distributed on the shell, but mostly on the opposite pole one or two spines are located.
Occurrence: Illyrian (*Paraceratites trinodosus*-Zone up the Lower Fassanian).
Assigned species:
Pragomberellus pulcher n. gen. n. sp.
Gomberellus mocki DUMITRICA, KOZUR & MOSTLER, 1981
Remarks: Most primitive representative of the Gomberellidae KOZUR & MOSTLER, 1981. The position of the 3 closely spaced spines near one pole remembers already to *Gomberellus* DUMITRICA, KOZUR & MOSTLER, 1981, but these spines are not separated in size and form from the other spines, like in *Gomberellus*. Moreover, the shell is still subglobular and not ellipsoidal.

Praegomberellus pulcher n. gen. n. sp.
(Pl. 9, figs. 6, 8)

Derivatio nominis: pulcher (lat.) according to the nice shape
Holotypus: The specimen on pl. 9, fig. 8; rep.-no. KoMo 1980 I-128.
Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section.
Stratum typicum: Bed 87, Illyrian (*Paraceratites trinodosus* Zone).
Material: 37 specimens.
Diagnosis: Shell subglobular to globular, spongy. Spines large, tricarinate. 3 spines closely spaced around one pole. On the opposite pole a spine may be present. The other 6-8 spines are irregularly distributed. All spines have about the same size, but the three spines around the pole are mostly somewhat smaller or more slender.
Dimensions:
Diameter of shell = 140–148 µm
Length of spines = 100–144 µm
Occurrence: Illyrian (*Paraceratites trinodosus* Zone) of Hungary.
Remarks: The Lower Fassanian *Praegomberellus mocki* (DUMITRICĂ, KOZUR & MOSTLER, 1981) displays on one pole 2 bifurcated or 4 closely spaced spines, on the other side a bunch of 3-4, rarely 5 spines. Except these spines mostly only 2 additional spines are present.

Family Oertlispongidae KOZUR & MOSTLER, 1980

Genus *Oertlispongus* DUMITRICĂ, KOZUR & MOSTLER, 1980

Type species: *Oertlispongus inaequispinosus* DUMITRICA, KOZUR & MOSTLER 1980

Remarks: LAHM (1984, p. 47) pointed out: "Nach der Definition von DUMITRICĂ, KOZUR & MOSTLER (1980) ist bei der Gattung *Oertlispongus* nur einer der beiden Polarstacheln gebogen, somit muß *Oertlispongus cornubovis* in eine neue Gattung gestellt werden." However, *O. cornubovis* DUMITRICĂ, KOZUR & MOSTLER, 1980 is one of the two originally included species of the genus *Oertlispongus*. Therefore it is impossible that according the original definition only such forms were included into *Oertlispongus*, in which only one spine is curved. DUMITRICĂ, KOZUR & MOSTLER (1980, p. 5) wrote in the original diagnosis of *Oertlispongus*: 'At least one of these spines is characteristically bended'. Even in the type species of *Oertlispongus*, *O. inaequispinosus*, the thinner second polar spine is sometimes curved. Also in *Oertlispongus longispinosus* n. sp. specimens with straight and curved second polar spine are present.

Oertlispongus inaequispinosus DUMITRICĂ, KOZUR & MOSTLER, 1980

(Pl. 10, figs. 1-4, ? 5, 6, 7, 11, 13;
pl. 11, figs. 2, 6, 7, 9, ? 11; pl. 47, figs. 6, 7)

Occurrence: See under the subspecies.

Remarks: This species with 4 subspecies is highly variable, but the straight part of the first (main) polar spine is always shorter than the diameter of the shell.

Oertlispongus inaequispinosus inaequispinosus DUMITRICĂ, KOZUR & MOSTLER, 1980

(Pl. 10, figs. 1, 4, 7, 13, pl. 47, fig. 6)

1980 *Oertlispongus inaequispinosus* n. gen. n. sp. – DUMITRICĂ, KOZUR & MOSTLER, p. 5, pl. 10, fig. 7

Occurrence: Upper part of upper subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone and Middle Fassanian *Ladinocampe multiperforata* Zone. Worldwide.

Remarks: The three to numerous by-spines are mostly arranged in a bunch that is situated in different positions from the equator to near the second polar spine. The by-spines are mostly restricted to those side of the lower shell hemisphere, where the bunch is present, rarely also on the other side a single by-spine is present. One spine of the by-spine bunch, mostly situated at the upper margin of the bunch may be considerably larger than the other by-spines, but also this spine is considerably thinner and shorter than the second polar spine.

The second polar spine is considerably thinner than the first (main) polar spine, needle-like and very long. Mostly it is situated in the axis of the main polar spine, but sometimes also obliquely to this axis. The second polar spine is mostly straight but in some specimens distally distinctly curved.

The recurvation of the main polar spine is always strong; its distal end lies at least in the level of the lower shell hemisphere, but mostly below the shell level.

In *Oertlispongus primitivus* n. sp. the long, straight part of the main polar spine is at least as long as the diameter of the shell, mostly even longer.

Differences to the other subspecies see there.

Oertlispongus inaequispinosus longispinosus n. subsp.

(Pl. 10, figs. ? 5, 11; pl. 11, figs. 2, 6, ? 7, ? 11)

Derivatio nominis: According to the one-two long by-spines.

Holotypus: The specimen on pl. 10, fig. 11; rep.-no. KoMo 1980 I-397.

Locus typicus: Passo della Gabiola, Vicentinian Alps.

Stratum typicum: Sample MD 18, middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.

Material: 19 specimens.

Diagnosis: Shell globular to subglobular, spongy, consisting of several (mostly 7-9) layers with small pores. Microsphere very small. Straight proximal part of first (main) polar spine shorter than diameter of shell. The distal end of the first polar spine lies above, below or in the level of the shell. A subhorizontal, slightly curved middle part of the main polar spine is not present. Second polar spine thin, needle-shaped, straight. It is situated in the lower hemisphere, but not always opposite to the main polar spine. Mostly two by-spines (rarely one by-spine) needle-shaped, mostly as large as the second polar spine, situated on one side of the lower hemisphere. If two by-spines are present, mostly one is situated near to the equator, the other one near to the second polar spine.

Measurements:
Diameter of shell = 120–167 µm
Length of straight proximal part of main polar spine = 65–116 µm
Length of second polar spine = 169–342µm
Length of by-spines = 165–285 µm
Occurrences: Middle subzone and lower part of upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone. Southern Alps.
Remarks: *Oertlispongus inaequispinosus longispinosus* n. subsp. belongs to the main line of *Oertlispongus*: *O. primitivus* n. sp. - *O. inaequispinosus longispinosus* - *O. inaequispinosus tumidospinosus* n. subsp. with only one or two, but mostly rather strong by-spines. In *O. primitivus* n. sp. the proximal straight part of the main polar spine is as long as, mostly longer than the shell diameter. *O. inaequispinosus tumidospinosus* n. subsp. is distinguished by a very short tumid straight proximal-part of the main polar spine.

Oertlispongus inaequispinosus inaequispinosus DUMITRICĂ, KOZUR & MOSTLER, 1980 is distinguished by the presence of three to numerous by-spines, arranged in a bunch. Those by-spines are small, needle-like, but one of them is mostly larger. However, also this larger by-spine is by far thinner and shorter than the second polar spine and it lies at the (mostly upper) margin of a bunch of smaller spines.

Although *O. inaequispinosus inaequispinosus* and *O. inaequispinosus longispinosus* occur both in the upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone, they have not been found together in one profil or even in one sample. *O. inaequispinosus inaequispinosus* is known from Val di Creme (single sample VCB, not from a profil) and from red modular limestone immediately above the Pietra Verde in the San Ulderico section. From this section no further radiolarian-bearing samples have been investigated. Both samples with *O. inaequispinosus inaequispinosus* have yielded the same radiolarian fauna that can be placed into the upper subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone.

In the Passo della Gabiola section the lowermost sample (MD 1) is characterized by rich occurrence of *Oertlispongus primitivus* n. sp. together with radiolarians from the middle subzone of the Lower Fassanian *S. italicus* Zone that is clearly older than the fauna with *O. inaequispinosus inaequispinosus*. Then a 3 m thick interval follows that has not yielded *Oertlispongus*. In the upper part of the section from samples MD18 to MD25 *Oertlispongus inaequispinosus longispinosus* n. sp. is present. This part belongs to the upper part of the middle and to the upper subzone of *Spongosilicarmiger italicus* Zone. Only 25 cm higher, in sample MD27, O. *inaequispinosus tumidospinosus* begins. This level belongs to the topmost *Spongosilicarmiger italicus* Zone. Transitional forms between *O. inaequispinosus longispinosus* and *O. inaequispinosus inaequispinosus* occur above all in the upper part of the *Spongosilicarmiger italicus* Zone. The characteristic tripartite subdivision of the main polar spine into a short straight proximal part, a subhorizontal middle part of different length and a slightly curved, backward directed distal part is present in the most specimens of *O. inaequispinosus inaequispinosus* and in all specimens of *O. inaequispinosus tumidospinosus* n. subsp., but not yet in *O. inaequispinosus longispinosus.*

Oertlispongus inaequispinosus tumidospinosus n. sp.
(Pl. 10, fig. 6; pl. 11, fig. 9)

Derivatio nominis: According to the tumid straight proximal part of the main polar spine.
Holotypus: The specimen on pl. 10, fig. 6; rep.-no. KoMo 1980 I-390.
Locus typicus: Passo della Gabiola, Vicentinian Alps.
Stratum typicum: Sample MD 27, uppermost part of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Material: 6 specimens.
Diagnosis: Shell globular, spongy, consisting of several (mostly 6–7) layers with small pores. Straight part of main polar spine very short and tumid. Distal part strongly recurvated. Distal end in the level of lower shell hemisphere or below it. Between the straight proximal part and the backward directed distal part a slightly curved subhorizontal part of various length is present. Second polar spine considerably thinner, needle-like, straight or slightly curved, situated in the axis of main polar spine.

One needle-like, but long by-spine is present, situated in different positions between the equator and the second polar spine.
Measurements:
Diameter of shell = 142–157 µm
Length of the tumid, straight proximal part of the main polar spine = 55–80 µm
Length of the second polar spine = 130–260 µm
Length of the by spine = 85–120 µm
Occurrence: Uppermost part of Lower Fassanian *Spongosilicarmiger italicus* Zone and basal part of Middle Fassanian *Ladinocampe multiperforata* Zone. Southern Alps.

Remarks: *Oertlispongus inaequispinosus longispinosus* n. subsp. from the middle and upper subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone has no tumid proximal part of the main polar spine. The subhorizontal middle part of the main polar spine is missing.
Oertlispongus inaequispinosus inaequispinosus DUMITRICĂ, KOZUR & MOSTLER, 1980 has a bunch of mostly small by-spines and the short, straight proximal part of the main polar spine is not or only a little widened.

Oertlispongis inaequispinosus unispinosus n. subsp.

(Pl. 10, figs. 2, 3)

Derivatio nominis: According the presence of only one polar spine
Holotypus: The specimen on pl. 10, fig. 3; rep.-no. KoMo 1980 I-622
Stratum typicum: Sample VCB, upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Material: 6 specimens.
Diagnosis: Shell globular, spongy, consisting of 7–9 concentrically arranged layers with small pores around a tiny microsphere. Straight proximal part of the main polar spine somewhat shorter than diameter of shell, remaining part strongly recurvated. Second polar spine replaced by several small needle-like by-spines. A bunch of numerous needle-like by-spines is present on one side of the lower hemisphere, in general nearer to the lower pole than to the equator.
Measurements:
Diameter of shell = 155–80 μm
Length of straight proximal part of polar spine = 107–115 μm
Maximum length of by-spines = 45–87 μm
Occurrence: Upper part of Lower Fassanian *Spongosilicarmiger italicus* Zone. Southern Alps (Italy).
Remarks: The replacement of the second polar spine, by several small needle-like spine distinguishes *Oertlispongus inaequispinosus unispinosus* from all other *Oertlispongus.* In all other features the new subspecies is identical with *inaequispinosus* DUMITRICĂ, KOZUR & MOSTLER, 1980.

Oertlispongus aspinosus n. sp.

(Pl. 10, figs. 9, 12; pl. 47, fig. 8)

1982 *Oertlispongus inaequispinosus* DUMITRICĂ, KOZUR et MOSTLER, pars - DUMITRICĂ, p. 64–65, pl. 1, figs. 2, 4 non! figs. 6, 7, 9
Derivatio nominis: According to the missing by-spines
Holotypus: The specimen on pl. 10, fig. 9; rep.-no. KoMo 1980 I-392B
Locus typicus: Passo della Gabiola section, Vicentinian Alps.
Stratum typicum: Sample MD 1, middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone
Material: 17 specimens.
Diagnosis: Shell globular, spongy, consisting of several layers with small pores around a tiny microsphere. Main polar spine hook-like, to scythe-like, with long proximal straight part (longer than or as long as the diameter of shell) and sharply recurvated distal part that ends somewhat above or in the level of the shell. Second polar spine somewhat narrower than main polar spine, long, straight or curvated, situated mostly somewhat obliquely to the axis of the main polar spine. By-spines missing or one needle-like, very small by-spine is present.
Measurements:
Diameter of shell = 110–135 μm
Length of straight proximal part of main polar spine = 131–160 μm
Length of second polar spine = 305–328 μm
Occurrence: Middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone. Southern Alps (Italy) and Northern Calcareous Alps (Austria).
Remarks: The long, straight proximal part of the main polar spine (longer than shell diameter) distinguishes this species from *Oertlispongus inaequispinosus* DUMITRICĂ, KOZUR & MOSTLER, 1980 that has, moreover, either a bunch of small by-spines or one to two long by-spines. The second polar spine in this species is more delicate.

Transitional forms to the forerunner of the genus *Oertlispongus* with very long straight part of the main polar spine occur in the lower *S. italicus* Zone. The distal part of the main spine is only slightly curved to slightly recurved. These most primitive representatives of the genus Oertlispongus begin at the base of the *reitzi* Oppel Zone (base of the *Kellnerites* fauna).

Oertlispongus aspinsosus aspinosus n. subsp.
(Pl. 10, fig. 9)

Holotypus: Holotypus of the species.
Diagnosis: With the character of the species. Second polar spine straight.
Occurrence: As for the species.
Remarks: *Oertlispongus aspinosus curvatus* n. subsp. is distinguished by its distally distinctly curved second polar spine.

Oertlispongus aspinosus curvatus n. subsp.
(Pl. 10, fig. 12)

Derivatio nominis: According to the distally curved second polar spine.
Holotypus: The specimen on pl. 10, fig. 12; rep.-no. KoMo 1980 I-394
Locus typicus: Passo della Gabiola section, Vicentinian Alps.
Stratum typicum: Sample MD 1, middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Diagnosis: With the character of the species. Distal part of second polar spine distinctly curved.
Occurrence: Middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone. Southern Alps (Italy).
Remarks: *Oertlispongus aspinosus aspinosus* n. subsp. displays a straight second polar spine.

Oertlispongus bispinosus n. sp.
(Pl. 11, fig. 1)

Derivatio nominis: According to the two main polar spines.
Holotypus: The specimen on pl. 11, fig. 1; rep.-no. KoMo 1980 I-624.
Locus typicus: Passo della Gabiola section, Vincentinian Alps.
Stratum typicum: Sample MD 1, middle subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone
Material: 1 specimen
Diagnosis: Shell spherical, spongious, consisting of several layers with small pores. Two main polar spines originate adjacent to each other in one pole region. Their straight part is a little shorter than the shell diameter. The curvature is rather symmetrical, but the recurvation is only weak. The distal end lies considerably above the shell level. Second polar spine very fragile, not fully preserved, but surely not very long. The by-spine in the lower shell hemisphere has seemingly the same shape and size as the second polar spine, but only the proximal part is preserved.
Measurements:
Diameter of shell = 105 μm
Length of the straight proximal part of the two main polar spines = 90 μm and 95 μm
Occurrence: Only known from the stratum typicum.
Remarks: Only one, but well preserved specimen is present. The possibility of a pathologic form can be therefore not excluded. However, the *Oertlispongus* species from the same sample have all a robust, large second polar spine and the proximal straight part of the main polar spine is shorter than the diameter of shell.

Similar is *Oertlispongus inaequispinosus longispinosus* n. subsp. from the upper subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone, distinguished by the missing second main polar spine and the robuster, mainly two by-spines.

Most similar, perhaps identical, in *Oertlispongus* sp. from the upper subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone. This form is only distinguished by the robuster second polar spine and the missing second main polar spine. The form of the main polar spine is identical, its straight main part is a little longer in *Oertlispongus* sp. The by-spine is in both taxa delicate.

Oertlispongus primitivus n.sp.
(Pl. 11, figs. 4, 10)

Derivatio nominis: According to the primitive features for the genus *Oertlispongus*.
Holotype: The specimen on pl. 11, fig. 10, rep.-no. KoMo 1980 I-392C.
Locus typicus: Passo della Gabiola section, Vincentinian Alps.
Stratum typicum: Sample MD 1, middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Material: 11 specimens.
Diagnosis: Shell subglobular, spongy, consisting of 6-8 layers with small pores around a microsphere. Main polar spine scythe-like. The long, straight proximal part is longer than or as long as the diameter of shell. Distal part moderately to strongly recurved. The distal end of the main polar spine lies somewhat above to considerably below the shell level. Second polar spine rather robust, large, straight, situ-

ated somewhat obliquely to the axis of the main polar spine. By-spine large, situated in different positions between the equator and the second polar spine. On the opposite hemisphere a second small, needle-like by-spine may be present.

Measurements:

Diameter of shell = 125-132 µm

Length of the straight proximal part of the main polar spine = 135-154 µm

Length of the second polar spine (not fully preserved in any specimen) = more than 200 µm

Length of the by-spine = 195-213 µm

Occurrence: Middle subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone. Southern Alps (Italy).

Remarks: The similar *Oertlispongus aspinosus* n. sp. is distinguished by the missing or very small by-spine.

In *Oertlispongus inaequispinosus* DUMITRICĂ, KOZUR & MOSTLER, 1980 the straight proximal part of the main polar spine is shorter than the diameter of the shell.

In the upper subzone of the Lower Fassanian *Spongosilicarmiger* italicus Zone very rarely a similar form occurs (*Oertlispongus* sp. pl. 10, fig. 8), in which the main polar spine is distally curvated, but not recurved. The by-spine is only small. Only two specimens (one of it well preserved) have been found that represent perhaps a further new species or subspecies.

Genus *Baumgartneria* DUMITRICĂ, 1982

Type species: *Baumgartneria retrospina* DUMITRICĂ, 1982

Baumgartneria retrospina DUMITRICĂ, 1982
(Pl. 12, figs. 1, 4–6, 8, 9)

1982 *Baumgartneria retrospina* n.sp., pars – DUMITRICA, p. 70, pl. 9, figs. 4, 5, 7, 8; non! figs. 3, 6; pl. 10, figs. 1, 2; pl. 12, fig. 3

Occurrence: Middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone up to lower subzone of Middle Fassanian *Ladinocampe multiperforata* Zone. Hungary, Italy, Yugoslavia.

Remarks: Forms with triangular, broad axial spine are here regarded as independent species.

The occurrence in the Longobardian and Tuvalian (because of the occurrence of *Halobia styriaca* really Lower Norian), reported by DUMITRICĂ (1982) cannot be confirmed.

Baumgartneria retrospina hemicircularis n. subsp.
(Pl. 12, fig. 3)

1982 *Baumgartneria retrospina* n. sp., pars – DUMITRICĂ, p. 70, only the specimen on pl. 12, fig. 3.

Derivatio nominis: According to the half circle formed by the lateral branches

Holotypus: The specimen on pl. 12, fig. 3; rep.-no., KoMo 1980 I-345

Locus typicum: Road cut San Ulderico-Palle, Vincentinian Alps

Stratum typicum: Sample TT 4, lower subzone of Middle Fassanian *Ladinocampe multiperforata* Zone

Material: 3 specimens.

Diagnosis: Shell globular, spongy, consisting of 7-9 layers with small pores around a microsphere. Main polar spine very large. Stem slender, with round cross section, shorter than shell diameter. Axial spine long, needle-shaped. Lateral branches very long, with round cross section, forming a half circle with the shell in the centre. No other spines are present.

Measurements:

Diameter of shell = 175–183 µm

Length of stem = 117–125µm

Length of axial spine = 180–250 µm

Distance between the ends of the lateral branches = 500–525 µm

Occurrence: Middle Fassanian *Ladinocampe multiperforata* Zone of Southern Alps (Italy) and Eastern Carpathians (Romania).

Remarks: *Baumgartneria retrospina retrospina* DUMITRICĂ, 1982 displays always a more or less long, distinct, slightly upward curved or straight inner part of the lateral branches.

Baumgartneria curvisipina DUMITRICĂ, 1982 from the Longobardian displays similarly shaped lateral branches, but lacks an axial spine. Moreover, the stem is shorter.

Baumgartneria bifurcata DUMITRICĂ, 1982
(Pl. 13, figs. 3, 5, 6, 10)

1982 *Baumgartneria bifurcata* n. sp. – DUMITRICĂ, p. 71, pl. 10, figs. 3, 4

Occurrence: Middle and upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone. Southern Alps and Sosio Valley (Italy), Dinarides (Yugoslavia), Eastern Carpathians (Romania), Balaton Highland and Darnóhegy area (Hungary).

Remarks: There are two morphotypes: One with slightly recurved lateral branches of the main polar spine and another one with straight branches, perpendicular to the stem. In our material the first morphotype occurs in the middle and upper subzone, the second morphotype in the upper subzone of Lower Fassanian.

The occurrence of typical *Baumgartneria bifurcata* DUMITRICĂ and *B. retrospina* DUMITRICĂ already in the lower part of the middle subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone indicates that the genus *Baumgartneria* was possibly present already in the lower part of this zone, probably already before the genus *Oertlispongus* DUMITRICĂ, KOZUR & MOSTLER.

Baumgartneria lata n. sp.

1982 *Baumgartneria retrospina* n. sp., pars – DUMITRICĂ, p. 71–72, only the specimens on pl. 9, figs. 3, 6

Derivatio nominis: According to the broad, triangular axial spine.

Holotypus: The specimen figured by DUMITRICA, 1982 on pl. 9, fig. 3.

Locus typicus: Eastern end of the klippe of Piatra Zimbrului, Rarău Mountain, Eastern Carpathians, Romania.

Stratum typicum: Sample R 78/1 (see DUMITRICĂ, 1982, p. 62), grey, micritic cherty limestone, Middle Fassanian *Ladinocampe multiperforata* Zone.

Diagnosis: Shell spongy, consisting of 7–10 layers. Main polar spine very robust, somewhat flattened. Stem relatively broad, with oval to roundish oval cross section. Axial spine short, flattened, triangular with broad base. Lateral branches slightly downward curved, distally a little to moderately recurved.

Measurements:

Length of stem = 100-147 µm
Length of axial spine = 105–130 µm
Basal width of axial spine = 67–93 µm

Occurrence: Middle Fassanian *Ladinocampe multiperforata* Zone. Southern Alps (Italy) and Eastern Carpathians (Romania).

Remarks: Only 3 broken specimens are present in our material. Therefore the holotype has been choicen from the well preserved material of this species figured by DUMITRICĂ (1982).

Baumgartneria retrospina DUMITRICĂ, 1982 is distinguished by the needle-like axial spine (basal width 20–46 µm, mostly around 30 µm) with roundish cross section. Only in few specimens the axial spine is somewhat flattened. Transitional forms from the higher part of Lower Fassanian displays a somewhat flattened, slender triangular axial spine. These forms display still a distinct, straight or slightly upward curved inner part of the lateral branches.

Baumgartneria stellata DUMITRICĂ, 1982
(Pl. 13, fig. 1)

1982 *Baumgartneria stellata* n. sp. – DUMITRICĂ, p. 72, pl. 10, fig. 5, pl. 11, figs. 1-3.

Occurrence: Middle subzone (upper part) of Lower Fassanian *Spongosilicarmiger italicus* Zone up to Lower Longobardian. Italy, Romania. In our material this rare species occur in the higher part of Lower Fassanian.

Baumgartneria transita n. sp.
(Pl. 13, figs. 2, 9)

Derivatio nominis: According to the transitional character between *B. bifurcata* and *B. trifurcata.*

Holotypus: The specimen on pl. 13, fig. 9; rep.-no. KoMo 1980 I-331.

Locus typicus: Passo della Gabiola section, Vicentinian Alps.

Stratum typicum: Sample MD 23, upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.

Material: 7 specimens.

Diagnosis: Spongy shell displays 7-9 layers. Main polar spine stout, differentiated. Stem robust. Side branches straight, perpendicularly to the spine axis, distally on one side bifurcated, on the other side trifurcated. Axial spine long, needle-shaped.

Measurements:

Total length of spine = 300–430 µm
Length of stem = 130-195 µm

Length of axial spine = 133-200 µm
Length of side branches = 120-140 µm
Occurrence: Upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone. Southern Alps (Italy).
Remarks: In *Baumgartneria bifurcata* DUMITRICĂ, 1982 both side branches are terminally bifurcated, in *B. trifurcata* DUMITRICĂ, 1982 both side branches are terminally trifurcated.

Baumgartneria trifurcata DUMITRICĂ, 1982
(Pl. 13, fig. 7)

1982 *Baumgartneria trifurcata* n. sp. – DUMITRICĂ p. 71, pl. 10, fig. 6, pl. 11, figs. 4–7..

Occurrence: ? Upper part of middle subzone, upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone. CSFR, Hungary, Italy, Romania, Yugoslavia.
Remarks: In our material *Baumgartneria trifurcata* DUMITRICĂ begins after *B. bifurcata* DUMITRICĂ that is seemingly the forerunner of *B. trifurcata.* Because of the straight side branches in *B. trifurcata,* this species derived from the morphotype with straight side branches within *B. bifurcata.*

Baumgartneria yehae n. sp.
(Pl. 12, figs. 2, 11)

Derivatio nominis: In honour of Dr. Kuei-Yu YEH, Taichung, Taiwan
Holotypus: The specimen on pl. 12, fig. 11; rep.-no. KoMo 1980 I-371.
Locus typicus: FD section between Mte. Fallison and Mte. Spitz, Vicentinian Alps (Italy).
Stratum typicum: Sample FD 17.
Material: 8 specimens.
Diagnosis: Shell globular, spongy, consisting of several concentric layers around a microsphere. Only one polar spine is present. Its stem is slender, round, moderately long. Lateral branches only a little downward curved, ending above the shell. Axial spine moderately long, slender.
Dimensions:
Diameter of shell = 122–29 µm
Total length of spine = 200–250 µm
Length of stem = 80–116 µm
Length of axial spine = 120–131 µm
Length of lateral branches = 330-445 µm
Occurrence: Fassanian, Vicentinian Alps (Italy).
Remarks: This species is distinguished by the only slightly recurvated lateral branches that end considerably above the shell level..

Genus *Falcispongus* DUMITRICĂ, 1980

Type species: *Falcispongus falciformis* DUMITRICĂ, 1980
Remarks: Already DUMITRICĂ (1982) recognized that common morphogenetic trends can be observed in the genera *Oertlispongus* and *Falcispongus,* especially among the most primitive species *Falcispongus calcaneus.* In our material further phylomorphogenetic trends have been observed that are common in both genera. Stratigraphically older *Oertlispongus* species have a long, straight proximal part (stem) of the main polar spine, as long as or longer than the diameter of shell. Contemporaneous specimens of *Falcispongus calcaneus* DUMITRICĂ, 1982 display the same feature. Stratigraphically younger *Oertlispongus* species display a short stem of the main polar spine, contemporaneous successors of *Falcispongus calcaneus* display also here the same features.

The morphologic differences between *Oertilspongus* and *Falcispongus* are only minimal (development of lateral wings on the main polar spine in *Falcispongus).* In general, this is not a generic feature. However, *Falcispongus* is the first representative of Oertlispongidae with strongly differentiated main polar spines. For this reason we follow here DUMITRICĂ (1982) and regard *Falcispongus* as independent genus.

Falcispongus falciformis DUMITRICĂ, 1982
(Pl. 14, figs. 2, 6, 12)

1982 *Falcispongus falciformis* n. sp., pars – DUMITRICĂ, p. 66, pl. 2, fig. 7; pl. 3, figs. 5, 6, non! pl. 1, fig. 5; pl. 2, figs. 1, 3; pl. 3, figs. 2, 3

Occurrence: Middle Fassanian *Ladinocampe multiperforata* Zone of Sosio Valley and Southern Alps (both Italy) and Eastern Carpathians (Romania). First primitive forms begin in the higher part of the upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Remarks: In the forerunner *Falcispongus praefalciformis* n. sp. from the Lower Fassanian the outer wing widens proximally gradually and tapers distally stronger. Transi-

tional forms, in which the proximal widening and the distal narrowing of the outer wing are of the same degree (subhemicircular outline of the outer wing) are here placed into *F. falciformis*.

The Longobardian occurrence of *Falcispongus falciformis* in the Darnóhegy area (Hungary) reported by DE WEVER (1984) cannot be confirmed. DE WEVER figured under this species on pl. 3, fig. 8 a still undescribed new species. In this form half of the subhorizontally to slightly downward curved part of the spine is broad and flattened, whereas this part of the spine is needle-shaped in real *F. falciformis*.

Falcispongus calcaneus DUMITRICĂ, 1982 nom. corr.

1982 *Falcispongus calcaneus* n. sp., pars – DUMITRICĂ, p. 65–66, pl. 1, fig. 1; pl. 2, figs. 5 (?), 6, non! figs. 2, 4, 8 (?)

Occurrence: Middle to upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone. Italy (Southern Alps, Sicily, Lagonegro Basin), Hungary.

Remarks: Most primitive forms of the *F. calcaneus* group have a very long, slender stem of the main polar spine that is considerably longer than the shell diameter. The angle between the stem and the slightly recurved distal part of the main polar spine is rather large and the distal end of the main polar spine lies above the level of the shell. This shape of the main polar spine corresponds to *Falcispongus falciformis* DUMITRICĂ, 1982 that is only distinguished by the presence of an narrow inner flattened wing on the main polar spine and by the shorter stem. These primitive forms of the *F. calcaneus* group, here described as *F. prisucs* n. sp. are characteristical for the middle subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone.

Somewhat higher evolved are the holotype and the topotype specimens figured by DUMITRICĂ (1982) from sample Rc4. In these forms the stem of the main polar spine is still slender and long (as long as the shell diameter or a little longer), but the distal part is already strongly recurved and it ends in the level of the shell, mostly below it. These forms occur in the (higher part of) middle subzone and (or) in the lower part of the upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.

In the Middle Fassanian *Ladinocampe multiperforata* Zone and in the Upper Fassanian only specimens with short stem of the main polar spine occur in which the recurvation is as strong as in the holotype. These forms are here separated from *F. calcaneus* as independent species *F. postcalcaneus* n. sp. The occurrence of *F. calcaneus* in the Longobardian of the Darnóhegy area (DE WEVER, 1984) cannot be confirmed. DE WEVER (1984, pl. 3, fig. 1) figured under this species a badly preserved *F. hamatus* DUMITRICĂ, 1980.

Falcispongus postcalcaneus n. sp.
(Pl. 14, figs. 5, 8, 9)

1982 *Falcispongus calcaneum* n. sp., pars – DUMITRICĂ, p. 65, pl. 2, figs. 2, 4, 8 (?), non! pl. 1, fig. 1; pl. 2, figs. 5, 6

1990 *Falcispongus calcaneum* DUMITRICĂ, pars – GORIČAN, p. 144-145, pl. 3, figs. 5 (?), 6, non! fig. 4

Derivatio nominis: According to the occurrence after *F. calcaneus* DUMITRICĂ.

Holotypus: The specimen on pl. 14, fig. 8; rep.-no. KoMo 1980 I-627.

Locus typicus: Road cut San Ulderico-Pallé, Vicentinian Alps.

Stratum typicum: Sample TT 7, lower subzone of Middle Fassanian *Ladinocampe multiperforata* Zone.

Material: 53 specimens.

Diagnosis: Shell subglobular, spongy, consisting of 7-10 layers with small pores around a microsphere. Main polar spine with short, relatively broad stem that is somewhat to considerably shorter than the diameter of the shell. Distal part moderately to strongly recurved, its end lies mostly in the level of the shell, rarely immediately above it or below it. Outer wing on the distal part of the stem and on the flexuose part of the main polar spine rounded subtriangular to subhemicircular. A bunch of small needle-like by-spines is situated in the lower hemisphere of the shell, obliquely to the axis of the main polar spine.

Measurements:
Diameter of shell = 135–187 µm
Length of stem = 100–144 µm

Occurrence: Middle Fassanian *Ladinocampe multiperforata* Zone to Upper Fassanian.

Remarks: In the Lower Fassanian *Falcispongus calcaneus* DUMITRICĂ, 1982 the stem is as long as the diameter of shell or longer.

In the Lower to Middle Fassanian *Falcispongus priscus* n. sp. the stem is longer than the diameter of shell and the distal part of the main polar spine is only a little recurved or horizontally.

Falcispongus praefalciformis n. sp.
(Pl. 14, fig. 1)

1982 *Falcispongus falciformis* n. sp., pars – DUMITRICĂ, p 66, pl. 1, fig. 5; pl. 3, fig. 2, 3, non! pl. 2, figs. 1, 3, 7; pl. 3, figs. 5, 6

Holotype: The specimen, figured by DUMITRICĂ (1982) on pl. 3, fig. 3.

Locus typicus: 550 m northeast of Monte Anghebe, along the road descending to Recoaro, Vicentinian Alps.

Stratum typicum: Sample Rc 4, Buchenstein Formation, middle subzone or lower part of upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.

Material: 12 specimens.

Diagnosis: Shell spongy, consisting of 6–9 layers with small pores. Main polar spine sickle-shaped with wings on both sides along the upper part of the stem and at the beginning of the flexuose portion. Inner wing very narrow, sometimes indistinct. Outer wing widens gradually and slowly in its proximal part and narrows faster in its distal part. Distal part of the spine long, needle-shaped, straight or a little curved, only a little or not backward directed. Angle between the proximal and distal part of the polar spine large, partly about 90°. Several needle-like short by-spines are present, often arranged in a bunch near the pole opposite to main polar spine but they are never situated directly in the axis of the main polar spine. Further very small by-spines may be present, above all near the equator.

Occurrence: Middle and upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone of Southern Alps and Sosio Valley (Italy).

Measurements:

Diameter of shell = 161–172 µm

Length of stem of main polar spine = 215–253 µm

Remarks: In *Falcispongus falciformis* DUMITRICĂ 1982 the proximal widening is stronger and not so gradual than the distal narrowing. In continuation of this development the Upper Fassanian *Falcispongus uncus* GORICAN, 1990 evolved, in which the proximal widening is abrupter.

Falcispongus priscus n. sp.
(Pl. 14, figs. 3, 4, 7, 11)

Derivatio nominis: Oldest known representative of the genus *Falcispongus*.

Holotypus: The specimen on pl. 14, fig. 3; rep.-no. KoMo 1980 I-625.

Locus typicus: Passo della Gabiola section, Vincentinian Alps

Stratum typicum: Sample MD 1, middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.

Material: 34 specimens.

Diagnosis: Shell spherical, spongy, consisting of several layers with small pores. Main polar spine with slender, very long stem that is in stratigraphically older forms considerably longer, in stratigraphically younger forms somewhat longer than the shell diameter. Distal part of the main polar spine only slightly or not recurved. It ends considerably above the shell level. Angle between the stem and the distal part of the main polar-spine therefore rather large, partly 90°. On the outer side of the flexuose portion of the spine a rounded triangular to hemicircular flattened wing is present.

Second polar spine missing. A bunch of very small needle-like spines is mostly present, situated in the lower hemisphere of the shell.

Measurements:

Diameter of shell = 110–168 µm

Length of stem of the main polar spine = 135–192 µm

Occurrence: Middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone to lower subzone of Middle Fassanian *Ladinocampe multiperforata* Zone. Southern Alps (Italy), Hungary.

Remarks: *Falcispongus calcaneus* DUMITRICĂ, 1982 has a stronger recurved main polar spine that ends in or below the level of the shell. The angle between the proximal and distal parts of the main polar spine is therefore in *F. calcaneus* smaller. Moreover, the stem of the main polar spine is somewhat shorter in this species.

Falcispongus falciformis DUMITRICĂ, 1982 displays the same shape of the main polar spine with a similar angle between the proximal and distal part and a similar degree of recurvation. However, the stem of the main polar spine is shorter and also on the inner side of the stem a narrow wing is present.

Falcispongus transitus n. sp.

Derivatio nominis: According to the morphological transition between the *F. calcaneus* and *F. falciformis* group

Holotypus: The specimen figured by DUMITRICĂ (1982) on pl. 2, fig. 1.

Locus typicus: 500 m northeast of Monte Anghebe, along the road descending to Recoaro, Vicentinian Alps.

Stratum typicum: Sample Rc 4, Buchenstein Formation, middle subzone or lower part of upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.

Diagnose: Shell spongy, consisting of 7–9 layers. Main polar spine sickle-shaped, distal part long, needle-shaped, nearly straight, somewhat downward directed. Distal end somewhat above the shell level. Inner and outer wing developed in the distal parts of the stem and along the flexuose portion of the spine. Inner wing narrow, with concave, in the lower part oblique margin. Outer wing in its distal part also narrow, in its proximal part with rounded subtriangular to subcircular lobe.

Occurrence: Middle subzone or lower part of upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone of Southern Alps.

Remarks: This species was originally placed into *Falcispongus falciformis* DUMITRICĂ, 1982, in which all forms with two undifferentiated wings and long, needle-like, only a little recurved distal part of the main polar spine have been united. They were differentiated from *Falcispongus calcaneus* DUMITRICĂ, 1982 s. l. by the form of the main polar spine, the rounded subtriangular to subcircular lobe-like outer wing and the missing inner wing in the latter species. However, the oldest species of the *F. calcaneus* group, *F. prisus* n. sp. displays the same spine outline as the *F. calcaneus* group and *Falcispongus transitus* n. sp. displays a subtriangular or subhemicircular lobe on the outer wing as in the *calcaneous* group, the typical spine shape of the *falciformis* group and wings on the inner and outer side of the spine. In these stratigraphically oldest *Falcispongus* species characters both of *F. calcaneus* and of *F. falciformis* are present.

Falcispongus prisus n. sp. from the middle subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone is distinguished by the missing inner wing; *Falcispongus calcaneus* DUMITRICĂ, 1982 additionally by the strongly recurved spine.

Falcispongus falciformis DUMITRICĂ, 1982 and *F. praefalciformis* n. sp. display no lobe on the outer wing.

Falcispongus n. sp.

1990 Falcispongus hamatus DUMITRICĂ, 1982a - GORIČAN, p. 145, pl. 3, fig. 7

Occurrence: Upper Fassanian of Yugoslavia and Hungary.

Remarks: This new species is characterized by a hemicircular outline of the outer wing and a relatively broad inner wing. Both wings are present on large parts of the stem and on the flexion part of the main polar stem.

The Middle Fassanian *Falcispongus falciformis* DUMITRICĂ, 1982 is distinguished by the larger size of the main polar spine and by a longer stem.

The Longobardian *Falcispongus hamatus* DUMITRICĂ 1982 is distinguished by the abrupt widening of the outer wing in its proximal part.

Genus *Paroertlispongus* KOZUR & MOSTLER, 1981

Type species: *Paroertlispongus multispinosus* KOZUR & MOSTLER, 1981

Synonyma:

Acaeniospongus KOZUR & MOSTLER, 1981
Flexispongus LAHM, 1984
Parachaeospongoprunum LAHM, 1984
Pseudoertlispongus LAHM, 1984

Remarks: Nodes on the shell may be present in typical Paroertlispongus. Therefore *Acaeniospongus* KOZUR & MOSTLER, 1981 is regarded as synonym of *Paroertlispongus* KOZUR & MOSTLER, 1981.

In *Flexispongus* LAHM, 1984 both polar spines are curved, but not recurved. Bending of different degree without recurvation is typical for several typical *Paroertlispongus* species. Therefore Flexispongus LAHM, 1984 is an younger synonym of *Paroertlispongus* KOZUR & MOSTLER, 1981.

In *Pseudoertlispongus* LAHM, 1984 (only one species with two badly preserved specimens) the main polar spine is terminally slightly curved. This is only a species character. In some specimens also the second polar spine is somewhat curved, like in "*Flexispongus*". All transitions between forms with straight polar spines and forms with terminally totally curved polar spine(s) are present. Recurvation, as in the main polar spine of *Oertlispongus* KOZUR & MOSTLER, 1981 is never present. Both in forms with straight and curved polar spine(s) forms with and without nodes on the shell surface are present. Therefore between the genera *Acaenisopongus, Flexispongus, Paroertlispongus* and *Pseudoertlispongus* all transitions are present. Because they have all the same stratigraphic range, they are here regarded as synonymous.

Pararchaeospongoprunum LAHM, 1984 is a typical *Paroertlispongus*, in which the base of one or both polar spines is carniate. The largest part of the polar spines is round. Only one species is present that may be near related to primitive forms of the Oertlispongidae. A separation from *Paroertlispongus* is not possible. All transitions to typical *Paroertlispongus* species with throughout round spines are present. Even within *P. hermi,* the only *"Pararchaeospongoprunum"* species, all transitions are present. There are forms, in wich both polar spines are at their basis carinate, in other ones only one polar spine displays a carinate base and in some specimens both polar spines display a round cross section throughout their length.

Paroertlispongus multispinosus KOZUR & MOSTLER, 1981

(Pl. 12, fig. 10; pl. 13, figs. 4, 11)

1981 *Paroertlispongus multispinosus* n. gen. n. sp. – KOZUR & MOSTLER, p. 48, pl. 44, fig. 2; pl. 45, fig. 1

Occurrence: Upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.

Remarks: Some specimens of *P. multispinosus* display distinct nodes around the base of the needle-like by-spines. In other specimens these nodes are indistinct.

Paroertlispongus hermi (LAHM, 1984)

(Pl. 10, fig. 10; pl. 11, figs. 3, 5; pl. 47, fig. 11)

1984 *Pararchaeospongoprunum hermi* n. gen. n. sp. - LAHM, p. 42, pl. 7, fig. 1

Occurrence: Middle and upper subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone. Alps, Hungary, Sosio Valley (Sicily, Italy), Yugoslavia.

Remarks: Some specimen display a subglobular shell. Perhaps they can be later separated from the typical *P. hermi* with elongated ellipsoidal shell as separate taxon.

Paroertlispongus obliquus n. sp.

(Pl. 11, fig. 8)

Derivatio nominis: According to the arrangement of the polar spines.

Holotypus: The specimen on pl. 11, fig. 8; rep.-no. KoMo 1980 I-729.

Locus typicus: Road cut San Ulderico - Pallé, Vicentinian Alps (Italy).

Stratum typicum: Sample TT 13, upper subzone of Middle Fassanian *Ladinocampe multiperforata* Zone.

Material: 7 specimens.

Diagnosis: The ellipsoidal shell consists of 10 or more spongy layers around a microsphere. One polar spine is robust, broad, but short. Its distal part is needle-like. The opposite polar spine lies obliquely to the other polar spine. It is long, slender. Several tiny, short, needle-like by-spines are present. The shell displays no nodes around the base of the by-spines.

Measurements:

Long axis of shell = 215–223 μm
Short axis of shell = 185–189 μm
Length of the short polar spine = 142–166μm
Length of the long polar spine = 200–231μm

Occurrence: Upper subzone of Middle Fassanian *Ladinocampe multiperforata* Zone.

Remarks: The similar *Paroertlispongus hermi* (LAHM, 1984) from the Lower Fassanian displays only a little excentric polar spines. By-spines are missing.

Paroertlipsongs rarispinosus KOZUR & MOSTLER, 1981

(Pl. 12, figs. 7)

1981 *Paroertlispongus rarispinosus* n.sp. – KOZUR & MOSTLER, p. 48, pl. 1, fig. 3

Occurrence: Upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone to lower subzone of Middle Fassanian *Ladinocampe multiperforata* Zone.

Remarks: Primitive forms display an ellipsoidal shell. In these forms the second polar spine is small, but distinctly larger than the by-spines. All other forms display a spherical shell and the second polar spine displays about the same size as the by-spines.

Paroertlispongus weddigei (LAHM, 1984)

(Pl. 12, figs. 12–14)

1984 *Pseudoertlispongus weddigei* n. gen. n. sp. – LAHM, pp. 46–67, pl. 8, fig. 10

Occurrence: Uppermost part of Lower Fassanian *Spongosilicarmiger italicus* Zone and lower subzone of Middle Fassanian *Ladinocampe multiperforata* Zone. Hungary, Italy (Southern Alps and Sosio Valley, Sicily).

Remarks: The length of the bent distal end of the main cusp varies, but the angle of this part again the stem is nearly constant. The distal end of the main polar spine is therefore always obliquely upward directed. The distal end of the second polar spine may be also slightly curved. Bending of different degree, but never recurvation is characteristic for several *Paroertlispongus* species. It is only a species character. Therefore the monotypic *Pseudoertlispongus* LAHM, 1984 is an younger synonym of *Paraoertlispongus* KOZUR & MOSTLER, 1981.

Paroertlispongus weddigei displays especially well developed nodes around the by-spines on the shell surface. It belongs therefore to the *Acaeniospongus* morphotype.

Genus *Turospongus* n. gen.

Type species: *Turospongus trispinosus* n. gen.
Diagnosis: Shell spherical, consisting of 7–11 layers of spongy meshwork around a micropsphere. Only one polar spine is present. Distally 3 recurvated branches in triangular arrangement and an axial spine are present.
Occurrence: Lower subzone of Middle Fassanian *Ladinocampe multiperforata* zone of the Southern Alps.
Remarks: *Baumgartneria* DUMITRICĂ, 1982 displays only 2 recurvated side-branches at the stem end of the polar spine. These side branches are situated in one plane.

Turospongus trispinosus n. gen. n. sp.
(Pl. 13, fig. 8; pl. 14, fig. 10)

Derivatio nominis: According to the 3 lateral branches of the polar spine.
Holotypus: The specimen on pl. 13, fig. 8; pl. 14, fig. 10; rep.-no. KoMo 1980 I-262.
Locus typicus: Road cut San Ulderico-Pallé (Vincentian Alps, Italy).
Stratum typicum: Sample TT 7, lower part of Middle Fassanian an *Ladinocampe multiperforata* Zone.
Material: 4 specimens.
Diagnosis, occurrence and remarks: As for the genus.
Dimensions:
Diameter of shell = 170–175 µm
Length of stem = 132–138 µm
Length of lateral branches = 220–250 µm

Family Intermediellidae LAHM, 1984

Remarks: The genus *Paurinella* KOZUR & MOSTLER, 1981 comprises both forms with subspherical and with subdiscoidal shell. All transitions between these shell shape are present. The type species *P. curvata* KOZUR & MOSTLER, 1981 comprises forms with subsphaerical to inflated discoidal shell.

LAHM (1984) introduced for a form with (inflated) discoidal shell the new genus *Intermediella* LAHM, 1984 that is an younger synonym of *Paurinella* KOZUR & MOSTLER, 1981. He introduced also a new family Intermediellidae LAHM, 1984 that is according to his opinion transitional between the families Oertlispongidae KOZUR & MOSTLER, 1980 and Relindellidae KOZUR & MOSTLER, 1980. Their are really near relations to the family Oertlispongidae, but no relations to the Relindellidae.

KOZUR & MOSTLER (1981) placed forms of the Intermediellidae in the Oertlispongidae. However, forms with 3 or more spines, not in polar arrangement as in the Oertlispongidae, may be separated as independent family from the Oertlispongidae. Inspite of the synonymy of the nominate genus, the family Intermediellidae can be used after emendation.
Emended diagnosis: Shell subspherical to discoidal, spongy, consisting of a microsphere surrounded by numerous concentric shells of spongy meshwork. Mostly 3 and 4 main spines are present that do not show polar arrangement. In forms with 3 spines one spine can be replaced by a pylom, surrounded by smaller spines. The main spines may be situated in one plane, but they may be also in tetrahedral arrangement, rarely irregularly spaced on the shell surface. Additional by-spines may be present.
Occurrence: Ladinian to Rhaetian, worldwide.
Assigned genera:
Paurinella KOZUR & MOSTLER, 1981
Synonym: *Intermediella* LAHM, 1984
Katorella KOZUR & MOSTLER, 1981
Neopaurinella KOZUR & MOSTLER, 1981
Discokatorella n. gen.
Tetrapaurinella n. gen.
Remarks: The similar Oertlispongidae KOZUR & MOSTLER, 1980 display always polar arrangement of the two main spines. One of the polar spines may be reduced.

The genus *Recoaroella* LAHM, 1984 originally placed into the Intermediellidae LAHM, 1984, is here regarded as a representative of the Relindellidae KOZUR & MOSTLER, 1980 with basally carinate, thin round spines.

The Gomberellidae KOZUR & MOSTLER, 1981 emend. displays a polar arrangement of 2–3 spines around one pole. Moreover, they tend to get an ellipsoidal shell.

Genus *Paurinella* KOZUR & MOSTLER, 1981

Type species: *Paurinella curvata* KOZUR & MOSTLER, 1981
Synonym: *Intermediella* LAHM, 1984

Paurinella curvata spinosa n. subsp.
(Pl. 15, fig. 1,8)

Derivatio nominis: According to the presence of by-spines.
Holotypus: The specimen on pl. 15, fig. 1; rep.-no. KoMo 1980 I-339.
Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy).
Stratum typicum: Sample TT 2, lower subzone of Middle Fassanian *Ladinocampe multiperforata* zone.
Material: 12 specimens.
Diagnosis: Shell subsphaerical to inflated discoidal, consisting of numerous concentric layers of spongy meshwork around a microsphere. The 3 round main spines are situated in one plane, but each curved out from this plane in different directions. Two of the main spines are always curved against each other. Short, needle-like by-spines always present.
Dimensions:
Largest diameter of shell = 156–163 µm
Length of main spine = 200–215 µm
Length of by-spines = 12–20 µm
Occurrence: Lower subzone of Middle Fassanian *Ladinocampe multiperforata* Zone.
Remarks: *Paurinella curvata curvata* KOZUR & MOSTLER, 1981 from the upper subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone has no by-spines.

In *Paurinella tornata* n. sp. the 3 main spines are curved in the same direction.

Paurinella curvata tenispinosa n. subsp.
(Pl. 15, figs. 2–3)

Derivatio nominis: According to the slender spines
Holotypus: The specimen on pl. 15, fig. 2; rep.-no. KoMo 1980 I-338.
Locus typicus: Passo della Gabiola, section II, Vicentinian Alps (Italy).
Stratum typicum: Sample MD 32, Fassanian.
Material: 14 specimens.
Diagnosis: Shell spongy, inflated discoidal, lateral outline rounded subrectangular. The shell consists of numerous layers of spongy network around a microsphere. The 3 main spines are slender with round cross section. They are each curved in different directions from the plane, in which they start, but there are not 2 main spines, curved against each other. No by-spines.
Dimensions:
Largest diameter of the shell = 144–156 µm
Length of the main spines = 139–183 µm
Occurrence: Lower Fassanian *Spongosilicarmiger italicus* Zone.
Remarks: *Paurinella curvata curvata* KOZUR & MOSTLER, 1981 from the upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone displays robuster, stronger curved main spines, two of which are strongly curved against each other.

Paurinella acutispinosa n. sp.
(Pl. 16, fig. 5)

Derivatio nominis: According to the needle-like main spines.
Holotypus: The specimen on pl. 16, fig. 5; rep.-no. KoMo 1980 I-790.
Locus typicus: Köveskál (Balaton Highland, Hungary), section at the cemetery.
Stratum typicum: Sample Köveskál 6, Middle Longobardian part of *Budurovignathus mungoensis* Zone
Material: 12 specimens.
Diagnosis: Shell subspherical, spongy, consisting of several layers of spongy meshwork. The 3 main spines are straight, situated in one plane, arranged different angles to each other. Two of the main spines are very long, broadly needle-shaped. The third main spine is considerably smaller, slender needle-shaped. The gracile, needle-like by-spines are relatively long.

Dimensions:
Diameter of shell = 185–200 µm
Length of the long main spines = 269–300 µm
Length of the small main spine = 177–192 µm
Length of the by-spines = 38-46 µm
Occurrence: Longobardian of Balaton Highland.
Remarks: The Lower Fassanian *Paurinella mesotriasica* KOZUR & MOSTLER, 1981 displays considerably thicker and shorter main spines.

The Middle Fassanian *Paurinella trettoensis* n. sp. displays also needle-like, slender main spines, but one of them is larger than the other two ones. If by-spines are present, they are very short.

Paurinella aequispinosa KOZUR & MOSTLER, 1981
(Pl. 15, figs. 9, 11)

1981 *Paurinella aequispinosa* n. sp. - KOZUR & MOSTLER, p. 50, pl. 42, fig. 1; pl. 43, fig. 1
Occurrence: Upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone. Tethys.

Paurinella balatonica n. sp.
(Pl. 15, fig. 10)

Derivatio nominis: According to the occurrence in the Balaton Highland.
Holotypus: The specimen on pl. 15, fig. 10; rep.-no. KoMo 1980 I-86.
Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section.
Stratum typicum: Bed 104, '*Xenoprotrachyceras*' *reitzi* Oppel Zone.
Material: 5 specimens.
Diagnosis: Shell inflated discoidal to subsphaerical, spongy, consisting of numerous concentric layers around a tiny microsphere. The 3 main spines of about equal size start from one plane, but are a little downward directed, partly in different degree. No by-spines.
Dimensions:
Longest diameter of shell = 169–175 µm
Shortest diameter of shell = 150–161 µm
Length of main spines = 156–200 µm
Occurrence: Middle part of Lower Fassanian *Spongosilicarmiger italicus* Zone (beds with '*X.*' *reitzi*) of the Balaton Highland.
Remarks: In the similar *N. aequispinosa* KOZUR & MOSTLER, 1981 from the upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone all 3 main spines are situated along their whole length in one plane.

Paurinella ? inaequispinosa n. sp.
(Pl. 15, figs. 13, 14)

Derivatio nominis: According to the different length of the main spines.
Holotypus: The specimen on pl. 15, fig. 14; rep.-no. KoMo 1980 I-200.
Locus typicus: Val di Creme (Vicentinian Alps, Italy).
Stratum typicum: VCB, isolated sample of Buchenstein Formation, upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Material: 39 specimens.
Diagnosis: Shell subspherical, spongy, consisting of numerous concentric layers around a microsphere. 3 main spines of different shape and size are situated in the equatorial plane of the shell. One main spine is long, strong, slightly curved. The second, considerably smaller main spine lies about opposite of the large one. The third main spine is rather small, needle-shaped. It is situated in different distance from the other 2 main spines. The 2 smaller main spines are straight. Tiny by-spines may be present or absent.
Dimensions:
Largest diameter of shell = 205–211 µm
Smallest diameter of shell = 171–179 µm
Length of the longest main spine = 268–300 µm
Length of the smallest main spine = 78–93 µm
Occurrence: Upper part of Lower Fassanian. Tethys.
Remarks: In *Paurinella trettoensis* n. sp. the biggest main spine is straight and no other main spine lies opposite to this cusp.

Two of the three main cusp are in subpolar arrangement. *Paurinella inaequispinosa* n. sp. is therefore a transitional form to the Oertlispongidae. It could be also regarded as an extreme *Paroertlispongus*.

Paurinella latispinosa n. sp.
(Pl. 15, fig. 4)

Derivatio nominis: According to the broad spines.
Holotypus: The specimen on pl. 15, fig. 4; rep.-no. KoMo 1980 I-792.
Locus typicus: Köveskál (Balaton Highland, Hungary), section at the cemetery.
Stratum typicum: Sample Köveskál 6, Middle Longobardian part of the *Budurovignathus mungoensis* Zone.
Material: 3 specimens.
Diagnosis: Small spongy shell with rounded triangular lateral outline. The 3 main spines display the same shape, size and they are situated equidistant under the same angle in the equatorial plane of the shell. Compared with the small size of the shell, the spines are tumid in their mid-length. After their broadest part they taper rapidly to a needle-like terminal part. No by-spines.
Dimensions:
Largest diameter of shell = 98–105 µm
Length of spines = 94–100 µm
Occurrence: Middle Longobardian of Balaton Highland.
Remarks: This species is distinctly different from all other known *Paurinella* species.

Paurinella ? *longispinosa* n. sp.
(Pl. 16, fig. 1)

Derivatio nominis: According to the long by-spines.
Holotypus: The specimen on pl. 16, fig. 1; rep.-no. KoMo 1980 I-186.
Locus typicus: Passo della Gabiola section, Vicentinian Alps (Italy).
Stratum typicum: Sample MD 6, middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Material: 4 specimens.
Diagnosis: Shell subcircular, spongy, consisting of several layers surrounding a microsphere. The 3 round, distally needle-shaped main spines start from a plane a little below the equator and they are somewhat downward directed. By-spines very large.
Dimensions:
Longest diameter of shell = 152–160 µm
Length of the main spines = 150–178 µm
Length of the by-spines = 34–68 µm
Occurrence: Middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.

Remarks: *Paurinella ? longispinosa* n. sp. is a transitional form to the genus *Kulacella* KOZUR & MOSTLER, in which the shell is ellipsoidal, the 3 main spines are still near to one pole and they are still stronger downward directed.

The Intermediellidae LAHM, 1984 are therefore not only connected by transitional forms with the Oertlispongidae KOZUR & MOSTLER, 1981, but also with the Gomberellidae.

Paurinella mesotriassica KOZUR & MOSTLER, 1981
(Pl. 15, fig. 7; pl. 16, figs. ? 2, 4)

1981 *Paurinella mesotriassica* n. sp. – KOZUR & MOSTLER, p. 50, pl. 44, fig. 1
Occurrence: Upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone of Southern Alps.
Remarks: One of the 3 main spines in typical *P. mesotriassica* KOZUR & MOSTLER, 1981 is more slender than the remaining two ones. It is situated at the margin of a spot with looser spongy structure than the remaining shell. This species is a transitional form to *Neopaurinella* KOZUR & MOSTLER, 1981, in which the third spine is still more or totally reduced and the field with looser shell structure finally changed into a pylome.

Paurinella tornata n. sp.
(Pl. 16, fig. 3)

Derivatio nominis: According to the curved main spines
Holotypus: The specimen on pl. 16, fig. 3; rep.-no. KoMo 1980 I-11
Locus typicus: Sample MD 13, middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Material: 5 specimens.
Diagnosis: Shell subspherical, spongy, consisting of numerous shells around a microsphere. The 3 main spines of equal length are round, thin, in the upper view all clockwise curved. Short by-spines are present.
Dimensions:
Diameter of shell = 185–201 µm
Length of main spines = more than 200 µm
Length of by-spines = 11–17 µm
Occurrence: Middle part of Lower Fassanian. Southern Alps.

Remarks: The similar *Paurinella curvata spinosa* n. subsp. from the upper part of Lower Fassanian and lower part of Middle Fassanian is distinguished by main spines curved in different directions, 2 of which are always curved against each other.

Paurinella trettoensis n. sp.

(Pl. 15, fig. 15)

Derivatio nominis: According to its occurrence.
Holotypus: The specimen on pl. 15, fig. 15; rep.-no. KoMo 1980 I-791.
Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy).
Stratum typicum: Sample TT 13, upper subzone of Middle Fassanian *Ladinocampe multiperforata* Zone.
Material: 9 specimens.
Diagnosis: Shell subspherical, spongy, consisting of numerous layers around a microsphere. 3 main spines needle-like, one of them is very long, the other 2 are shorter, thinner. By-spines mostly missing, sometimes 1-2 tiny by-spines are present.
Dimensions:
Diameter of shell = 185–192 μm
Length of large main spine = 294–315 μm
Length of small main spines = 130–185 μm
Occurrence: Upper subzone of Middle Fassanian *Ladinocampe multiperforata* Zone.
Remarks: *Paurinella aequispinosa* KOZUR & MOSTLER, 1981 from the upper subzone of Lower Fassanian *Spongosilicarmiger italicus* zone displays thicker spines of equal length.

The Longobardian *Paurinella acutispinosa* n. sp. displays rather long by-spines and one of the main spines is shorter and thinner than the other two.

Paurinella trispinosa (LAHM, 1984)

(Pl. 17, fig. 1-2)

1984 *Intermediella trispinosa* n. gen. n. sp. - LAHM, p. 53–54, pl. 9, fig. 4.

Occurrence: Upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone to Lower subzone of Middle Fassanian *Ladinocampe multiperforata* Zone of Southern Alps.

Remarks: Our specimens from the highest Lower Fassanian displays broader main spines than the holotype. Because only the holotype was figured by LAHM (1984) and no remarks to the intraspecific variability were made, we cannot decide, whether the broader and shorter main spines of our material indicate intraspecific variability or differences in subspecies character.

Genus *Discokatorella* n. gen.

Derivatio nominis: According to the disciodal shell with 4 furcated spines in the equatorial plane.
Type species: *Discokatorella tetraspina* n. gen. n. sp.
Diagnosis: Shell discoidal, spongy, with numerous concentric layers around a microsphere. Lateral outline of the shell quadratic to rectangular. 4 round main spines in cross-position are terminally trifurcated, partly bifurcated. No by-spines.
Occurrence: Middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone. Southern Alps.
Assigned species:
Discokatorella tetraspina n. gen. n. sp.
Remarks: *Katorella* KOZUR & MOSTLER, 1981 displays more main spines irregularly distributed on the shell surface.

Discokatorella tetraspina n. gen. n. sp.

(Pl. 16, fig. 11)

Derivatio nominis: According to the 4 cross-like arranged spines.
Holotypus: The specimen on pl. 16, fig. 11; rep.-no. KoMo 1980 I-172.
Locus typicus: Passo della Gabiola section, Vicentinian Alps (Italy).
Stratum typicum: Sample MD 1, middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Material: 17 specimens.
Diagnosis, occurrence and remarks: As for the genus.
Dimensions:
Equatorial diameter of shell = 90–125 μm
Length of spines = 75–100 μm

Genus *Katorella* KOZUR & MOSTLER, 1981

Type species: *Katorella bifurcata* KOZUR & MOSTLER, 1981

Katorella trifurcata n. sp.
(Pl. 16, figs. 10, 12)

Derivatio nominis: According to the tri-branched main spines.
Holotypus: The specimen on pl. 16, fig. 10; rep.-no. KoMo 1980 I-210.
Locus typicus: Valle di Creme, Vicentinian Alps (Italy).
Stratum typicum: Limestone of Buchenstein Formation, single sample VCB, upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Material: 29 specimens.
Diagnosis: Shell subspherical with rounded polygonal equatorial outline, spongy, consisting of several layers around a microsphere. Main spines situated in different positions on the shell. 3 of them start from one plane but may be inclined against this plane in different degree. They are distally trifurcated, one may be also bifurcated. Further needle-like, unbranched main spines start partly from the same plane, partly from different positions on the shell including perpendicularly to the plane of the branched spines. No by-spines.
Dimensions:
Diameter of shell = 126–140 µm
Length of spines = 70–118 µm
Occurrence: Upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone. Southern Alps (Italy), Balaton Highland (Hungary).
Remarks: *Katorella bifurcata* KOZUR & MOSTLER, 1981 (pl. 16, fig. 8) displays only bifurcated and unbranched spines.

In *Discokatorella tetraspina* n. gen. n. sp. only 4 main spines are present, all situated in one plane. Moreover, the shell is discoidal.

Genus *Neopaurinella* KOZUR & MOSTLER, 1981

Type species: *Neopaurinella sevatica* KOZUR & MOSTLER, 1981

Neopaurinella ladinica n. sp.
(Pl. 15, figs. 5, 6; pl. 16, fig. 6)

Derivatio nominis: According to the occurrence in the Ladinian.
Holotypus: The specimen on pl. 16, fig. 6; rep.-no. KoMo 1980 I-198.
Locus typicus: Valle di Creme, Vicentinian Alps (Italy).
Stratum typicum: Limestone bed from the Buchenstein Formation, single sample VCB, upper subzone of *Spongosilicarmiger italicus* Zone.
Material: 15 specimens.
Diagnosis: Shell subspherical to subellipsoidal, a little flattened in the short axis, spongy, consisting of several layers. 3 round main spines. Two of them are rather tumid, broadest about in their midlength. The third main spine is considerable longer, thinner, needle-shaped. The angle between the thicker spines is smaller than between the thicker spines and the long, needle-like spine. This latter spine is situated opposite to the midline between the thicker spines at the margin of a flattened, mostly slightly depressed field with loose spongy meshwork. Around this field also some tiny by-spines may be present.
Dimensions:
Diameter of shell (along the long axis) = 218–230 µm
Diameter of shell (along the short axis) = 191–200 µm
Length of the thick main spines = 200–220 µm
Length of the slender, needle-like main spine = 280–300 µm
Length of the by-spines = maximally 20 µm
Occurrence: Upper subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone. Southern Alps.
Remarks: *Neopaurinella sevatica* KOZUR & MOSTLER, 1981 displays a spherical shell and the third needle-like spine is shorter than the 2 tumid main spines or at least not distinctly longer. It is always situated at the margin of a pylom.

Neopaurinella lahmi n. sp. displays a distinct pylom. The two thicker main spines are also very long and needle-like.

Neopaurinella tumidospina n. sp. displays a pylom, surrounded by rather long by-spines, but a distinct third main spine is missing.

Neopaurinella lahmi n. sp.

Derivatio nominis: In honour of Dr. B. LAHM, who figured this form for the first time.

1984 *Neopaurinella sevatica* KOZUR & MOSTLER 1981 - LAHM, p. 51, pl. 8, fig. 10

Holotypus: The specimen figured by LAHM (1984, pl. 8, fig. 10).

Locus typicus: Section Recoaro A by LAHM (1984), Vicentinian Alps (Italy).

Stratum typicum: Sample Rec. A 12 (see LAHM, 1984, p. 10), Lower Fassanian *Spongosilicarmiger italicus* Zone.

Material: 4 specimens

Diagnosis: Shell subspherical to subelliptical, spongy, consisting of several layers. 3 equidistant, round main spines.

All 3 main spines are long, needle-like of similar length. One is more slender than the other two main spines. This narrower main spine is situated at the margin of a distinct pylom. By-spines short, situated around the pylom, but rarely also as high as the equator.

Occurrence: Middle and upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone. Southern Alps.

Remarks: In our material all 3 main spines are fragmentary. Therefore the well preserved specimen figured by LAHM (1984) has been selected as holotype and no dimensions for the main spines can be given. However, the length of the thicker spines of the holotype is in full preservation about 270 μm, considerably longer than in all other known *Neopaurinella* species.

LAHM (1984) placed *Neopaurinella lahmi* n. sp. into *N. sevatica* KOZUR & MOSTLER, 1981. However, this species displays 2 tumid, short main spines and a third, likewise short slender spine.

In *Neopaurinella ladinica* n. sp. 2 of the main spines are tumid and relatively short. The third is needle-like and considerably longer than the tumid spines. Moreover, no distinct pylom is present. However, this may be a preservationally controlled difference, because in *N. ladinica* n. sp. the area beside the third, slender, long main spine is slightly flattened and consists of looser spongy meshwork than the remaining shell.

Neopaurinella tumidospina n. sp.
(Pl. 16, fig. 7)

Derivatio nominis: According the 2 tumid main spines.

Holotypus: The specimen on pl. 16, fig. 7; rep.-no. KoMo 1980 I-199.

Locus typicus: Val di Creme.

Stratum typicum: Isolated limestone sample VCB from the Buchenstein Beds, upper subzone of Lower Ladinian *Spongosilicarmiger italicus* Zone.

Material: 3 specimens.

Diagnosis: Shell subspherical, spongy, consisting of several concentric layers. Two short, tumid main spine. Opposite to the mid-line between the 2 main spines a rather large pylom is present. It is surrounded by several, needle-like, rather long by-spines. Further shorter by-spines are present on the remaining shell surface, mostly situated below the equator. The third main spine is missing or so thin and small that it is not differentiated from the largest by-spines.

Dimensions:

Diameter of shell = 165–174 μm

Length of tumid main spines = 150–165 μm

Length of the by-spines = maximally 60 μm

Occurrence: Upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone of Southern Alps.

Remarks: Most similar is *Neopaurinella* sevatica KOZUR & MOSTLER, 1981 that has still shorter tumid main spines and the third, slender main spine is distinct.

Genus *Tetrapaurinella* n. gen.

Derivatio nominis: According to the 4 spines and the similarity with *Paurinella* KOZUR & MOSTLER, 1981.

Diagnosis: Shell discoidal, inflated discoidal or subspherical, consisting of several spongy layers around a microsphere. 4 needle-like main spines in cross-like arrangement, situated in one plane or with slightly tetrahedral arrangement.

Assigned species:

Tetrapaurinella discoidalis n. gen. n. sp.

Tetrapaurinella tetrahedrica n. sp.

Distribution: Middle and upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone of Southern Alps.

Remarks: *Paurinella* KOZUR & MOSTLER, 1981 displays only 3 main spines.

Tetrapaurinella discoidalis n. gen. n. sp.
(Pl. 16, fig. 9; pl. 17, figs. 4, 6)

Derivatio nominis: According to the discoidal shell.
Holotypus: The specimen on pl. 16, fig. 9; rep.-no. CK 1980 I-201.
Locus typicus: Val di Creme, Vicentinian Alps, Italy
Stratum typicum: Limestone of Buchenstein Formation, sample VCB, upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Material: 17 specimens.
Diagnosis: Shell flat, discoidal, spongy, consisting of several layers around a microsphere. The 4 needle-like main spines with round cross section are cross-like arranged and situated in one plane. In general one spine is distinctly longer than the other three ones.
Measurements:
Diameter of shell = 140–158 μm
Length of main spines = 156–220 μm
Distribution: Upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone. Southern Alps.
Remarks: In the Lower Fassanian *Tetrapaurinella tetrahedrica* n. sp. the 4 main spines are not situated in one plane, but slightly tetrahedrically arranged.

Tetrapaurinella tetrahedrica n. sp.
(Pl. 15, fig. 12; pl. 17, figs. 3, 5)

Derivatio nominis: According to the slightly tetrahedrical arrangement of the main spines.
Holotypus: The specimen on pl. 17, fig. 3; rep.-no. KoMo 1980 I-202.
Locus typicus: Val di Creme, Vicentinian Alps.
Stratum typicum: Limestone of Buchenstein Formation, sample VCB, upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Material: 29 specimens.
Diagnosis: Shell inflated discoidal to subspherical, spongy, consisting of numerous layers around a microsphere. The 4, needle-like main spines with round cross section are cross-like arranged. However, they are not situated in one plane, but slightly tetrahedrally arranged.
Measurements:
Diameter of shell = 157–173 μm
Length of main spines = 144–233 μm
Distribution: Middle and upper subzone of *Spongosilicarmiger italicus* Zone, Southern Alps.
Remarks: *Tetrapaurinella discoidalis* n. sp. displays a flat, discoidal shell. Moreover, all 4 main spines are situated in one plane.

Most probably this species is the transition form to *Paurinella* KOZUR & MOSTLER, 1981. 3 of the 4 main spines are often arranged in one plane, whereas the fourth lies in tetrahedral position.

Entactinaria or Spumellaria, fam. inc.
Genus *Sarla* PESSAGNO, 1979

Type species: *Sarla prietoensis* PESSAGNO, 1979

Sarla ? anisica n. sp.
(Pl. 17, figs. 7, 8)

Derivatio nominis: According to the occurrence in the Anisian (Illyrian).
Holotypus: The specimen on pl. 17, fig. 7; rep-no. KoMo 1980 I-155.
Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section.
Stratum typicum: Limestone bed 87 within greenish tuffites, *Paraceratites trinodosus* Zone (Illyrian).
Material: 12 specimens.
Diagnosis: Cortical shell globular, with relatively large, high, predominantly pentagonal pore frames bearing small to distinct nodes on the joints. Inner layer with small pores not observed but small, fragile short bars are present that do not join each other or with the opposite wall of the pore frames. They could be the remnants of very fragile inner pore frames.

3 tricarinate spines are present displaying strong torsion. Their distal part is needle-like. The angles between the spines are somewhat different each other.
Inner structure unknown.
Dimensions:
Diameter of cortical shell = 144–150 μm
Length of spines = 145-172 μm
Occurrence: *Paraceratites trinodosus* Zone (Illyrian) of Balaton Highland, Hungary.
Remarks: The inner structure of the Upper Triassic Sarla PESSAGNO, 1979 is still unknown. It is used in North America as a collective genus for radiolaria with spherical or subspherical double-layered shell and 3, mostly twisted tricarinate spines in one plane. A part of this forms, e.g.

Sepsagon longispinosus (KOZUR & MOSTLER, 1979) are Entactinaria with well known inner structure (medullary shell as part of modified paleoscenidiid pentactine spicular system). From all species that are only known from the Upper Triassic of North America, including the type species, the inner structure is either unknown or the presence of a medullary shell is knwon, but without any data, whether it is part of a pentactine spicular system of Entactinaria or a spumellarian medullary shell.

Norian *Sarla* species of Sicily have either an eptingiid Entactinaria spicular system or an double medullary shell, of which the inner one is part of a modified pentactine palaeoscenidiid Entactinaria spicular system. However, none of these species is identical with the North American *Sarla* species and they do not belong to the *Sarla prietoensis* group. Therefore the taxonomic position of *Sarla* PESSAGNO, 1979 remains furthermore open. If the type species would be really related to *Capnuchosphaera* DE WEVER, 1979 than *Sarla* sensu str. would be a Spumellarian Radiolaria.

Most similar to our species is *Sarla natividadensis* PESSAGNO, 1979 that has no long needle-like distal part of the main spines.

Suborder Nassellaria EHRENBERG, 1875

Remarks: The Nassellaria families are arranged in alphabetic order.

Family Anisicyrtiidae KOZUR & MOSTLER, 1981
Genus *Anisicyrtis* KOZUR & MOSTLER, 1981

Type species: *Anisicyrtis hungarica* KOZUR & MOSTLER, 1981

Anisicyrtis hungarica KOZUR & MOSTLER, 1981
(Pl. 17, figs. 9, 10; pl. 18, figs. 1–4, 8)

1981 *Anisicyrtis hungarica* n. gen. n. sp. – KOZUR & MOSTLER, p. 105, pl. 13, fig. 2

Occurrence: Upper Illyrian (*Paraceratites trindosus* Zone) of Balaton Highland.

Remarks: Very rich new material (several 100 specimens) from the stratum typicum shows variability in the length of the abdomen and of the postabdominal segment. The hoop-like abdomen may be as long as or even somewhat shorter than the thorax. However, it can be also considerably longer than the thorax. In this latter case often an indistinct constriction is present in the distal part of the abdomen that separates a partial segment.

The postabdominal segment is in full preservation longer than the abdomen. In specimens with very long postabdominal segment the middle part of this segment is widest. If the postabdominal segment is somewhat shorter, its widest part is at the end of this segment.

Most characteristical for *Anisicyrtis hungarica* is the long postabdominal segment separated by a very shallow and broad constriction from the abdomen. The widest parts of the abdomen and of the postabdominal segments have always the same width (maximum width of the test).

Thorax and abdomen are covered by an outer layer consisting of elevations around the pores of the inner layer. At the joints of this outer pore frames short spines and nodes are present. At the postabdominal segment this outer layer is missing, only in its proximal part shallow elevations around the pores are present.
Differences to other species see under the new species.

Anisicyrtis conica n. sp.
(Pl. 18, fig. 12)

Derivatio nominis: According to the conical test.
Holotype: The specimen on pl. 18, fig. 12; rep.-no. KoMo 1980 I-77.
Locus typicus and stratum typicum: as for *Anisicyrtis mocki* n. sp.
Material: 17 specimens.
Diagnosis: Test conical. Cephalis large, hemiglobular, smooth, poreless, with stout, moderately long apical horn. Spicular system with Mb, A, V, 2l, D, 2l. In prolongation of V lies always a long tricarinate horn. In prolongation of 2l, there are also relatively long spines, situated in the stricture below the cephalis. In prolongation of D and 2L small spines on the thorax are present.

Thorax and following segments become continuosly broader, but are shorter than the cephalis. The strictures are deep and smooth. Only the stricture between the 2 postabdominal segments may be shallow and partly overgrown by the outer layer. All postcephalic segments display small, widely and irregularly scattered pores. In all these segments an outer layer with irregular pore frames at nodes or short spines at the joints is present. In the strictures pores are missing. Only the stricture between the 2 postabdominal segments may have partly pores and may be there overgrown by the outer layer (see above).

Dimensions:

Length of test = 168–175 µm

Maximum width of test = 86–94 µm

Occurences: Beds 87-100 D (*Paraceratites trinodusus* Zone to *lower K. felsoeoersensis* Subzone of '*Xenoprotrachyceras*' *reitzi* Oppel Zone). Illyrian to basal Fassanian.

Remarks: In the Illyrian *Anisicyrtis hungarica* KOZUR & MOSTLER the thorax is about as high as or higher than the cephalis. The postabdominal segment is long and even, if it is subdivided into 2 segments, these segments are considerably higher than the postabdominal segments in *Anisicyrtis conica* n. sp. Moreover, the postabdominal segment displays either no outer layer or only slight elevations around the pores of the inner layer in the proximal part.

The Illyrian *Anisicyrtis mocki* n. sp. displays higher segments and the abdomen to second postabdominal segment built up a subcylindrical part of test without distinct distalward broadening of the segments.

In the basal Fassanian *Anisicyrtis postillyrica* n. sp. the thorax to first postabdominal segments are similarly low as in *A. conica* n. sp. The second postabdominal segment, however, is high and inflated.

Anisicyrtis foremanae n. sp.

(Pl. 18, figs. 5, 6, ? 11)

Derivatio nominis: In honour of the late H. FOREMAN.

Holotypus: The specimen on pl. 18, fig. 6; rep.-no. KoMo 1980 I-357.

Locus typicus: Road cut San Ulderico-Pallé (Vicentinian Alps, Italy).

Stratum typicum: Sample TT 6, *Ladinocampe multiperforata* Zone, Middle Fassanian.

Material: 23 specimens.

Diagnosis: Shell subconical, in the lower half mostly more cylindrical. Cephalis moderately large, mostly slightly asymmetrically subhemispherical with moderately large to large apical horn. Cephalic spicular system with Mb, A, V, 2L, D, 2l. A short spine in prolongation of V is always, a short spine in prolongation of D is mostly present. Very short spines in prolongation of V, 2l and 2l may be present.

Thorax hoop-like distinctly separated by deep strictures. It is considerably broader, but shorter than cephalis. Abdomen cylindrical, in its middle part slightly constricted, considerably longer and somewhat wider than thorax. First postabdominal segment about as wide as abdomen, separated from the abdomen by a shallow, partly indistinct stricture and from the second postabdominal segment by an indistinct, very shallow stricture. Second postabdominal segment somewhat wider than the foregoing 2 segments.

The inner layer has widely scattered small pores, like the primitive *Anisicyrtis* species. These pores are irregularly scattered, only partly arranged in irregular rings. In the thorax and abdomen these pores are closed by a layer of microgranular silica. In the abdomen few tiny pores remains open. In the thorax this outer layer displays short indistinct vertical ribes, in the proximal part of the abdomen irregular, indistinct shallow nodes are present. In the postabdominal segments the area around the inner pores is slightly elevated and the pores narrowed, but mostly not closed by a thin layer of microgranular silica.

Dimensions:

Length of test = 257–301 µm

Maximum width of test = 100–109 µm

Occurrence: Upper *Silicarmiger italicus* A.Z. to *Ladinocampe multiperforata* Zone. Upper part of Lower Fassanian to Middle Fassanian.

Remarks: This species remembers to the primitive Illyrian *Anisicyrtis hungarica* n. sp. In this species, however, the abdomen is hoop-like or otherwise inflated and its pores of the inner layer are open, surrounded by elevations (outer layer), but not closed.

In the topmost *X. reitzi* Oppel Zone of the Balaton Highland a primitive form exists that has already a cylindrical abdomen, but with open pores. Also the pores of the thorax are not covered by a layer of microgranular silica. It is here designated as *Anisicyrtis* cf. *foremanae* n. sp.

Anisicyrtis goricanae n. sp.

(Pl. 18, fig. 9; pl. 19, figs. 1, 2)

1990 *Anisicyrtis* sp. A, pars - GORICAN; p. 140, pl. 12, only fig. 11

Derivatio nominis: In honour of Dr. S. GORIČAN, Ljubljana, who figured this form for the first time

Holotypus: The specimen on pl. 18, fig. 9; rep.-no. KoMo 1980 I-457.

Locus typicus: Road cut between Mte. Spitz and Mte. Fallison, Vicentinian Alps (Italy).
Stratum typicum: Sample FD 6, Fassanian.
Material: 5 specimens.
Diagnosis: Test conical, cephalis subhemispherical, smooth. Few pores near the base of the lateral horns may be present, otherwise poreless. Cephalic spicular system with Mb, A, V, 2L, D, 21. Apical horn moderately large, tricarinate. Lateral horns relatively large, broad, at least basally carinate. Horn in prolongation of D distally needle-like. Horns V and 21 situated on the cephalis, horns D and 21 situated on the thorax.

Thorax hoop-like, considerably broader than cephalis. Its height is variable, but always lower than cephalis.

Abomen hoop-like always relatively high, broader and somewhat to considerably higher than thorax.

First postabdominal segment about as high as or a little higher than the abdomen and always somewhat broader than the abdomen. The broadest and highest segment is the second postabdominal segment. Mostly it has a somewhat lower proximal part and a higher, inverted frustum-like or subcylindrical distal part. Third postabdominal segment incomplete.

Thorax, abdomen and first postabdominal segment display on the inner layer small, roundish to oval pores of different size. On the first postabdominal segment few pores are larger. On the thorax and abdomen the pores are irregularly spaced or arranged in irregular rings. In the first postabdominal segments most pores are arranged in 2 irregular rings. Some widely scattered pores occur between these rings. The second postabdominal segment displays in its lower proximal part a pore ring with small pores and some tiny pores below it. The wide distal part displays one pore ring with pores of different size (tiny to large) and shape and below it irregularly spaced, mostly small pores of different size and shape are present.

Thorax and abdomen are covered by an outer layer with irregular pore frames that narrow or cover part of the inner pores. The outer pore frames of the first postabdominal segments are mostly also high, but consists exclusively of elevations around the inner pores that are not narrowed or covered. The same type, but generally lower outer pore frames exist on the proximal part of the second postabdominal segment. The distal part of the second postabdominal segment displays no outer layer. From the thorax to the first postabdominal segment the outer pore frames display few, but relatively large spines.

Dimensions:
Length of test = 222–270 μm
Maximum width of test = 94–120 μm
Occurrence: Upper part of Lower Fassanian *Spongosilicarmiger italicus* Zone. Hungary, Italy.
Remarks: The hoop-like, relatively high segments remember to the Illyrian *Anisicyrtis mocki* n. sp. However, this species has either no outer layer or the low outer pore frames consist of low elevations around the pores of the inner layer that are never narrowed or overgrown by the outer pore frames.

The contemporaneous or somewhat younger Lower Fassanian *Anisicyrtis recoaroensis* n. sp. displays considerably lower abdomen, first and second postabdominal segments and only the third postabdominal segment is large.

Anisiscyrtis italica n. sp.
(Pl. 19, figs. 5, 7)

Derivation nominis: According to the occurrence in the Southern Alps (Italy).
Holotypus: The specimen on pl. 19, fig. 5; rep.-no. KoMo 1980 I-455.
Locus typicus: Passo della Gabiola near Recoaro (Vicentinian Alps, Italy).
Stratum typicum: Sample MD 12, middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Material: 3 specimens.
Diagnosis: Shell conical. Cephalis moderately large, poreless, smooth. Apical horn stout, moderately long. Cephalic spicular system with Mb, A, V, 2L, D, 21. In prolongation of V, 2L, and 21 short, broad, carinate horns are present.

Thorax narrow, shorter than or as high as cephalis. Abdomen slightly inflated, subglobular. 2 postabdominal segments inverted trapezoidal to nearly hoop-like, proximally more distinctly contrasted against the stricture than distally. Strictures between the segments always distinct.

Pore frames of inner layer relatively large. Pores arranged in often irregular rings. Outer layer consists of ridges around the pores of inner layer that are therefore well visible and not narrowed in unrecrystallized material. Joints of outerpore frames with small nodes, subordinately also with small spines. On the second postabdominal segment the outer layer is already indistinct.

Dimensions:
Length of test = 283–301 μm
Maximum width of test = 100–109 μm
Occurrence: Middle to upper subzone of Lower Ladinian *Spongosilicarmiger italicus* Zone. Italy.
Remarks: Forerunner of *Anisicyrtis nodos*a n. sp. This species is distinguished by a thicker outer layer with distinct broad nodes on the joints of the outer pore frames that are at least on the thorax and abdomen distinctly thickened narrowing or overgrowing by this the inner pores.

Anisicyrtis mocki n. sp.

(Pl. 17, fig. 11; pl. 18, figs. 7, 10, 13; pl. 47, ? figs. 12, 13)

Derivatio nominis: In honour of Dr. R. MOCK, Bratislava.
Holotypus: The specimen on pl. 17, fig. 11; rep.-no. KoMo 1980 I-56.
Locus typicus: Felsöörs (Balaton Highland, Hungary) Forráshegy section.
Stratum typicum: Limestone bed 87 within greenish tuffites, *Paraceratites trinodosus* Zone (Illyrian)
Material: 32 specimens.
Diagnosis: Multicyrtid. Test proximally subconical, in the postabdominal part subcylindrical. Cephalis moderately large, subconical to elongated subhemispherical, smooth and with exception of an often present pore above horn V poreless. Cephalic spicular system with Mb, A, V, 2L, D, 2l. The spicule D is short, delicate and often broken away. Apical horn moderately long, tricarinate. Horn in prolongation of V on the cephalis rather large, slender. The slender, rather large horns in prolongation of 2L, D, 2l are situated on the upper part of the thorax (D, 2L) and in the collar stricture (2l). All lateral horns are proximally carinate, distally round.

Thorax, abdomen and the 2 postabdominal segments are hoop-like, separated by distinct, pore-less, smooth strictures. Thorax considerably broader than cephalis, abdomen distinctly broader than cephalis. First abdominal segment as wide as or a little shorter than the abdomen. Second postabdominal segment as wide as or a little wider than the abdomen. A third, delicate, thin-walled third postabdominal segment is only fragmentary preserved. It is distinctly broader than the foregoing segments.

The thorax displays widely scattered small pores. Abdomen and postabdominal segments display scattered pores of different size and shape (round, oval, triangular, irregular shape). Outer layer missing or slight elevations around the pores are present on the thorax, abdomen, sometimes also on the postabdominal segments.

Dimensions:
Length of test = 193–245 μm
Maximum width of test = 82-100 μm
Occurrence: Illyrian (*Paraceratites trinodosus* Zone) of Balaton Highland (Hungary).
Remarks: The Illyrian *Anisicyrtis hungarica* KOZUR & MOSTLER, 1981 displays a long postcephalic segment, partly subdivided into 2 segments. Thorax and abdomen display distinct outer pore frames with nodes and short spines.

The Illyrian *Anisicyrtis conica* n. sp. displays low, but relatively broad postcephalic segments that become until the second postabdominal segment continuously broader. All postcephalic segments display a distinct outer layer. Elevations around the pores of the inner layer in the thorax, abdomen and first abdominal segment rather high with nodes and short spines at the joints of the outer pore frames.

All Ladinian *Anisicyrtis* species display at least on the thorax, abdomen and first postabdominal segment a distinct outer pore frame with nodes or small spines on the joints that covers the inner pore frames, partly even the strictures.

Anisicyrtis nodosa n. sp.

(Pl. 19, figs. ? 3, 6, 8, 9)

Derivatio nominis: According to the nodes on the joints of the outer pore frames.
Holotypus: The specimen on pl. 19, fig. 6; rep.-no. KoMo 1980 I-450.
Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy.)
Stratum typicum: Sample TT 5, lower subzone of Middle Fassanian *Ladinocampe multiperforata* Zone.
Material: 81 specimens.
Diagnosis: Cephalis rounded conical to elongated subhemispherical, smooth, poreless. Cephalic spicular system with Mb, A, V, 2L, D, 2l. Apical horn moderately large to large, tricarinate. Vertical horn small.

Thorax small, lower than or as high as cephalis, but broader than it. The thorax is covered by a nodose outer layer, only few small pores remain open.

Abdomen considerably larger (higher and broader) than thorax, subglobular to hoop-like, often somewhat inflated sometimes a low partial segment is indistinctly separated in the lower part of the abdomen.

Following postabdominal segments separated by distinct, narrow, poreless strictures. They are considerably lower, but somewhat wider than the abdomen and their width increases distalwards.

Pores of the inner layer small, arranged in often irregular rings. With exception of the third postabdominal segment there is a thick outer layer. It consists of a high pore frame around the inner pores, considerably broadened and node-like elevated at the joints. At the thorax and abdomen these outer pore frames narrow and partly overgrow the inner pores. If present, the lower partial segment of the abdomen displays especially high pore frames and nodes.

The nodes on the outer pore frames are arranged into partly irregular rings. Sometimes they are also connected by indistinct, short, irregular vertical ribs.

In the third postabdominal segment the outer layer is only thin, partly even missing (especially in the distal part).

Dimensions:

Length of test = 312–350 μm

Maximum width of test = 111–117 μm

Occurrence: Frequent in the Middle Fassanian *Ladinocampe multiperforata* Zone. Italy.

Remarks: The Middle Fassanian *Anisicyrtis trettoensis* n. sp. displays the same kind of outer layer and an inflated abdomen. However, the postabdominal part is conical to subcylindrical without distinct strictures. The outer layer is only present in the upper third of this postabdominal portion of the test. In the subspecies *A. trettoensis postera* n. subsp. from the higher Middle Fassanian the thick nodose outer layer covers also most of the postabdominal portion of the test. In contrast to *A. nodosa* n. sp., abdomen, first and second postabdominal segments are not separated each other by distinct strictures on the outer surface. *Anisicyrtis italicus* n. sp. from the upper subzone of the Lower Fassanian *S. italicus* Zone is the forerunner of *A. nodosa* n. sp. In this species the outer pore frames are not so high and not distinctly thickened at the joints. Therefore also on the thorax and abdomen no narrowing of the inner pores is present.

***Anisicyrtis postillyrica* n. sp.**

(Pl. 19, fig. 4)

Derivatio nominis: According to its occurrence after the Illyrian.

Holotypus: The specimen on pl. 19, fig. 4; rep.-no. KoMo 1980 I-76.

Locus typicus: Felsöörs, Forráshegy section (Balaton Highland, Hungary).

Stratum typicum: Limestone bed 100 D, basal part of the *'Xenoprotrachyceras' reitzi* Oppel Zone (*Kellnerites* fauna).

Material: 7 specimens.

Diagnosis: Test conical. Cephalis rounded conical, moderately large, poreless, with stout, moderately long carinate apical horn. Cephalic spicular system with Mb, A, V, 2L, D, 2l. Horns in prolongation of V (big, always present), D, 2L, 2l (smaller) are present.

Thorax trapezoidol, broader, but not longer than cephalis. Abdomen broader than thorax, but also low, hoop-like. First postabdominal segment of the same size and shape as abdominal segment. All these segments are separated by narrow, but deep and distinct smooth strictions. The following stricture is broader. The second postabdominal segment is considerably higher and broader than the other segments.

All post-cephalic segments are covered by an outer layer with distinct pore frames that have until the first postabdominal segment short spines at the joints. All pores are small, roundish to triangular. They are widely scattered and in the outer pore frame often ringlike arranged around a central node.

Further segments seemingly present, but not preserved.

Dimensions:

Length of test = 263–275 μm

Maximum width of test = 110–121 μm

Occurrence: Lower to middle subzone of Lower Ladinian *Spongosilicarmiger italicus* Zone. Hungary.

Remarks: *A. postillyrica* n. sp. is the first representative of the Lower Fassanian *Anisicyrtis recoarensis* group, characterized by a low abdomen and first postabdominal segment with narrow separating stricture that is in higher evolved forms more and more overgrown by the strong outer pore frame. *A. postillyrica* n. sp. is distinguished from *A. recoaroensis* n. sp. (middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone to lower subzone of Middle Fassanian *Ladinocampe multiperforata* Zone) by the somewhat weaker outer pore frames, the never overgrown stricture between abdomen and first postabdominal segment and above all by the inflated second postabdominal segment from which the proximal part is not yet separated as low independent segment.

Anisicyrtis recoaroensis n. sp.
(Pl. 20, figs. 3–5)

1990 *Anisicyrtis* sp. A, pars-GORIČAN, p. 140, only pl. 12, fig. 10

Derivatio nominis: According to the occurrence in the Recoaro area (Italy).

Holotypus: The specimen on pl. 20, fig. 4; rep.-no. KoMo 1980 I-161.

Locus typicus: Val di Creme near Recoaro (Vicentinian Alps, Italy).

Stratum typicum: Sample VCB, limestone from the Buchenstein Beds, upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.

Material: 29 specimens.

Diagnosis: Test subconical. Cephalis moderately large, elongated subhemispherical, poreless. Apical horn moderately large, tricarinate. Cephalic spicular system with Mb, A, V, 2L, D, 2l. Short horns are present in prolongation of V, 2L, D and 2l (horns V and 2l on the cephalis, horns D and 2L on the thorax). Thorax considerably broader, but shorter than or as long as the cephalis. The post-thoracic segments increase slowly and continuously in width. Abdomen and first postabdominal segment low, separated by a very narrow, shallow constriction that is in stratigraphically older forms partly, in stratigraphically younger forms always overgrown by the thick outer pore frames and then not recognizable. Second postabdominal segment also low, third postabdominal segment long, with fragile velum or remnant of an incomplete fourth postabdominal segment.

Pores in the inner layer from the thorax until the second postabdominal segment small, in the third postabdominal segment of different size. In the proximal part of the segments the pores are arranged into often irregular rings, in the distal parts the pores are more irregularly distributed.

Thorax, abdomen and first postabdominal segment always covered by thick outer pore frames with short spines on the joints. These outer pore frames narrow or totally cover the pores of the inner layer. Especially in stratigraphically younger forms also the low, narrow stricture between the abdomen and first postabdominal segment is covered by this outer layer and on the outer surface not more recognizable.

The second postabdominal segment displays only in stratigraphically younger forms thick outer pore frames that cover partially the inner pores. In stratigraphically older forms only the margin of the inner pores are elevated or some short ridges and spines are present around the pores of the inner layer.

The third postabdominal segment displays no outer layer or only low outer pore frames around the pores of the inner layer in the proximal part of the third postabdominal segment are present.

Dimensions:
See under the subspecies.

Occurrence: Middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone to lower subzone of Middle Fassanian *Ladinocampe multiperforata* Zone. Italy, Yugoslavia.

Remarks: Successor of *Anisicyrtis postillyrica* n. sp. from the lower to middle subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone. In this species the outer pore frames are lower and have only tiny spines. The stricture between the abdomen and the first postabdominal segment is somewhat broader and never overgrown by the outer pore frames. The second postabdominal segment is high and inflated.

The Middle Fassanian *Anisicyrtis spinosa* n. sp. is the successor of *A. recoaroensis* n.sp. In this species all postcephalic strictures with exception of the last one are overgrown by the thick outer pore frames and not or only very indistinctly visible on the outer surface. The spines on the outer pore frames are as large as the lateral horns in prolongation of the cephalic spines.

Anisicyrtis recoaroensis recoaroensis n. subsp.
(Pl. 20, figs. 4, 5)

Holotypus: Holotypus of the species.

Material: 17 specimens.

Diagnosis: With the character of the species. Narrow, shallow stricture between abdomen and first postabdominal segment not or only partly covered by the thick outer pore frames. Outer pore frames of the second postabdominal segment low, consisting only of ridges around the pores of the inner layer, sometimes still incomplete, but also with single small spines.

Dimensions:
Length of test = 241–267 μm
Maximum width of test = 90–107 μm

Occurrence: Middle and upper subzone of *Spongosilicarmiger italicus* Zone. Italy, Yugoslavia.

Remarks: See also under the species. *Anisicyrtis trettoensis deweveri* n. subsp. from the lower subzone of the Middle Fassanian *Ladinocampe multiperforata* Zone displays also on the second postabdominal segment high outer pore frames that narrow and overgrow the pores of the inner layer. The stricture between the abdomen and the first postabdominal segment is always totally overgrown by the outer pore frames and therefore outside not visible. Therefore these 2 segments look from outside as a large abdomen.

Anisicyrtis recoaroensis deweveri n. subsp.

(Pl. 20, fig. 3)

Derivatio nominis: In honour of P. DE WEVER, Paris.
Holotypus: The specimen on pl. 20, fig. 3; rep.-no. KoMo 1980 I-243.
Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy).
Stratum typicum: Sample TT 7, lower subzone of Middle Fassanian *Ladinocampe multiperforata* Zone.
Material: 12 specimens.
Diagnosis: With the character of the species. Shallow stricture between the abdomen and first postabdominal segment totally overgrown by the thick, spinose outer pore frames that covers also the second postabdominal segment and narrow or overgrown here, like on the thorax to first postabdominal segments, the pores of the inner layer.
Dimensions:
Length of test = 233–243 μm
Maximum width of test = 98–101 μm
Occurrence: Lower part of Middle Fassanian *Ladinocampe multiperforata* Zone. Italy.
Remarks: See also under the species. *Anisicyrtis recoaroensis recoaroensis* n. subsp. from the upper subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone is distinguished by the low and often still incomplete outer layer on the second postabdominal segment that never overgrow or narrow the pores of the inner layer. Moreover, the narrow and low stricture between the abdomen and the first postabdominal segment is never totally overgrown by the outer pore frames.

Anisicyrtis spinosa n. sp.

(Pl. 19, figs. 11–14)

1990 *Anisicyrtis* sp. A, pars - GORIČAN, p. 140, only pl. 12, fig. 9
Derivatio nominis: According to the spinose outer layer
Holotypus: The specimen on pl. 19, fig. 12; rep.-no. KoMo 1980 I-244.
Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy).
Stratum typicum: Sample TT 7, Middle Fassanian, *Ladinocampe multiperforata* Zone.
Material: More than 100 specimens.
Diagnosis: Test conical. Cephalis hemiglobular, smooth, moderately large. Apical horn stout, tricarinate, moderately large spicular system with Mb, A, V, 2L, D, 2l. Tricarinate, rather small vertical horn always present. Further small spines in prolongation of 2l mostly present.

Thorax trapezoidal, abdomen cylindral. On the outer side these segments are not or only indistinctly to distinguish, because the stricture between them is overgrown. First postabdominal segment of about the same size as abdomen, often well separated on the outer shell surface by a narrow stricture. Second postabdominal segment may be present.

Pores in the thorax small, in the abdomen and postabdominal segments relatively large and here arranged in often indistinct rings. Thorax, abdomen and at least proximal part of the last postabdominal segment overgrown by an outer layer, thickest on the thorax and thinner distally. The joints of the pore frames bears spines that may be on the thorax as large as the horns in prolongation of V and 2l. On the abdomen the spines are sometimes shorter and partly replaced by nodes. On the first postabdominal segment the outer layer is low and has mostly no elevation on the joints, but some nodes or spines may be here present as well. The second postabdominal segment, if present, has no elevations at joints or only low nodes. The outer layer overgrows also the stricture between the thorax and abdomen that can be therefore often not separated on the outer shell surface. Sometimes the outer layer overgrows also the stricture between the abdomen and the postabdominal segments. In this case all postcephalic segments are unseparable or nearly unseparable on the outer shell surface.
Dimensions:
Length of test = 250–290 μm
Maximum width of test = 109–118 μm
Occurrence: Widely distributed in the Middle Fassanian *Ladinocampe multiperforata* Zone.

Remarks: The Anisian *Anisicyrtis* species have either no outer layer or this layer is thin and does not overgrow the strictures.

The Fassanian *Anisicyrtis* species are distinguished by the following features:

Anisicyrtis nodosa n. sp. has strong nodes at the pore frame joints of the outer layer, but no spines. The apical horn is longer. The strictures are narrow but well visible.

Anisicyrtis italica n. sp. has well defined strictures between all segments. Spines at the joints of the outer pore frame are only very small.

Anisicyrtis recoaroensis n. sp. has often also relatively large spines on the joints of the outer pore frames, but most of the strictures are not overgrown and the last segment has often no outer layer. Only the narrow and shallower stricture between the abdomen and first abdominal segments is often overgrown.

Anisicyrtis trettoensis n. sp. displays a subglobular abdomen and no spines at the joints of the outer pore frames.

Anisicyrtis trettoensis n. sp.

(Pl. 19, figs. 10, 15; pl. 20, figs. 1, 2)

Derivatio nominis: According the occurrence in Tretto.
Holotype: The specimen on pl. 20, fig. 1; rep.-no. KoMo 1980 I-247.
Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy).
Stratum typicum: Sample TT 7, Middle Fassanian *Ladinocampe multiperforata* Zone.
Material: 37 specimens.
Diagnosis: Shell conical, in the lower part sometimes cylindrical. Cephalothorax conical with large tricarinate apical horn. Upper part of cephalothorax (cephalis) smooth, poreless, lower part (thorax), covered by a layer of microgranular silica that is fine pustulose or displays irregular outer pore frames with nodes at the joints. By this outer layer most of the pores on the inner layer of the thorax are closed. Cephalic spicular system with Mb, A, V, 2L, D, 2l. Small vertical horn always present. Additionally small spines in prolongation of D and 2l may be present.

Abdomen inflated, distinctly larger than adjacent segments. Postabdominal segment long, conical, slowly widening distally, but in typical forms only distal part may be broader than abdomen. Partly the postabdominal segment is cylindrical.

The pores of the inner layer are small and arranged in irregular rings. On the abdomen, the inner layer is covered by a thick outer layer that narrows and partly covers the pores of the inner layer. Distinct nodes are present at the joints of the outer pore frames. They are arranged in irregular rings, but may be also vertically connected by low ridges.

On the proximal, mostly slightly elevated part of the postabdominal segment the same structure of outer layer may be present. This part may be separated by a shallow stricture as separate segment from the following postabdominal part. Sometimes the outer layer is nearly missing on the postabdominal part and in these specimens only indistinct elevations around the pores of the inner layer are present. In *A. trettoensis postera* n. subsp. the outer layer covers more than half of the postabdominal portion. The distal part of the postabdominal portion has no outer layer.
Dimensions: see under the subspecies.
Occurrence: Middle Fassanian *Ladinocampe multiperforata* Zone of Southern Alps.
Remarks: Most similar is the Middle Fassanian *Anisicyrtis nodosa* n. sp. that is distinguished by postabdominal segments separated by distinct deep strictures.

Anisicyrtis trettoensis trettoensis n. subsp.

(Pl. 19, fig. 15; pl. 20, figs, 1, 2)

Holotypus = Holotypus of the species.
Material: 31 specimens.
Diagnosis: With the characters of the species. Abdomen distinctly contrasted against the postabdominal portion. Only the proximal third of the postabdominal portion of test is covered by a thick outer layer, narrowing or closing the inner pores. In the remaining part the inner pores are free and only few node-like elevations may be present between some pores.
Dimensions:
Length of test = 271–309 µm
Maximum width of test = 100–135 µm
Remarks: See also under the species. *Anisicyrtis trettoensis postera* n. subsp. from the upper subzone of the Middle Ladinian *L. multiperforata* Zone displays a distinct outer layer on the proximal half of the postabdominal portion. It is so thick that the abdomen is not more distinctly contrasted against the postabdominal portion.

Anisicyrtis trettoensis postera n. subsp.
(Pl. 19, fig. 10)

Derivatio nominis: According to the stratigraphic succession of the 2 subspecies.
Holotypus: The specimen on pl. 19, fig. 10; rep.-no. KoMo 1980 I-453.
Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy)
Stratum typicum: Sample TT 16, upper part of Middle Fassanian *Ladinocampe multiperforata* Zone.
Material: 6 specimens.
Diagnosis: With the character of the species. The proximal half of the postabdominal portion is covered by the same thick outer pore frames than the abdomen that is only indistinctly or not separated from the postabdominal portion on the outer surface.
Dimensions:
Length of test = 345–357 μm
Maximum width of test = 119–124 μm
Occurrence: Upper part of Middle Fassanian *Ladinocampe multiperforata* Zone. Italy.
Remarks: See also under the sepcies. *Anisicyrtis trettoensis trettoensis* n. subsp. from the lower part of the Middle Fassanian *Ladinocampe multiperforata* Zone displays only in the proximal third of the postabdominal portion outer pore frames that may be here so thick as on the abdomen. However, the abdomen is always well differentiated from the postabdominal portion on the outer surface.

Family Deflandrecyrtiidae KOZUR & MOSTLER, 1979
Genus *Goestlingella* KOZUR & MOSTLER, 1979

Type species: *Goestlingella cordevolica* KOZUR & MOSTLER, 1979

Goestlingella toempeae n. sp.
(Pl. 20, figs. 6, 7)

Derivatio nominis: In honour of Dr. Zs. TÖMPE, Budapest, wife of one of the authors (H. KOZUR).
Holotypus: The specimen on pl. 20, figs. 6, 7; rep.-no. KoMo I-252.
Locus typicus: Passo della Gabiola section near Recoaro, Italy.
Stratum typicum: Sample MD 8, middle *Spongosilicarmiger italicus* Zone, highest Lower Fassanian
Material: 18 specimens.
Diagnosis: Shell bell-shaped. Cephalis moderately large, elongated subhemispherical, with big round apical horn. Cephalic spicular system with Mb, A, V, 2L, 2l. Short slender, slightly carinate horn in prolongation of V. Surface of cephalis microgranular, almost poreless, often with ring pores in prolongation of L and l.

Thorax considerably broader than cephalis, but not inflated. Upper part conical, with numerous small round pores, lower part cylindrical, only with few, small, widely scattered round pores. Abdomen indistinctly separated from thorax, long, bell-shaped, upper part cylindrical, lower part flaring to a skirt, moderately wide for the genus. Whole abdomen including skirt with large, round, diagonally arranged pores.
Dimensions:
Length of test = 205–211 μm
Maximum width of test (without skirt) = 73–77 μm
Width of skirt = 138–142 μm
Occurrence: Middle part of Lower Fassanian of Southern Alps.
Remarks: The shape of test resembles *Deflandrecyrtium* KOZUR & MOSTLER, 1979. However, the cephalic spicular system without D and the presence of a vertical horn is typical for *Goestlingella* KOZUR & MOSTLER, 1979.

The Carnian representatives of *Goestlingella* have one segment more than the Middle Triassic one, but are otherwise similar.

The Illyrian *Goestlingella illyrica* KOZUR, 1984 displays a large, globular thorax with large pores.

Goestlingella n. sp. aff. *illyrica* KOZUR, 1984 (= *Goestlingella illyrica* sensu GORIČAN, 1990) has a long abdomen as *G. toempeae* n. sp., but the thorax is globular inflated and displays throughout large pores, as in *G. illyrica* KOZUR, 1984.

Family Monicastericidae n. fam.

Diagnosis: Test spindle-shaped, multicyrtid. Segments mostly indistinctly separated each other. Cephalis large, conical, with large tricarinate apical horn and short carinate spines in prolongation of V and 2l. Cephalic spicular system with Mb, A, V, 2L, D, 2l. Following segments cylindrical, last segment inversely conical. Distal a short to long smooth, poreless tube is present. At the distal end in primitive forms 3 unreduced, later rudimentary feet are present. In higher evolved forms feet are absent.

Wall latticed, small pores arranged in irregular rings. Cephalis with few tiny, irregularly scattered pores. Smooth or nodose rings on the surface mostly present. In the proximal half or third of the test often an outer layer is present, displaying irregular pore frames with nodes or short, broad spines on the joint.

Occurrence: Fassanian. Japan, Italy.

Assigned genera:

Monicasterix n. gen.

Tubotriassocyrtis n. gen.

Remarks: This family has evolved from *Hozmadia longispinosa* n. sp. by further prolongation and segmentation of the long cephalis. The feet in this species are already on the upper side round, on the inner side excavated as in *Monicasterix* n. gen., but unlike other *Hozmadia* species.

Pseudoeucyrtis PESSAGNO, 1977 has a similar shape, but no smooth tubus. Feet, horns V, 2l and a large tricarinate apical horn are never present. The cephalis is very small. This genus represents probably a homoeomorph form.

In the Syringocapsidae FOREMAN, 1973 the tubus displays pores, has never feet or rudimentary feet and an inflated first postabdominal segment is present.

Genus *Monicasterix* n. gen.

Derivatio nominis: In honour of the secretary of the Institut für Geologie und Paläontologie, Innsbruck, Mrs. Monika Tessadri-Wackerle, who likes Asterix stories.

Type species: *Monicasterix alpina* n. gen. n. sp.

Diagnosis: Test spindle-shaped to subcylindrical. Cephalis large, conical to subhemispherical, with few, widely scattered tiny pores. Spicular system with Mb, A, V, 2L, D, 2l. Broad, but short carinate spines in prolongation of A and l situated on the distal part of the cephalis and on the proximal part of the thorax. Surface of cephalis with distinct ridges in the place of the arches AV and Al. In the distal part also short ridges may be present reaching upward from the secondary outer layer of the thorax. Following segments cylindrical, last segment inversely conical. Segments in primitive forms almost unseparable, in stratigraphic younger forms at least the 2–4 postabdominal segments are mostly well separated by rings and shallow strictures. Distal smooth tubus short. The 3 feet are in primitive forms still long, in higher evolved forms rudimentary and very short.

Occurrence: Middle part of *Spongosilicarmiger italicus* Zone to lower part of *Ladinocampe multiperforata* Zone (upper part of Lower Fassanian to Middle Fassanian)

Assigned species:

Monicasterix alpina n. gen. n. sp.

Monicasterix brevituba n. sp.

Monicasterix gabiolaensis n. sp.

Monicasterix prisca n. sp.

Remarks: *Monicasterix prisca* n. sp. has still unreduced feet and nearly unseparable segments. Both remembers to the forerunner *Hozmadia longicephalis* n. sp., which has, however, not yet a smooth distal tubus and a considerably shorter test.

Tubotriassocyrtis n. gen. has no feet or rudimentary feet at the end of the long distal tubus.

Monicasterix alpina n. gen. n. sp.

(Pl. 21, figs. 1–3, 5, 7)

Derivatio nominis: According to its occurrence in the Alps.

Holotypus: The specimen on pl. 21, figs. 1-3, 5, 7; rep.-no. KoMo 1980 I-253.

Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy)

Stratum typicum: Sample TT 7, lower part of Middle Fassanian *Ladinocampe multiperforata* Zone.

Material: 5 specimens.

Diagnosis: Test elongated subcylindrical. Cephalis large, subhemiglobular to subconical. Cephalic spicular system with Mb, A, V, 2L, D, 2l. Apical horn very large, tricarinate, carinae basally bifurcated. Multicarinate horns in prolongation of V, 2L and 2l very broad, rather large. Surface of cephalis with ridges in the place of arches AV and Al and VL. Remaining surface with imperfect, indistinct reticulum. Only very few, widely scattered tiny pores are present. Sometimes the cephalis is poreless.

Thorax, abdomen cylindrical, not well seperable each other, with small pores on the inner layer, covered by an outer layer with irregular large pore frames (with nodes or short spines at the joint). 1-2 postabdominal segments with small pores, arranged in irregular rings on the inner layer. At one postabdominal segment a narrow slightly nodose ring is present. Also the postabdominal segments, that become narrower in distal direction, are covered by a secondary outer layer with irregular larger pore frames.

Smooth distal tubus relatively long, broad, with 3 short, triangular feet that are on the outer side slightly convex, on the inner side excavated. Aperture relatively broad, rounded triangular.

Dimensions:
Length of test = 211–226 µm
Maximum width of test = 67–73 µm

Occurrence: Lower part of Middle Fassanian *Ladinocampe multiperforata* Zone of Southern Alps.

Remarks: *Monicasterix prisca* n. sp. has still unreduced, large feet and no distinct outer layer with different pores frames than on the inner layer.

Monicasterix gabiolaensis n. sp. has 3 rings on the 3 postabdominal segments that displays outer pore frames arranged in irregular rings.

Monicasterix brevituba n. sp. has a very short smooth distal tubus with very small strongly rudimentary feet. The rings on the 4 postabdominal segments are distinct, the outer layer is only indistinct or missing.

Monicasterix brevituba n. sp.
(Pl. 20, fig. 9)

Derivatio nominis: According to the very short distal tube
Holotypus: The specimen on pl. 20, fig. 9; rep.-no. KoMo 1980 I-526.
Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy)
Stratum typicum: Sample TT 3, lower part of Middle Fassanian *Ladinocampe multiperforata* Zone.
Material: 3 specimens.
Diagnosis: Test elongated spindle-shaped. Cephalis large, hemiglobular. Cephalic spicular system unknown. Apical horn large, tricarinate. Vertical horn carinate. 2 short carinate horns lie probably in prolongation of 2l.

Thorax and abdomen cylindrical. Inner pore frames with small pores arranged in irregular rings. Pore frames of outer layer irregular; on the thorax with nodes or short spines at the joints. The 3 following postabdominal segments are narrow, subcylindrical to inversely trapezoidal, proximally with a slightly nodose narrow ring, irregular and indistinct in the first postabdominal segment. The inner layer consists in these segments of 1-2 irregular pore rings with small pores. The outer layer is there indistinct and consists only of elevations of the pore frames around the inner pores. The last postabdominal segment is inversely conical and considerably higher than the foregoing ones. It has also a narrow proximal ring and an irregular pore ring below it. The other small pores are rather irregularly spaced.

Smooth distal tubus very short, with 3 tiny, broadly triangular rudimentary feet with slightly elevated margin.

Dimensions:
Length of test = 209–237 µm
Maximum width of test = 72–78 µm

Occurrence: Lower part of Middle Fassanian *Ladinocampe multiperforata* Zone.

Remarks: By the very short distal tubus and the very small rudimentary feet this species is well distinguished from all other known *Monicasterix* species.

Monicasterix gabiolaensis n. sp.
(Pl. 21, figs. 4, 6)

Derivatio nominis: According to the occurrence in the Passo della Gabiola section.
Holotypus: The specimen on pl. 21, figs. 4, 6; rep.-no. KoMo 1980 I-527.
Locus typicus: Passo della Gabiola section near Recoaro
Stratum typicum: Sample MD 9, middle part of *Spongosilicarmiger italicus* Zone, middle part of Lower Fassanian.
Material: 5 specimens.
Diagnosis: Test subcylindrical. Cephalis large, subhemiglobular. Cephalis spicular system with Mb, A, V, 2L, D, 2l. Broad, but short multicarinate horn in prolongation of V lies on the cephalis. Broad, but very short multicarinate horns in prolongation of 2l lie on the proximal part of thorax. Arches AV and Al well visible on the cephalis as ridges. Some low ridges of the outer layer reaches from the thorax on the lower part of the cephalis. Remaining cephalis surface smooth. Only very few widely scatterd pores are present on the cephalis.

Thorax cylindrical, widest segment of the test. Abdomen and following 3 postabdominal segments subcylindrical. Their width decreases continuously and very slowly.

The small pores of the inner layer are arranged into regular to irregular pore rings. The thick outer layer of the thorax and abdomen displays irregular pore frames, especially on the thorax with high walls. On the postabdominal segments the outer pore frames follow the inner pore frames, but are larger. Therefore also the outer pore frames are arranged in indistinct rings. In the first postabdominal segment one complete and one incomplete ring are present, in the following 2 postabdominal segments only one pore ring in each segment is present.

Smooth distal tubus relatively long for the genus, broad, narrowest in its middle part. The 3 feets are rudimentary, short, broadly triangular, outer side convex, inner side excavated.

Dimensions:
Length of test = 201–219 µm
Maximum width of test = 65–73 µm

Occurrence: Middle part of Lower Fassanian *Spongosilicarmiger italicus* Zone, Southern Alps.

Remarks: *Monicasterix alpina* n. sp. from the lower part of the *Ladinocampe multiperforata* A.-Z. is similar, but it has only 1-2 postabdominal segments with only one distinct ring, the horns in prolongation of V and 21 are larger and the outer pore frames are also on the postabdominal segments irregular.

Monicasterix brevituba n. sp. has a short distal tubus and strongly rudimentary, very small feet. The test is elongated spindle-shaped.

Monicasterix prisca n. sp. has long, unreduced feet and a spindle-shaped test.

Monicasterix prisca n. sp.
(Pl. 20, figs. 8, 10–12)

Derivatio nominis: Oldest known *Monicasterix* species
Holotypus: The specimen on pl. 20, figs. 10, 11; rep.-no. KoMo 1980 I-528.
Locus typicus: Val di Creme section near Recoaro.
Stratum typicum: Sample VCB, upper part of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Material: 14 specimens.
Diagnosis: Test spindle-shaped, segments almost inseparable. Cephalis large, rounded conical. Cephalic spicular system with Mb, A, V, 2L, D, 21. Apical horns large, tricarinate; horns in prolongation of V and 21 broad, short, multicarinate.

Following part (thorax or thorax and abdomen subcylindrical). Last segment inversely conical, separated by a distinct narrow, slightly nodose ring from the foregoing segment.

Cephalis with few, widely scattered, very small pores. partly poreless. Other segments with small pores, below the ring of the last segment arranged in an irregular pore ring, in the remaining test irregularly spaced.

Distal smooth tubus short. Terminal feet unreduced, long for the genus. Their outer side is convex, their inner side excavated.

Dimensions:
Length of test = 175–262 µm
Maximum width of test = 68–77 µm

Occurrence: Upper part of Lower Fassanian *Spongosilicarmiger italicus* Zone

Remarks: *Monicasterix prisca* n. sp. is by its large, unreduced distal feet easily to distinguish from all other *Monicasterix* species.

Genus *Tubotriassocyrtis* n. gen.

Derivatio nominis: According the presence of a long, smooth, poreless distal tubus and the occurrence in the Triassic.
Type species: *Tubotriassocyrtis angustituba* n. gen. n. sp.
Diagnosis: Test small, elongated spindle-shaped to subcylindrical. Cephalis large, conical to subhemispherical, with big tricarinate apical horn. Cephalic spicular system with Mb, A, V, 2L, D?, 21. Short carinate horns are present in prolongation of V, 2L and 21.

Following segments cylindrical, last segment inversely conical, followed by a long, narrow to braod, smooth poreless tubus with small to moderately wide round aperture.

Thorax and abdomen often covered by an outer layer with irregular moderately coarse pore frame. The postabdominal segments consist of an alteration of straps with small pores, closed or partly closed by an outer layer of microgranular silica and straps with 1-2 rings of somewhat larger pores that are not closed by an outer layer of microgranular silica. In higher evolved forms this type of wall structure is also present in the thorax and abdomen, where the outer layer with coarse pore frames is missing. In the most primitive forms the above described type of wall structure is still missing in all segments.

Occurrence: Middle part of Lower Fassanian to Upper Fassanian.

Assigned species:
Tubotriassocyrtis angustituba n. gen. n. sp.
Tubotriassocyrtis annulata n. sp.
Tubotriassocyrtis latotuba n. sp.
Tubotriassocyrtis n. sp. A (= *Eucyrtis* ? sp. H sensu YAO, 1982 = *Stichomitra ? triassica* DUMITRICĂ sensu KIDO, 1982)

Tubotriassocyrtis n. sp. B (= *Eucyrtis* ? sp. sensu KOJIMA & MIZUTANI, 1987)

Remarks: *Monicasterix* n. gen. is distinguished by the presence of feet at the end of the distal tubus. In higher evolved forms of this genus the feet are strongly reduced. *Monicasterix* n. gen. is seemingly the forerunner of *Tubotriassocyrtis* n. gen.

Pseudoeucyrtis PESSAGNO, 1977 is a homoeomorph form distinguished by the missing distal tubus. Moreover, the cephalis is distinctly smaller. Between the last occurrence of *Tubotriassocyrtis* n. gen. (Lower Ladinian) and the first occurrence of *Pseudoeucyrtis* PESSAGNO, 1977 (Middle Jurassic), there is a long time interval, where similar forms are missing. This indicate that *Pseudoeucyrtis* PESSAGNO, 1977 is a homoeomorph form that evolved iteratively from multicyrtid Jurassic radiolarians. However, our knowledge about the Upper Triassic and Lower Jurassic radiolarians is not yet well enough to exclude any relations between *Tubotriassocyrtis* n. gen. and *Pseudoeucyrtis* PESSAGNO, 1977. Independent from this question the morphologic differences are large enough to place both groups into different genera.

Tubotriassocyrtis angustituba n. gen. n. sp.

(Pl. 22, fig. 1)

Derivatio nominis: According to the narrow distal tubus.
Holotypus: The specimen on pl. 22, fig. 1; rep.-no. KoMo 1980 I-530.

Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy).

Stratum typicum: Sample TT 3, lower part of Middle Fassanian *Ladinocampe multiperforata* Zone

Material: 7 specimens.

Diagnosis: Test small, elongated spindle-shaped. Cephalis large, subhemispherical to broadly conical with large, tricarinate apical horn. The cephalis displays few, widely scattered tiny pores. Its surface is coarsely reticulated by an secondary outer layer with irregular, large pore frames. Cephalic spicular system as for the genus. Short multicarinate horns are present in prolongation of V, 2L and 2l. Horn V is situated on the cephalis, horns 2l at the boundary between cephalis and thorax and horns 2L upper part of the thorax.

Thorax cylindrical. Inner layer with very small pores totally covered by an outer layer with coarse, irregular pore frames. Abdomen outside not separated, cylindrical and about as wide as thorax, with very small pores in its distal part, closed or partly closed by a layer of microgranular silica. The proximal part of the abdomen is (like the thorax and cephalis) covered by an outer layer displaying irregular larger pore frames. The following 2-3 postabdominal segments built up an at first cylindrical then inversely hemiglobular part of the test. The first postabdominal segment consists of a strap with 2 somewhat irregular rings of small open pores and of a strap with tiny pores, to the largest part closed by a layer of microgranular silica. In each of the two following smaller postabdominal segments beside the strap with closed or mostly closed tiny pores there exists a strap with one irregular pore ring of small pores.

Distal tubus smooth, poreless, narrow, slowly tapering against the distal end. Aperture small, round.

Dimensions:
Length of test = 251–263 μm
Maximum width of test = 66–74 μm

Occurrence: Lower part of Middle Fassanian *Ladinocampe multiperforata* Zone of Southern Alps.

Remarks: *Tubotriassocyrtis latotuba* n. sp. is clearly distinguished by its broader distal tubus that becomes distally somewhat broader.

Tubotriassocyrtis annulata n. sp. has only one postabdominal segment with strong proximal ring.

In *Tubotriassocyrtis* n. sp. A and *Tubotriassocyrtis* n. sp. B (synonyma see under the genus, assigned species) also the thorax and abdomen display straps of open and closed pores not covered by an outer layer with irregular large pore frames.

Tubotriassocyrtis annulata n. sp.

(Pl. 21, figs. 9, 11)

Derivatio nominis: According to the strong narrow smooth ring at the beginning of the postabdominal segment.

Holotypus: The specimen on pl. 21, figs. 9, 11; rep.-no. KoMo 1980 I-532.

Locus typicus: Val di Creme near Recoaro (Vicentinian Alps, Italy).

Stratum typicum: Sample VCB, upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.

Material: 3 specimens.

Diagnosis: Test very small, subcylindrical with 2 conical ends. Cephalis large, with big tricarinate apical horn. Cephalic spicular system as for the genus. Short, broad, carinate horns are present in prolongation of V, 2L and 2l. Horn V lies on the cephalis, horns 2l in the collar stricture, horns 2L in the upper part of the thorax. Surface of cephalis smooth or with indistinct ridges AV and Al. Cephalis poreless or with very few tiny, widely scattered pores.

Thorax cylindrical, outer layer displays irregular, moderately large pore frames. Abdomen separated from thorax by a low, indistinct smooth ridge. It is considerably lower than thorax, proximally of the same width, distally a little narrower. Outer layer displays moderately large to small pore frames. The postabdominal segment begins with a distinct, high, narrow smooth ring of about the same diameter as thorax and proximal part of abdomen. Below it lies a ring of small pores. Remaining part smooth, poreless, rapidly tapering into the long, smooth, moderately wide, poreless distal tubus.

Dimensions:
Length of test = 173–180 µm
Maximum width of test = 73–77 µm

Occurrence: Upper part of Lower Fassanian *Spongosilicarmiger italicus* Zone.

Remarks: By the high, narrow smooth ring at the beginning of the postabdominal segment *Tubotriassocyrtis annulata* n. sp. is easily to distinguish from the 4 other known *Tubotriassocyrtis* species. The primitive character of *T. annulata* n. sp. is indicated by the absence of the wall structure with straps of open and closed pores, present in all higher evolved *Tubotriassocyrtis* species.

Tubotriassocyrtis latotuba n. sp.

(Pl. 21, figs. 8, 10)

Derivatio nominis: According to the presence of a broad distal tubus.

Holotypus: The specimen on pl. 21, figs. 8, 10; rep.-no. KoMo 1970 I-531.

Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps)

Stratum typicum: Sample TT 3, lower part of the Middle Fassanian *Ladinocampe multiperforata* Zone

Material: 5 specimens.

Diagnosis: Test very small, spindle-shaped. Cephalis large, subhemiglobular, with big, tricarinate apical horn. Cephalic spicular system as for the genus. 2 small, carinate horns on the boundary between cephalis and thorax are probably continuations of 2l. Two big, carinate spines in the middle part of the thorax are probably continuations of 2L. Very small horn V sometimes present. Cephalis covered by an outer layer with coarse pore frames, displaying small nodes or even short spines on the joints. Pores of inner layer tiny, widely scattered.

Thorax cylindrical, as wide as the broadest (distal most) part of cephalis. Outer pore frames irregular, but partly the relatively small pores are arranged in rings with 6–7 pores. Abdomen and 1–2 postabdominal segments narrower than thorax and continuously tapering distalwards. They consist of a poreless strap and a strap with an irregular open pore ring with small to moderately large pores and display no outer layer. Few additional small pores may be present below the pore ring.

Distal tubus smooth, poreless, long, broad, distalwards slightly broadening. Aperture relatively large, round.

Dimensions:
Length of test = 170–185 µm
Maximum width of test = 63–70 µm

Occurrence: Lower part of Middle Fassanian *Ladinocampe multiperforata* Zone.

Remarks: By the broad distal tubus easily to distinguish from the otherwise similar *Tubotriassocyrtis angustituba* n. gen. n. sp. that displays a narrow, distalwards tapering tubus.

Family Planispinocyrtiidae KOZUR & MOSTLER, 1981

Remarks: In this family D is absent in the cephalic spicular system.

The genus *Ladinocampe* KOZUR, 1984 was originally placed into the Triassocampidae KOZUR & MOSTLER, 1981. However, *Ladinocampe* evolved from *Planispinocyrtis*, KOZUR & MOSTLER, 1981 by prolongation and downward-bending of the vertical horn. By this the columella-like spine in the upper half of the shell evolved.

Genus *Ladinocampe* KOZUR, 1984

Type species: *Ladinocampe multiperforata* KOZUR 1984.

Ladinocampe multiperforata KOZUR, 1984

(Pl. 22, figs. 3, 11–14; pl. 23, figs. 1, 2)

1984 *Ladinocampe multiperforata* n. gen. n. sp. – KOZUR, p. 73–74, pl. 5, fig. 2

Occurrence: *Ladinocampe multiperforata* Zone of Middle Fassanian. In the lower part of this zone the index species is accompanied by *Ladinocampe annuloperforata* n. sp. (frequent) and *Ladinocampe latiannulata* n. sp. (rare). In the upper part of the zone beside the index species *Ladinocampe vicentinensis* n. sp. is present.

Remarks: See under the new species.

Ladinocampe annuloperforata n. sp.

(Pl. 22, figs. 2, 4–9; pl. 47, fig. 9)

Derivatio nominis: According to the arrangement of the pores in rings.

Holotypus: The specimen on pl. 22, figs. 4–6; rep.-no. KoMo 1980 I-491.

Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy).

Stratum typicum: Sample TT 5, lower part of *Ladinocampe multiperforata* Zone, Middle Fassanian

Material: 48 specimens.

Diagnose: Shell elongated conical. Cephalis small, hemiglobular to subcylindrical, smooth, poreless, with large, tricarinate apical horn. Cephalis spicular system consists of Mb, A, V, 2L, 2l. In prolongation of V a very long, columella-like foot runs until the 3.–5. postabdominal segment downward. On its inner side this blade-like foot is fused with the shell. Small spines are present in prolongation of 2L (situated at the lower part of the thorax) and in prolongation of 2l (situated in the collar stricture).

Thorax hemispherical, distinctly broader, but shorter than cephalis. The following segments increase slowly and continuously in width, but remain narrow (considerably shorter than cephalis). Abdomen mostly narrow hoop-like, with 2-3, partly irregular pore rings. Often the abdomen is already ring-like with one central pore ring like the following postabdominal segments until the end of the vertical columella. Sometimes few additional pores are present below the central pore ring. Rarely still the first postabdominal segment is hoop-like with 2 pore rings. After the end of the columella the segments consist of a high smooth ring with a pore ring below it. Toward the distal end of the shell the pores become somewhat larger and more elongated, often with slightly elevated ridges between them. Strictures between all postabdominal segments deep, narrow and smooth. The last segment, rarely preserved, is thin-walled, cylindrical and has no ring.

Dimensions:

Length of test = 295–370 µm

Maximum width of test = 95–105 µm

Occurrence: Very rare in th middle and upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone; frequent in the lower part of *Ladinocampe multiperforata* Zone (Middle Fassanian) of Southern Alps.

Remarks: *Ladinocampe multiperforata* KOZUR, 1984 displays rather broad, hoop-like segments until the end of the columella that contains numerous small pores, ring-like arranged in the uppermost parts and more irregular distributed in the remaining parts of the segments.

In *Ladinocampe vicentinensis* n. sp. narrow, ring-like segments with one central pore ring may occur among the first abdominal segments, the first segment after the end of the columella is, however, always broad, inversely trapezoidal and displays many small pores.

In *Ladinocampe latiannulata* n. sp. all segments are hoop-like with numerous small pores.

Ladinocampe latiannulata n. sp.

(Pl. 22, fig. 10)

Derivatio nominis: According to the broad hoop-like segments throughout the test.

Holotypus: The specimen on pl. 22, fig. 10; rep.-no. KoMo 1980 I-492.

Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy).

Stratum typicum: Sample TT 3, lower part of *Ladinocampe multiperforata* Zone, Middle Fassanian.

Material: 4 specimens.

Diagnosis: Shell slender conical. Cephalis small, conical, smooth, poreless, with big, tricarinate apical horn. Cephalic spicular system with Mb, A, V, 2L, 2l. In prolongation of V lies a very long spine that is downward-directed and columella-like fused with the segments until the second postabdominal chamber. Short, broad, tricarinate spines are present in prolongation of 2L and 2l.

Thorax subhemiglobular, not separated by a collar stricture. It has tiny irregularly distributed pores. Abdomen hoop-like, stricture against the first postabdominal segment deep. In the upper part of the abdomen is an irregular ring of tiny pores, remaining pores irregularly scattered. The following 4-5 postabdominal segments are hoop-like (also after the end of the columella) and display numerous tiny pores, in the upper part of each segment arranged in one often somewhat irregular pore ring, in the remaining part of the segments irregularly scattered. Strictures between the postabdominal segments relatively broad, smooth, poreless.

Dimensions:
Length of test = 321–339 µm
Maximum width of test = 100–110 µm

Occurrence: Rare in the lower part of *Ladinocampe multiperforata* Zone (Middle Fassanian).

Remarks: *Ladinocampe latiannulata* n. sp. is the only *Ladinocampe* species, in which also at least 2 segments below the end of the columella no smooth proximal ring is present.

Ladinocampe vicentinensis n. sp.

(Pl. 23, figs. ? 3, 4, 5)

Derivatio nominis: According to the occurrence in the Vicentinian Alps.

Holotypus: The specimen on pl. 23, fig. 5; rep.-no. KoMo 1980 I-495.

Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy).

Stratum typcium: Sample TT 16, upper part of Middle Fassanian *Ladinocampe multiperforata* Zone.

Material: 39 specimens.

Diagnosis: Shell slender conical. Cephalis small, smooth, poreless, subcylindrical or subconical with big tricarinate apical horn. Cephalic spicular system with Mb, A, V, 2L, 2l. Columella in prolongation of V bladelike, reaching until the third to fifth postabdominal segment, on its inner side fused with the segments. Small carinate spines are present in prolongation of 2L and 2l.

Thorax subhemispherical, considerably broader, but mostly not longer than cephalis, often even shorter. Pores tiny, numerous, irregularly scattered. Abdomen very narrow, ring-like, with 2 rings of pores. Following 2-4 postabdominal segments narrow, ring-like, with 1-2 rings of pores. At the end of the columella or immediately after its end the segments become large, inversely trapezoidal.

They begin abruptly with a smooth ring and become distally narrower until the narrow, deep stricture. These segments display numerous small pores, below the ring of each segment arranged in a pore ring, distally in each segment irregularly distributed. Most of the "post-columella" segments have irregular vertical ribs between the pores. Only in the last segment they are missing. These ribs are only exceptionally missing in primitive specimens (*L.* cf. *vicentinensis*).

Dimensions:
Length of test = 300–400 µm
Maximum width of test = 97–110 µm

Occurrence: Restricted to the upper part of the *Ladinocampe multiperforata* Zone (Middle Fassanian).

Remarks: The first postabdominal segments in *Ladinocampe multiperforata* KOZUR, 1984 are braod and hoop-like with numerous small pores. Toward the end of the columella or after its end the segments become shorter, ring like with fewer pores, finally with one pore ring below the smooth proximal ring of these segments. Vertical ribs in the "post-columella" segments are only present in some highly evolved representatives of *L.* cf. *multiperforata* n. sp. They may represent a new subspecies of this species.

The first postabdominal segments of *Ladinocampe annuloperforata* n. sp. may have the same shape and arrangement of pores as in *L. vicentinensis* n. sp. However, in this species the segments at the end or immediately below the columella become ring-like (one proximal smooth ring with one pore ring below it).

Genus *Planispinocyrtis* KOZUR & MOSTLER, 1981

Type species: *Planispinocyrtis baloghi* KOZUR & MOSTLER, 1981

Planispinocyrtis baloghi KOZUR & MOSTLER, 1981

(Pl. 23, figs. 6–9, 12)

1981 *Planispinocyrtis baloghi* n.gen.n.ssp. – KOZUR & MOSTLER, p. 111–112, pl. 10, fig. 2

Occurrence: Illyrian (*Paraceratites trinodosus* Zone) to Lower Fassanian *"Xenoprotrachyceras" reitzi* Zone of Balaton Highland (Hungary).

Remarks: In the holotype, refigured here, the last segment was not fully preserved. Fully preserved material show that this segment has no distinct distal broadening and no skirt.

The postabdominal segments are only slightly and irregularly, partly not elevated. In this latter case they look like a very long stricture with a pore ring, like in the holotype. In oblique view from above or below, the elevation of the postabdominal segments is better to seen, even on specimens where this elevation is not clearly recognizable in lateral view. Therefore here different views of the holotype and other specimens are given.

Mostly only one pore ring is present in each postabdominal segment, but often few additional pores are present below the proximal pore ring. They may be arranged in an incomplete second ring with wide distances between the pores or pore groups.

Very characteristic is the strong downward inclination of the vertical horn. The only other species with this feature, *Planispinocyrtis brevis* n. sp. has a distinct, moderately broad distal skirt.

In the Lower Fassanian *Planispinocyrtis pelsoensis* n. sp. the vertical horn is moderately strong downward inclined. This species is distinguished by differently shaped postabdominal segments with many pores in the first and second postabdominal segment and by a prominent proximal smooth ring in the second and third postabdominal segment.

Planispinocyrtis ? annulata n. sp.
(Pl. 23, figs. 10, 11)

Derivatio nominis: According to the narrow smooth rings in the distal postabdominal segments.
Holotypus: The specimen on pl. 23, fig. 11; rep.-no. KoMo 1980 I-567.
Locus typcius: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy).
Stratum typicum: Sample TT 13, upper part of Middle Fassanian *Ladinocampe multiperforata* Zone.
Material: 11 specimens.
Diagnosis: Test in the apical half slender conical, in the distal half cylindrical. From the cephalis to the second or third postabdominal segment the width increases continuously and slowly, in the following segments the width remains constant. Cephalis small, subhemiglobular to subconical, smooth, poreless, with round apical horn. Cephalic spicular system unknown. In prolongation of V (?) and 2l (?) 3 small (2l) to long (V?) proximally carinate, distally round horns are present that start all on the cephalis or on the collar stricture.

Thorax, abdomen, first and second postabdominal segments hoop-like, the latter more broadly ring-like, separated by deep smooth strictures. The thorax is generally poreless, but at the junction of the spines 2L (?) with the thoracic wall 3 small pores are present. From the abdomen to the second postabdominal segment only one central ring of small pores is present.

From the third to the eighth postabdominal segment a distinct, smooth, narrow proximal ring is present that arises sharply from the stricture. Immediately below this ring a ring of small pores is present. Remaining segment smooth, inversely trapezoidal.

Dimensions:
Length of test = 337-385 µm
Maximum width of test = 91–100 µm
Length of lateral horns = 30–33 µm (V)
13–15 µm (2/l)

Occurrence: Upper part of Middle Fassanian *Ladinocampe multiperforata* Zone.
Remarks: In contrast to all other *Planispinocyrtis* species, where the lateral horns are situated on the thorax, the 3 lateral horns in *Planispinocyrtis ? annulata* n. sp. lie all on the cephalis or on the collar stricture. The thorax is considerably smaller than in the other *Planispinocyrtis* species. The proximal rings in the distal postabdominal segments remembers to *Yeharaia* NAKASEKO & NISHIMURA, 1979, but such rings occur also in some *Triassocampe*, *Ladinocampe* and some other *Planispinocyrtis* species and are therefore not a specific taxonomic feature. *Yeharaia* is distinguished by the always missing lateral horns.

Planispinocyrtis brevis n. sp.
(Pl. 23, fig. 14)

Derivatio nominis: According to the relatively small postabdominal part.
Holotypus: The specimen on pl. 23, fig. 14; rep.-no. KoMo 1980 I-46.
Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section.
Stratum typicum: Limestone bed 87 within greenish tuffites, *Paraceratites trinodosus* Zone (Illyrian.
Material: 6 specimens.
Diagnosis: Test small, subcylindrical, with short postabdominal part. Cephalis moderately large, subconical with large tricarinate apical horn. Cephalic spicular system with Mb, A, V, 2L, 2l. In prolongation of V, 2L and 2l large carinate horns are present, from which the horn V is the largest and strongly downward directed, whereas all other stand about perpendicular to the shell

surface. Surface of cephalis smooth, poreless or with few widely scattered tiny pores.

Thoraco-abdomen large, subglobular to subcylindrical. Thoracic part of thoraco-abdomen with tiny, irregularly distributed pores, often closed by a layer of microgranular silica. Abdominal part of thoraco-abdomen as broad as thorax, but considerably shorter, with one or two irregular pore rings. Only 2 postabdominal segments are present. The first is shallow hoop-like with one pore ring and very few, widely scattered pores below this ring. The second is proximally cylindrical, with one pore ring, distally widened to a moderately wide skirt with one ring of mostly closed pores. Strictures after the abdomen and after the first postabdominal segment shallow, after the abdomen often moderately deep here often rather broad.

Dimensions:
Length of test = 153–185 μm
Maximum width of test (without last segment) = 55–69 μm
Width of skirt = 65–74 μm

Occurrence: Illyrian of Balaton Highland.

Remarks: *Planispinocyrtis* brevis n. sp. is by its short postabdominal part with only 2 postabdominal segments distinguished from the most other *Planispinocyrtis* species. Most similar is *Planispinocyrtis baloghi* KOZUR & MOSTLER, 1981 which has, however, 4 postabdominal segments that are only slightly and irregularly, partly not elevated. Moreover, this species displays no distal widening skirt.

Planispinocyrtis ? gabiolaensis n. sp.
(Pl. 23, fig. 13)

Derivatio nominis: According to the occurrence in the Passo della Gabiola section.

Holotypus: The specimen on pl. 23, fig. 13; rep.-no. KoMo 1980 I-568.

Locus typicus: Passo della Gabiola near Recoaro, Vicentinian Alps (Italy).

Stratum typicum: Sample MD 1, lower subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.

Material: 3 specimens.

Diagnosis: Cephalis moderately large, elongated subhemiglobular, smooth, poreless. Apical horn moderately large, tricarinate. Lateral horn in prolongation of V (?) large, basally blade-like high. Upper line with sharp bent downward inclined, lower line perpendicular to the thorax. Lateral horns in prolongation of 2l (?) moderately large, broad, tricarinate. Thorax inflated, hemiglobular, considerably broader, but not higher than cephalis, with numerous small pores. Pore frames a little elevated, with small nodes on the joints. Two V-shaped (above open) shallow vertical incisions are present between the horns V (?) and 2l (?). At the end of these incisions a small, indistinct node-like elevation may be present. From here indistinct ribs run inside the shell to the upper end of the horns V (?) and 2l (?).

Abdomen considerably lower and narrower than thorax, separated from the thorax by a shallow, smooth, poreless stricture. The abdomen displays a central ring of small pores.

The following 6 postabdominal segments are narrow, sharply contrasted against the deep, smooth, poreless strictures that are partly somewhat broader than the segments. These segments become very slowly and continuously broader. The sixth postabdominal segment is about as broad as the thorax. All these 6 postabdominal segments have a central ring of small round pores that become distalwards a little larger.

The following postabdominal segments are somewhat higher than the foregoing ones and about as wide as the sixth postabdominal segment or a little wider. They display a pore ring of vertically elongated pores and a second, irregular or incomplete pore ring of small round pores below it.

Dimensions:
Length of test = 331–346 μm
Maximum width of test = 72–74 μm
Length of horn V (?) = 37–40 μm

Occurrence: Lower part of Lower Fassanian *Spongosilicarmiger italicus* Zone, Southern Alps.

Remarks: *Planispinocyrtis ? gabiolaensis* n. sp. belongs to a group of *Planispinocyrtis* species (*P. ? longispinosa* n. sp., *P. ? nishimurai* n. sp. and *P. ? thoraciglobulosa* n. sp.) that displays no horns or rudimentary horns in prolongation of 2L. Only in *P. ? longispinosa* n. sp. the cephalic spicular system is known that displays no spicule D, like in typical *Planispinocyrtis* species. By the presence of only 3 lateral horns this group is similar to the genus *Tetraspinocyrtis* n. gen., in which, however, the horns are situated in prolongation of D and 2L and D is never missing in the cephalic spicular system. Forms, in which the spicular system is not yet known, are here placed tentatively to *Planispinocyrtis* KOZUR & MOSTLER, 1981.

The Upper Fassanian *Planispinocyrtis ? longispinosa* n. sp. is distinguished by longer lateral horns, specially also the horns 2l are very long.

The Middle Fassanian *Planispinocyrtis ? nishimurai* n. sp. has a globular thorax.

The higher Middle Fassanian *Planispinocyrtis ? thoraciglobulosa* n. sp. displays a globular thorax. Abdomen as well as first postabdominal segment display more than one pore ring.

The higher Middle Fassanian *Planispinocyrtis* ? *annulata* n. sp. has a small thorax and the fourth to eighth postabdominal segments have a high, narrow, smooth proximal ring.

In all other *Planispinocyrtis* species there are 5 lateral horns (horns 2L not reduced).

Planispinocyrtis haeckeli n. sp.
(Pl. 24, figs. 1–3)

Derivatio nominis: In honour of E. HAECKEL, the most famous pioneer of the radiolarian research.
Holotypus: The specimen on pl. 24, figs. 1, 3; rep.-no. KoMo 1980 I-236.
Locus typicus: Road cut San Ulderico-Pallé. Tretto (Vicentinian Alps, Italy).
Stratum typcium: Sample TT 7, lower part of *Ladinocampe multiperforata* Zone, Middle Fassanian. Southern Alps.
Material: 53 specimens.
Diagnosis: Test subcylindrical with distal skirt. Cephalis moderately large, subglobular to hemiglobular, with big tricarinate apical horn. Cephalic spicular system with Mb, A, V, 2L, 2l. A very strong and high, carinate, a little downward directed horn lies in prolongation of V; 2 very small horns are present in prolongation of 2L, and 2 small carinate horns are situated in continuation of 2l. All these horns are situated almost in one plane on the thorax, only the horns 2L are situated a little deeper, in the stricture below the thorax. Surface of cephalis poreless, granulate.

Thoraco-abdomen large, subglobular to subcylindrical. Dividing stricture between thorax and abdomen very shallow, very narrow, smooth or with few indistinct ribs, poreless. Abdomen as wide as thorax, but considerably lower. Thoracic part of the thoraco-abdomen with irregularly scattered very small pores with slightly elevated margins of the pore frames. Abdominal part of thoraco-abdomen with one proximal ring of small pores. Few tiny pores of the remaining part closed by a layer of microgranular silica. Following strictures deep, broad, entirely smooth. Three postabdominal segments high, narrow, both proximally and distally steeply dipping, broadest below a central ring of pores, that are smallest in the first postabdominal segment and largest in the third postabdominal segment. Fourth postabdominal segment considerably larger than the foregoing segments, proximally trapezoidal, with one ring of large pores, distally with a moderately broad skirt displaying a second ring of large pores.
Dimensions:
Length of test = 246–260 µm
Maximum width of test (without last segment) = 69-73 µm
Width of skirt = 131–137 µm
Occurrence: Lower part of Middle Fassanian. *Ladinocampe multiperforata* Zone.
Remarks: In the most *Planispinocyrtis* species at least the first postabdominal segment has numerous small pores beside the pore ring. The species with only one pore ring on the first postabdominal segment are distinguished from *Planispinocyrtis haeckeli* n. sp. as follows:

The Illyrian to deeper Lower Fassanian *P. baloghi* KOZUR & MOSTLER, 1981 has broad, but shallow, sometimes even missing constrictions between the postabdominal segments that are, moreover, not so high and partly even not elevated. All 5 horns on the thorax are large, the cephalic horn is strongly downward directed, the cephalis is longer, subconical.

The Illyrian *Planispinocyrtis pulchra globulata* n. subsp. displays beside the central pore ring in the first postabdominal segment still single, widely scattered pores, the distal skirt is very small and all horns on the thorax are large.

The Illyrian *Planispinocyrtis brevis* n. sp. has a shorter postabdominal part with only 2 postabdominal segments, the first postabdominal segment displays some additional, widely scattered pores below the pore ring, the horns on the thorax are all large and the distal skirt is somewhat smaller and displays smaller pores.

The higher Middle Fassanian *Planispinocyrtis paronai* n. sp. has a globular thorax and the abdomen is distinctly separated.

Planispinocyrtis illyrica n. sp.
(Pl. 24, figs. 4–7)

Derivatio nominis: According the frequent occurrence in the Illyrian of the Balaton Highland.
Holotypus: The specimen on pl. 24, figs. 4, 6; rep.-no. KoMo 1980 I-43.
Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section.

Stratum typicum: Limestone bed 87 within greenish tuffit, *Paraceratites trinodosus* Zone (Illyrian).
Material: 29 specimens.
Diagnosis: Test subcylindrical with moderately broad distal skirt. Cephalis moderately large, subhemispherical, poreless, with granulate surface. Cephalic spicular system with Mb, A, V, 2L, 21. In prolongation of V, 2L and 21 large, carinate horns are present, all located on the thorax.

Thoraco-abdomen large, broadest in the thoracic part, here with tiny, mostly irregularly distributed pores, sometimes also arranged in irregular rings. At least in the proximal part an outer layer with somewhat larger, irregular pore frames is present. Abdominal part separated by a narrow, smooth, poreless shallow stricture. It is shorter and somewhat narrower than or as wide as the thoracic part and has one proximal pore ring of small pores. Below this pore ring scattered tiny pores are present, often closed by a layer of microgranular silica. Strictures against the first postabdominal segment and between the postabdominal segments deep, smooth, poreless.

The first 3 postabdominal segments are high, rounded, hoop-like, with one central ring of small, in the second and third postabdominal segment somewhat larger roundish pores. The first postabdominal segment displays often few widely scattered tiny pores below the pore ring. Fourth postabdominal segment bell-shaped, with moderately wide skirt. In the proximal part one ring of vertically elongated pores is present. In the skirt occur a ring of widely scattered, moderately large pores.
Dimensions:
Length of test = 200–240 μm
Maximum width of test (without last segment) = 62–68 μm
Width of skirt = 85–98 μm
Occurrence: Illyrian of Balaton Highland.
Remarks: The Illyrian *Planispinocyrtis pulchra* n. sp. has only a very small skirt.

The Middle Fassanian *Planispinocyrtis haeckeli* n. sp. has with exception of the apical and vertical horns only small horns, the postabdominal segments are not broadely rounded and the distal skirt is larger and has larger pores.

Planispinocyrtis baloghi KOZUR & MOSTLER, 1981 has only slightly and irregularly elevated postabdominal segments, the ventral horn is strongly downward directed and the distal end is not widened.

Planispinocyrtis ? longispinosa n. sp.
(Pl. 24, figs. 8, 10, 11)

Derivatio nominis: According to the very long lateral horns V and 21.
Holotypus: The specimen on pl. 24, figs. 8, 10, 11; rep.-no. KoMo 1980 I-571.
Locus typicus: Köveskál (Balaton Highland, Hungary), section at the cemetery.
Stratum typicum: Limestone lenses within tuffites, sample 4b, 10 cm below sample 4, *Budurovignathus truempyi* A.Z., Upper Fassanian.
Material: 4 specimens.
Diagnosis: Cephalis moderately large, subconical with broadely rounded apical part. Apical horn moderately large, tricarinate, asymmetrically located nearer to horns 21. Cephalic spicular system with Mb, A, V, 2L, short 21. The spine A is obliquely upward directed. 3 very long lateral spines are present in prolongation of V and 21. Horn V is basally very high, and slightly downward directed.

Thorax large, subglobular, between the horns V and 2L incised (V-shaped incision above open), with small pores arranged in irregular rings.

Abdomen considerably lower and narrower than thorax, with one central pore ring. First to fourth postabdominal segments highly elevated, somewhat higher and broader than abdomen, with one proximal pore ring. In the first to third postabdominal segment the outline is trapezoidal in the proximal part of the segments, and inversely trapezoidal in their distal part. The fourth postabdominal segment is narrow ring-like in its proximal part (with pore ring) and inversely trapezoidal in its distal part. The fifth postabdominal segment is again narrower, slowly hoop-like, with central pore ring. Further segment(s) not preserved.
Dimensions:
Length of test = 272–285 μm
Maximal width of test = 73–77 μm
Length of lateral horns: 50–61 μm
Occurrence: Upper Fassanian of Balaton Highland (Hungary).
Remarks: By its unusual long lateral horns in prolongation of V and 21 distinguished from all other *Planispinocyrtis* species. Moreover, only in the Lower Fassanian *Planispinocyrtis ? gabiolaensis* n. sp., in the Middle Fassanian *P. ? nishimurai* n. sp. and in the Middle Fassanian *P. ? thoraciglobulosa* n. sp. that display all large globular to hemiglobular thorax, the horns 2L are missing or rudimentary (P. ? thoraciglobulosa n. sp.). From these species *P. ? thoraciglobulosa* n. sp. is easily to

distinguish by the larger abdomen with numerous small pores. In *Planispinocyrtis ? nishimurai* n. sp. the segmentation is similar and the pore ring on the post-thoracic segments is similar arranged, but the lateral horns are considerably shorter.

Planispinocyrtis macrocephalis n. sp.
(Pl. 24, figs. 9, 12)

Derivatio nominis: According to the large cephalis
Holotypus: The specimen on pl. 24, figs. 9, 12; rep.-no. KoMo 1980 I-47.
Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section.
Stratum typicum: Limestone bed 87 within greenish tuffites, *Paraceratites trinodosus* Zone (Illyrian).
Material: 10 specimens.
Diagnosis: Test short subcylindrical. Cephalis very large, with few tiny, widely scattered pores. Surface with few, indistinct, low, narrow ribs between the horns, otherwise smooth. Cephalic spicular system with Mb, A, V, 2L, 2l. Apical horn stout, large, tricarinate. Carinate horns in prolongation of V, 2L, 2l large.

Thoraco-abdomen large, subcylindrical. Thoracic part large, but not or only a little wider and somewhat lower than cephalis. Abdominal part separated by narrow, shallow smooth poreless constriction. Thoracic part with widely scattered small pores. Abdominal part as wide as thoracic part or a little narrower, considerably lower than thoracic part and with 1-2 irregular rings of small pores.

First postabdominal segment low, rounded, with small pores, often arranged into 1-2 rings. Second postabdominal segment large, bell-shaped. In the cylindrical long upper part lies proximally a ring with large pores. Distal skirt narrow to moderately broad, with 6 broadly triangular distal appendages.
Dimensions:
Length of test = 165–175 μm
Maximum width of test (without skirt) = 60–63 μm
Width of skirt = 75–79 μm
Occurrence: Illyr (*Paraceratites trinodosus* Zone) of Balaton Highland.
Remarks: *Planispinocyrtis macrocephalis* n. sp. is easily to distinguish from the other *Planispinocyrtis* species by its very large cephalis and by the triangular distal appendages.

Planispinocyrtis multiporata n. sp.
(Pl. 25, figs. 1, 3, 5, 6, 9)

Derivatio nominis: According to the numerous small pores at least in the first postabdominal segment.
Holotypus: The specimen on pl. 25, figs. 5, 9; rep.-no. KoMo 1980 I-540.
Locus typcius: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy).
Stratum typicum: Sample TT 7, lower part of Middle Fassanian *Ladinocampe multiperforata* Zone.
Material: 69 specimens.
Diagnosis: Test cylindrical with wide distal skirt. Cephalis moderately large, poreless, granulat. Cephalic spicular system with Mb, A, V, 2L, 2l. Apical horn large, carinate, distally roundish. Vertical horn multicarinate, large, somewhat upward directed. Its upper carina begins in the lower part of the cephalis. The other horns are small, broad, carinate and are totally situated on the thorax, the lower ridge of horns 2L may even reaches down until the uppermost part of the abdomen.

Thoraco-abdomen subcylindrical, only slightly divided into thoracic and abdominal part by a narrow, poreless very shallow constriction, near to the horns crossed by low narrow ridges in prolongation of the carinae of the horns. The abdominal part is lower, but a little broader than the thoracic part due to a slight, hoop-like elevation. Both thoracic and abdominal part of the thoraco-abdomen are covered by tiny pores, in the abdominal part at least proximally arranged in a ring, also below it and in the distal thoracic part sometimes arranged in indistinct rings.

Constriction after the abdomen and between the postabdominal segments deep, proximally rather narrow, distally somewhat wider. They are smooth, poreless. The first 2 postabdominal segments are hoop-like and displays numerous small pores, proximally arranged in a pore ring, distally irregularly distributed. In the second post-abdominal segment these pores are somewhat larger than in the first one and their number is lower. The third postabdominal segment is, depending from the subspecies either also rounded hoop-like with one proximal pore ring and additional pores, often arranged in a second ring, or it is narrower with one central pore ring and a low, narrow proximal smooth ring. The fourth postabdominal ring is considerably larger with subcylindrical proximal part and large distal skirt. The proximal part has a proximal ring of large pores. Below it a second incomplete ring of pores may be present. The skirt displays one ring of large pores.

Dimensions:
Length of test = 257–293 µm
Maximum width of test (without last segment) = 67-73 µm
Width of skirt = 119–127 µm
Occurrence: Middle Fassanian *Ladinocampe multiperforata* Zone of Southern Alps.
Remarks: In the Illyrian to Lower Fassanian *Planispinocyrtis baloghi* KOZUR & MOSTLER, 1981, in the Illyrian *P. illyrica* n. sp., in the Illyrian *P. brevis* n. sp. and in the Middle Fassanian *P. haeckeli* n. sp. already the first postabdominal segment has only one central pore ring. Moreover, in *P. baloghi* n. sp. and *P. brevis* n. sp. all horns are large, the ventral horn is strongly downward directed. P. baloghi n. sp. has no skirt.

The species with numerous pores in a hoop-like first postabdominal segment as in *P. multiporata* n. sp. are distinguished from this species as follows:

The Lower Fassanian *Planispinocyrtis pelsoensis* n. sp. displays a prominent proximal smooth ring on the second and third postabdominal segment. Moreover, the ventral horn is distinctly downward directed.

The basal Fassanian *Planispinocyrtis praecursor* n. sp. has a very high, blade-like vertical horn. Its upper line is strongly downward directed. Moreover, this species has 6 postabdominal segments.

The Illyrian *Planispinocyrtis pulchra* n. sp. has only a minute skirt and all horns on the thorax have the same size.

Planispinocyrtis multiporata multiporata n. subsp.
(Pl. 25, figs. 3, 5, 9)

Holotypus = Holotypus of the species.
Material: 41 specimens.
Diagnosis: With the character of the species. The first 3 postabdominal segments are hoop-like with many small pores that become from the first to the third postabdominal segments somewhat larger. The pores between the proximal pore ring are irregularly distributed. Only in the third pore ring they may be arranged in a second pore ring. Fourth postabdominal ring with additional moderately large pores below the proximal pore ring with moderately large pores.
Occurrence: Middle Fassanian *Ladinocampe multiperforata* Zone of Southern Alps.
Remarks: See also at the species. In *Planispinocyrtis multiporata annuloporata* n. subsp. the second postabdominal segment is hoop-like to inversely subtrapezoidal. Below the proximal ring of small pores lies only an incomplete, irregular second ring of tiny pores. The third segment is inversely subtrapezoidal and has only one ring of moderately large pores. The fourth postabdominal segment has only one proximal ring with large, vertically elongated pores without additional pores.

Planispinocyrtis multiporata annuloporata n. subsp.
(Pl. 25, figs. 1, 6)

Derivatio nominis: According to the arrangement of the pores in the single rings in the last 2 postabdominal segments.
Holotypus: The specimen on pl. 25, fig. 1; rep.-no. KoMo 1980 I-239.
Locus typicus: Road cut San Ulderico-Pallé. Tretto (Vicentinian Alps, Italy).
Stratum typicum: sample TT 7, lower part of Middle Fassanian *Ladinocampe multiperforata* Zone
Material: 28 specimens.
Diagnosis: With the character of the species. Second postabdominal segment hoop-like to subtrapezoidal, with one proximal pore ring and tiny pores below it that are arranged in a second incomplete ring. Third postabdominal ring inversely subtrapezoidal, with slow, narrow smooth proximal ring followed by pore ring with relatively large pores. No additionally pores. Last segment with proximal ring of large, vertically elongated pores, without additional pores.
Remarks: See also at the species. In *Planispinocyrtis multiporata multiporata* n. subsp. the first 3 postabdominal segments are hoop-like and display numerous small pores, arranged in a proximal pore ring below which they are irregularly spaced. Also the last segment has still some additional large pores below the proximal pore ring.

Planispinocyrtis ? nishimurai n. sp.
(Pl. 25, figs. 10, 11)

Derivatio nominis: In honour of Prof.Dr.A. NISHIMURA, Osaka.
Holotypus: The specimen on pl. 25, fig. 11; rep.-no. KoMo 1980 I-570.
Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy).
Stratum typicum: Sample TT 6, lower part of Middle Fassanian *Ladinocampe multiperforata* Zone.

Material: 21 specimens.

Diagnosis: Cephalis moderately large, rounded subconical, smooth, poreless. Cephalic spicular system unknown.

Thorax globular, with numerous tiny pores. Horn in prolongation of V (?) large, downward inclined. Horns in prolongation of 21 (?) moderately large.

The abdomen is considerably lower than the thorax, but it has the same width. The following segments increases very slowly in width, whereas their height remains nearly constant. Abdomen to second postabdominal segment in their upper part (with pore ring) with trapezoidal outline, in their lower part (poreless) with inversely trapezoidal outline. Pore ring with small pores. Following third to seventh postabdominal segments high, narrow, sharply contrasted against the deep, smooth, poreless strictures. Their middle part is mostly straight, with a ring of moderately large pores, but some of these segments may be also inversely trapezoidal.

Dimensions:

Length of test = 254–285 µm

Maximum width of test = 66–77 µm

Length of horn V (?) = 32–40 µm

Length of horns 21 (=) = About 25 µm

Occurrence: Lower part of Middle Fassanian *Ladinocampe multiperforata* Zone.

Remarks: In the Lower Fassanian *Planispinocyrtis ? gabiolaensis* n. sp. already the first 2 postabdominal segments are sharply contrasted against the deep strictures. The thorax is considerably broader than the abdomen and has a hemiglobular shape.

The Upper Fassanian *Planispinocyrtis longispinosus* n. sp. is distinguished especially by its very long horns 21.

Planispinocyrtis paronai n. sp.
(Pl. 26, fig. 1)

Derivatio nominis: In honour of C.F. PARONA, one of the pioneers of the fossil Radiolaria research.

Holotypus: The specimen on pl. 26, fig. 1; rep.-no. KoMo 1980 I-571.

Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy)

Stratum typicum: sample TT 13, upper part of Middle Fassanian *Ladinocampe multiperforata* Zone.

Material: 7 specimens.

Diagnosis: Cephalis moderately large, smooth, poreless, with asymmetrically situated apical horn. It is tricarinate with broad, deep furrow between the ridges that are subdivided by a central relatively deep furrow into 2 ridges. By this the apical horn looks hexacarinate. The uppermost part of the apical horn is round. Cephalic spicular system unknown, but the 5 lateral horns are probably prolongations of V, 2L and 21. The horns V and 2L are basally high, specially horn V almost blade-like. Horns 21 are shorter, broad, multicarinate.

Thorax large, inflated, globular, considerably wider and higher than cephalis, with numerous tiny irregularly spaced pores.

Abdomen narrower and lower than thorax, distinctly separated by deep, smooth, poreless stricture hoop-like with central ring of very small pores. Following 3 postabdominal segments separated by very deep, broad, smooth, poreless strictures. They are also hoop-like with central pore ring. In the first 2 postabdominal segments the pores are small, in the third postabdominal segment the pores are moderately large, roundish to subrectangular.

The fourth postabdominal segment displays a cylindrical proximal part with a proximal pore ring of large, roundish pores and a distal, moderately wide skirt with a ring of large, elongated pores.

Dimensions:

Length of test = 244–278 µm

Maximum width of test (without skirt) = 74–77 µm

Width of skirt = 96–99 µm

Occurrence: Upper part of Middle Fassanian *Ladinocampe multiperforata* Zone of Southern Alps.

Remarks: The Illyrian *Planispinocyrtis pulchra globulata* n. subsp. displays also a globular cephalis, a distinctly separated hoop-like abdomen and similar postabdominal segments with one pore ring. However, the abdomen displays pores additional to the pore ring, the skirt of the fourth postabdominal segment is very narrow and this segment displays only one pore ring.

Most similar is *Planispinocyrtis haeckeli* n. sp. from the lower part of the Middle Fassanian *Ladinocampe multiperforata* Zone. However, this species has a thoracoabdomen. The abdominal part is only a little separated from the thoracic part by an indistinct, shallow stricture and it is as wide as the thoracic part.

Planispinocyrtis pelsoensis n. sp.
(Pl. 25, fig. 12)

Derivatio nominis: According to the occurrence in the Balaton Highland (lat. Lake Balaton = Pelso).

Holotypus: The specimen on pl. 25, fig. 12; rep.-no. KoMo 1980 I-533.

Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section.
Stratum typicum: Limestone sample FÖ 110, greenish-gray limestone, upper part of the pietra verde, upper '*Xenoprotrachyceras' reitzi* Oppel Zone above the last occurrence of the index species. Upper subzone of *Spongosilicarmiger italicus* Zone (Lower Fassanian).
Material: 7 specimens.
Diagnosis: Test subcylindrical. Cephalis moderately large, subhemiglobular to globular with very big tricarinate apical horn. Surface poreless, smooth to microgranular, with slow ridge AV and Al. Cephalic spicular system unknown. Thorax considerably larger than cephalis, subhemiglobular, with very small, irregulary scattered pores on the inner layer and coarser pore frames of the outer layer. Very strong, tricarinate spine seemingly in prolongation of V obliquely downward directed. 2 distinct carinate horns in opposite position seemingly in prolongation of 2l. Two further smaller spines on the thorax lies seemingly in prolongation of 2L.

Constriction against abdomen relatively broad and deep and therefore no thoraco-abdomen is present. Abdomen hoop-like, about as high and broad as thorax, with numerous small, irregularly spaced pores.

First postabdominal segment about as large as abdomen, in the upper part hoop-like, in the lower part inversely trapezoidal, proximally sharply set off against the stricture by a slightly nodose, narrow, low, often indistinct ring. Below it a pore ring with small pores is present. The numerous other small pores are irregularly spaced.

The next 2 postabdominal segments are inversely trapezoidal, proximally sharply set off against the deep strictures by a narrow, prominent smooth ring. Below this ring lies a pore ring with small pores in the second postabdominal segment and soemwhat larger pores in the third postabdominal segment. Below this pore ring small, irregularly scatterd pores are present in the second postabdominal segment, whereas the narrower third postabdominal segment is below the pore ring poreless. Last, distally expanded segment not preserved in our material.
Dimensions:
Length of test = 263–290 μm
Maximum width of test = 86–95 μm
Occurrence: Upper part of *Spongsosilicarmiger italicus* Zone (Lower Fassanian), Balaton Highland. In the Middle Fassanian *Ladinocampe multiperforata* Zone a similar form (*P.* cf. *annulata* n. sp.) occurs, in which the abdomen and first abdominal segment are lower than in typical forms.

Remarks: The generic position of this species is somewhat insure, because the cephalic spicular system is unknown. Because of the position and arrangement of the horns a placement into the genus *Planispinocyrtis* KOZUR &MOSTLER, 1981 is probably.

In the Illyrian *Planispinocyrtis pulchra* n. sp. the thorax and abomen are not or only slightly separated by a shallow, narrow stricture and the abdomen is considerably lower than the thorax within the thoraco-abdomen. The proximal smooth rings on the postabdominal segments are not so strong and the second postabdominal segment has only few additional tiny pores below the proximal pore ring.

In the Middle Fassanian *Planispinocyrtis multiporata annuloporata* n. subsp. the abdomen is only slightly separated from the thorax in the thoraco-abdomen. The smooth proximal ring in the postabdominal segments is not so prominent, in the nominate subspecies of *Planispinocyrtis multiporata* n. sp. missing.

Planispinocyrtis pulchra n. sp.
(Pl. 25, figs. 2, 4, 8; pl. 26, fig. 2)

Derivatio nominis: pulcher (-ra, rum) = beautiful (lat.)
Holotypus: The specimen on pl. 26, fig. 2; rep.-no. KoMo 1980 I-41.
Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section.
Stratum typicum: Limestone bed 87 within greenish tuffites, *Paraceratites trinodosus* Zone (Illyrian).
Material: 31 specimens.
Diagnosis: Test subcylindrical. Cephalis moderately large, subconical to subhemiglobular, smooth, poreless, with big tricarinate apical horn. Cephalis spicular system with Mb, A, V, 2L, 2l. Stout tricarinate horns are present in prolongation of V, 2L and 2l, situated in one, often slightly oblique plane in the upper part of the thorax. Upper edge of horn V begins in the lower part of cephalis, upper edge of horns 2l begins in the collar stricture.

Thoraco-abdomen large, globular to elongated subglobular, either subdivided by a very shallow, indistinct, poreless, smooth stricture into higher thorax and narrow abdomen or undivided. Pores small, on the thoracic part irregularly distributed, overlain, but not closed by an outer layer with larger pore frames. In the abdominal part one pore ring is present, regular in forms with divided thoraco-abdomen and indistinct, irregular in forms with undivided thoraco-abdomen. First postabdominal segment rather broad, hoop-like, with indistinct smooth or slightly nodose, narrow proximal ring, followed by a pore ring with small pores, below it with tiny irregularly and widely spaced pores. Stricture against thoraco-abdomen and against the second postabdominal segment deep, rather narrow. The following strictures are also deep and mostly broader.

Following 2-3 postabdominal segments high, either narrow hoop-like (especially the second postabdominal segment) or inversely trapezoidal, with one pore ring below a narrow, indistinct to distinct smooth proximal ring. Pores become somewhat larger in the distaler segments. Few single widely scattered tiny pores may be present between or below the larger pores of the pore ring.

Last postabdominal segment is proximally cylindrical, distally a little skirt-like broadened. It has one ring of vertically elongated large pores.

Dimensions:
Length of test = 253–285 μm
Maximum width of test = 70-73 μm
Maximum width of skirt = 77–81 μm
Occurrence: Illyrian of Balaton Highland (Hungary).

Remarks: The Lower Fassanian *Planispinocyrtis pelsoensis* n. sp. has a clearer separated hoop-like abdomen as large as the thorax. The proximal ring on the second and following postabdominal segments is prominent.

In the Lower to Middle Fassanian *Planispinocyrtis multiperforata*, the first 2-3 postabdominal segments are broad, hoop-like, with numerous pores arranged only proximally in a ring. The skirt is large.

In the Illyrian *Planispinocyrtis illyrica* n. sp. all postabdominal segments with exception of the last one are hoop-like, also the segments with only one pore ring. The distal skirt is moderately broad.

In *Planispinocyrtis baloghi* KOZUR & MOSTLER, 1980 the strictures between the postabdominal segments are broader, shallower, partly even missing and the postabdominal segments are lower, partly even not elevated, all with only one pore ring and without smooth proximal narrow ring.

The Illyrian *Planispinocyrtis brevis* n. sp., has a shorter postabdominal test and a broader skirt.

Planispinocyrtis pulchra pulchra n. subsp.
(Pl. 26, fig. 2)

Holotype: as for the species.
Diagnosis: With the character of the species. Elongated subglobular thoraco-abdomen subdivided by a narrow, shallow, smooth, poreless stricture into a larger thorax and a narrow abdomen, as broad as the thorax. The abdomen has one proximal pore ring with small pores. Other pores tiny and irregulary scattered as on the thorax. Proximal slightly nodose ring on the postabdominal segments rather distinct.
Remarks: See also at the species. *Planispinocyrtis pulchra* globulata n. subsp. has an undivided globular thoraco-abdomen. The proximal, narrow, slightly nodose ring on the postabdominal segments is indistinct, if present.

Planispinocyrtis pulchra globulata n. subsp.
(Pl. 25, figs. 2, 4, 8)

Derivatio nominis: According to the undivided, globular thoraco-abdomen.
Holotypus: The specimen on pl. 25, figs. 2, 4, 8; rep.-no. KoMo 1980 I-42.
Locus typicus and stratum typicum: as for the species.
Diagnosis: With the character of the species. The thoraco-abdomen is globular and undivided. Thorax and abdomen only differentiated by their sculpture. The thoracic part of the thoraco-abdomen has an outer layer with coarser pore frames, on the abdominal part of the thoraco-abdomen the outer layer is missing. The proximal, narrow, slightly nodose ring on the postabdominal segments is indistinct, if present.
Remarks: See also at the species. The undivided globular thoraco-abdomen distinguishes *Planispinocyrtis pulchra globulata* n. sp. both from the nominate subspecies and from other *Planispinocyrtis* species.

The Fassanian ? *Planispinocyrtis longispinosa* group (*P. ? gabiolaensis* n. sp., *P. ? longispinosa* n. sp., *P. ? nishimurai* n. sp., *P. ? thoraciglobulosa* n. sp.) that displays an undivided globular to subglobular thorax and distinctly separated abdomen is clearly distinguished by the missing or rudimentary horns 2L.

Planispinocyrtis praecursor n. sp.

(Pl. 25, figs. 7, ? 13, 14)

Derivatio nominis: According the phylomorphogenetic position within the *P. multiporata* group.
Holotypus: The specimen on pl. 25, fig. 7; rep.-no. KoMo 1980 I-74.
Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section.
Stratum typicum: Limestone bed 100 D, lowermost part of '*Xenoprotrachyceras*' *reitzi* Oppel Zone (*Kellnerites* fauna), basal Fassanian.
Material: 29 specimens.
Diagnosis: Test cylindrical. Cephalis subhemiglobular, moderately large, smooth, poreless. Apical horn large, tricarinate. Cephalic spicular system with Mb, A, V, 2L, 2l. Vertical horn large, very high (bladelike), lower boundary line slightly downward directed, upper boundary line strongly downward directed with distinct bend in the basal part. Other horns in prolongation of 2L and 2l small, broad, carinate.

Thoraco-abdomen subglobular to subcylindrical, indistinctly separated in large subhemiglobular thoracic part and narrow clyindrical abdominal part that has the same width as the thoracic part, but is considerably narrower. Separating poreless stricture very narrow and shallow, overgrown by the multicarinate horns 2L. Thoracic part with tiny, irregularly spaced pores on the inner layer that is overgrown by an outer layer with large, irregular pore frames. Abdominal part with one or two rings of tiny pores. Outer layer missing.

The 3 first postabdominal segments are hoop-like, separated by deep, narrow, smooth, poreless strictures. They display numerous small pores, often arranged in regular to irregular rings. The next 2 postabdominal segments are narrower and have only one central ring of small pores that are a little larger than the pores of the foregoing segments. Sixth segment in the typical material only partly preserved, with one proximal pore ring. Distal part not preserved. In similar Middle Fassanian forms with broad distal skirt.

Dimensions:
Length of test = 279–291 μm
Maximum width of test (without last segment) = 71–80 μm
Width of skirt (*P.* cf. *praecursor*) = 112–120 μm

Occurrence: Basal Fassanian of Balaton Highland (Hungary). Similar forms (*P.* cf. *praecursor* n. sp.) occur in the Middle Fassanian of the Southern Alps.
Remarks: In *Planispinocyrtis* cf. *praecursor* n. sp. from the Middle Fassanian of the Southern Alps the vertical horn is not blade-like high and downward directed and the thorax is not covered by an outer layer. All other features are identical. Probably these forms represent a new subspecies, but the preservation is not well enough for establishing this taxon.

P. praecursor n. sp. is the oldest representative of the *P. multiperforata* group that is dominant during the Lower Ladinian, but it may be also the forerunner of the *Planispinocyrtis* ? longispinosus group with rudimentary or missing horns 2L and numerous postabdominal segments.

Planispinocyrtis ? thoraciglobulosa n. sp.

(Pl. 26, figs. 3, 4, 9)

Derivatio nominis: According to the globular, inflated thorax.
Holotypus: The specimen on pl. 26, figs. 3, 4, 9; rep.-no. KoMo 1980 I-362.
Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy).
Stratum typcium: Sample TT 16, upper part of the Middle Fassanian *Ladinocampe multiperforata* Zone.
Material: 15 specimens.
Diagnosis: Cephalis moderately large, elongated subhemiglobular, smooth, poreless. Cephalic spicular system unknown. Apical horn moderately large, tricarinate. Horn in prolongation of V (2) large, downward inclined. Horns in prolongation of 2l(?) moderately large. All lateral horns are carinate.

Thorax large, inflated, globular, considerably broader and higher than cephalis, with numerous small pores. Pore frames elevated, at the joints of 2L (?) with the thorax wall slightly conical elevated. From this elevation low, rather indistinct radial ribs radiate.

Abdomen considerable smaller (lower and narrower) than thorax, but also inflated, subglobular to broadly hoop-like, with proximal ring of very small pores and numerous irregularly arranged pores below it. Strictures both against thorax and first-postabdominal segments, like the following strictures deep, narrow, smooth, poreless.

First postabdominal segment about as large as abdomen, broadly hoop-like, with narrow, smooth proximal ring, immediately follwed by a ring of small pores. Below it follow an often irregular ring of very small pores. Below it further very small pores may be present, but they are mostly closed.

The following 2-3 postabdominal segments become a little broader, whereas their height remains constant. They display an inverted trapezoidal outline and are proximally sharply contrasted against the stricture. They begin with a narrow smooth ring, followed by a ring of vertically elongated pores. Below this pore ring they are poreless and smooth.

Dimensions:
Length of test = 259–271 μm
Maximum width of test = 69–73 μm
Length of longest lateral horn = 32–40 μm

Occurrence: Upper part of Middle Fassanian *Ladinocampe multiperforata* Zone.

Remarks: In the Middle Fassanian (lower part of *Ladinocampe multiperforata* Zone) *Planispinocyrtis multiperforata annuloporata* n. subsp. all lateral horns (V, 2L, 21) are in their length unreduced. Moreover, this subspecies displays a thoraco-abdomen, like the majority of the *Planispinocyrtis* species.

In the Illyrian *Planispinocyrtis pulchra globulata* n. subsp. with globular thorax and clearly separated abdomen displays fewer pores on the abdomen, the first postabdominal segment displays only one central pore ring, and the second and third postabdominal segments display a ring with round pores.

Because the cephalic spicular system is not known and the horns in prolongation of 2L (?) are only rudimentary, the assignment of *P.* ? *thoraciglobulosa* n. sp. to the genus *Planispinocyrtis* is not sure. The other species with missing horns 2L (*P.* ? *gabiolaensis* n. sp., *P.* ? *longispinosa* n. sp., *P.* ? *nishimurai* n. sp.) have already on the abdomen only one pore ring.

Planispinocyrtis ? truempyi n. sp.
(Pl. 26, figs. 5, 6, 10)

Derivatio nominis: In honour of Prof. TRÜMPY, Zürich.
Holotypus: The specimen on pl. 26, figs. 5, 6, 10; rep.-no. KoMo 1980 I-173.
Locus typicus: Passo della Gabiola section near Recoaro, Italy.
Stratum typicum: Sample MD 1, middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Material: 7 specimens.
Diagnosis: Test elongated bell-shaped. Cephalis moderately large, subhemiglobular, with stout, basally very broad, large apical horn. Cephalic spicular system with Mb, A, V, 2L, 21. Stout, broad, multicarinate horns in prolongation of V, 2L and 21 all situated on the cephalis or at the boundary cephalis thorax. Inner layer of cephalis poreless. Outer layer consisting of a coarse irregular reticulum and rather high narrow ribs in the place of the arches AV and 2 Al.

Thorax, abdomen and first abdominal segment and strictures between them covered by a thick outer layer with coarse pore frames, partly arranged in irregular rings by stronger elevated pore walls. 2 distinct, but irregular narrow rings are present about at the upper and lower boundary of the thorax. Inner layer with very small pores. Boundaries of cephalis, thorax and abdomen totally covered by outer layer and not visible. Stricture between abdomen and first postabdominal segment also on the outer layer slightly depressed.

Second postabdominal segment shallow hoop-like, with small pores arranged in a proximal pore ring, followed by a second irregular pore ring or irregularly scattered pores. Strictures above and below this segment narrow, smooth, poreless, distinct, but not deep. Third postabdominal segment large, with very short proximal cylindrical part and continuously widening moderately large skirt. Cylindrical part and skirt with each one pore ring of mostly large pores.

Dimensions:
Length of test = 269–277 μm
Maximum width of test (without skirt) = 98–102 μm
Width of skirt = 127–135 μm

Occurrence: Middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone, Southern Alps.

Remarks: *Planispinocyrtis* ? *truempyi* n. sp. is easily to distinguish from all other *Planispinocyrtis* species by the thick outer layer with coarse pore frames that covers cephalis, thorax, abdomen and first postabdominal segment. Moreover, the horns A, 2L and 21 lies higher than in other *Planispinocyrtis* species and V, 21 are connected by distinct ridges on the cephalis with the 3 ridges of the apical horn.

Genus *Spinotriassocampe* KOZUR, 1984

Type species: *Spinotriassocampe hungarica* KOZUR, 1984.
Synonym: *Bikinella* TIKHOMIROVA, 1986
Occurrence: Upper Anisian – Middle Carnian. Eurasiatic Tethys.
Remarks: The 2 very long, round spines on the small cephalis are at their base obliquely upward directed. A

third very short spine is often present on the cephalis and it is also obliquely upward directed. Despite the fact that the cephalic spicular system is not known, it can be therefore concluded that the very long spines are situated in prolongation of 21, the short one in prolongation of V. In this constellation D may be missing. For this reason *Spinotriassocampe* is placed into the Planispinocyrtiidae KOZUR & MOSTLER, 1981 that have a similar multicyrtid test.

Planispinocyrtis ? annulata n. sp. is especially similar to *Spinotriassocampe* KOZUR, 1984. It belongs to a species group within *Planispinocyrtis* KOZUR & MOSTLER, 1981 that has in contrast to typical *Planispinocyrtis* species with lateral horns V, 2L, 21 only 3 lateral horns (V, 21). However, it is also distinguished from this group by the position of the lateral horns on the cephalis (V?) and in the collar stricture (21?) and not on the thorax as in the other *Planispinocyrtis* species.

This position of the lateral horns is similar as in *Spinotriassocampe* KOZUR, 1984, but unlike this genus, the horns 21(?) are small and the horn V(?) is large, similar to other *Planispinocyrtis* species. Moreover, in the place of the junction 2L(?) with the wall, pores are known on the thorax. This remembers to the *Planispinocyrtis* group with 5 spines.

Spinotriassocampe carnica n. sp.
(Pl. 26, fig. 7)

Derivatio nominis: According to the occurrence in the Carnian.
Holotypus: The specimen on pl. 26, fig. 7; rep.-no. CK 1188 VII-82.
Locus typicus: Rupe de Passo di Burgio, Sosio Valley area, Sicily (Italy).
Stratum typicum: Sample S 8, dark grey marly cherty limestone of Middle Carnian age (Mufara Formation).
Material: 7 specimens.
Diagnosis: Multicyrtid. Test slender conical. Cephalis very small, globular with conical upper part, smooth, poreless, with very long, needle-like, round apical horn. Lateral horns in prolongation of 21(?) extremely long, roundish, needle-like, after short straight perpendicular or slightly upward directed part downward curved. The long distal straight part is obliquely downward and outward directed.

Postcephalic segments have all about the same height. They become distalwards slowly and continuously broader. Until the seventh or eighth postabdominal segment all segments are hoop-like, separated by deep strictures. From the eighth or ninth postabdominal segment the lateral outline is inverted trapezoidal. Thorax to second postabdominal segment have small pores arranged in one often irregular proximal pore ring and a second incomplete pore ring, with small pores. On the thorax and abdomen the pores may be also irregularly spaced. The following postabdominal segments have one central pore ring, but few scattered additional pores may be occasionally present.
Dimensions:
Length of test (without apical horn) = 298–316 μm
Maximum width of test = 79–81 μm
Length of apical horn = 160–170 μm
Length of lateral spines = 150–180 μm
Occurrence: Middle Carnian of Sicily.
Remarks: *Spinotriassocampe longobardica* n. sp. from the Middle and Upper Longobardian displays similar downwards recurvated lateral horns, but it is easily distinguished by its very short, rudimentary apical horn.

The *Spinotriassocampe hungarica* group (*S. hungarica* KOZUR, 1984, *S. eofassanica* n. sp., *S. mediofassanica* n. sp.) displays also a long apical horn, but is characterized by obliquely upward directed straight lateral horns.

Spinotriassocampe transita n. sp. that is transitional between these 2 groups, displays perpendicular to distally slightly downward curved lateral horns.

Spinotriassocampe eofassanica n. sp.
(Pl. 27, fig. 3)

Derivatio nominis: According to the occurrence in the Lower Fassanian.
Holotypus: The specimen on pl. 27, fig. 3; rep.-no. KoMo 1980 I-613.
Locus typicus: Passo della Gabiola near Recoaro, Vicentinian Alps (Italy).
Stratum typicum: Sample MD 12, middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone
Material: 3 specimens.
Diagnosis: Multicyrtid. Test slender concial. Cephalis small, globular with conical upper part. Apical horn very long, roundish, needle-like. 2 lateral horns very long, straight, obliquely outward and somewhat upward directed.

Postcephalic segments have about the same height. They increase slowly and continuously in width, but the last 3-4 segments decrease again in width. All these segments are rounded hoop-like, separated by narrow, but deep strictures. The thorax displays only some scattered pores. Abdomen and the first 3 postabdominal segments display numerous small spines, arranged in irregular rings. In the fourth to seventh postabdominal segment one pore ring of small pores and scattered additional pores are present.

Dimensions:

Length of test = 260–274 µm

Maximum width of test = 83–86 µm

Length of apical spine = More than 95 µm (not fully preserved)

Length of lateral horns = About 145 µm

Occurrence: Middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone, Italy.

Remarks: The Longobardian to Middle Carnian *Spinotriassocampe carnica* group (*S. carnica* n. sp., *S. longobardica* n. sp.) is easily to distinguish by the recurvated lateral spines, *S. longobardica* n. sp. additionally by its very short rudimentary apical horn. The Middle Fassanian *Spinotriassocampe transita* n. sp. displays perpendicular to distally slightly curvated spines.

All members of the Illyrian to Middle Fassanian *Spinotriassocampe* hungarica group - *S. hungarica* KOZUR, 1984 *S. sabaluevae* (TIKHOMIROVA, 1986), *S. eofassanica* n. sp., *S. mesofassanica* n. sp. - display long, round, needle-like apical spines and long, round, needle-like, straight, slightly obliquely upward directed lateral horns. The Illyrian (*P. trinodosus* Zone) *S. illyrica* KOZUR, 1984 displays more inflated postcephalic semgments, the thorax is distinctly larger than the cephalis, apical and lateral horns are shorter. The Lower Ladinian *S. sabaluevae* (TIKHOMIROVA), 1986 displays extremely long lateral horns and the test becomes distally broad. In IS. *mesofassanica* n. sp. the fourth and following postabdominal segments display an inverted trapezoidal lateral outline. Beginning with thè third postabdominal segment all following segments are proximally sharply contrasted against the very deep strictures.

Spinotriassocampe longobardica n. sp.

(Pl. 26, figs. 8, 11, 12, 14; pl. 27, figs. 4, 6, 8)

Derivatio nominis: According to the occurrence in the Longobardian.

Holotypus: The specimen on pl. 26, figs. 11, 12; pl. 27, figs. 6-8; rep.-no. KoMo 1980 I-615.

Locus typicus: Köveskál (Balaton Highland, Hungary) section at the cemetery

Stratum typicum: Nemesvámos Limestone Formation, 65 cm below sample 6/83, lower *Budurovignathus mungoensis* conodont zone, Middle Longobardian.

Material: 41 specimens.

Diagnosis: Multicyrtid. Test proximally slender subconical, distally subcylindrical. Cephalis small, globular, in the upper part conical to subcylindrical. Apical horn tiny, needle-like. Lateral spines in prolongation of 21(?) wing-like, needle-like, proximally somewhat higher, here obliquely outward and somewhat upward directed, than strongly recurvated. Long, needle-like distal part either straight or slightly curvated, obliquely outward-downward directed. Horn in prolongation of V(?) very short, carinate, between each adjacent ridges with a tiny pore in the wall.

The thorax has the same width as the cephalis. The following segments increase slowly and continuously until the sixth postabdominal segment, the following (at least 5) postabdominal segments display about the same width.

Thorax to first or second postabdominal segment hoop-like, with tiny pores, proximally arranged in a ring, below it irregularly scattered, often closed by a layer of microgranular silica. Following postabdominal segments at first ring-like with straight middle part that displays a central ring of small pores. Distalwards segments with inversely trapezoidal lateral outline follow. They are proximally sharply contrasted against the deep, smooth poreless strictures and display a ring of small pores.

Dimensions:

Length of test = 325–444 µm

Maximum width of test = 71–100 µm

Length of lateral wings = 130–188 µm

Occurrence: Frequent in the Middle Longobardian of Hungary. A nearly identical form, but with large pores (? corroded) occurs in the Ladinian of Japan, described as *Triassocampe* (?) sp. by YAO (1982).

Remarks: The Middle Carnian *Spinotriassocampe carnica* n. sp. that displays also strongly recurvated long, needle-like wings is clearly distinguished by its very long apical horn.

The Illyrian to Middle Fassanian *Spinotriassocampe hungarica* group - *S. hungarica* KOZUR, 1984, *S. sabaluevae* (TIKHOMIROVA, 1986), *S. eofassanica* n. sp., *S. mesofassanica* n. sp. - is clearly distinguished by long, straight, needle-like lateral spines that are outward and slightly upward directed along their whole length. Moreover, all species of this group display a long apical spine.

The Middle Fassanian *Spinotriassocampe transita* n. sp. displays only slightly curvated lateral spine and a moderately long apical spines.

Spinotriassocampe mesofassanica n. sp.
(Pl. 26, fig. 13; pl. 27, figs. 1, 2, 5, 9)

1979 *Stichopilium* sp. A, pars - NAKASEKO & NISHIMURA, pp. 79-80, pl. 9, only figs. 6, 7

Derivatio nominis: According to the occurrence in the Middle Fassanian.

Holotypus: The specimen on pl. 26, fig. 13; pl. 27, figs. 2, 9; rep.-no. KoMo 1980 I-228.

Locus typicus: Road cut San Ulderico-Pallé, Tretto, Vicentinian Alps (Italy)

Stratum typicum: Sample TT 3, lower subzone of Middle Fassanian *Ladinocampe multiperforata* Zone.

Material: 14 specimens.

Diagnosis: Multicyrtid. Test proximally slender conical, distally subcylindrical. Cephalis small, globular, granular, poreless. Apical horn long, rounded, needle-like. Lateral spines in prolongation of 21(?) very large, straight, obliquely outward and somewhat upward directed. Horn in prolongation of V(?) very short, tricarinate, between each two adjacent ridges with one tiny pore in the wall.

Postcephalic segments increase in width until the fourth postabdominal segment. In the following segments the width remains nearly constant. Thorax, abdomen, first and second, sometimes also third postabdominal segments hoop-like, proximally and distally rounded, separated by deep smooth, narrow, poreless strictures. Third or fourth postabdominal segment ring-like with straight middle part, proximally sharply contrasted against the stricture. Following 5–6 postabdominal segments with inverted trapezoidal lateral outline, proximally sharply contrasted against the stricture.

In the thorax and abdomen the tiny pores are mostly closed by a layer of micrograngualr silica. Only few pores of the inner pore rings are open. First abdominal segment with numerous tiny pores, arranged in a regular proximal pore ring and irregular or incomplete following 2 pore rings. Second postabdominal segment with proximal ring of tiny pores and below it some scattered pores or with second, often incomplete pore ring. Third postabdominal segment with central ring of small pores or with the same size and arrangement of the pores as the second postabdominal segment, if it is still hoop-like.

Following postabdominal segments with proximal ring of small pores and few, widely scattered tiny pores below it that may be arranged in a second, mostly incomplete pore ring.

Dimensions:

Length of test (without apical horn) = 308–326 µm
Maximum width of test = 75–77 µm
Length of apical horn = 125–131 µm
Length of long lateral spines = 171–179 µm

Occurrence: Lower subzone of Middle Fassanian *Ladinocampe multiperforata* Zone. Italy, Japan.

Remarks: The Longobardian to Middle Carnian *Spinotriassocampe carnica* group (*S. carnica* n. sp., *S. longobardica* n. sp.) is clearly distinguished by the strongly recurvated lateral spines. In the Middle Fassanian *Spinotriassocampe transita* n. sp. the lateral spines are slightly curvated.

In the Illyrian to Middle Fassanian *Spinotriassocampe hungarica* group - *S. hungarica* KOZUR, 1984, *S. sabaluevae* (TIKHOMIROVA, 1986), *S. eofassanica* n. sp., *S. mesofassanica* n. sp. - the 2 latter species are most similar each other. *S. eofassanica* n. sp. is distinguished from *S. mesofassanica* n. sp. by the form of the segments that remain until the last known (seventh) postabdominal segment hoop-like, proximally not sharply contrasted against the strictures.

Spinotriassocampe transita n. sp.
(Pl. 27, fig. 7)

1979 *Stichopilium* sp. a, pars - NAKASEKO & NISHIMURA, pp. 79-80, pl. 9, only fig. 8

Derivatio nominis: According to the transitional position between the *S. hungarica* group and the *S. carnica* group.

Holotypus: The specimen on pl. 27, fig. 7; rep.-no. KoMo 1980 I-618.

Locus typicus: Road cut San Ulderico-Pallé. Tretto, Vicentinian Alps (Italy)

Stratum typicum: Sample TT 5, lower part of Middle Fassanian *Ladinocampe multiperforata* Zone.

Material: 9 specimens.

Diagnosis: Multicyrtid. Test slender conical. Cephalis small, subglobular, in the upper part conical, smooth, poreless. Apical horn round, needle-like, moderately long. Lateral spines roundish, needle-like, slightly curvated. Horn in prolongation of V(?) very short, multicarinate. Tiny pores in the wall are present at the junction of this horn with the wall. They are situated between adjacent ridges of the horn.

Postcephalic segments until the fifth postabdominal segment rounded hoop-like. Pores on the thorax mostly closed by an outer layer of microgranular silica. Some more tiny pores are open on the abdomen arranged in a proximal ring. Scattered pores below it almost all closed by a layer of microgranular silica. The following segments have a proximal ring of small pores, followed by widely scattered pores or by an incomplete second pore ring. Last preserved segment (sixth postabdominal segment) proximally sharply contrasted against the deep, smooth, poreless stricture, with proximal pore ring. Its distal part and further segments not preserved.

Dimensions:

Length of test (without apical horn) = More than 258 µm (distal part of test not fully preserved)

Maximum width of test = 70–77 µm

Length of apical spine = 35–44 µm

Length of lateral spines = 65–68 µm

Occurrence: Lower subzone of Middle Fassanian *Ladinocampe multiperforata*-Zone.

Remarks: The Longobardian to Middle Carnian *Spinotriassocampe carnica* group (*S. carnica* n. sp., *S. longobardica* n. sp.) can be easily distinguished by the strongly recurvated winglike lateral spines.

In the *Spinotriassocampe hungarica* group (*S. hungarica, S. sabaluevae, S. eofassanica, S. mesofassanica*) the lateral spines are straight, obliquely outward and somewhat upward directed.

Family Ruesticyrtiidae KOZUR & MOSTLER, 1979
Genus *Pararuesticyrtium* KOZUR & MOSTLER, 1981

Type species: *Pararuesticyrtium densiporatum* KOZUR & MOCK, 1981

Occurrence: Lower Fassanian to Carnian of the Eurasiatic Tethys.

Remarks: *Pararuesticyrtium* KOZUR & MOSTLER, 1981 was separated by the presence of an apical horn and horns in prolongation of V and D from the genus *Ruesticyrtium* KOZUR & MOSTLER, 1979. In the light of newer investigations, the form of the postabdominal segments seems to be important as well. In *Pararuesticyrtium* those segments are broad, hoop-like. In *Ruesticyrtium*, they are narrow, sharp-edged in their medium part with acute triangular marginal outline.

The primitive representatives of *Pararuesticyrtium* from the Ladinian display not yet strong horns, but the excentric apical horn is mostly present, the other horns may be present as well.

The forerunner of *Ruesticyrtium*, the genus *Paratriassocampe* n. gen., displays in many species already the sharp-edged postabdominal segments with triangular marginal outline. None of these species display an apical horn or other horns. In *Ruesticyrtium* the surface of the most segments is covered by a layer of micrograpular silica, in *Pararuesticyrtium* this outer layer is sometimes also present.

Regarding the above mentioned features the Carnian *Ruesticyrtium robustum* KOZUR & MOSTLER, 1981 belongs to *Pararuesticyrtium*. The apical part of the cephalis is not preserved in the 2 present specimens. Therefore an apical horn may be also present in this species.

In the Lower Fassanian the later clearly distinct genera *Pararuesticyrtium* and *Paratriassocampe* are still very similar and connected by transitional species.

Pararuesticyrtium constrictum n. sp.
(Pl. 28, figs. 7,8)

Derivatio nominis: According to the distinct narrowing of the test before the last segment with skirt.

Holotypus: The specimen on pl. 28, figs. 7, 8; rep.-no. KoMo 1980 I-760.

Locus typicus: Road cut San Ulderico-Pallé, Tretto, Vicentinian Alps (Italy).

Stratum typicum: Sample TT 16, upper subzone of Middle Fassanian *Ladinocampe multiperforata* Zone.

Material: 3 specimens.

Diagnosis: Test conical, before the last segment (with skirt) distinctly narrowed. Cephalothorax dome-shaped, smooth, poreless. Cephalic part small, semiglobular; thoracic part larger, subglobular. Excentric apical horn small, short. Further small, short horns in prolongation of V and D may be present. Abdomen and first to fifth postabdominal segments hoop-like, with at least 3, often irregular pore rings. Pores small. Strictures between the segments narrow, moderately deep, smooth, poreless.

Abdomen somewhat broader, but lower than cephalothorax. The following 3 postabdominal segments increases continuously in width and height. The third postabdominal segment is about as high as the cephalothorax, but considerably broader than it. The fourth postabdominal segment is about as wide and high as the foregoing one or only a little higher. The fifth postabdominal segment is again distinctly narrower and somewhat lower than the fourth segment. The last segment is high and displays a distinct, moderately wide distal skirt. Its proximal part is subcylindrical and displays 3 rings of moderately large pores. The skirt displays at least 4 irregular rings of moderately large pores.

Measurements:

Length of test = 314–323 µm

Maximum width of test (without skirt) = 93–102 μm
Width of skirt = 135–152 μm
Occurrence: Upper subzone of Middle Fassanian *Ladinocampe multiperforata* Zone.
Remarks: The similar *Pararuesticyrticum trettoense* n. sp. from the lower subzone of Middle Fassanian *Ladinocampe multiperforata* Zone displays more segments and only a narrow skirt (?preservation). Abdomen and first 2-3 postabdominal segments are covered by a layer of microgranular silica.

Pararuesticyrtium eofassanicum n. sp.
(Pl. 28, figs. 5, 6, 10, 12; pl. 43, fig. ? 13)

Derivatio nominis: According to the occurrence in the Lower Fassanian.
Holotypus: The specimen on pl. 28, figs. 6, 10; rep.-no. KoMo 1980 I-330.
Locus typicus: Passo della Gabiola section, Vicentinian Alps (Southern Italy).
Stratum typicum: Sample MD 21, upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Material: More than 100 specimens.
Diagnosis: Test concial with narrow but distinct distal skirt. Cephalothorax dome-shaped, smooth, poreless. Cephalic part small, semiglobular. Thoracic part larger, globular. Apical horn very small and very excentric. Further horns in prolongation of V and D rarely present.

Abdomen and postabdominal segments become gradually wider, but their height remains with exception of the last segment nearly constant and is a little less than the length of the cephalothorax. Abdomen and first 2–3 postabdominal segments are hoop-like, with 2–3 rings of very small pores that may be covered by a layer of microgranular silica on the abdomen and first postabdominal segment in higher evolved, untypical forms. The following 2–3 segments are subcylindrical, with 2 rings of small pores and in some of these segments with a third, distal, incomplete ring of very small pores. These pores are arranged in vertical rows with short, often indistinct, low vertical ribs between them. The last (sixth) postabdominal segment is considerably higher than the foregoing segments and displays a distinct, but narrow distal skirt. This last segment displays at least 5, partly irregular rings of moderately large pores. The strictures between all postthoracic segments are relatively deep, moderately broad, smooth, poreless.

Measurements:
Length of test = 267–284 μm
Maximium width of test (without skirt) = 96–108 μm
Width of skirt = 113–133 μm
Distribution: Upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone of the European Tethys. Highly evolved forms are rarely present in the lower part of Middle Fassanian.
Remarks: This species is in some respects still similar to *Paratriassocampe* n. gen. (subcylindrical third to fifth postabdominal segments with only 2 rings of pores). However, the skirt is already distinct and a very small excentric apical horn is always present.

In the Middle Fassanian *Pararuesticyrtium mediofassanica* n. sp. all postabdominal segments are hoop-like, display 3 ribs between the pores and vertical ribs between the pores are never present.

Pararuesticyrtium ? illyricum (KOZUR & MOSTLER, 1981)
(Pl. 43, figs. 11, 12, 15, 16)

1981 *Triassocampe illyrica* n. sp. – KOZUR & MOSTLER, p. 98, pl. 15, fig. 2
1990 *Triassocampe* sp. A – GORIČAN, p. 160, pl. 12, fig. 1
Occurrence: Illyrian (*Paraceratites trinodosus* Zone) up to Middle Fassanian. Eurasiatic Tethys.
Remarks: This species is transitional to *Paratriassocampe* n. gen. Like in this genus, an apical horn is still missing and the most segments display only 2 rings of pores. However, a narrow skirt is present and the segments are hoop-like as in *Pararuesticyrtium* KOZUR & MOSTLER, 1981.

Pararuesticyrtium mediofassanicum n. sp.
(Pl. 28, figs. 1–4, 9, 11)

Derivatio nominis: According to the occurrence in the Middle Fassanian.
Holotypus: The specimen on pl. 28, fig. 4; rep.-no. KoMo 1980 I-758.
Locus typicus: Road cut San Ulderico-Pallé, Tretto, Vicentinian Alps (Italy).
Stratum typicum: Sample TT 13, upper subzone of Middle Fassanian *Ladinocampe multiperforata* Zone.

Material: More than 100 specimens.
Diagnosis: Test conical, with narrow distal skirt. Cephalothorax dome-shaped, smooth, poreless, with excentric small apical horn. Cephalic part rounded conical to subhemiglobular. Thoracic part broader, but not higher, hoop-like.

Abdomen and postabdominal segments hoop-like, broad, separated by narrow to very narrow, deep, smooth, poreless strictures. Abdomen broader, but lower than cephalothorax. The postabdominal segments becomes gradually wider. Their height increases until the second or third postabdominal segment and remains than constant or decreases even a little. All postabdominal segments display 3, in the fifth or (and) sixth postabdominal segments sometimes only 2 rings of pores. Abdomen and first postabdominal segment, in highly evolved forms also second postabdominal segment covered by a layer of microgranular silica. Only in primitive forms this layer is still missing. The last (seventh) postabdominal segment displays a distinct, but narrow skirt.
Measurements:
Length of test = 284–355 μm
Maximum width of test (without skirt) = 115–135 μm
Width of skirt = 158–165 μm
Distribution: Widely distributed in the Middle Fassanian *Ladinocampe multiperforata* Zone. Primitive forms occurs already in the upper subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone.
Remarks: The Lower Fassanian *Pararuesticyrtium eofassanicum* n. sp. displays only 6 postabdominal segments. The third to fifth postabdominal segments display only 2 complete pore rings and low vertical ribs between the vertical pore lines.

***Pararuesticyrtium trettoense* n. sp.**
(Pl. 43, fig. 14)

Derivatio nominis: According to the occurrence in Tretto
Holotypus: The specimen on pl. 43, fig. 14; rep.-no. KoMo 1980 I-761.
Locus typicus: Road cut San Ulderico-Pallé, Tretto, Vicentinian Alps (Italy).
Stratum typicum: Sample TT 3, lower part of Middle Fassanian *Ladinocampe multiperforata* Zone.
Material: 7 specimens.
Diagnosis: Test slender conical, distally subcylindrical and becomes than even narrower. Cephalothorax dome-shaped, smooth, poreless, with tiny, excentric apical horn. An additional apical horn in prolongation of V may be present. Cephalic part of cephalothorax very small, hemiglobular. Thoracic part larger, globular.

Abdomen and postabdominal segments hoop-like, separated by deep, moderately wide, smooth, poreless strictures. Abdomen broader, but lower than cephalothorax. The width of the postabdominal segments increases gradually until the fourth postabdominal segment. The following 2 segments display nearly the same width. The seventh postabdominal segment is again narrower, the eighth postabdominal segment displays the same width as the foregoing segment. The height of the segments increases from the abdomen to the fifth postabdominal segment very slowly. All these segments are shorter than the cephalothorax. The sixth to eighth postabdominal segments are considerably higher than the foregoing ones. Abdomen to sixth postabdominal segment display 3, especially distally irregular rings of very small to small pores. The last 2 segments display small to moderately large pores of irregular arrangement.
Measurements:
Length of test = 324-337 μm
Maximum width of test = 89-93 μm
Distribution: Lower subzone of Middle Fassanian *Ladinocampe multiperforata* Zone. Southern Alps.
Remarks: *Pararuesticyrtium constrictum* n. sp. from the upper subzone of the Middle Fassanian *Ladinocampe multiperforata* Zone displays only 6 postabdominal chambers and a moderately wide distal skirt.

Family Sanfilippoellidae KOZUR & MOSTLER, 1979

Synonym: Poulpinae DE WEVER, 1981
Remarks: The Sanfilippoellidae KOZUR & MOSTLER, 1979 was established for the genus *Sanfilippoella* KOZUR & MOSTLER, 1979 that has a large cephalis with stout tricarinate apical horn, and 3 large tricarinate feet, followed by a differently structured velum that can be subdivided by a wide, shallow stricture into 2 pseudosegments. For this reason *Sanfilippoella* was originally regarded as tricyrtid, but by KOZUR & MOSTLER (1981) as dicyrtid.

It is a matter of choice to regard the velum as an independent segment (than the Sanfilippoellidae are dicyrtid) or as a velum of the cephalis (than the Sanfilippoellidae would be monocyrtid with long velum).

DE WEVER (1981) established the monocyrtid Poulpinae that are on the first view distinctly different from the Sanfilippoellidae. However, in *Poulpus transitus* KOZUR & MOSTLER, 1981 3 long velate lobs are present that grow together in *Parapoulpus* KOZUR & MOSTLER, 1979 to a long, cylindrical velum.

The only difference of *Parapoulpus* from the Sanfilippoellidae is the absence of an apical horn and of the short lateral horns in prolongation of V and 2l in *Parapoulpus*. However, in the Poulpinae both forms with and without apical and lateral horns are present (*Poulpus* DE WEVER, 1979, *Hozmadia* DUMITRICĂ, KOZUR & MOSTLER, 1980, *Baratuna* KOZUR & MOSTLER, 1981) that are connected by all transitions. The here described *Poulpus illyricus* n. sp. has a very small apical horn and tiny horns in prolongation of V and 2l may be present.

Therefore the Poulpinae comprises forms with and without apical and lateral horns and with and without a long velum after the cephalis and all these forms are in family or subfamily level unseparably connected by transitional forms.

Whereas all transitional forms between *Poulpus* (without horns, without velum) and *Parapoulpus* (without horns, with long velum) are known (*Poulpus transitus* KOZUR & MOSTLER, 1981), transitional forms between *Hozmadia* (with apical horn, partly also with lateral horns V and 2l, without velum) and *Sanfilippoella* (with horns, with long velum) have not been recognized. However, restudies of the genus *Eonapora* KOZUR & MOSTLER, 1979 have now shown these transitional forms between *Hozmadia* and *Sanfilippoella*.

Hozmadia has a smooth distal margin of the cephalis, often elevated in a smooth ridge. The apical horn is always stout. Small horns in prolongation of V and 2l are mostly absent. The type species of *Eonapora, E. pulchra* KOZUR & MOSTLER 1979 has a distinct velum and short horns in prolongation of V and 2l. This species is similar to Sanfilippoellidae KOZUR & MOSTLER, 1979, but the velum is thin-walled and considerably shorter.

The oldest known *Eonapora* species from the Illyrian, *E. robusta* KOZUR & MOSTLER, 1981 displays a short, fragile velum. This species is nearer related to *Hozmadia* than to *Sanfilippoella*. The same is true for the Illyrian *Eonapora mesotriassica* KOZUR & MOSTLER, 1981, from which only small, short pieces of the very fragile velum are known. Both species have Ladinian successors, from which one is described here. They have a clearly larger, more stable velum transitional between Illyrian and Carnian *Eonapora* species.

These transitional forms from Poulpinae with stout apical horn, without velum (*Hozmadia*) into typical Sanfilippoellidae with stout apical horn with long velum indicate that both family taxa are very near related. Because also typical Poulpinae without apical horn, without velum (*Poulpus*) show all transitions to forms with velum (*Parapoulpus*), the development of a velum could be only used for separating 2 family taxa, if the forms with velum would begin later than forms without velum. Until now, both *Parapoulpus* and Sanfilippoellidae have been known only from the Upper Triassic. Poulpinae with and without horn since the Upper Anisian and transitional forms (*Eonapora*) since the Upper Anisian. However, now a typical *Sanfilippoella* was found in the Upper Anisian (Illyrian) from the Balaton Highland. Therefore typical Poulpinae (without velum), typical Sanfilippoellidae (with long velum) and transitional forms (with very short to short delicate velum) occur in the Middle and Upper Triassic together. For this reason, the Poulpinae DE WEVER, 1981 are here regarded as younger synonym of the Sanfilippoellidae KOZUR & MOSTLER, 1981 emend. that contain monocyrtid radiolarians with or without apical horn and small horns in prolongation of V and 2l and with or without velum.

Genus *Sanfilippoella* KOZUR & MOSTLER, 1979

Type species: *Sanfilippoella tortilis* KOZUR & MOSTLER, 1979

Sanfilippoella laevis n. sp.
(Pl. 29, figs. 1, 2)

Derivatio nominis: According to the smooth cephalis.
Holotypus: The specimen on pl. 29, figs. 1, 2; rep.-no. KoMo 1980 I-17.
Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section.
Stratum typicum: Limestone bed 87 within greenish tuffites, *Paraceratites trinodosus* Zone (Illyrian).
Material: 11 specimens.
Diagnosis: Cephalis large, hemiglobular, smooth, with few widely scattered pores, in the largest part poreless. Cephalic spicular system very robust, with Mb, A, V, 2L, D, 2l. Apical horn very large, tricarinate, without torsion. 3 downward directed, proximally outward-, distally inward curved tricarinate spines in prolongation of D and 2L and 2 very short, tricarinate horns in prolongation of V and 2l are present. The arches AV, Al, Dl, Ll and LV are recog-

nizable as ridges on the cephalis that originate in the ridges of the apical horn and feet. In direction of the horns V and 2l the ridges on the cephalis (arches AV, Al, LV, Ll, DL) become very low and indstinct.

Velum large, but shorter than the feet, in the apical part widened, in the distal part narrowing. The velum is rather thick-walled and displays scattered small, oval and triangular pores.

Aperture moderately large.

Dimensions:

Length of cephalis = 50–68 µm
Maximum width of cephalis = 50–68 µm
Length of velum = 78–82 µm
Maximum with of velum = 97–103 µm
Length of apical horn = 70–83 µm
Length of feet = 100–120 µm

Occurrence: Illyrian (*Paraceratites trinodosus* zone) of Balaton Highland (Hungary).

Remarks: Most of the Carnian *Sanfilippoella* species display a distinct torsion of ridges and groves of the apical horn. Only *Sanfilippoella recta* KOZUR & MOSTLER, 1981 displays straight ridges on the apical horn as in *Sanfilippoella laevis* n. sp. However, also this species is easily to distinguish by the reticulated cephalis, by the shorter and not so strongly downward curved feet and by the longer spongy velum that is distinctly longer than the feet.

By the unreticulated cephalis and by the velum shorter than the feet, Sanfilippoella laevis n. sp. is a primitive representative of the genus Sanfilippoella.

Genus *Eonapora* KOZUR & MOSTLER, 1979

Type species: *Eonapora pulchra* KOZUR & MOSTLER, 1979

Eonapora fassanica n. sp.
(Pl. 30, figs. 1–3, 5)

Derivatio nominis: According to the occurrence in the Fassanian.

Holotypus: The specimens on pl. 30, figs. 1, 5; rep.-no. KoMo 1980 I-174.

Locus typicus: Passo della Gabiola near Recoaro, Vicentinian Alps, Italy.

Stratum typicum: Sample MD 1, middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.

Material: 32 specimens.

Diagnosis: Cephalis large, hemiglobular. Surface with distinct ridges expressing arches Dl, Ll, Al, AV and AL. Between these ridges some further narrower and lower ridges are present that become indstinct on the velum. Remaining surface with irregularly scatterd small pores that are to a large part closed by a layer of microgranular silica. Velum distinct, relatively fragile, but strengthened by some irregular, low ribs. Cephalic spicular system very robust, with Mb, A, V, 2L, D, 2l. The 3 feet in prolongation of D and 2L are tricarinate, downward and outward directed, but only a little curved. Therefore also their distal ends are still downward and outward directed. Apical horn stout, large, tricarinate, with broad, deep furrows. In continuation of V a small, tricarinate lateral horn is present. Horns in prolongation of 2l indstinct.

Dimensions:

Length of cephalis = 118–145 µm
Maximum width of cephalis (+ velum) = 104–125 µm
Length of apical horn = 104–135 µm
Length of feet = 141–200 µm

Occurrence: Middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone, Italy.

Remarks: The Illyrian *Eonapora mesotriassica* KOZUR & MOSTLER, 1981 displays a very fragil velum, mostly totally broken away. The feet are proximally strongly outward directed and than strongly curved in a directly downward directed position.

In the Middle Fassanian *Eonapora longispinosa* n. sp. the feet are not curved and along their whole length downward and only a little outward directed.

Eonapora longispinosa n. sp.
(Pl. 30, figs. 6, 9)

1980 *Eonapora* sp. – DUMITRICĂ, KOZUR & MOSTLER, p. 21, pl. 9, figs. 3, 4

Derivatio nominis: According to the long apical horn and feet.

Holotypus: The specimen on pl. 30, fig. 6; rep.-no. KoMo 1980 I-606.

Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy).

Stratum typicum: Sample TT 5, lower part of Middle Fassanian *Ladinocampe multiperforata* A.Z.

Material: 31 specimens.

Diagnosis: Monocyrtid. Cephalis very large, with very long, stout, tricarinate, slightly twisted apical horn and 3 very long, slender tricarinate, downward and only proximally a little outward directed feet in prolongation of D and 2L. Surface covered with strong ribs that express the arches AV, Al, Vl, Dl, and few shorter delicate ribs. Pore frames with small node-like elevations at the joints. Pores very small, irregularly arranged. Velum of similar structure with numerous small pores, but thinner than cephalis wall and without nodes on the joints of the pore frames.

Cephalic spicular system very robust with Mb, A, V, 2L, D, 2l. Very small horns in prolongation of V and 2l.

Dimensions:
Length of cephalis = 123–148 µm
Width of cephalis = 137–172 µm
Length of apical horn = 177–213 µm
Length of feet = 150–300 µm

Occurrence: Higher part of Lower, and Middle Fassanian, Southern Alps.

Remarks: Successor of the Illyrian *Eonapora mesotriassica* KOZUR & MOSTLER, 1981. This species is distinguished by proximally more outward directed feet.

The Lower Longobardian *Eonapora longobardica* (KOZUR & MOSTLER, 1981) displays shorter more outward directed feet and a shorter, but still broader apical horn. One specimen, determined here as *Eonapora cf. longispinosa* n. sp. has a similar broad and short horn and also shorter and broader feet. It is distinguished from *Eonapora longobardica* the missing outer reticulum and not so much outward directed feet.

Eonapora pulchra KOZUR & MOSTLER, 1979

1979 *Eonapora pulchra* n. gen. n. sp. – KOZUR & MOSTLER, p. 90, fig. 1

Occurrence: Middle Carnian of Tethys.

Eonapora robusta KOZUR & MOSTLER, 1979
(Pl. 30, figs. 8, 11)

1981 *Eonapora robusta* n. sp. – KOZUR & MOSTLER, P. 82, pl. 29, fig. 1

Occurrence: Illyrian (*Paraceratites trinodosus* Zone of Balaton Highland, Hungary).

Remarks: The Fassanian specimen, figured by GORIČAN (1990) as *Eonapora* aff. *robusta* KOZUR & MOSTLER is the successor of *Eonapora robusta.* The differences of this new species against *E. robusta* have been clearly recognized by GORIČAN (1990, p. 144). We have not enough well preserved material to describe this species. Apical horn and feet are distinctly slender than in *Eonapora robusta.*

Eonapora transita n. sp.
(Pl. 30, fig. 10)

Derivatio nominis: According to the transitional position between the genera *Eonapora* KOZUR & MOSTLER and *Sanfilippoella* KOZUR & MOSTLER.

Holotypus: The specimen on pl. 30, fig. 10; rep.-no. KoMO 1980 I-605.

Locus typicus: Road cut San Ulderico-Pallé, Tretto, Vicentinian Alps (Italy).

Stratum typicum: Sample TT 12, upper part of Middle Fassanian *Ladinocampe multiperforata* Zone.

Material: 4 specimens.

Diagnosis: Cephalis very large, elongated subhemiglobular, with distinct, distally somewhat widening velum. Cephalic spicular system very robust, with Mb, A, V, 2L, D, 2l. 3 tricarinate long feet in prolongation of D and 2L are downward and almost not outward directed. Apical horn stout, tricarinate with distinct torsion. Horns in prolongation of V and 2l very short.

Surface of cephalis with distinct ridges expressing the position of AV, Al, Vl and Dl.

Cephalic wall two-layered. Inner layer with small pores covered by an outer, irregular reticulum. On the velum the outer layer is only weak.

Dimensions:
Length of cephalic (+ velum) = 191–213 µm
Maximum width of cephalis = 90–94 µm
Length of apical horn = 145–149 µm
Length of feet = 147–167 µm

Occurrence: Upper part of Middle Fassanian *Ladinocampe multiperforata* Zone.

Remarks: *Eonapora longispinosa* n. sp. from the lower part of the Middle Fassanian *Ladinocampe multiperforata* Zone displays only a very little torsion of the apical horn, the velum is more delicate and not strengthened by an outer layer. The cephalis wall has no outer layer that built up an irregular reticulum.

By the stabiler, somewhat longer velum and the development of an outer reticulum of the cephalis surface as well as by the distinct torsion of the apical horn, *Eonapora transita* n. sp. is a transitional form to the typical Carnian *Sanfilippoella* species that are distinguished by a longer, still stabiler velum, a more regular and stronger reticulum and in general by a still stronger torsion of the apical spine.

The phylomorphogenetic line *Eonapora mesotriassica* KOZUR & MOSTLER, 1981 (very fragile, often not preserved velum, transitional form to *Hozmadia*) - *Eonapora fassanica* n. sp. - *Eonapora longispinosa* n. sp. (both species with distinct, but still fragile, thin velum) - *Eonapora transita* n. sp. (transitional to typical *Sanfilippoella*) indicates that the genus *Sanfilippoella* KOZUR & MOSTLER, 1979 has developed in several lines from *Hozmadia* DUMITRICĂ, KOZUR & MOSTLER, 1980 through the genus *Eonapora* KOZUR & MOSTLER, 1979. The distinction between *Eonapora* and *Sanfilippoella* is in the transitional field between both genera difficult. Here all species with stabile velum, longer than the height of the cephalis are placed into *Sanfilippoella*. Species with mostly fragile velum shorter than the height of the cephalis are placed into *Eonapora*. Most *Eonapora* species display no torsion of the apical spine and most *Sanfilippoella* species display distinct torsion of the apical spine, but this difference is not diagnostic, because few *Sanfilippoella* species without torsion of apical spine are present (*S. recta* KOZUR & MOSTLER, 1981, *S. laevis* n. sp.) and *Eonapora transita* n. sp. displays distinct torsion of apical spine.

Genus *Hozmadia* DUMITRICĂ, KOZUR & MOSTLER, 1980

Type species: *Hozmadia reticulata* DUMITRICĂ, KOZUR & MOSTLER, 1980

Hozmadia reticulata DUMITRICĂ, KOZUR & MOSTLER, 1980
(Pl. 31, fig. 4)

1980 *Hozmadia reticulata* n. sp. – DUMITRICĂ, KOZUR & MOSTLER, pp. 21-22, pl. 9

Occurrence: Lower Fassanian *Spongosilicarmiger italicus* Zone, Hungary, Italy, Yugoslavia.

Hozmadia costata n. sp.
(Pl. 31, figs. 1, 2, 5–10)

Derivatio nominis: According to the distinct costae on the outer surface.

Holotypus: The specimen on pl. 31, figs. 2, 8, 9, 10; rep.-no. KoMo 1980 I-1.

Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section.

Stratum typicum: Limestone bed 87 within greenish tuffites, *Paraceratites trinodosus* Zone (Illyrian).

Material: More than 100 specimens.

Diagnosis: Monocyrtid. Cephalis very large, subhemiglobular with widely scattered tiny pores. Surface covered by high narrow ribs expressing the arches between the spicules (AV, Al, LV, Ll, Dl) and few strong connecting costae between them. Strong, smooth distal ridges are built up by the connections between the lateral ridges of the feet. The wall surface between the ridges is smooth, pitted or has an indistinct, incomplete reticulum (above all in the fields above the distal ridges).

Apical horn stout, tricarinate. Feet in prolongation of D and 2L, stout, tricarinate, slightly curved.

Cephalic spicular system very robust, with Mb, A, V, 2L, D, 2l.

Aperture moderately large, round, distal limit of cephalis triangular, built up by the distal marginal ridges.

Dimensions:

Height of cephalis = 94–100 µm

Width of cephalis = 94–110 µm

Length of apical horn = 41–57 µm

Length of feet = 63-78 µm

Occurrence: Illyrian (*Paraceratites trinodosus* Zone) and Lower Fassanian of Balaton Highland and Southern Alps. The Lower Fassanian forms belong to a different subspecies, described in an other paper.

Remarks: *Hozmadia costata* n. sp. is the forerunner of *Hozmadia reticulata* DUMITRICĂ, KOZUR & MOSTLER, 1980 from the higher part of Lower Fassanian *Spongosilicarmiger italicus* Zone. In this species the whole surface between the ridges displays a strong reticulum.

Transitional forms (*H. costata* n. subsp.) are present in the Lower Fassanian. In these forms the surface between the ridges is strongly nodose and the nodes are connected by a low, often indistinct reticulum.

Hozmadia koeveskallensis n. sp.
(Pl. 31, fig. 3)

Derivatio nominis: According to the occurrence in Köveskál, Balaton Highland (Hungary.

Holotypus: The specimen on pl. 31, fig. 3; rep.-no. KoMo 1980 I-612.

Locus typicus: Koveskál (Balaton Highland, Hungary) section at the cemetery.

Stratum typicum: Sample 4b, Nemesvámos Limestone Formation, Upper Fassanian *Budurovignathus truempyi* conodont zone.

Material: 52 specimens.

Diagnosis: Monocyrtid. Cephalis large, subglobular; inner layer with widely scattered small pores. Outer layer consists of a coarse reticulum with large triangular to pentagonal pore frames broadened at the joints and here with nodes. Pores of the outer layer large, but of different size and shape, mostly rounded triangular to rounded rhomboidal. Arches AV and Al incerted as somewhat thicker ridges into the outer reticulum.

Cephalic spicular system very robust, with Mb, A, V, 2L, D, 2l. Apical horn tricarinate, stout, large. Feet in prolongation of D and 2L long, stout, tricarinate, obliquely outward-downward directed.

Dimensions:
Length of cephalis = 100–122µm
Maximum width of cephalis = 156–161 µm
Length of apical horns = 105–111 µm
Length of feet = 194–222 µm

Occurrence: Upper Fassanian *Budurovignathus truempyi* Zone of the Balaton Highland.

Remarks: *Hozmadia reticulata* DUMITRICĂ, KOZUR & MOSTLER, 1980 has the same shell structure with widely scattered small pores on the inner layer and an outer reticulum with large pore frames. However, the feet of this species are considerably shorter and not so far outward directed.

Hozmadia longicephalis n. sp.
(Pl. 29, figs. 5, 6)

Derivatio nominis: According to the long cephalis.

Holotypus: The specimen on pl. 29, figs. 5, 6; rep.-no. KoMo 1980 I-525.

Locus typicus: Felsöörs (Balaton Highland), Forráshegy section.

Stratum typicum: Limestone bed 87 within a tuffitic layer, *Paraceratites trinodosus* Zone (Illyrian).

Material: 4 specimens.

Diagnosis: Test small. Cephalis long, subellipsoidal, constricted above the feet. Cephalic spicular system with Mb, A, V, 2L, D, 2l. Arches between the spiculae at the surface visible as indistinct ribs. Remaining surface smooth, to a large part poreless. Pores only present around the junction between the spiculae with the wall. Here are also very small tricarinate horns present. Apical horn very large, tricarinate. 3 feets in prolongation of D, L and l (only observed in one specimen, may be that the feet in prolongation of l is a occasional feature). Feet outside rounded, inside excavated. In the proximal part the feet are still indistinctly tricarinate.

Dimensions:
Length of test = 131–145 µm
Length of cephalis = 65–74 µm
Maximum width of cephalis = 50–55 µm

Occurrence: Illyrian (*P. trinodosus* Zone) of Balaton Highland.

Remarks: *Hozmadia pyramidalis* GORIČAN, 1990 from the Ladinian has also a somewhat elongated cephalis constricted above the feet, but it is shorter than in *H. longicephalis* n. sp. The feet are clearly tricarinate, the horn V is stronger, the arches are visible on the shell surface as strong ridges. Between these ridges the shell surface is slightly reticulate.

Hozmadia longicephalis n. sp. is the forerunner of the Monicastericidae n. fam., that have at primitive forms the same shape of the feet, but the test is still more elongated and displays a short distal tubus on which the feet are situated. The test becomes dicyrtid and in higher forms with reduced or lacking feet multicyrtid. By this the development of slender multicyrtid Nassellaria from monocyrtid forms is demonstrated.

Hozmadia spinosa n. sp.
(Pl. 30, figs. 4, 7)

Derivatio nominis: According to the spinose apical horn and feet.

Holotypus: The specimen on pl. 30, figs. 4, 7; rep.-no. KoMo 1980 I-10.

Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section.

Stratum typicum: Limestone bed 87 within greenish tuffites, *Paraceratites trinodosus* zone (Illyrian).

Material: 9 specimens.

Diagnosis: Monocyrtid. Cephalis large, surface with few large pores near the feet, otherwise poreless, covered by distinct ridges as expressions of the arches Al and AV starting from the 3 ridges of the apical horn. Remaining surface smooth or with few low, indistinct ridges. Collar edge sharp, but only a little thickened by marginal distal ridges.

Cephalic spicular system very robust, with Mb, A, V, 2L, D, 2l. Apical ridge stout, tricarinate. Somewhat before its distal end 3 spines branch off from the 3 high ridges.

The 3 straight, stout, but relatively short feet are situated in prolongation of D and 2L. They are tricarinate. Somewhat before the distal end also in the feet 3 spines branch off from the 3 ridges. The inner one is very long and slender, the lateral ones are considerably shorter and triangular.

In prolongation of 2l and V very small spines are present.

Dimensions:

Length of cephalis = 60–68 μm

Width of cephalis = 70–75 μm

Length of apical horn = 55–58 μm

Length of feet = 50-55 μm

Occurrence: Illyrian (*Paraceratites trinodosus* Zone) of Balaton Highland.

Remarks: This species has a transitional position between Hozmadia DUMITRICĂ, KOZUR & MOSTLER, 1980 and *Neopylentonema* KOZUR 1984. As in *Neopylentonema* all feet and the apical horn display 3 subterminal vertices. However, in *Neopylentonema* also the prolongations of 2l are tricarinate, stout and display 3 subterminal vertices, whereas the prolongation of V is stout, tricarinate without vertices. In *Hozmadia spinosa* n. sp. only tiny spines in prolongation of V and 2l are present. The other *Hozmadia* species, in turn, have no subterminal vertices at the apical horn and feet.

Hozmadia rotunda (NAKASEKO & NISHIMURA, 1979)

(Pl. 29, figs. 3, 4, 7)

1979 *Tripilidium rotundum* NAKASEKO & NISHIMURA n.sp. – NAKASEKO & NISHIMURA, pp. 81–82, pl. 8, figs. 1–3

Occurrence: Typical and frequent species in the Illyrian (*Paraceratites trinodosus* Zone) of Balaton Highland. Illyrian of Japan (erroneously placed into the Upper Triassic by NAKASEKO & NISHIMURA, 1979).

Genus *Poulpus* DE WEVER, 1979

Type species: *Poulpus piabyx* DE WEVER, 1979

Poulpus curvispinus curvispinus DUMITRICĂ, KOZUR & MOSTLER, 1980

(Pl. 32, figs. 5, 8)

Occurrence: Upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone up to Upper Fassanian.

Poulpus curvispinus praecurvispinus n. sp.

(Pl. 32, figs. 3, 6, 7)

Derivatio nominis: According to the stratigraphic occurrence before *P. curvispinus curvispinus* DUMITRICĂ, KOZUR & MOSTLER.

Holotypus: The specimen on pl. 32, figs. 6, 7; rep.-no. KoMo 1980 I-277.

Locus typicus: Passo della Gabiola near Recoaro, Vicentinian Alps (Italy).

Stratum typicum: Sample MD 2, middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.

Material: 39 specimens.

Diagnosis: Monocyrtid. Cephalis large, hemiglobular. Arches AV and 2Al recognizable on the wall as distinct ridges. Remaining surface smooth, distal part of the arches often with small nodes. Near the base of the feet and near the junction of V and 2l with the wall often small pores are present. Remaining surface poreless. Cephalic spicular systems very robust with Mb, A, V, 2L, D, 2l. The 3 very large, downward and proximally also outward directed curved feet are situated in prolongation of D and 2L. They display 3 high ridges and broad deep furrows. The outer furrow ends in a large pore in the wall. A tiny needle-like apical horn may be present. Tiny denticles as remnants of a velum are present around the aperture.

Dimensions:

Length of cephalis = 69–75 μm

Maximum width of cephalis = 84–89 μm

Length of the feet = 144–175 μm

Occurrence: Middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone. Italy.

Remarks: The Illyrian (*Paraceratites trinodosus* Zone) *Poulpus illyricus* n. sp. has shorter spines. The very small to small tricarinate apical horn is always distinct and a tiny vertical horn, sometimes also tiny horns in prolongation of 2l are present.

Poulpus curvispinus curvispinus DUMITRICĂ, KOZUR & MOSTLER, 1980 from the upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone to Upper Fassanian displays distinct nodes on the whole surface of cephalis.

Poulpus gracilis n. sp.

(Pl. 32, figs. 9, 12)

Derivatio nominis: According the delicate cephalis wall.
Holotypus: The specimen on pl. 32, figs. 9, 12; rep.-no. KoMo 1980 I-18.
Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section.
Stratum typicum: Limestone bed 87 within greenish tuffites, *Paraceratites trinodosus* Zone (Illyrian).
Material 12 specimens.
Diagnosis: Monocyrtid. Cephalis large, hemiglobular, consisting of a loose meshwork of round bars. These bars are the arches Al, AV, Dl, Ll and connecting bars that branch off to a large part from the base of the feet. The pores between this loose pore frames are very large, polygonal to oval.

Cephalic spicular system robust, consisting of Mb, A, V, 2L, D, 2l. The feet are long, slender, round, downward and proximally also outward directed. Their distal parts are a little inward curved.

Dimensions:
Length of cephalis = 85–89 μm
Width of cephalis = 67–73 μm
Length of feet = 129–137 μm
Occurrence: Illyrian (*Paraceratites trinodosus* Zone) of Balaton Highland (Hungary).
Remarks: *Poulpus gracilis* n. sp. represents together with *P. longicephalis* n. sp. a characteristic Upper Anisian *Poulpus* group, from wich no successors are so far known in the Ladinian. By their loose pore frames and large pores they are distinctly distinguished from all younger *Poulpus* species.

Poulpus longicephalis n. sp. is distinguished by the shap of the cephalis that is considerably longer than broad, by the denser meshwork of finely spined bars and therefore not so large pores.

Poulpus illyricus n. sp.

(Pl. 29, figs. 8–10; pl. 32, figs. 1, 2, 4)

Derivatio nominis: According to the occurrence in the Illyrian.
Holotypus: The specimen on pl. 32, fig. 4; rep.-no. KoMo 1980 I-7.
Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section.
Stratum typicum: Limestone bed 87 within greenish tuffites, *Paraceratites trinodosus* Zone (Illyrian.)
Material: 51 specimen.
Diagnosis: Monocyrtid. Cephalis large, hemiglobular, with very small to small tricarinate apical horn. Surface with few pores near the base of the feet and at the junction of V and 2l with the wall, otherwise poreless, smooth, but with low ridges in the place of arches Al and AV. Cephalic spicular system very robust, in prolongation of 2l tiny horns may be present, in prolongation of V always a tiny horn is situated. The 3 tricarinate feet in prolongation of D and 2L are stout, large, in the basal part cylindrical with low continuation of the inner ridge, in the remaining part tricarinate with high ridges and deep furrows. In prolongation of the outer furrow the 3 feet are open.
Dimensions:
Length of cephalis = 45–50 μm
Width of cephalis = 63–70 μm
Length of feet = 100–113 μm
Occurrence: Illyrian *Paraceratites trinodosus* Zone of Balaton Highland, Hungary.
Remarks: *Poulpus illyricus* n. sp. is a very primitive form that has still a very small, but distinct apical horn and horns in prolongation of V, sometimes also in prolongation of 2l. It is the forerunner of the Lower to Fassanian *Poulpus curvispinus* DUMITRICĂ, KOZUR & MOSTLER, 1980 that is distinguished by longer, recurvated spines, missing or indistinct apical horn, and a nodose surface. *P. curvispinus praecurvispinus* n. subsp. is a transitional form between *P. illyricus* and *P. curvispinus.* Differences of *P. illyricus* from *P. curvispinus praecurvispinus* see under this subspecies.

It is stratigraphically important that all 3 Illyrian *Poulpus* species are very primitive forms with features unknown in younger *Poulpus* species. 2 of these 3 species have no successors in the Ladinian.

Poulpus longicephalis n. sp.
(Pl. 32, figs. 10, 11)

Derivatio nominis: According to the long cephalis
Holotypus: The specimen on pl. 32, figs. 10, 11; rep.-no. KoMo 1980 I-6
Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section
Stratum typicum: Limestone bed 87 within greenish tuffites, *Paraceratites trinodosus* Zone (Illyrian)
Material: 5 specimens.
Diagnosis: Monocyrtid. Cephalis large, long, proximally hemiglobular, distally subcylindrical. Pore frames large, consisting of roundish bars with numerous tiny, needle-like spines. Cephalic spicular system very robust, with Mb, A, V, 2L, D, 21. Arches AV, Al, Dl and Ll are part of the pore frames. 3 feet in prolongation of D and 2L long, roundish, needle-like, downward and outward directed.
Dimensions:
Length of cepalis = 135-150 μm
Width of cephalis = 110-123 μm
Length of feet = More than 135 μm (no exemplare with fully preserved feet)
Occurrence: Illyrian (*Paraceratites trinodosus* Zone) of Balaton Highland (Hungary).
Remarks: The Ilylrian *Poulpus gracilis* n. sp. has a shorter cephalis and still larger pores in a still looser pore frames.

Family Silicarmigeridae KOZUR & MOSTLER, 1980
Genus *Silicarmiger* DUMITRICĂ, KOZUR & MOSTLER, 1980

Type species: *Silicarmiger costatus* DUMITRICĂ, KOZUR & MOSTLER, 1980

Silicarmiger costatus costatus DUMITRICĂ, KOZUR & MOSTLER, 1980
(Pl. 33, figs. 6, 15, 16; pl. 34, fig. 8)

1980 *Silicarmiger costatus* n. gen. n. sp. - DUMITRICĂ, KOZUR & MOSTLER, p. 23, pl. 7, figs. 1-6; pl. 14, fig. 4
1981 *Silicarmiger costatus costatus* DUMITRICĂ, KOZUR & MOSTLER, 1980 - KOZUR & MOSTLER, p. 104

Occurrence: Lower to Middle Fassanian of European Tethys.

Silicarmiger costatus anisicus KOZUR & MOSTLER, 1981
(Pl. 33, figs. 1-5, 7-9, 13)

1981 *Silicarmiger costatus anisicus* n. subsp. – KOZUR & MOSTLER, p. 104, pl. 10, fig. 1
Occurrence: Upper Anisian (*Paraceratites trinodosus* Zone) of Balaton Highland.

Silicarmiger costatus magnicornus n. subsp.
(Pl. 33, fig. 10; pl. 34, fig. 7)

Derivatio nominis: According to the big apical spine
Holotypus: The specimen on pl. 34, fig. 7; rep.-no. KoMo 1980 I-576
Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy)
Stratum typicum: Sample TT 7, lower part of Middle Fassanian *Ladinocampe multiperforata* Zone
Material: 43 specimens.
Diagnosis: With the character of the species. Apical horn very large, stout; broad proximal part straight, transition to round, needle-like distal part fast. Feet slender, only in the proximal part tricarinate, in the distal part roundish and needle-shaped. Number of costae on the thorax high (5-8).
Dimensions:
Length of test (without apical horn and feet) = 175–207 μm
Width of test = 131—135 μm
Length of apical horn = 138–160 μm
Length of feet = 200–220 μm
Occurrence: Middle Fassanian of Italy.
Remarks: In the Lower to Middle Fassanian *Silicarmiger costatus costatus* DUMITRICA, KOZUR & MOSTLER, 1980 the apical horn has no straight, broad proximal part, but it tapers continuously from its broad base toward the round, needle-shaped distal part that is with exception of the Middle Fassanian forms always very short.

In the Upper Anisian (*P. trinodosus* Zone) *Silicarmiger costatus anisicus* KOZUR & MOSTLER, 1981, the apical horn typers continuously toward the very short roundish, needle-shaped distal part, the feet are broader, shorter and tricarinate until their distal ends and the test has fewer costae (1–4).

***Silicarmiger curvatus* (KOZUR & MOSTLER, 1979)**
(Pl. 33, figs. 11, 12, 14)

1979 *Eonapora curvata* n. sp. - KOZUR & MOSTLER, pp. 90-91, pl. 13, fig. 5
1984 *Silicarmiger curvatus* (KOZUR & MOSTLER, 1979) - KOZUR, p. 63, pl. 4, fig. 3
Occurrence: Middle Longobardian to Julian of European Tethys (Austria, Hungary, Italy).

***Silicarmiger latus* n. sp.**
(Pl. 34, figs. 1-4, 9; pl. 35, figs. 1, 2, 4, 5)

1979 *Stichopterium* (?) sp. A - NAKASEKO & NISHIMURA, p. 80, pl. 11, figs. 1(?), 3(?), 4
1990 *Silicarmiger* aff. costatus DUMITRICĂ, KOZUR & MOSTLER, 1980 - GORIČAN, p. 156, pl. 10, fig. 9
Derivatio nominis: According to the broad thorax
Holotypus: The specimen on pl. 34, fig. 9; rep.-no. KoMo 1980 I-578
Locus typicus: Köveskál (Balaton Highland, Hungary), section at the cemetery
Stratum typicum: Nodular cherty limestone within tuffites, 65 cm below sample 6/83, Nemesvámos Formation, lower part of *Budurovignathus mungoensis* A.Z., Middle Longobardian
Material: More than 100 specimens.
Diagnosis: Cephalis small to moderately large, hemiglobular to subglobular, with ribs in the place of arches AV, Al and few additional oblique or ring-like costae. Cephalic spicular system robust, with Mb, A, V, 2L, D, 2l. In prolongation of V and 2l small, carinate horns are present. Apical horn stout, tricarinate, short, with missing to long needle-like prolongation.

Thorax large, subglobular to broadly frustum-like, with 4-8 sharp narrow rings that are interrupted and often displaced along the feet.

The feet in prolongation of D and 2L are long, slender, in their distal part roundish and needle-like, in their free proximal part tricarinate. In large parts of their proximal section the feet are inserted into the thoracic wall as a strong ridge.

Aperture large, subtriangular to round.

Dimensions: See under the subspecies.

Occurrence: Upper part of Middle Fassanian *Ladinocampe multiperforata* Zone up to Longobardian. Hungary, Italy, Japan.
Remarks: In the Lower to Middle Fassanian *Silicarmiger costatus costatus* DUMITRICĂ, KOZUR & MOSTLER, 1980 the lib relation of the thorax is larger and the broad tricarinate part of the apical spine is longer. The nominate subspecies is additionally distinguished by a smaller cephalis and a missing roundish distal part of the apical spine.

***Silicarmiger latus latus* n. subsp.**
(Pl. 34, figs. 3, 4, 9; pl. 35, figs. 2, 5)

Holotypus = Holotypus of the species
Material: More than 100 specimens.
Diagnosis: With the character of the species. Cephalis small, only in primitive forms moderately large. Apical horn very broad, but short. Distal needle-like, roundish part missing or very short. Thorax subglobular, with 5–8 very high ring-like costae.
Dimensions:
Length of test (without apical horn and feet) = 225–270 µm,
in primitive Upper Fassanian forms about 180 µm
Maximum width of test = 200–233 µm, in primitive Upper Fassanian forms about 175 µm
Length of cephalis = 50–60 µm, in primitive Upper Fassanian forms about 65 µm~
Maximum width of cephalis= 65–73 µm, in primitive Upper Fassanian forms about 80 µm
Length of apical horn = about 40 µm, in primitive Upper Fassanian forms 65–75 µm
Occurrence: Primitive forms with still moderately large cephalis occur in the Upper Fassanian *Budurovignathus truempyi* conodont A.Z., but the main occurrence of typical forms is in the Longobardian. Hungary, Japan.
Remarks: See also under the species.

The Middle Fassanian *Silicarmiger latus longispinosus* n. subsp. has a long, roundish, needle-like distal part of the apical horn. The cephalis is somewhat broader.

Silicarmiger latus mediospinosus n. subsp. has a medium-long distal, roundish, needle-like part of the apical horn and the cephalis is somewhat broader.

***Silicarmiger latus longispinosus* n. subsp.**
(Pl. 35, fig. 1)

Derivatio nominis: According to the long needle-like distal part of the apical spine
Holtoypus: The specimen on pl. 35, fig. 1; rep.-no. KoMo 1980 I-577

Locus tyicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy)
Stratum typicum: Sample TT 14, upper part of Middle Fassanian *Ladinocampe multiperforaia* Zone
Material: 8 specimens.
Diagnosis: With the characters of the species. Cephalis moderately large, hemiglobular. Apical horn with long, roundish distal part. Thorax broadly frustum-like.
Dimensions:
Length of test (without apical horn and feet) = 150-170 µm
Maximum width of test = 181-190 µm
Length of cephalis = 50-60 µm
Width of cephalis = 82-90 µm
Length of apical horn = 125-134 µm
Occurrence: Upper part of Middle Fassanian *Ladinocampe multiperforatus* Zone, Italy.
Remarks: See also under the species.
The Longobardian nominate subspecies has a somewhat smaller cephalis and a broad, short apical horn without or with very short roundish needle-like part of the apical horn.

Silicarmiger latus mediospinosus n. subspecies from the uppermost part of the Middle Fassanian displays a medium-sized roundish, needle-shaped distal part of the apical horn.

Silicarmiger latus longispinosus n. subsp. in the most primitive member of a phylomorphogenetic line within *S. latus* n. sp. in which the long, needle-shaped distal part of the apical spine is rapidely reduced and finally also the cephalis becomes smaller. *S. latus longispinosus* n. subsp. is still near related to *S. costatus costatus* DUMITRICA, KOZUR & MOSTLER, from which it is only distinguished by the broader thorax, the common feature of all subspecies of *S. latus* n. sp.

Silicarmiger latus mediospinosus n. subsp.
(Pl. 34, figs. 1, 2; pl. 35, fig. 4)

Derivatio nominis: According to the medium-sized needle-like distal segment of the apical horn
Holotypus: The specimen on pl. 35, fig. 4; rep.-no. KoMo 1980 I-358
Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy)
Stratum typicum: Sample TT 16, uppermost part of the Middle Fassanian *Ladinocampe multiperforata* Zone
Material: 17 specimens.
Diagnosis: With the character of the species. Cephalis moderately large. Apical horn with medium-sized needle-like, round distal part of apical spine. Thorax broadly frustum-like.
Dimensions:
Length of test (without apical spine and feet) = 142-154 µm
Maximum width of test = 134-139 µm
Length of cephalis = 46-50 µm
Width of cephalis = 68-70 µm
Length of apical horn = 60-72 µm
Occurrence: Uppermost part of Middle Fassanian *Ladinocampe multiperforata* Zone.
Remarks: In the Middle Fassanian *Silicarmiger latus longispinosus* n. subsp. the distal needle-like part of the apical horn is longer.

In the Upper Fassanian and Longobardian *Silicarmiger latus latus* n. subsp. the distal needle-like part of the apical horn is missing or very short, the whole apical spine is therefore short.

Genus *Nofrema* DUMITRICA, KOZUR & MOSTLER, 1980

Type species: *Nofrema trispinosa* DUMITRICĂ, KOZUR & MOSTLER, 1980

Nofrema trispinosa DUMITRICĂ, KOZUR & MOSTLER, 1980
(Pl. 34, figs. 5, 6, 10)

1980 *Nofrema trispinosa* n. sp. - DUMITRICĂ, KOZUR & MOSTLER, p. 25, pl. 9, fig. 1; pl. 15, fig. 3
Occurrence: Upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.

Genus *Spongosilicarmiger* KOZUR, 1984

Type species: *Spongosilicarmiger italicus* KOZUR, 1984

Spongosilicarmiger italicus italicus KOZUR, 1984
(Pl. 35, fig. 7; pl. 37, figs. 1, 5, 6, 9, 10)

1984 *Spongosilicarmiger italicus* n. gen. n. sp. - KOZUR, pp. 64-65, pl. 6, fig. 2; pl. 7, fig. 1

Occurrence: Lower and Middle Fassanian, Hungary, Italy, Japan, Philippines, Yugoslavia.

Spongosilicarmiger italicus transitus n. subsp.
(Pl. 35, fig. 10; pl. 36, fig. 6)

1989 *Silicarmiger* sp. A, pars - CHENG, p. 148, only pl. 7. fig. 12

Derivatio nominis: According to the transitional position between *S. italicus* KOZUR and *S. priscus* n. sp.

Holotypus: The specimen on pl. 36, fig. 6; rep.-no. KoMo 1980 I-384

Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section

Stratum typicum: Limestone bed 100D within the Pietra verde of Buchenstein Formation. Lower *Spongosilicarmiger italicus* Zone, basal *"Xenoprotrachyceras" reitzi* Oppel Zone (*Parakellnerites* fauna), basal Fassanian

Material: 32 specimens.

Diagnosis: Cephalis subglobular, poreless, covered with a nodose outer layer. Cephalic spicular system with Mb, A, V, 2L, D, 2l. Apical horn stout, cylindrical, distally conical. With exception of a short distal spine the whole apical horn is covered by an outer layer with pores and distinct nodes that may join partly to short ribs around the pores. The basal part of the apical spine displays fewer or lower nodes. The transition between the cylindrical and distal conical part may be a little widened. The 3 needle-like, long feet in prolongation of D and 2L are proximally inserted in the shell wall, outside visible as a ridge, than they are connected with the wall by ridges and blades with pores. The distal part of the feet is free and rather strongly outward and downward directed.

Postcephalic portion of the test subcylindrical. Inner layer with 9-11 transversal ribs that connect the feet with the wall. In the distal part of test, where the feet are free, these transversal ribs are uninterrupted rings. Between the rings pores are present, mostly arranged in irregular pore rings. The outer layer consists of distinct nodes connected each other by short narrow bars. The pores of the outer layer are somewhat longer than that of the inner layer and triangular to oval. Distal part of test slightly narrowing, in the distalmost portion the outer layer is missing. Aperture roundish, relatively large.

Dimensions:

Length of test (without apical horn) = 321–340 μm

Maximum width of test = 130–136 μm

Length of apical horn = 120–133 μm

Width of apical horn in its midlength = 53–50 μm

Occurrence: Lower subzone of *Spongosilicarmiger italicus* Zone. Hungary, Philippines. In Felsöörs this level belongs to the lower part of *'Xenoprotrachyceras' reitzi* Oppel Zone (level with *Kellnerites*), basal Fassanian.

Remarks: The Illyrian *Spongosilicarmiger priscus* n. sp. displays a conical apical horn that becomes continuously narrower from its broad base. Moreover, the feet are not so much outward directed.

Spongosilicarmiger italicus italicus KOZUR 1984 displays also a subcylindrical apical horn, but it is not covered by an outer layer in its basal part and therefore here distinctly narrower than in the midlength. In *S. italicus transitus* n. subsp. the widening in the midlength is either missing or weak. In many specimens of *S. italicus italicus* the distal part of the test becomes distinctly narrower with relatively small aperture, but in the holotype and many other forms the distal narrowing is not significantly stronger than in *S. italicus transitus* n. subsp.

In the Illyrian a similar form with broad, slightly conical apical horn occurs, covered like the inflated cephalis by nodes. Probably it belongs into the field of intraspecific variation of *Spongosilicarmiger priscus* n. sp., because the apical horn is slightly conical, but it does not taper so rapidly as in this species. Only one specimen is present, here regarded a *Spongosilicarmiger cf. priscus* n. sp.

The Lower Fassanian *Spongosilicarmiger gabiolaensis* n. sp. from the middle subzone of *Spongosilicarmiger italicus* Zone displays also a subcylindrical, in the midlength not or only indistinctly widened apical horn, but it has a long, uncovered, needle-like distal part of the apical horn.

According to the form of the apical horn, *S. italicus transitus* n. subsp. could be both the forerunner of *S. italicus italicus* KOZUR and of *S. gabiolaensis* n. sp.

Spongosilicarmiger gabiolaensis n. sp.
(Pl. 35, figs. 3, 6, 8, 9, 11; pl. 36, figs. ?1, 4, 5, 7, 8, 10; pl. 37, figs. 2–4, 7, 8)

1990 *Spongosilicarmiger italicus* KOZUR, 1984 - GORIČAN, p. 158, pl. 10, fig. 7

Derivatio nominis: According to the occurrence in the Passo della Gabiola section
Holotypus: The specimen on pl. 36, fig. 4, 5, 8; rep.-no. KoMo 1980 I-386
Locus typicus: Passo della Gabiola near Recoaro, Vicentinian Alps (Italy)
Stratum typicum: Sample MD 20, middle subzone of *Spongosilicarmiger italicus* Zone, Lower Fassanian
Material: More than 100 specimens.
Diagnosis: Cephalis relatively small, globular, imperforat, covered with a nodose or pustulose outer layer. Nodes sometimes connected in irregular ribs. Cephalic spicular system with Mb, A, V, 2L, D, 2l. The 3 needle-like feet are situated in prolongation of D and 2L. They are straight downward and somewhat outward directed. The feet are in their upper part inserted into the wall. In the lower part the feet are connected with the wall by the ends of the transversal ribs. The distal ends of the feet are free. Apical spine very large, in the proximal part slender subcylindrical, straight or slightly curved. It is here covered by an outer layer with small pores. Pore frames with short irregular ribs and nodes. Distal part needle-shaped, moderately to very long, straight or curved, not covered by an outer layer. Basal part of apical spine may be also uncovered by the outer layer and it is than a little narrower than the following part. Postcephalic part of test subconical, distally somewhat narrowing. The inner layer consists of 6-10 transversal ribs, irregularly spaced between two adjacent feet. The pores between the ribs vary in size and shape. The outer layer has irregular pore frames with small nodes on the joints. Outer pore frames arranged in irregular short longitudinal ribs.
Dimensions: See under the subspecies.
Occurrence: Middle and upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Remarks: Well preserved representatives of the Lower Fassanian *Spongosilicarmiger italicus* KOZUR, 1984 have a very short, conical, tricarinate terminal spine, in *S. italicus transitus* n. subsp. this very short spine may be rounded. In *S. italicus* never a long terminal spine was observed. The characteristic widening of the middle part of the relatively short subcylindrical portion of the apical spine of *S. italicus italicus* KOZUR, 1984 can be also observed in some of those specimens of *S. gabiolaensis* n. sp., where the basal apical spine displays no cover of the outer layer. In general, this widening is considerably weaker than in *S. italicus italicus* KOZUR 1984, similar to *S. italicus transitus* n. subsp. that displays, however, no long smooth, needle-like apical spine. Moreover, this subspecies is also distinguished by more outward directed feet, a longer, subcylindrical distal part of the test behind the inserted feet and a different pore frames of the outer layer (more pronounced nodes, connected by radially bars).

Spongosilicarmiger gabiolaensis gabiolaensis n. subsp.

(Pl. 35, fig. 8; pl. 36, figs. ?1, 4, 5, 7, 8, 10; pl. 37, figs. ?7, 8)

Holotypus: Holotype of the species.
Material: 28 specimens.
Diagnosis: With the characters of the species. Both slender cylindrical proximal part and straight, needle-like moderately long to long terminal part of the apical horn straight.
Dimensions:
Length of test (without apical horn and feet) = 310-356 µm
Maximum width of test = 190-261 µm
Length of apical horn = 145-310 µm
Length of distal needle-like part of apical horn = 54-110 µm
Occurrence: Upper part of middle and upper subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone. Transitional forms to *S. italicus italicus* KOZUR, 1984 occur in the middle subzone of the *S. italicus* zone.
Remarks: Transitional forms to *Spongosilicarmiger italicus italicus* KOZUR have a broader and shorter cylindrical proximal part of the apical horn that is distinctly broadened in its middle portion and has only a short needle-like distal part that is at least basally tricarinate.

In *Spongosilicarmiger gabiolaensis curvatospinus* n. subsp. is at least the needle-shaped distal part distinctly curved.

Spongosilicarmiger gabiolaensis curvatospinus n. subsp.

(Pl. 35, figs. 3, 6, 9, 11; pl. 37, figs. 2-4)

Derivatio nominis: According to the distally distinctly curved apical spine
Holotypus. The specimen on pl. 35, figs. 9, 11; rep.-no. KoMo 1980 I-592
Locus typicus: Passo della Gabiola near Recoaro, Vicentinian Alps, Italy
Stratum typicum: Sample MD 1, middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Material: 79 specimens.

Diagnosis: With the character of the species. Proximal, slender cylindrical part of apical spine very long, covered with a thick porous outer layer, but basally often smooth. This part is mostly oblique or somewhat curved, rarely straight. The following needle-shaped distal part of the apical horn is always distinctly curved.

Dimensions:

Length of test (without apical horn) = 245-294 µm
Maximum width of test = 127-195 µm
Length of apical horn = 114-200 µm

Occurrence: Frequent in the middle subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone, rare in the upper subzone of this zone.

Remarks: Clearly distinguished from the Lower Fassanian *Spongosilicarmiger italicus italicus* KOZUR, 1984 both by the longer, slender cylindrical proximal part of the apical horn and by the long, needle-like, curved distal part of the apical horn. This latter feature distinguishes *S. gabiolaensis curvatospinosus* n. subsp. also from *S. gabiolaensis gabiolaensis* n. subsp. that has a straight distal needle-like spine. Moreover, the slender subcylindrical part covered by the thick outer layer is shorter in the nominate subspecies.

Spongosilicarmiger posterus n. sp.

(pl. 35, figs. 12, 13; pl. 36, figs. 2, 3)

Derivatio nominis: According to the occurrence after *Spongosilicarmiger italicus* n. sp.

Holtopyus: The specimen on pl. 36, figs. 2, 3; rep.-no. KoMo 1980 I-600

Locus typicus: Passo della Gabiola near Recoaro, Vicentinian Alps, Italy

Stratum typicum: Sample MD 28, basal part of Middle Fassanian *Ladinocampe multiperforata* Zone

Material: 27 specimens.

Diagnosis: Cephalis relatively small, elongated subhemiglobular, poreless, covered with low ribs and nodes. Cephalic spicular system with Mb, A, V, 2L, D, 21. Apical horn cylindrical, with short distal tip that is on one side rounded or with broadly rounded, only a little elevated ridge, whereas on the other side a broad furrow is present. The basal part is smooth, but has about the same width as the following part with small roundish pores surrounded by high pore frames of short, rounded bars, nodes, sometimes short spines. Thorax shallowly hoop-like elevated, with few tiny pores, mostly closed by an outer layer that bears numerous short, often indistinct, irregular, but mostly transversal and diagonal ribs and small nodes. The outer expression of the inserted feet begins only below the thorax. The distal part of the needle like, long feet in continuation of D and 2L is free, the proximal part is connected by the ends of the transversal ribs with the wall. The distal end of the inserted part of the feet is often blade-like high.

The inner layer of the postthoracic velum displays 6-8 transversal ridges between the inserted part of the feet. Between these transversal ridges irregularly sized and spaced pores are present. They are mostly roundish or oval. Outer pore frames considerably larger consisting of irregular bars and indistinct nodes at the joints.

Dimensions:

Length of test (without apical horn and feet) = 235-307 µm
Maximum width of test = 170-194 µm
Length of apical horn = 105-118 µm

Occurrence: Basal part of Middle Fassanian *Ladinocampe multiperforata* Zone.

Remarks: Both *Spongosilicarmiger italicus* KOZUR, 1984 and *S. gabiolaensis* n. sp. from the Lower Fassanian are distinguished by the missing elevation of the thorax and above all by the outer expression of the inserted feet that begins in the collar stricture below the cephalis, where it is at least indicated by a vertical line of nodes. *S. italicus italicus* KOZUR 1984 is additionally distinguished by widening of the middle part of apical horn, *S. gabiolaensis* n. sp. by the presence of a long needle-like distal part.

Spongosilicarmiger priscus n. sp.

(Pl. 36, figs. 9, 11)

1979 *Stichopterium* (?) sp. B - NAKASEKO & NISHIMURA, pp. 80-81, pl. 11, only fig. 2

1989 *Silicarmiger* sp. A, pars - CHENG, p. 148, only pl. 6, fig. 12

Derivatio nominis: Oldest known *Spongosilicarmiger* species

Holotypus: The specimen on pl. 36, figs. 9, 11; rep-no. KoMo 1980 I-385

Locus typicum: Limestone bed 87 within greenish tuffites, *Paraceratites trinodosus* Zone (Illyrian)

Material: 9 specimens.

Diagnosis: Cephalis large, subglobular. Cephalic spicular system with Mb, A, V, 2L, D, 21. Apical horn stout covered with an outer layer with irregular pore frames bearing irregular short ribs and nodes around irregularly distributed roundish pores. Only a very short, tricarinate tip is not covered by the outer layer. The apical horn is conical. The outer layer continues either without interruption onto the poreless cephalis (here mostly in form of nodes) or it may be somewhat reduced on the basal part of the apical cone. In prolongation of D and 2L 3 needle-like long feet are present that start in the collar stricture. The proximal part of the feet is connected by bars and pore-bearing blades with the test. Distal parts of feet free, downward and moderately outward-directed.

The postcephalic part of the test is cylindrical and bears an inner layer with about 10 irregular transverse ribs. The pores of the inner layer are irregular in shape and size, but rather small. The pore frames of outer layer are nodes with radial thin bars. The inner transversal ribs are outside indicated by a ring of these nodes, but in the distal parts these nodes are also present between the rings. The pores of the outer layer are small and triangular. In the distalmost part of the test the outer layer consists only of elevations around the pores of the inner layer. Test only indistinctly narrowing toward the distal end. Aperture roundish, large.

Dimensions:

Length of test = 389-400 μm

Maximum width of test = 123-129 μm

Length of apical horn = 86-90 μm

Width of apical horn in its midlength = 37-39 μm

Occurrence: Illyrian (*Paraceratites trinodosus* Zone) of Balaton Highland, Hungary. Illyrian of Japan.

Remarks: *Spongosilicarmiger italicus* KOZUR, 1984 displays a subcylindrical apical horn that widens in its middle part. The test after the inserted part of the feet becomes narrower. In transitional forms between both species (*S. italicus transitus* n. subsp.) the apical horn is not yet widened in its middle part or this widening is only indistinct, but the apical horn is already subcylindrical and not conical from its base, as in *S. priscus* n. sp.

Family Spongolophophenidae n. fam.

Diagnosis: Test spongy, dicyrtid. Cephalis large, globular, elongated subhemiglobular or large-concial. Cephalic spicular system with Mb, A, V, 2L, D, 21. Thorax long, cylindrical or conical. 3 long, needle like feet in prolongation of D and 2L may be present, starting about from the cephalis-thorax boundary. Aperture wide.

Occurrence: Upper Devonian-Ladinian.

Assigned genera:

Spongolophophaena n. gen.

Cyrtentactinia FOREMAN, 1963

Conospongocyrtis n. gen.

Triassospongocyrtis n. gen.

Remarks: The Triassic forms of this family are seemingly directly related to the Upper Devonian *Cyrtentactinia* FOREMAN, 1963 that displays the same shape and cephalic spicular system. Some larger individuals of the type species *Cyrtentactinia primatica* FOREMAN, tends to have a spongy wall.

Spongomelissa HAECKEL, 1887 from the Paleogene has the same shape and feet as *Triassospongocyrtis* n. gen. However, the spicules 21 are missing. *Spongomelissa* HAECKEL, 1887 has seemingly evolved from the new family, but the total reduction of 21 and the latticed, in the cephalis two-layered shell exclude this genus from the Spongolophophaenidae n. fam.

Lophophena EHRENBERG, 1847 from the Tertiary to Recent displays the same outline as *Spongolophophaena* n. gen. However, the wall is latticed. Seemingly also the Lophophaenidae HAECKEL, 1881 have evolved from the Spongolophophaenidae n. fam. The transformation of thick spongy shell into latticed shell can be observed during the Mesozoic-Recent evolution in different radiolarian groups (e.g. within the Saturnaliacea DEFLANDRE, 1954: Pseudacanthocircidae KOZUR & MOSTLER, 1990 - Saturnalidae DEFLANDRE, 1954, see KOZUR & MOSTLER, 1990). These differences in shell wall have family rank.

Seemingly the Spongolophophaenidae n. fam. are a conservative group within the Narsellaria that begin in the Upper Devonian and reaches until the Triassic with Recent successors that can be distinguished in family rank.

Genus *Spongolophophaena* n. gen.

Derivatio nominis: According the identical shape with *Lophopaena* EHRENBERG, 1847 and the spongy wall.

Type species: *Spongolophophaena globocephalis* n. gen. n. sp.

Diagnosis: Cephalis large, globular. Cephalic spicular system with long Mb that bears on one side 3 on the other side 4 spicules that represent V, 2L on one side and A, D, 21 on the other side. Their arrangement is asymmetrical. V runs so steep upward as A, both in a left direction. D runs downward in a right direction, 2L and 21 are situated in oblique planes. Thorax long conical to subcylindrical. Wall spongy. Inner layers with big pores, outer layers with very small pores.

Occurrence: Middle Fassanian *Ladinocampe multiperforata* Zone of Southern Alps.

Assigned species:
Spongolophophaena globocephalis n. gen. n. sp.
Spongolophophaena longa n. sp.
Remarks: *Lophophaena* EHRENBERG, 1847 (Tertiary-Recent) has the same shape, but a single-layered latticed shell.

Triassospongocyrtis n. gen. has an elongated subhemisphaerical or rounded broadly conical cephalis that continues fluently into the cylindrical thorax. Long needle-like feet in prolongation of D, 2L are always present. The cephalic spicular system is not asymmetric.

Spongolophophaena globocephalis n. gen. n. sp.
(Pl. 38, figs. 1, 3, 5)

Derivatio nominis: According the very large, globular cephalis.
Holtypus: The specimen on pl. 38, figs. 1, 3; rep.-no. KoMo 1980 I-233
Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy)
Stratum typicum: sample TT 7, Middle Fassanian *Ladinocampe multiperforata* Zone
Material: 14 specimens.
Diagnosis: With the character of the genus. Cephalis very large, globular. Apical region often with small spines, the largest of them in prolongation of A and V. Thorax broadly conical, long. Its broadening begins either immediately below the cephalis or after a short cylindrical proximal part. Proximal part of thorax narrower than cephalis, distal end considerably broader than cephalis and skirt-like widened.
Dimensions:
Length of test = 300-330 µm
Maximum width of test = 164-195 µm
Occurrence: Lower and middle part of Middle Fassanian *Ladinocampe multiperforata* Zone.
Remarks: *Spongolophophaena longa* n. sp. displays a somewhat smaller cephalis and a longer, fewer widened thorax.

Spongolophophaena longa n. sp.
(Pl. 38, figs. 2, 4)

Derivatio nominis: According to the long thorax
Holotypus: The specimen on pl. 38, fig. 2; rep.-no. I-509
Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy)
Stratum typicum: sample TT 18, upper part of *Ladinocampe multiperforata* Zone, Middle Fassanian.
Material: 9 specimens.
Diagnosis: With the character of the genus. Cephalis large, globular, apically with 2 very small denticles in prolongation of V and A.

Thorax very long, slender conical to almost subcylindrical, in the upper half narrower than cephalis, distalwards only very slowly widening, at the distal end only somewhat broader than cephalis.
Dimensions:
Length of test = 325-400 µm
Maximum width of test = 130-160 µm
Occurrence: Upper part of Middle Fassanian *Ladinocampe multiperforata* Zone.
Remarks: In *Spongotriassocyrtis globocephalis* n. sp. the cephalis is still larger, the thorax is shorter and distally considerably broader.

Genus *Conospongocyrtis* n. gen.

Derivatio nominis: According the conical shape and spongy shell
Type species: *Conospongocyrtis cephaloconica* n. gen. n. sp.
Diagnosis: Shell conical or in the upper part conical, in the lower part cylindrical with apical spine, but without feet. Cephalic spicular system with Mb, A, V, 2L and 2l. Wall thick, spongy.
Occurrence: Middle Fassanian *Ladinocampe multiperforata* Zone.
Assigned species:
Conospongocyrtis cephaloconica n. gen. n. sp.
Conospongocyrtis conica n. sp.
Remarks: *Triassospongocyrtis* n. gen. has a very large, elongated subhemispherical to rounded subconical cephalis and 3 long feet in prolongation of D and 2L. *Spongosilicarmiger* KOZUR, 1984 of the *S. ultima* group (described in a separate paper) has an inner latticed shell with rings covered by a spongy layer. It is only a homoeomorphic form group. In the form and outer wall structure similar Lower Jurassic Nassellaria (e.g. within the genus *Droltus* PESSAGNO & WHALEN, 1982) have a different inner layer with distinctly vertically arranged pore frames. They are also homoeomorphic forms.

Conospongocyrtis cephaloconica n. gen. n. sp.
(Pl. 38, figs. 6, 7, 9)

Derivatio nominis: According to the conical cephalis, clearly separated from the cylindrical thorax
Holtypus: The specimen on pl. 38, figs. 6, 9; rep.-no. KoMo 1980 I-513
Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy)
Stratum typicum: sample TT 13, upper part of Middle Fassanian *Ladinocampe multiperforata* Zone
Material: 7 specimens.
Diagnosis: With the character of the genus. Cephalis large conical, with short, broad apical horn that has several narrow carinae. Thorax abruptly broader, cylindrical to subcylindrical (in the latter case with very slight broadening toward the distal end. Shell wall thick, spongy, on the cephalis additionally covered by a layer of microgranular silica that closes all pores. In the thorax this layer may be missing, showing than the deeper spongy layer with indistinct *Alievium* pore frames. Also the basal part of the apical horn is covered by a dense spongy layer.
Dimensions:
Length of test = 275-330 µm
Maximum width of test = 145-175 µm
Occurrence: Upper part of Middle Fassanian *Ladinocampe multiperforata* Zone.
Remarks: *Conospongocyrtis conica* n. sp. has a conical shell, that becomes distalward broader both in the cephalis and thorax that are not distinctly separated on the outer shell surface.

Conospongocyrtis conica n. sp.
(Pl. 38, fig. 10)

Derivatio nominis: According to the conical shell
Holotypus: the specimen on pl. 38, fig. 10; rep.-no. KoMo 1980 I-511
Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy)
Stratum typicum: sample TT7, Middle Fassanian *Ladinocampe multiperforata* Zone
Material: 19 specimens.
Diagnosis: With the character of the genus. Test conical. Cephalis conical with stout, short apical horn that bears several (5 or more) narrow, low carinae; its basal part is covered by a spongy layer. The cephalis is not separated from the following segments on the shell surface. Therefore the whole test widens continuously toward the distal end. The number of segments is unclear. There are minimally 2, maximally 4 segments that are also at the inner side almost unseparable. Shell wall thick, spongy. The outer pore frames are partly arranged into short, irregular vertical striae. At the distal end of the shell short, delicate, needle-like spines are present that continue into the shell wall as needle-like bars.
Dimensions:
Length of test = 277-330 µm
Maximum width of test = 154-165 µm
Occurrence: Lower and middle part of Middle Fassanian *Ladinocampe multiperforata* Zone.
Remarks: *Conospongocyrtis cephaloconica* n. sp. displays only a conical proximal part of shell. The distal part of shell is cylindrical to subcylindrical. Also the outer pore frames are different.

Genus *Triassospongocyrtis* n. gen.

Derivatio nominis: According to the throughout spongy wall and the occurrence in the Triassic
Type species: *Triassospongocyrtis longispinosa* n. gen. n. sp.
Diagnosis: Shell broadly cylindrical to subcylindrical with broadly, rarely narrowly rounded apical part and roundish to roundish subtriangular, big aperture. Cephalis very large, elongated subhemispherical, rarely apically rounded conical or apically broadly rounded cylindrical. Thorax long cylindrical. Shell spongy, with large pores frames, partly arranged in rings on the inner side. Outer pore frames very small to moderately large, mostly covered by a nearly dense, fine-spongy layer.

Cephalic spicular system with Mb, A, V, 2L, D, 21 and distinct arches between them, especially Ll. In prolongation of A a needle-like lateral-apical horn is present. A second lateral-apical horn or short horn-like elevation covered by spongy material may be present. It is situated in prolongation of V. 3 only basally broad and carinate, than needle-like and round, long feet are present in prolongation of D and 2L. Additional needle-like spines may be present around the aperture.
Occurrence: Lower Fassanian *Spongosilicarmiger italicus* Zone to Upper Longobardian *Muelleritortis cochleata* Zone of Hungary and Southern Alps.
Assigned species:
Triassospongocyrtis longispinosa n. gen. n. sp.
Triassospongocyrtis cylindrica n. sp.

Triassospongocyrtis ruesti n. sp.
Triassospongocyrtis yaoi n. sp.
Remarks: *Spongomelissa* HAECKEL 1887 from the Paleogene has the same shape and the same position of the spines in prolongation of A, V, D, 2L. However, the wall is latticed, consisting of 2 layers in the cephalis and of one layer in the thorax. Moreover, the spines 2l of the cephalic spicular system are not more present. *Spongomelissa* HAECKEL is surely the successor of *Spongotriassocyrtis* n. gen.

In *Cyrtentactinia* FOREMAN, 1963, the shell is mostly latticed and the position of the outer spines in prolongation of the inner spicules is not yet fixed. Forms with 3 characteristically arranged feet in prolongation of D and 2L are missing.

Triassospongocyrtis cylindrica n. sp.
(Pl. 38, figs. 8, 11)

Derivatio nominis: According to the cylindric shape of the test
Holotypus: The specimen on pl. 38, figs. 8, 11; rep.-no. KoMo 1980 I-515
Locus typicus: Köveskál (Balaton Highland), section at the cemetery
Stratum typicum: Siliceous nodular limestone from a 70-80 cm thick greenish tuffit, about 15 cm above the base of the tuffit; with *"Posidonia" wengensis, Budurovignathus mungoensis* (DIEBEL). *B. mungoensis* A.Z. (Middle Longobardian). Nemesvámos Formation, 5.60 m below the base of the Füred Limestone Formation, ca. 6.20 m below the base of the Cordevolian.
Material: 7 specimens.
Diagnosis: Test large, cylindrical. Cephalis very large, cylindrical with broadly rounded apical end, on the outer surface not separated from the thorax. Cephalic spicular system with Mb, A, V, 2L, D, 2l and arches between the ends of the spicules. Apical horn often missing, replaced by a latero-apical area with different sculpture.

Thorax long, likewise cylindrical. The needle-like, but tricarinate feet in prolongation of D and 2L are situated near to the distal end of the thorax.

Wall thick, spongy. Inner layer with large and small pores, partly arranged in rings, separated by narrow, solid rings. Outer pore frames irregular, with moderately large and tiny pores both on the cephalis and thorax. However, the pores on the cephalis are mostly closed by a layer of microgranular silica, not present in the apical part of the cephalis.

Dimensions:
Length of test = 509-543 µm
Maximum width of test = 221-239 µm
Occurrence: Middle Longobardian of Hungary.
Remarks: This large species is clearly distinguished from all other *Spongotriassocyrtis* species by the position of the tricarinate feet near the distal end of the cephalothorax.

Triassospongocyrtis longispinosa n. gen. n. sp.
(Pl. 39, figs. 1-3, 6, 7, 9)

Derivatio nominis: According to the 3 long, needle-like feet
Holotpyus: The specimen on pl. 39, figs. 1, 2; rep.-no. KoMo 1980 I-342
Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy)
Stratum typicum: Sample TT 2, lower part of Middle Fassanian *Ladinocampe multiperforata* Zone
Material: More than 100 specimens.
Diagnosis: Shell subcylindrical. Cephalis very large, elongated subhemispherical with broadly, in the view perpendicularly to VA obliquely rounded apical end.

Thorax long, cylindrical with the same diameter as the cephalis.

Cephalic spicular system with Mb, A, V, 2L, D, 2l. The spicule V is strongly upward directed (about in the same degree as A). Between the spicules arches run in the wall or at the inner margin of the wall. Especially distinct is the arch Ll, but also the arches LL, AV, VL are distinct. In prolongation of A a latero-apical needle-like relatively long, delicate (mostly not preserved in its full length) horn is present (excentric apical horn). In prolongation of V a likewise latero-apical, mostly very short, broad horn is present totally coverd by spongy material. 3 long feet are present in prolongation of D and 2L. On the outer surface they start about at the boundary between cephalis and thorax. Only their very basal part is broad and bears here several short carinae. The remaining part is needle-like with roundish cross section.

The wall consists of a thick spongy meshwork. The innermost layer has in the thorax rather big pores, partly arranged in rings, the outer layer is on the cephalis almost dense with only tiny pores, on the thorax it has longer, irregular pore frames, at least in its distal part the joints of the outer pore frames display tiny nodes or spines. Sometimes the outer layer is imperfect or missing in the distal parts of the thorax.

The aperture is large, round or roundish subtriangular. Few needle-like, delicate, mostly broken spines are here present. They continue within the shell wall or on its inner side as delicate, long spicules until the joints of the cephalic spicular system with the shell wall. The most distinct distal spine at the aperture is connected with the joint of the shell wall with V, where 4 arches start, one of it running to the most distinct distal aperture spines.

Dimensions:
Length of test (without spines) = 271-375 μm
Maximum width of test = 146-210 μm

Occurrence: Widely distributed in the *Spongosilicarmiger italicus* Zone and in the lower part of the *Ladinocampe multiperforata* Zone (Lower and Middle Fassanian of Hungary and Italy).

Remarks: The Longobardian *Triassospongocyrtis cylindrica* n. sp. has a cylindrical cephalothorax, in which the tricarinate, needle-like feet start on the outer shell wall near the distal end of the thorax.

Triassospongocyrtis ruesti n. sp. from upper part of the Middle Fassanian *Ladinocampe multiperforata* A.Z. has a rounded subconical cephalis with narrowly rounded apical end. The subcylindrical thorax becomes narrower toward the distal end.

Most similar is the Upper Fasanian *Triassospongocyrtis yaoi* n. sp. In this species the needle-like latero-apical apical horn is tricarinate and the short vertical horn is not totally covered by a spongy layer. Moreover, the outer pore frames both on the cephalis and thorax are coarser.

Triassospongocyrtis ruesti n. sp.
(Pl. 39, figs. 4, 8)

Derivatio nominis: In honour to D. RÜST, one of the pioneers of the fossil Radiolaria research.
Holotypus: The specimen on pl. 39, figs. 4, 8; rep.-no. KoMo 1980 I-516
Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps)
Stratum typicum: Sample TT 16, upper part of the Middle Fassanian *Ladinocampe multiperforata* Zone
Material: 12 specimens.
Diagnosis: Test large, in the proximal part subconical, distally cylindrical. Cephalis very large, rounded subconical with narrowly rounded apical end. Latero-apical apical horn very small. Cephalic spicular system with Mb, A, V, 2L, 2l. In prolongation of D and 2L 3 needle-like feet with round cross section are present about in the middle part of the cephalothorax. In their very basal part they are broad and covered by a spongy layer. Near to one of the feet a very delicate additional spine is present. Thorax long, in the proximal part narrowing, in the distal part cylindrical. At the margin of the round aperture with one or few needle-like short, delicate spines, mostly broken away.

Wall thick, spongy. Outer layer in the cephalis nearly dense, only with tiny pores. In the thorax the irregularly distributed pores are a little larger, but the most are also here very small.

Dimensions:
Length of test = 411-485 μm
Maximum width of test = 283-312 μm

Occurrence: Upper part of the Middle Fassanian *Ladinocampe multiperforata* Zone of Southern Alps.

Remarks: *Triassospongocyrtis ruesti* n. sp. is distinguished from all other *Triassospongocyrtis* species by its rounded conical cephalis with narrowly rounded apical end.

Triassospongocyrtis yaoi n. sp.
(Pl. 39, figs. 5, 10)

Derivatio nominis: In honour of Prof. Dr. A. YAO, Osaka
Holotypus: The specimen on pl. 39, figs. 5, 10; rep.-no. KoMo 1980 I-517
Locus typicus: Köveskál (Balaton Highland, Hungary), section at the cemetery
Stratum typicum: Sample 4a. Nodular cherty limestone with reddish chert nodules from a 160 cm thick interbedding of greenish tuffite and thin limestone beds within the lower part of the Nemesvámos Formation, 55 cm below the top of the tuffit-limestone, stone interbedding, 2.75 m above the base of the Nemesvámos Formation. Rich occurrence of *Budurovignathus truempyi* (HIRSCH), the index species of the *B. truempyi* conodont zone. Upper Fassanian.
Material: 4 specimens
Diagnosis: Test cylindrical with broadly rounded to nearly blunt apical end. Cephalis very large, elongated subhemispherical. Cephalic spicular system with Mb, A, V, 2L, D, 2l. Latero-apically lies a distinct, needle-like, but tricarinate, basally broad apical horn, at its very base covered with spongy material. Opposite the apical horn, likewise in latero-apical position, lies a short carinate, broad horn in prolongation of V. 3 long needle-like feet are situated in prolongation of D and 2L. At their very base they are broad, carinate. The feet 2L begin near the boundary between the

cephalis and thorax, the foot D begins in the upper part of the thorax.

The thorax is cylindrical and outside not separated from the cephalis. However, the outer layer of the spongy wall is different in the cephalis and thorax. In the cephalis the irregular pore frames display only tiny pores. The position ot the collar stricture is indicated by a poreless stripe. The pores of the outer layer in the thorax have different size, the most are small, but as a whole distinctly larger than in the cephalis.

Dimensions:

Length of test (without spines) = 260-290 µm

Maximum width of test = 168-182 µm

Occurrence: Upper Fassanian of the Balaton Highland.

Remarks: Most similar is *Triassospongocyrtis longispinosa* n. sp. from the Lower and Middle Fassanian. In this species the outer layer on the cephalis is nearly dense and also the pores in the outer layer of the thorax are smaller than in *T. yaoi* n. sp. The latero-apical apical horn is tricarinate and larger in *T. yaoi* n. sp. than in *T. longispinosa*. Also the latero-apical vertical horn is somewhat larger than in *T. longispinosa* n. sp. and not covered by a spongy layer.

Family Tetraspinocyrtiidae n. fam.

Diagnosis: As for the genus *Tetraspinocyrtis* n. gen. (see there).

Occurrence: Illyrian to Lower Fassanian of the Tethys.

Remarks: The Planispinocyrtiidae KOZUR & MOSTLER, 1981 display a similar shape, but D is missing in the cephalic spicular system.

In the Triassocampidae KOZUR & MOSTLER, 1981 horns in prolongation of D and 2L are missing.

Genus *Tetraspinocyrtis* n. gen.

Derivatio nominis: According to the 4 spines in prolongation of A, D, 2L

Type species: *Tetraspinocyrtis laevis* n. gen. n. sp.

Diagnosis: Test multicyrtid, subcylindrical to subconical. Cephalis large, partly fused with the thorax to a large cephalothorax. Cephalic spicular system with Mb, A, V, 2L, D, 2l. The spine V is sometimes missing. On the lower side of the joints D, 2l, A with Mb, and (V) 2L with Mb a distinct node is present. Thorax large, hoop-like or subcylindrical, sometimes united with cephalis to globular cephalothorax. Abdomen and postabdominal segments hoop-like, strongly elevated to almost flat.

Apical horn moderately large to large; round to tricarinate. Other 3 horns large to moderately large, tricarinate to vertically oval with lateral groves. These horns are situated on the thorax or cephalothorax. They are the prolongations of D and 2L.

Occurrence: Illyrian to Lower Fassanian of the Tethys.

Assigned species.

Tetraspinocyrtis laevis n. gen. n. sp.

Tetraspinocyrtis anisica n. sp.

Tetraspinocyrtis annuloporata n. sp.

Tetraspinocyrtis fassanica n. sp.

Remarks: *Planispinocyrtis* KOZUR & MOSTLER, 1981 is in the shape similar, but has horns in prolongation of V, 2L and 2l. The spine D is missing in the cephalic spicular system. *Planispinocyrtis* species, in which the horns 2L are rudimentary or missing have also 3 lateral horns, but they are in prolongation of other spines of the cephalic spicular system (V, 2l) than in *Tetraspinocyrtis* (D, 2L).

Spinotriassocampe KOZUR, 1984 has only 2 round spines in prolongation of 2L, starting from the always small cephalis.

Yeharaia NAKASEKO & NISHIMURA, 1979 has only an apical horn, but no additional horns.

Tetraspinocyrtis laevis n. gen. n. sp.
(Pl. 40, figs. 4, 5, 6, 10, 12)

1989 Forme évoque les Albaillellides connus dans le Permien - MARTINI, DE WEVER et al., p. 158, pl. 3, fig. 7

Derivatio nominis: According to the almost smooth postabdominal part

Holotypus: The specimen on pl. 40, figs. 5, 6, 10; rep.-no. KoMo 1980 I-402

Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section

Stratum typicum: Limestone bed 87 within greenish tuffits, *Paraceratites trinodosus* Zone (Illyrian).

Material: 43 specimens.

Diagnosis: Cephalis large, hemiglobular to subglobular, smooth, poreless or with few pores, with moderately large, proximally carinate, distally round apical horn, situated somewhat excentrically on the dorsal side.

Cephalic spicular system with Mb, AV, 2L, D, 2l. Large horns in prolongation of D and 2L. They are proximally carinate, distally smooth. The horn D starts from the collar stricture and is downward inclined. The horns 2L start from the thorax and stand nearly perpendicularly on the thorax.

Thorax slightly hoop-like elevated, as wide as, but lower than the cephalis, smooth, covered with a layer of microgranular silica and therefore outside poreless.

Abdomen and at least 3 postabdominal segments somewhat narrower than or as wide as thorax. They form a long cylindrical part with very shallow strictures. Segments in this cylindrical part only slightly elevated, with small pores (mostly more than one porering), most of them closed by a layer of microgranular silica.

Dimensions:
Length of test = 163-189 µm
Maximum width of test = 42-48 µm
Length of lateral horns = 39-50 µm

Occurrence: Illyrian (*Paraceratites trinodosus* Zone) of the Balaton Highland (Hungary) and Lagonegro Basin (Southern Italy).

Remarks: Most similar to the Illyrian *Tetraspinocyrtis annuloporata* n. sp., in which all pores in the abdomen and postabdominal segments are open. These pores are arranged in one pore ring in each segment. Moreover, the thorax is distinctly broader than the cephalis, the apical horn is throughout round and the lateral horns are likewise round or oval and may be only basally slightly carinate.

Tetraspinocyrtis multiperforata n. sp., likewise present in the Illyrian, has a globular cephalothorax. The pores on the distinctly elevated abdomen and postabdominal segments are always open.

Highly interesting that MARTINI, DE WEVER et. al. (1989, 1990) compared these typical Nassellaria (with Nassellarian spicular system and without columella) with Permian Albaillellaria that are not related to Nassellaria (presence of 2 columella, absence of Nasselarian spicular system).

The evidence that these forms (also *Tetraspinocyrtis annuloporata* n. sp. was compared with Permian Albaillellaria) are typical Anisian (Illyrian) Radiolaria is in so far important, because the Lagonegro Basin belongs to the margin of the Permian Tethys, in which Albaillellaria are frequent (CATALANO, DI STEFANO & KOZUR, 1988a, b, 1989). Reworked Permian rocks are known in the Lagonegro Basin. However, so far only shallow-water carbonates without Permian radiolarians have been found. The presence or absence of Permian Albaillellaria is paleogeographically important.

Tetraspinocyrtis anisica n. sp.

(Pl. 40, fig. 1)

Derivatio nominis: According to the occurrence in the Anisian
Holotypus: The specimen on pl. 40, fig. 1; rep.-no. KoMo 1980 I-52.
Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section
Stratum typicum: Limestone bed 87 within greenish tuffites, *Paraceratites trinodosus* Zone (Illyrian)
Material: 15 specimens.
Diagnosis: Test subconical, short for the genus. Cephalothorax still distinguishable into cephalis and thorax, but with fluent transition. Cephalic part rounded subconical to subhemiglobular. Thoracic part globular. Whole cephalothorax smooth, poreless. Only at the junction between 2l and the wall small pores may be present. Cephalic spicular system with Mb, A, 2L, D, 2l. Apical horn large, tricarinate. Horns in prolongation of D, 2L stout, broad and multicarinate.

Abdomen and first postabdominal segment broad, hoop-like, with small, roundish, irregularly spaced pores. Second postabdominal segment frustum-like, poreless.

Dimensions:
Length of test = 150-163 µm
Maximum width of test = 55-70 µm
Length of lateral horn = 25-35 µm

Occurrence: Illyrian (*Paraceratites trinodosus* Zone) of Balaton Highland (Hungary).

Remarks: Both *Tetraspinocyrtis anisia* n. sp. and *T. fassanica* n. sp. are clearly distinguished from typical *Tetraspinocyrtis* species (*T. annuloporata* n. sp., *T. laevis* n. sp.) by the presence of a cephalothorax and the presence of numerous small pores in the abdomen and first postabdominal segment.

The near related Lower Fassanian *Tetraspinocyrtis fassanica* n. sp. is distinguished from *T. anisica* n. sp. by a subroundish apical horn and a globular cephalothorax, in which the cephalis and thorax are outside inseparable. Moreover, the abdomen and first postabdominal segment are stronger elevated in *T. fassanica* n. sp.

Tetraspinocyrtis annuloporata n. sp.

(Pl. 40, figs. 2, 3, 8)

1989 Forme évoque étrangement les Albaillides connus dans le Permian - MARTINI, DE WEVER et al., p. 158, pl. 3, figs. 4, 18 (?)

Derivatio nominis: According to the open pore rings on the post-thoracic segments

Holotypus: The specimen on pl. 40, fig. 8; rep.-no. KoMo 1980 I-51

Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section

Stratum typicum: Limestone bed 87 within greenish tuffites, *Paraceratites trinodosus* Zone (Illyrian)

Material: 41 specimens.

Diagnosis: Cephalis moderately large, subhemispherical to subconical, smooth, poreless, with moderately large, round apical horn. Cephalic spicular system with Mb, A, V, 2L, D, 2l. The spines D and 2L continue as large horns that are located on the thorax. Horns basally carinate, distally round or oval or rounded triangular. Thorax broader than and about as high as cephalis, hoop-like to subglobular, with small, irregularly arranged pores.

Abdomen and first 3 postabdominal segments shallow hoop-like, with distinct, but shallow, smooth strictures; each segment with a central pore ring. Following at least 5 segments flat, distinctly separated each other forming a distalwards very slightly widening cylindrical part, each segment with a ring of small roundish pores.

Dimensions:

Length of test = 208-221 μm

Maximum width of test = 78-82 μm

Maximum length of lateral horns = 30-38 μm

Occurrence: Illyrian (*Paraceratites trinodosus* Zone) of Balaton Highland (Hungary) and Illyrian of Lagonegro Basis (Southern Italy).

Remarks: The importance of the Nassellaria character of this species against the assumed Albaillellaria relationship (MARTINI, DE WEVER et al., 1989) has been discussed under *Tetraspinocyrtis laevis* n. gen. n. sp. (see there). This species is distinguished by a considerably larger cephalis, the carinate apical horn and the mostly closed pores on the abdomen and first postabdominal segment.

The Illyrian to Lower Fassanian *Tetraspinocyrtis anisica* group (*T. anisica* n. sp., *T. fassanica* n. sp.) has a cephalothorax, in which cephalis and thorax are outside not separated by a stricture. Abdomen and postabdominal segments are hoop-like with irregularly arranged small pores or with more than one pore ring.

Tetraspinocyrtis fassanica n. sp.

(Pl. 40, figs. 7, 9, 11)

Derivatio nominis: According to the occurrence in the Fassanian

Holotypus: The specimen on pl. 40, figs. 9, 11; rep.-no. KoMo 1980 I-401

Locus typicus: Val di Creme, near Recoaro (Vicentinian Alps, Italy)

Stratum typicum: Sample VCB, upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone

Material: 9 specimens.

Diagnosis: Cephalothorax large, globular, smooth, poreless, not separable in cephalis and thorax. Apical spine very large, round. Lateral horns large, tricarinate, perpendicularly to the cephalothorax or a little upward inclined.

Abdomen and first postabdominal segment high, rounded, hoop-like, with 2 rings of tiny pores. Below them still some additional pore may be present. Third postabdominal segment short trapezoidal.

Dimensions:

Length of test = 160-189 μm

Maximum width of test = 55-63 μm

Length of apical spines = 68-71 μm

Length of lateral spines = 37-45 μm

Occurrence: Lower Fassanian of Southern Alps.

Remarks: The Illyrian *Tetraspinocyrtis anisica* n. sp. is most similar, but distinguished by a tricarinate apical spine, not so strongly inflated abdomen and first postabdominal segment, and irregularly distributed pores on the abdomen.

These 2 species belong to a near related group within the genus *Tetraspinocyrtis* n. gen. The Illyrian *Tetraspinocyrtis laevis* group (*T. laevis* n. gen. n. sp., *T. annuloporata* n. sp.) is distinguished by clearly separated cephalis and thorax, only slightly elevated post-thoracic segments that have only one pore ring.

Family Triassocampidae
KOZUR & MOSTLER, 1981
Genus *Annulotriassocampe* KOZUR,
n. gen. (see appendix)

Type species: *Annulotriassocampe baldii* KOZUR, n. gen. n. sp. (see appendix)

Remarks: Typical *Annulotriassocampe* species begin in the Middle Fassanian *Ladinocampe multiperforata* Zone, but are most frequent in the Longobardian and in the Upper Triassic. They are characterized by narrow, highly and vertically elevated cylindrical postabdominal segments with one slightly depressed pore ring between an upper and lower solid ring.

In the Illyrian and Lower Fassanian a different species group occur, characterized by very slender, long cylindrical test with not so sharply elevated, often still narrow hoop-like postabdominal segments. Like in typical *Annulotriassocampe* they display only one central pore ring, but the upper and lower solid ring is not yet present. This group represents the most primitive *Annulotriassocampe* species.

***Annulotriassocampe campanilis* n. sp.**

(Pl. 41, figs. 1-4, 7, 9-11, 13-18)

Derivatio nominis: According to the shape of the very long, slender-cylindrical test

Holotypus: The specimen on pl. 41, fig. 9; rep.-no. KoMo 1980 I-34

Locus typicus: Felsöörs (Balaton Highland), Forráshegy section

Stratum typicum: Bed 87, Illyrian *Paraceratites trinodosus* zone

Material: More than 200 specimens.

Diagnosis: Test long, very slender, cylindrical. Cephalothorax dome-shaped, smooth, poreless. Cephalic part hemiglobular to subhemiglobular, situated somewhat excentric on the subglobular thoracic part. A tiny, excentric apical horn may be present. In prolongation of V, L and D a tiny, hornlike elevation or a pore (or both) may be present.

Abdomen subglobular to broadly hoop-like, with numerous tiny pores, mostly closed by a layer of microgranular silica. Proximally the pores are arranged into an irregular pore ring. Remaining pores irregularly arranged. First postabdominal segment hoop-like, with proximal ring of tiny pores followed by an often incomplete ring of tiny pores. Following 5-6, rarely up to 9 postabdominal segments hoop-like, in the distal part more inversely trapezoidal, in stratigraphically younger forms also narrow, ringlike. They display one central or subcentral ring of small, in the distal part moderately large pores. In the segment next to the last an incomplete second ring of pores may be rarely present below the complete pore ring. Outer pore frames in stratigraphically older forms roundish, in stratigraphically younger forms at least in the distal part vertically elongated. The last segment is thin-shelled, mostly broken away. It is considerably higher and broader than the foregoing segments and displays 3 or 4 pore rings or the pores are below the proximal pore ring irregularly arranged. All constrictions between the postthoracic segments are deep, broad, smooth, poreless.

Measurements:

Length of test = 258-400 μm

Maximum width of test (without last segment) = 58-70 μm

Width of last segment = 70-75 μm

Occurrence: Illyrian (*Paraceratites trinodosus* Zone) up to Middle Fassanian *Ladinocampe multiperforata* Zone.

Remarks: *Annulotriassocampe spinosa* n. sp. from the higher part of Lower Fassanian *Spongosilicarmiger italicus* Zone displays a distinct, relatively long, excentric apical horn and a distinct horn in prolongation of V.

The Middle Fassanian *Annulotriassocampe eoladinica* n. sp. belongs already to the typical *Annulotriassocampe* species and displays therefore high, vertically elevated ring-like postabdominal segments separated against the constrictions by solid rings.

***Annulotriassocampe campanilis campanilis* n. subsp.**

(Pl. 41, figs. 9-11, ?14)

Holotypus, locus typicus, stratum typicum: As for the species.

Material: More than 100 specimens.

Diagnosis: With the characters of the species. Postabdominal segments always hoop-like, in the distal part also rounded inversely trapezoidal. Outer pore frames always roundish, also in the distal postabdominal segments. Cephalic horns never present.

Measurements:

Length of test = 258-309 μm

Maximum width of test (without last segment) = 58-67 μm

Width of last segment (if preserved) = 70-75 μm

Distribution: Illyrian (*Paraceratites trinodosus* Zone) and basal Fassanian.

Remarks: In *Annulotriassocampe campanilis longiporata* n. subsp. displays in the distal half of the test vertically elongated outer pore frames. Moreover, in higher evolved forms of this subspecies the distal postabdominal segments are often narrow, ring-like.

Annulotriassocampe spinosa n. sp. displays also roundish outer pore frames in all postabdominal segments. However, this species displays a distinct, excentric apical horn and a distinct vertical horn.

***Annulotriassocampe campanilis longiporata* n. subsp.**

(Pl. 41, figs. 1-4, 7, 13, 15-18)

Derivatio nominis: According to the vertically elongated outer pore frames in the distal postabdominal segments

Holotypus: The specimen on pl. 41, figs. 7, 15; rep.-no. KoMo 1980 I-225

Locus typicus: Road cut San Ulderico-Pallé, Tretto, Vicentinian Alps (Italy)

Stratum typicum: Sample TT 7, lower subzone of Middle Fassanian *Ladinocampe multiperforata* Zone

Material: Several 100 specimens.

Diagnosis: With the characters of the species. First 2-4 postabdominal segments hoop-like, with roundish outer pore frames. Following postabdominal segments hoop-like, inversely trapezoidal or narrow, ringlike. Outer pore frames in these segments vertically elongated. Last segment subcylindrical, with proximal ring of vertically elongated pores followed by pores of irregular shape and arrangement. A tiny, excentric apical horn and a tiny vertical horn may be present.

Measurements:

Length of test = 267-400 µm

Maximum width of test (without last segment) = 60-70 µm

Width of last segment (if preserved) = 73-75 µm

Occurrence: Very frequent in the Lower and Middle Fassanian of the Eurasiatic Tethys.

Remarks: *Annulotriassocampe campanilis campanilis* displays in all postabdominal segments roundish outer pore frames.

Annulotriassocampe eoladinica n. sp.
(Pl. 42, figs. 5, 6)

Derivatio nominis: According to the occurrence in the Lower Ladinian

1990 *Triassocampe sulovensis* KOZUR & MOCK, 1981 - GORIČAN, p. 160, pl. 12, fig. 4, 5 (?)

Holotypus: The specimen on pl. 42, fig. 6; rep.-no. KoMo 1980 I-827

Locus typicus: Road cut San Ulderico-Pallé, Tretto, Vicentinian Alps (Italy)

Stratum typicum: Sample TT 6, lower subzone of Middle Fassanian *Ladinocampe multiperforata* Zone

Material: 51 specimens.

Diagnosis: Test conical, distally cylindrical. Cephalothorax dome-shaped, smooth, poreless. Cephalic part rounded conical, thoracic part hoop-like to trapezoidal.

Abdomen narrow, hoop-like, considerably lower than cephalothorax, with 1-2 rings of tiny pores, covered by a layer of microgranular silica. Postabdominal segments all narrower than cephalothorax, subcylindrical, distally inversely trapezoidal, highly and vertically elevated above the narrow, deep, smooth strictures. All postabdominal segments, with exception of the last one, display one central ring of pores bordered by a solid upper and lower ring. In the distal, inversely trapezoidal postabdominal segment the lower ring becomes indistinct and it is absent in the last postabdominal segments. The width of the test increases until the third to fifth postabdominal segment and it remains then unchanged. The last or the last two strictures are considerably broader than the foregoing ones. The last segment, if present, is considerably higher and displays numerous pores, proximally often arranged in a ring of vertically elongated pores, below it irregularly arranged or all pores are irregularly spaced.

Measurements:

Length of test = 262-345 µm

Maximum width of test = 85-110 µm

Occurrence: Middle Fassanian of the European Tethys. Longobardian (?) of Hungary and Yugoslavia.

Remarks: This species is the oldest typical *Annulotriassocampe* species. In the Longobardian and Upper Triassic *Annulotriassocampe* species the postabdominal segments are still more pronounced, the strictures deeper. In *Annulotriassocampe baldii* KOZUR, n. sp., moreover, the stricture between the cephalothorax and the abdomen is not so pronounced as in *A. eofassanica* n. sp. and the proximal ring is very strong.

Part of *Triassocampe sulovensis* KOZUR & MOCK sensu GORIČAN, 1990 belongs surely to *Annulotriassocampe eofassanica* n. sp. (GORIČAN, pl. 12, fig. 4). The Longobardian specimen figured by GORIČAN (1990, pl. 12, fig. 5) is more slender and may belong to a new species.

Annulotriassocampe spinosa n. sp.
(Pl. 41, figs. 5, 6, 8, 12)

Derivatio nominis: According to the distinct apical horn and vertical spines

Holotypus: The specimen on pl. 41, figs. 5, 6; rep.-no. KoMo 1980 I-824

Locus typicus: Road cut San Ulderico-Pallé, Tretto, Vicentinian Alps (Italy)

Stratum typicum: Sample TT 14, upper subzone of Middle Fassanian *Ladinocampe multiperforata* Zone

Material: 69 specimens.

Diagnosis: Test slender concial to slender subcylindrical. Cephalothorax dome-shaped, smooth, poreless. Cephalic part rounded conical to hemiglobular, situated obliquely on the subglobular thoracic part. Apical horn distinct, excentric, very short to moderately long. Vertical horn distinct. A tiny horn in prolongation of D may be also present.

Abdomen and postabdominal segments hoop-like, only the last segment is subcylindrical to bell-like. With exception of the last segment, their height is nearly the same along the whole test. Their width increases very slowly. Strictures relatively broad, deep, smooth, poreless. The abdomen displays two irregular rings of tiny pores covered by a layer of microgranular silica. Also the first, sometimes the first 3 postabdominal segments are covered by a layer of microgranular silica. The postabdominal segments display a central ring of pores, tiny in the first postabdominal segments, small to moderately large in the distal segments. The last postabdominal segment is rarely preserved, thin-shelled. It is subcylindrical with slight median constriction or bell-like. Beside of a proximal pore ring still further scattered pores are present. Pore frames in all segments roundish, very rarely the outer pore frames are vertically elongated, but not in the distal segments.

Measurements:

Length of test = 227-333 µm

Maximum width of test (without last segment) = 63-71 µm

Width of the last segment (if preserved) = 67-92 µm

Length of apical horn = 7-17 µm

Distribution: Upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone and above all Middle Fassanian. Eurasiatic Tethys.

Remarks: *Annulotriassocampe campanilis* n. sp. displays mostly no distinct apical horn and vertical horn. If a tiny apical horn is present, then only in specimens with distinctly elongated pores.

Stratigraphically older forms of *A. spinosa* n. sp. from the higher part of Lower Fassanian display a subcylindrical test, whereas stratigraphical younger forms from the Middle Fassanian display a slender conical test. However, also among the stratigraphically younger forms specimens with subcylindrical test are present. Therefore these difference is here regarded as intraspecific variability.

Genus *Paratriassocampe* n. gen.

Derivatio nominis: According to its similarity with *Triassocampe* DUMITRICĂ, KOZUR & MOSTLER, 1980

Type species: *Paratriassocampe gaetanii* n. gen. n. sp.

Diagnosis: Test multicyrtid, conical, rarely subcylindrical, without distal skirt. Cephalis conical to dome-shaped, smooth poreless. Abdomen, sometimes also first or first two postabdominal segments hoop-like, often covered by a layer of microgranular silica. Other postabdominal segments narrow, with triangular marginal outline. They display two rings of pores and with exception of the most primitive forms a distinct central nodose ring. Short irregular vertical ribs may be present on primitive forms.

Distribution: Illyrian to Middle Fassanian, Eurasiatic Tethys.

Assigned species:

Paratriassocampe gaetanii n. gen. n. sp.

Triassocampe ? pulchra KOZUR & MOSTLER, 1981

Paratriassocampe ? brevis n. sp.

Paratriassocampe ornata n. sp.

Paratriassocampe postornata n. sp.

Remarks: *Paratriassocampe* n. gen. is the forerunner of *Ruesticyrtium* KOZUR & MOSTLER, 1979. This Carnian genus is distinguished by a wide distal skirt and by the covering of all segments (with exception of the last segment and the distal skirt) by a layer of microgranular silica.

Triassocampe DUMITRICĂ, KOZUR & MOSTLER, 1980 displays different postabdominal segments, characterized by a distinct upper smooth or nodose ring and often also by a lower smooth or nodose ring. A central ring, like in *Paratriassocampe* n. gen., is never present in *Triassocampe*. By this, the outline of the segments in cross section is different. Subcylindrical with depressed central part and above all inversely trapezoidal in *Triassocampe* and ringlike with triangular outer margin in *Paratriassocampe* n. gen.

Paratriassocampe n. gen. has probably evolved from primitive *Pararuesticyrtium* KOZUR & MOSTLER, 1981 without distal skirt that may be the common ancestor for both genera. This is also indicated by the Illyrian *Paratriassocampe pulchra* (KOZUR & MOSTLER, 1981) that displays in many specimens a tiny apical horn, always present in *Pararuesticyrtium*, but missing in all other higher evolved *Paratriassocampe* species. Otherwise in *Paratriassocampe pulchra* already the typical *Paratriassocampe* structure and -outline of the postabdominal segments is present.

In general, *Pararuesticyrtium* KOZUR & MOSTLER, 1981 can be easily distinguished by its distinct distal skirt and by hoop-like postabdominal segments with mostly 3 rings of pores. Most similar is the primitive *Pararuesticyrtium ? illyricum* (KOZUR & MOSTLER, 1981), in which no distal skirt has been observed (? preservation) and the apical horn is mostly missing. The rounded hoop-like postabdominal segments are typical for *Pararuesticyrtium*. Both *Paratriasocampe pulchra* and *Pararuesticyrtium illyricum* are seemingly near related to the common forerunner of *Pararuesticyrtium* and *Paratriassocampe.*

Paratriassocampe gaetanii n. gen. n. sp.

(Pl. 42, figs. 7, 8, ?9, 10, 11)

Derivatio nominis: In honour of Prof. Dr. M. GAETANI, Milano

Holotypus: The specimen on pl. 42, fig. 10; rep.-no. KoMo 1980 I-762

Locus typicus: Passo della Gabiola section, Vicentinian Alps (Italy)

Stratum typicum: Sample MD 28, lower subzone of Middle Fassanian

Material: More than 100 specimens.

Diagnosis: Test conical. Cephalis dome-shaped, smooth, poreless, without apical horn. Thorax, abdomen, sometimes also the first postabdominal segment hoop-like, with two irregular rings of tiny pores. The thorax is in stratigraphically younger forms always, in stratigraphically older forms often covered by a layer of microgranular silica. In stratigraphic younger forms also the abdomen and the first postabdominal segments may be covered by a layer of microgranular silica.

The width of the postabdominal segments increases gradually, whereas their width remains nearly unchanged. The lateral outline of the postabdominal segments is triangular because of the distinct central slightly nodose ring and the symmetrical lowering of the postabdominal segments from this ring toward the upper and lower margin of the segment. Above and below the central ring a ring of mostly roundish pores is present. The outer pore frames are coarser, pentagonal the quadratic, sometimes irregular, with distinct nodes at the joints with the central ring and sometimes also with indistinct nodes at the upper and lower margin of the segments. The last postabdominal segment is thin-walled and therefore mostly not preserved. It is considerably higher than the foregoing postabdominal segments, subcylindrical or trapezoidal, with numerous moderately large pores that may be arranged into an irregular proximal pore ring followed by irregular arranged pores or all pores are irregularly arranged. The strictures between all postthoracic segments are deep, narrow, smooth, poreless.

Measurements:

Length of test = 280-340 μm

Maximum width of test = 117-129 μm

Distribution: Middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone to lower subzone of Middle Fassanian *Ladinocampe multiperforata* Zone. Eurasiatic Tethys.

Remarks: In the stratigraphic youngest forms, the first postabdominal segment may be already covered by a layer of microgranular silica, whereas in the stratigraphic oldest forms even the thorax may be uncovered. In continuation of this trend, the whole postabdominal segments have been covered with a layer of microgranular silica. By this way and by development of a distinct broad distal skirt, the genus *Ruesticyrtium* has evolved from the *Paratriassocampe gaetanii* group.

Paratriassocampe ? brevis n. sp.

(Pl. 42, figs. 14, 15)

Derivatio nominis: According to the short test

Holotypus: The specimen on pl. 42, fig. 15; rep.-no. KoMo 1980 I-768

Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section

Stratum typicum: Bed Fö 110, upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone

Material: 9 specimens.

Diagnosis: Test short, conical. Cephalis dome-shaped, smooth, with few widely scattered pores in its distal part, otherwise poreless. Thorax hoop-like, with one irregular pore ring, closed or nearly closed by a layer of microgranular silica. Abdomen hoop-like, with one irregular pore ring. The first 3 postabdominal segments are hoop-like to subcylindrical, the first one with rounded triangular outer margin. They display 2 rings of pores, but no distinct separating central ring. The outer pore frames are longer, elevated, quadratic to pentagonal in outline. The fourth postabdominal segment is considerably higher, inversely trapezoidal, but in its distalmost part again a little widening. At displays a proximal smooth ring, followed by two irregular pore rings and a larger smooth and poreless segment. No outer pore frames present. The strictures between all postcephalic segments are deep, narrow, smooth, poreless.

Measurements:

Length of test = 187-208 μm

Maximium width of test = 80-83 μm

Distribution: Rare in the upper subzone of the Lower Fassanian.

Remarks: *Paratriassocampe ? brevis* n. sp. does not fit well into the genus *Paratriassocampe* n. gen., but also not in any other genus of the Triassocampidae. It is easily to distinguished from other *Paratriassocampe* species by its very short test.

***Paratriassocampe ornata* n. sp.**
(Pl. 42, fig. 12)

Derivatio nominis: According to the sculptured test
Holotypus: The specimen on pl. 42, fig. 12; rep.-no. KoMo 1980 I-35
Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section
Stratum typicum: Bed 87, *Paraceratites trinodosus* Zone (Illyrian)
Material: 23 specimens.
Diagnosis: Test cylindrical. Cephalis dome-shaped, distally relatively broad, smooth, poreless. Thorax distinctly broader, but considerably lower than cephalis, hoop-like. Abomden somewhat broader, but not higher than thorax, marginal triangular. The postabdominal segments have about the same height and width as the abdomen. They are low, hoop-like, separated by narrow, deep, smooth, poreless strictures. The last two strictures are broader. Cephalis, abdomen and postabdominal segments display two, partly somewhat irregular rings of pores. The separating central ring is indistict, in some segments missing. The outer pore frames are very coarse and arranged into distinct, short vertical ribs. Their joints with the central ring are node-like thickened. Between some segments, a part of the vertical ribs is connected by very low ribs across the strictures. On the last two postabdominal segments the outer pore frames are very low or missing. This segment displays irregularly arranged pores of different size and shape.
Measurements:
Length of test = 256-274 µm
Maximum width of test = 66-71 µm
Occurrence: Illyrian (*Paraceratites trinodosus* Zone) of the Balaton Highland (Hungary).
Remarks: *Paratriassocampe* ornata n. sp. is not a typical representative of this genus. The typical triangular marginal outline is only developed in one or few segments and the central rib is indistinct.

The test of *Paratriassocampe postornata* from the lower subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone displays a conical outline and the central ring is in the distal segments distinct. These segments display a triangular marginal outline.

***Paratriassocampe postornata* n. sp.**
(Pl. 42, fig. 16)

Derivatio nominis: According to the occurrence after *P. ornata* n. sp.
Holotypus: The specimen on pl. 42, fig. 16; rep.-no. KoMo 1980 I-63
Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section
Stratum typicum: Sample 100 D, lower subzone of *"X." reitzi* Oppel Zone
Material: 17 specimens.
Diagnosis: Test slender conical. Cephalis dome-shaped, smooth, poreless. Thorax broader, but considerably lower than cephalis, hoop-like, with 2 or 3 irregular rings of tiny pores. Abdomen and postabdominal segments become slowly and gradually broader, but not or only insignificantly higher than the thorax. Those segments are partly hoop-like, partly (especially distally) they display distinct triangular marginal outline. All segments are separated by deep, narrow, smooth, poreless strictures.

Every postcephalic segment display two rings of pores separated by a central ring that is indistinct in the proximal postabdominal segments, but distinct in the distal ones. The outer pore frames are very strong, only in the last two segments shallow. They are mostly quadratic and arranged into distinct, short vertical ribs. Only in the last two segments these ribs are indistinct or missing. Distinct nodes are present at the joints between these vertical ribs and the central ring.
Measurements:
Length of test = 287-307 µm
Maximum width of test = 96-104 µm
Distribution: Lower subzone of Lower Ladinian *Spongosilicarmiger italicus* Zone of the Balaton Highland.
Remarks: *Paratriassocampe ornata* n. sp. displays a cylindrical test and the central ring of the postabdominal segments is not so well developed.

Genus *Pseudotriassocampe* n. gen.

Derivatio nominis: According to similarity with *Triassocampe* DUMITRICĂ, KOZUR & MOSTLER
Type species: *Pseudotriassocampe hungarica* n. gen. n. sp.
Diagnosis: Test multicyrtid, slender conical, postabdominal sector often cylindrical. Moderately large to large apical horn. Cephalothorax smooth or distally with indistinct

nodes, with few pores in the thorax or poreless. Abdomen and postabdominal segments with 2 pore rings, the distal one is often irregular. Pores mostly closed by thin layer of microgranular silica. The sculpture consists of short nodose vertical ribs or of nodes connected by short thin vertical ribs.
Occurrence: Illyrian to Middle Fassanian of European Tethys.
Assigned species:
Pseudotriassocampe hungarica n. gen. n. sp.
Pseudotriassocampe angustiannulata n. sp.
Pseudotriassocampe longispinosa n. sp.
Remarks: *Yeharaia* NAKASEKO & NISHIMURA, 1979 displays distinct proximal smooth rings on the postabdominal segments and the sculpture is not arranged into vertical ribs.

Triassocampe DUMITRICĂ, KOZUR & MOSTLER displays no apical horn. Only few species displays an indistinct, tiny apical horn.

Pseudotriassocampe hungarica n. gen. n. sp.
(Pl. 43, figs. 1, 5, 6)

Derivatio nominis: According to the occurrence in Hungary
Holotypus: The specimen on pl. 43, fig. 6; rep.-no. KoMo 1980 I-72
Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section
Stratum typicum: Bed 110 (upper part of the pietra verde, above the occurrence of *"X." reitzi*), upper part of Lower Fassanian
Material: 11 specimens.
Diagnosis: Test multicyrtid, conical. Cephalothorax dome-shaped, poreless, with distinct, but relatively short apical horn. Cephalic part smooth, poreless. Thoracic part not separated by a stricture, somewhat broader, but lower than cephalic part, with short, often indistinct or missing vertical ribs.

Abdomen and postabdominal segments narrow, hoop-like, broadest in their middle part. They become slowly, but continuously broader, whereas their height increases distally only very few. The sculpture consists of short vertical ribs that bear a distinct node in the middle part of the segments and indistinct nodes at their proximal ends. This sculpture is indistinct on the abdomen, partly even on the first two postabdominal segments, but distinct on all further postabdominal segments. The abdomen displays one irregular pore ring, the following segments two regular pore rings. The small pores are mostly closed (partially or totally) by a layer of microgranular silica. The strictures are narrow, deep, smooth, poreless.
Dimensions:
Length of test (without apical horn) = 250-267 µm
Maximum width of test = 90-92 µm
Length of apical horn = 19-27 µm
Occurrence: Upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone of Hungary and Southern Alps.
Remarks: The Illyrian *Pseudotriassocampe angustiangulata* n. sp. has only proximally a conical shape, distally it is cylindrical. The apical horn is larger and strongly asymmetrical.

Pseudotriassocampe angustiannulata n. sp.
(Pl. 43, fig. 2)

Derivatio nominis: According to the narrow segments
Holotypus: The specimen on pl. 43, fig. 2; rep.-no. KoMo 1980 I-405
Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section
Stratum typicum: Bed 87 (Illyrian, *Paraceratites trinodosus* Zone)
Material: 5 specimens.
Diagnosis: Test multicyrtid, in the proximal part conical, distally cylindrical. Cephalothorax dome-shaped, smooth, with strong, round, excentrical apical horn. Cephalic and thoracic part not separated by a collar stricture, but both parts can be distinguished by the shape (subhemicircular cephalic part and hoop-like thoracic part). Cephalic part poreless. Thoracic part with very few, often closed round pores.

From the abdomen to the second postabdominal segment the width increases continuously, in the following segments the width does not change. The abdomen is very narrow, the postabdominal segments are narrow, distally partly very narrow. Abdomen and all postabdominal segments are hoop-like, widest in their middle part. The abdomen displays an indistinct median ring of nodes and two irregular rings of tiny pores, mostly closed by a layer of microgranular silica. The postabdominal segments display short vertical ribs, in the middle part of the segment mostly thickened by low nodes. Each postabdominal segment displays two rings of tiny pores. Strictures between the postabdominal segments narrow, deep, smooth, poreless.

Dimensions:
Length of test (without apical horn) = 246-260 µm
Maximum width of test = 81-85 µm
Occurrence: Illyrian (*Paraceratites trinodosus* Zone) of Balaton Highland (Hungary).
Remarks: *Pseudotriassocampe angustiannulata* n. sp. is distinguished by its cylindrical distal part of test from the other two known species of this genus.

Pseudotriassocampe longispinosa n. sp.
(Pl. 43, fig. 9)

Derivatio nominis: According to the very long apical horn
Holotypus: The specimen on pl. 43, fig. 9; rep.-no. KoMo 1982 I-702
Locus typicus: Road cut between San Ulderico and Pallé, Tretto (Vicentinian Alps, Italy)
Stratum typicum: Sample TT 6, lower subzone of the Middle Fassanian *Ladinocampe multiperforata* Zone
Material: More than 50 specimens.
Diagnosis: Test multicyrtid, slender conical. Cephalis dome-shaped, smooth, poreless, with very long apical horn. The post-cephalic segments increase very slowly in width. The height increases slowly from the very low thorax until the second postabdominal segment and remains than unchanged. The strictures between all segments are narrow, moderately deep, poreless.

The thorax is distinctly broader and considerably lower than the cephalis. Both segments are separated by a shallow, but distinct collar stricture. The thorax is either narrow hoop-like or inversely trapezoidal. All other segments are hoop-like. The sculpture of all postcephalic segments consists of short, low vertical ribs that are node-like thickened in the middle part of the segments. In the proximal part of the test, especially on the thorax and abdomen, the vertical ribs may be indistinct or even missing. Then only the median nodes are distinct. All segments display 2-3 often irregular rings of tiny round pores.
Dimensions:
Length of test (without apical spine) = 345-407 µm
Maximum width of test = 90-94 µm
Length of apical spines = 245-268 µm
Occurrence: Lower subzone of Middle Fassanian *Ladinocampe multiperforata* Zone. Tethys.
Remarks: The Illyrian *Pseudotriassocampe angustiannulata* n. sp. is distinguished above all by its cylindrical distal test.

The Lower Fassanian *Pseudotriassocampe hungarica* n. sp. is distinguished by its smaller apical horn.

Genus _Striatotriassocampe_ n. gen.

Type species: *Striatotriassocampe nodosoannulata* n. gen. n. sp.
Diagnosis: Test very long, slender-subcylindrical. Each postcephalic segment is ring-like, with a subcentral smooth or nodose ring. Strictures, lower and upper part of the segments are covered with vertical ribs that may in the apical part continue across the ring of the segments. In the distal part, exceptionally also in the apical part the strictures are smooth.
Assigned species:
Striatotriassocampe nodosoannulata n. gen. n. sp.
Striatotriassocampe laeviannulata n. sp.
Occurrence: Middle Fassanian *Ladinocampe multiperforata* Zone up to Cordevolian.
Remarks: The genus *Striatotriassocampe* n. gen. has evolved from the Illyrian to Lower Fassanian *Triassocampe cylindrica* - *T. kahleri* group. These 2 species display, unusual for *Triassocampe*, a slender-subcylindrical test. The proximal ring of the postabdominal segments, typical for *Triassocampe* s. str., is still well developed in these species. In the Lower Fassanian *T. kahleri* n. sp. the outer pore frames of the first 2-3 postabdominal segments are already arranged into faint vertical ribs. This species is a transitional form to *Striatotriassocampe* n. gen.

Striatotriassocampe nodosoannulata n. gen. n. sp.
(Pl. 43, figs. 4, 10)

Derivatio nominis: According to the nodose ring in the first 6-7 postabdominal segments
Holotypus: The specimen on pl. 43, fig. 10; rep.-no. KoMo 1980 I-784
Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy)
Stratum typicum: Sample TT 13, upper subzone of Middle Fassanian *Ladinocampe multiperforata* Zone
Material: 21 specimens.
Diagnosis: Test very long, slender-subcylindrical. Cephalis rounded conical, smooth, poreless. The width of the segments increases very slowly and continuously until the sixth postabdominal segment and remains then the following 5-7 segments nearly constantly.

The postcephalic segments are narrow, ringlike, thorax and abdomen are often only indistinctly separated on the outer surface. Thorax, abdomen and the first 6-7 postabdominal segments display a subcentral to subproximal nodose ring or ring of nodes. The following 5-6 segments display a subcentral smooth or slightly nodose ring. Thorax, abdomen and first to fifth or sixth postabdominal segments are covered by vertical ribs that runs from the nodes of one segment ring across the stricture to the nodes of the adjacent segment ring. In the following segments shorter vertical ribs included into the outer pore frames are present that cover only the lower part of the segments and not the stricture and the smooth ring. Toward the distal end these vertical ribs and the whole outer pore frames becomes indistinct.

In the thorax, abdomen and in the first 6 postabdominal segments tiny pores are present that are mostly closed by a layer of microgranular silica or covered by the outer sculpture. Distalward the pores becomes somewhat larger, remain more and more open and are arranged into 2 pore rings.

Strictures narrow and moderately deep, in the proximal half covered by the vertical ribs, in the distal part smooth, poreless.

Dimensions:
Length of test = 360-425 µm
Maximum width of test = 83-92 µm

Occurrence: Middle Fassanian *Ladinocampe multiperforata* Zone of the Tethys.

Remarks: *Striatotriassocampe laeviannulata* n. sp. from the lowermost Middle Fassanian displays on the whole test smooth rings and the vertical ribs cross never these rings.

Striatotriassocampe laeviannulata n. sp.
(Pl. 43, figs. 3, 7, 8)

Derivatio nominis: According to the smooth nodes
Holotypus: The specimen on pl. 43, figs. 3, 7, 8; rep.-no. KoMo 1980 I-787
Locus typicus: Passo della Gabiola section, Vicentinian Alps (Italy)
Stratum typicum: Sample MD 28, lower subzone of Middle Fassanian *Spongosilicarmiger italicus* Zone
Material: 3 specimens.
Diagnosis: Test very long, slender subcylindrical. Cephalis rounded conical, smooth or with few pores at the junction of V with the cephalis wall. Thorax lower than cephalis and only a little wider, smooth, separated from the cephalis by a ring of tiny pores. The following segments become gradually wider until the third postabdominal segment, then they remain nearly constantly wide until the eleventh postabdominal segment.

All posthoracic segments are ring-like and become distalwards slightly higher. They display all a subcentral smooth ring. Until the sixth or seventh postabdominal segment the space between 2 rings of adjacent segments is covered by distinct, moderately large outer pore frames, arranged in vertical stripes. In the following segments this pore frames pattern is restricted to the lower part of the segments and the strictures remain smooth. In the last 2 segments the outer pore frames become indistinct and only slight elevation around the inner pores are present. In the strictures between the postthoracic segments until about the fifth postabdominal segment 2 rings of tiny pores are present. They are to a large part closed by the outer pore frames. In the following segments the pores (that become a little larger toward the distal end of the test) are more and more restricted to the lower part of the segment and an increasingly broader part of the strictures is poreless and smooth. In the segments the pores are arranged in one complete and one incomplete, often irregular pore ring. In the distal segments the pores are always open.

Dimensions:
Length of test = 469-484 µm
Maximum width of test = 92-96 µm

Occurrence: Lower subzone of Middle Fassanian *Ladinocampe multiperforata* Zone of Southern Alps.

Remarks: *Striatotriassocampe nodosoannulata* n. sp. displays in the proximal part of the test a ring of nodes or a nodose ring on each segment. The vertical ribs are stronger and cross in the apical part of test the rings.

Striatotriassocampe ? n. sp.
(Pl. 42, fig. 13)

Remarks: Only few specimens are known from a species that belongs probably to *Striatotriassocampe* n. gen. Their transitional character to *Triassocampe* is obvious. They occur in the middle and upper subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone.

Genus *Triassocampe* DUMITRICĂ, KOZUR & MOSTLER, 1980

Type species: *Triassocampe scalaris* DUMITRICĂ, KOZUR & MOSTLER, 1980
Remarks: The genus *Triassocampe* is here restricted to Triassocampidae without apical horn, with proximal ring of nodes or smooth ring and often also with distal ring of nodes. These forms begin rarely in the Upper Anisian (only the *T. deweveri*-group) and are the most frequent Nassellaria of the Lower Ladinian.

Triassocampe cylindrica n. sp.
(Pl. 42, fig. 3; pl. 47, fig. 10)

Derivatio nominis: According to the subcylindrical test
Holotypus: The specimen on pl. 42, fig. 3; rep.-no. KoMo. 1980 I-406
Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section
Stratum typicum: Bed 87, *Paraceratites trinodosus* Zone (Illyrian)
Material: 23 specimens.
Diagnosis: Test subcylindrical. Cephalis large, rounded conical, smooth, poreless. In prolongation of A and V tiny spines may be present. Thorax not separated from the cephalis, only a little broader, but considerably lower than cephalis. It is not higher than a ring of relatively widely spaced, distinct nodes. The pores are mostly closed or overgrown by the nodes. The abdomen is somewhat broader and higher than the thorax, but also considerably lower than the cephalis. It is short-cylindrical and bears a distinct proximal ring of nodes and below it an elevated, nodose outer pore frame. Inner pores small, mostly closed by the outer pore frame, arranged into 2 rings. The first 3 postabdominal segments are somewhat broader, but not higher than the abdomen. They have a distinct proximal ring of nodes, partly fused to a nodose ring. Their shape is increasingly inversely trapezoidal in lateral view. Below the proximal node ring nodose outer pore frames are present that partly built up a second, but always low ring of nodes. Inner pore frames of small pores arranged in 1-2 rings. The following postabdominal segments become again narrower. They are at first inversely trapezoidal, distal hoop-like. This part of the test has different length. In long forms the fourth to sixth or even seventh segment display a distinct, higher smooth proximal ring and a inversely trapezoidal outline. Only the following segments are hoop-like, without proximal ring. In short forms already the fourth or fifth postabdominal segment is hoop-like without proximal ring. All postabdominal segments display 2 pore rings. The proximal one is always complete, the lower ring is mostly incomplete and consists in some segments only of few widely scattered pores. Strictures narrow, smooth, poreless, in the short morphotype shallow, in the long morphotype deep.
Dimensions:
Length of test = 245-339 µm
Maximum width = 65-89 µm
Occurrence: Illyrian (*Paraceratites trinodosus* Zone) of Tethys.
Remarks: *Triassocampe cylindrica* n. sp. is very variable, but in the moment it is not possible to separate the short and long morphotype into 2 species.

The new species displays characters both of the *Triassocampe deweveri* group (in the most part of the test) and of the genus *Paratriassocampe* n. gen. (the distal segments). The very slender, subcylindrical test remembers to the genus *Annulotriassocampe* n. gen. It is the oldest and most primitive *Triassocampe* species, clearly distinguished from typical representatives, starting in the basal *Xenoprotrachyceras reitzi* Oppel Zone.

Most similar is *Triassocampe kahleri* n. sp. from the lower *X. reitzi* Oppel Zone. This species displays the same shape of the test and the same *Paratriassocampe* type of the distal segments. However, the thorax is higher and displays 2 rings of low nodes. The sculpture of the 3 first postabdominal segments is arranged into irregular short vertical ribs (transitional to *Striatotriassocampe* n. gen.).

Triassocampe deweveri (NAKASEKO & NISHIMURA, 1979)
(Pl. 42, fig. 1; pl. 44, fig. 14; pl. 45, fig. 6)

1979 *Dictyomitrella deweveri* NAKASEKO & NISHIMURA, n. sp. - NAKASEKO & NISHIMURA, p. 77, pl. 10, figs. 8?, 9
1982 *Triassocampe* sp. A - MIZUTANI & KOIKE, p. 128, pl. 4, figs. 3, 5
1982 *Triassocampe* sp. B - KISHIDA & SUGANO, p. 286, pl. 4, fig. 19
1982 *Triassocampe* sp. H - YAO, p. 64, pl. 1, fig. 4
1984 *Triassocampe deweveri* (NAKASEKO & NISHIMURA) - ISHIDA, p. 26, pl. 1, figs. 10.-12
Occurrence: Lower Fassanian, Worldwide.
Remarks: NAKASEKO & NISHIMURA (1979) united under this species different *Triassocampe* species, but

they figured only 2 small forms that belong both to the *T. deweveri* group. This group is characterized by the presence of one distinct proximal ring of nodes or one smooth proximal ring. The other nodes of the inversely trapezoidal segments are smaller or no nodes are present. It is clearly distinguished from *T. scalaris* DUMITRICA, KOZUR & MOSTLER, in which at least until the third postabdominal segment a proximal and a distal ring of nodes are present and these segments are short cylindrical with central incision.

Many forms have been placed into *T. deweveri* by later authors, but only a few of these forms belong to *T. deweveri*. Therefore here the main features of this species have to be evaluated. The holotype displays the following features:

Test conical. Upper part of the cephalis conical, lower part cylindrical. Thorax small, hoop-like. All following segments are inversely trapezoidal, in the abdomen this feature is not yet very distinct. The proximal ring of nodes is in all post-thoracic segments distinctly separated from the segments. Nodes below the proximal ring until the second postabdominal segment present, in the following segments missing or very indistinct. All postthoracic segments display one pore ring below the proximal ring of nodes and further small pores below it.

The paratype is similar, but it is not clear, whether it belongs to the same species. Cephalis and thorax are identical. The following segments are very narrow. Because of the bad preservation cannot be decided, whether below the proximal ring of nodes further nodes are present. If this would not be the case, then this specimen would represent an independent species. However, at least in some segments nodes below the nodose, distally smooth proximal ring seems to be present.

Also the presence of additional pores below the proximal pore ring is not sure, but in some segments their presence is probably. In the distal segments the proximal ring of nodes is fused to a smooth ring. The presence of a ring of separated nodes or of a smooth/nodose ring in the distal segments is an intraspecific feature of *Triassocampe* species, if the other features are the same.

In our material of the Southern Alps and Sicily well preserved specimens of *T. deweveri* are present that are restricted to the middle and upper subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone.

***Triassocampe deweveri pauciconstricta* n. sp.**
(Pl. 44, fig. 14)

Derivatio nominis: According to the indistinct constriction between the postabdominal segments
1989 Triassocampe deweveri, pars - KOJIMA, p. 219, pl. 1, fig. 3a non! fig 3b
Holotypus: The specimen on pl. 44, fig. 4; rep.-no. KoMo 1980 I-773
Locus typcius: Felsöörs (Balaton Highland, Hungary), Forráshegy section
Stratum typicum: Limestone Bed 110, upper part of the pietra verde, upper "*X.*" *reitzi* Oppel above the last occurrence of "*X.*" *reitzi*. Upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Material: 5 specimens.
Diagnosis: Test in the upper part conical, in the distal part subcylindrical. Cephalis subcylindrical, smooth, poreless. Thorax a little broader, but shorter than cephalis, trapezoidal, with 2 irregular rings of pores and 2 incomplete rings of indistinct, node-like elevations. The following segments becomes slowly and continuously broader until the third postabdominal segment, in the fourth postabdominal segment the width remains constantly, and the fifth postabdominal segment is again narrower. The height of the segments increases until the first postabdominal segment that is about as high as the cephalis. The height of the following postabdominal segments remains nearly constantly.

The abdomen is cylindrical or slightly trapezoidal. It displays a distinct, but not very high proximal ring of nodes and in the remaining part nodose larger outer pore frames that may cover even the stricture. The first 3 postabdominal segments are cylindrical, the fourth one is subcylindrical to inversely trapezoidal, the fifth one inversely trapezoidal. These segments display a distinct proximal node ring and elevated, in the first postabdominal segment, sometimes also in the following segment nodose outer pore frames arranged into 2-3 rings. In the fifth postabdominal segment the outer pore frames are low or missing.

Abdomen and first postabdominal segment displays 3 irregular rings of small inner pores that are narrowed or partly closed by the outer pore frames. The following segments display small to moderately large inner pores arranged into 2-3 rings. The inner pore frames are situated directly below the outer pore frames. Strictures between all segments narrow, shallow in the apical part sometimes overgrown by low ridges continuing from the outer pore frames.

Dimensions:
Length of test = 310-316 µm
Maximum width of test = 93-97 µm
Occurrence: Upper part of Lower Fassanian *Spongosilicarmiger italicus* Zone. Hungary, China.
Remarks: In *Triassocampe deweveri deweveri* (NAKASEKO & NISHIMURA, 1979) all postabdominal segments are inversely trapezoidal and the strictures are deeper.

Triassocampe transita n. sp. displays similarly shaped segments with shallow strictures, but the postabdominal segments displaya distinct second ring of nodes below the proximal ring of nodes or smooth ring.

Triassocampe deweveri velata n. subsp.
(Pl. 42, fig. 1)

Derivatio nominis: According to the velate last segment
Holotpyus: The specimen on pl. 4, fig. 1; rep.-no. KoMo 1980 I - 774
Locus typicus: Road cut San Ulderico-Pallé. Tretto (Vicentinian Alps, Italy)
Stratum typicum: Sample TT 5, lower subzone of Middle Fassanian *Ladinocampe multiperforata* Zone
Material: 17 specimens.
Diagnosis: Test conical, relatively short. Cephalis conical, distally often cylindrical, smooth, poreless. Thorax and abdomen, sometimes also the first postabdominal segment are low, subtrapezoidal. The thorax is nearly smooth and displays only few, tiny, widely scattered pores. The abdomen displays 2 rings of tiny pores that are mostly closed. Low, coarser outer pore frames are also present. The first, sometimes also the second postabdominal segment are cyclindrical with 2 rings of tiny pores, some of which are closed. 2 rings of nodes are totally included into coarse, irregularly shaped outer pore frames which are nodose in the place of the 2 ring of nodes. The following 2 postabdominal segments are inversely trapezoidal with distinct proximal nodose or smooth ring. The tiny inner pores are arranged into 2 pore rings, partly covered by coarse, irregularly shaped outer pore frames. The following postabdominal segment is higher than the foregoing segments, displays a strong smooth proximal ring and an inversily trapezoidal lower part with moderately large pores arranged into 3 irregular rings. The last segment is velum-like, without any proximal ring or other sculpture, with irregularly sized pores and poreless proximal part. This segment is distinctly narrower than the foregoing, but rather high. Because of its thin shell wall, it is often not or only partly preserved. It is separated from the foregoing segment by a shallow, rather broad stricture. All other strictures between the postabdominal segments are deep and narrow, partly overgrown by low outer pore frames.
Dimensions:
Length of test = 265-279 µm
Maximum width of test = 91-97 µm
Occurrence: Lower subzone of Middle Fassanian *Ladinocampe multiperforata* Zone.
Remarks: *Triassocampe deweveri deweveri* (NAKASAKO & NISHIMURA, 1979) displays no terminal velate structure, at least not until the maximally preserved eleventh segment. Fully preserved *T. deweveri deweveri* are considerably longer than the new subspecies.

Triassocampe striata n. sp. displays a similar shaped and sized test with the same small number of segments. However, the sculpture of the abdomen and first postabdominal segment is arranged into vertical ribs, partly crossing even the strictures.

Triassocampe kahleri n. sp.
(Pl. 42, fig. 4)

Derivatio nominis: In honour of Prof. Dr. F. KAHLER; Klagenfurt
Holotypus: The specimen on pl. 42, fig. 4; rep.-no. KoMo 1980 I-62
Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section
Stratum typicum: Bed 100 D, first limestone bed in the pietra verde, lower part of "*X.*" *reitzi* Oppel Zone (*Kellnerites* faunas)
Material: 12 specimens.
Diagnosis: Test very slender, subcylindrical. Cephalis conical, smooth, poreless or with few widely scattered pores in its lower part. Thorax hoop-like, somewhat broader but somewhat lower than cephalis. It has 2 rings of low nodes that are connected each other by low ridges forming partly imperfect outer pore frames. Very small inner pores mostly covered, arranged into 2, somewhat irregular rings. Abdomen short-cylindrical, somewhat broader and a little higher than thorax, but a little shorter than cephalis. A low proximal and a still lower distal ring of nodes are present. Some further low nodes are present between the 2 rings of nodes. All nodes are connected by low ribs forming larger outer pore frames. Inner pores small, arranged into 2, partly irregular pore rings, mostly closed.

First postabdominal segment cylindrical or slightly inversely trapezoidal. It displays a distinct, but low proximal ring of nodes. Below it, outer larger pore frames are present that are arranged into low, irregular, short vertical ribs. The inner pores are small, arranged into 2 or 3 partly irregular rings of pores. The second to fourth postabdominal segments have about the same size as the first postabdominal segments, but they are inversely trapezoidal. They display a distinct proximal ring of nodes that is partly fused to a nodose ring. The distinct, nodose outer pore frames are in the second and partly also in the third postabdominal segments arranged into short, irregular, often indistinct vertical ribs. A distinct ring of small inner pores is present below the proximal ring of nodes. Further 1-2 irregular rings of tiny pores are present.

The width of the distal segments decreases again slowly. Their shape changes from inversely trapezoidal (with distinct proximal ring) into hoop-like. One pore ring is present in the segments. Below it, a further incomplete ring of tiny pores or few widely scattered tiny pores may be present.

The strictures between the postabdominal segments are moderately deep, smooth, poreless, in the proximal part of the test narrow, in the distal part wider.

Dimensions:
Length of test = 296-346 μm
Maximum width of test = 68-73 μm

Occurrence: Lower *"Xenoprotrachyceras" reitzi* Oppel Zone (*Kellnerites* faunas) of Tethys (lower subzone of *Spongosilicarmiger italicus* Zone).

Remarks: *Triassocampe kahleri* n. sp. is a transitional form between the Illyrian *(Paraceratites trinodosus* Zone) *T. cylindrica* n. sp. and the Middle Fassanian genus *Striatotriassocampe* n. gen.

T. cylindrica n. sp. is distinguished by a very low thorax bearing only one ring of nodes, and by the missing arrangement of the outer pore frames of the first 3 or 4 postabdominal segments into vertical stripes.

In *Striatotriassocampe* n. gen. the vertical ribs are distinct in more than the proximal half of the postcephalic test. In typical forms, they cover also the strictures and join with the vertical ribs of the adjacent segments.

Triassocampe longicephalis n. sp.
(Pl. 45, fig. 5)

Derivatio nominis: According to the long subcylindrical cephalis

1982 *Triassocampe deweveri* (NAKASEKO & NISHIMURA) pars - YAO, p. 64, pl. 1, fig. 3, non! figs. 1, 2

1984 *Triassocampe* aff. *scalaris* DUMITRICA, KOZUR & MOSTLER, pars - ISHIDA, p. 26, pl. 1, figs. 1, 2, non! figs. 3, 4

Holotpyus: The specimen on pl. 45, fig. 5; rep.-no. KoMo 1980 I-752

Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy)

Stratum typicum: Sample TT 13, upper subzone of Middle Fassanian *Ladinocampe multiperforata* Zone

Material: 31 specimens.

Diagnosis: Test slender conical, distally cylindrical. Cephalis long, subcylindrical, smooth, poreless. Thorax somewhat broader, but considerably shorter than cephalis, hoop-like, with one pore ring of small pores and below it often some widely scattered additional pores. Pore frames elevated, often nodose or a low ring of nodes is present. The following segments become until the third or fourth postabdominal segment slowly and gradually, than the width remains nearly constant. The height of the segments increases only very slowly. Therefore even the largest postabdominal segments are distinctly shorter than the cephalis.

Abdomen and first 2 postabdominal segments are short-cylindrical, with 2 rings of nodes, connected across the median part of the segments that is only insignificantly incised. These segments display 2 rings of small pores. The following postabdominal segments are in their upper part cylindrical, in their lower part inversely trapezoidal. They display a distinct proximal ring of nodes or a nodose/smooth proximal ring. Below this ring a ring of pores with small to medium-sized pores are present, followed by 2 partly irregular pore rings of small pores. Distally some further small, widely scattered pores may be present in these segments. In the third postabdominal segment high, nodose, larger outer pore frames are present. In the following segments the outer pore frames are only a little elevated. The strictures between the postcephalic segments are narrow, deep, smooth, poreless.

Dimensions:
Length of test = 300-350 μm
Maximum width of test = 96-104 μm

Occurrence: Upper subzone of Middle Fassanian *Ladinocampe multiperforata* Zone.

Remarks: *Triassocampe longicephalis* n. sp. belongs to the *T. scalaris* group. T. *scalaris scalaris* DUMITRICĂ, KOZUR & MOSTLER, 1980 is distinguished by a distinct median incision between the proximal and distal ring of nodes in the abdomen until at least the third postabdominal segment.

In *Triassocampe scalaris baloghi* n. subsp. the median incision of the abdomen and first 3 postabdominal segments is likewise indistinct or missing, but in this form at least in the third postabdominal segment 2 node rings are present, the cephalis is shorter and the constrictions are shallower.

Triassocampe nishimurai n. sp.

(Pl. 44, fig. 7; pl. 45, figs. 4, 9-11)

Derivatio nominis: In honour of Prof. Dr. A. NISHIMURA, Osaka
Holotypus: The specimen on pl. 45, figs. 9-11; rep.-no. KoMo 1980 I-773
Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section
Stratum typicum: Bed 110, upper part of the pietra verde. Upper *"Xenoprotrachyceras" reitzi* Oppel Zone (above the last occurrence of *X. reitzi*), upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Material: More than 100 specimens.
Diagnosis: Test slender-subcylindrical. Cephalothorax large for the genus, long, cylindrical, apically broadly rounded. Cephalic part smooth, poreless, apically sometimes with a coarse, imperfect reticulum of very narrow, low, indistinct ribs. Thoracic part not or only a little broader and considerably shorter than cephalic part, with 2 rings of low nodes that become in some specimens very indistinct. Abdomen short-cylindrical, with 2, rarely 3 rings of distinct, round nodes, alternately arranged. Postabdominal segments inversely trapezoidal, with strong proximal smooth or nodose ring, in the first 3-4 postabdominal segments the proximal rings consists of separated, strong, round nodes. Until the third to fifth postabdominal segment a second ring of small nodes is present.

The thorax displays one ring of tiny, mostly closed pores. Abdomen and postabdominal segment display 2 rings of tiny pores, that are mostly closed. Only in the distal segments they are mostly open. Few widely scattered pores may be present below the second pore ring or even in the otherwise poreless constriction. The last segment (only rarely preserved) is long, velum-like, but not broader than the foregoing segments. It lacks a proximal ring and it displays numerous pores arranged in 4 or more irregular pore rings. Already one or two segments before this velum-like segments no nodes are present, only slightly nodose large outer pore frames.

Dimensions:
Length of test = 300-341 µm
Maximum width of test = 86-100 µm

Occurrence: Upper subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.
Remarks: *Triassocampe nishimurai* n. sp. belongs to the *T. deweveri* group. *T. deweveri* (NAKASEKO & NISHIMURA, 1979) is distinguished by its smaller size, smaller cephalis, and above all by its conical shape.

Triassocampe scalaris DUMITRICĂ, KOZUR & MOSTLER, 1980 is distinguished by the same size of the proximal and distal node rings at least in the first 3 postabdominal segments. Moreover, the shape of the test is conical to subconical.

Closest related is *Triassocampe transita* n. sp. that occurs in contemporaneous beds. It is distinguished by a smaller conical cephalis, conical shape of the test and differently sculptured abdomen.

In *Triassocampe striata* n. sp. the nodes of the proximal and distal node rings of the abdomen and of the first 1-3 postabdominal segments are connected by ribs that partly cross the strictures.

Triassocampe postdeweveri n. sp.

(Pl. 42, fig. 2)

Derivatio nominis: According to the occurrence after *T. deweveri* (NAKASEKO & NISHIMURA)

1982 *Triassocampe deweveri* NAKASEKO & NISHIMURA - HATTORI & YOSHIMURA, p. 112, pl. 1, fig. 4

1982 *Triassocampe deweveri* (NAKASEKO & NISHIMURA, 1979) - KISHIDA & SUGANO, p. 286, pl. 4, figs. 9, 10

Holotypus: The specimen on pl. 42, fig. 2; rep.-no. KoMo 1980 I-743
Locus typicus: Köveskál (Balaton Highland, Hungary), section at the cemetery
Stratum typicum: Siliceous limestone 10 cm below sample 4. Late Fassanian with *Budurovignathus truempyi* and *Eoprotrachyceras curionii*
Material: 7 specimens.
Diagnosis: Test conical. Cephalis in the lower part cylindrical, in the upper part rounded conical, smooth, poreless. Thorax broader, but shorter than thorax, rounded inversely trapezoidal, with one pore ring of tiny pores. The width of the following segments increases slowly, but gradually. Their heigh increases only insignificantly and varies somewhat in the proximal postabdominal segments. Only the distal segments are somewhat higher.

Abdomen and all postabdominal segments are inversely trapezoidal and display a distinct nodose or smooth proximal ring. Immediately below this ring a pore ring is present. The remaining part of the segment is in the abdomen and in the proximal postabdominal segments poreless and smooth. In the distal postabdominal segments, there is a second pore ring with slightly elevated or a little nodose pore frames or the segment is also here smooth. Strictures between all postcephalic segments deep, smooth.

Dimensions:
Length of the test = 310-335 µm
Maximum width of the test = 108-115 µm

Occurrence: Upper Fassanian of Hungary.

Remarks: *Triassocampe deweveri* (NAKASEKO & NISHIMURA, 1979) displays a hoop-like thorax and a cylindrical to slightly inversely trapezoidal abdomen. In the abdomen and first 2 postabdominal segments nodes below the proximal ring of nodes or nodose/smooth ring are present. Abdomen and all postabdominal segments display tiny pores below the proximal pore ring. Pore frames elevated or nodose.

Triassocampe scalaris scalaris DUMITRICĂ, KOZUR & MOSTLER, 1980
(Pl.44, figs. 1-6, 10-12; pl. 45, figs. 1, 2; pl. 47, figs. 2, 3)

1980 *Triassocampe scalaris* n. gen. n. sp. - DUMITRICA, KOZUR & MOSTLER, 1980, p. 26, pl. 9, figs. 5, 6, 11; pl. 14, figs. 2

1982 *Triassocampe deweveri* (NAKASEKO & NISHIMURA), - YAO, MATSUOKA & NAKAIANI, p. 37, pl. 1, fig. 1

1982 *Triassocampe scalaris* DUMITRICĂ - MIZUTANI & KOIKE, p. 128, pl. 4, fig. 4

1982 *Triassocampe deweveri* (NAKASEKO & NISHIMURA) pars - YAO, p. 64, pl. 1, figs. 1, 2, non! fig. 3

1989 *Triassocampe* sp. - MARTINI et al, p. 154, pl. 1, fig. 1

Occurrence: Lower Fassanian *Spongosilicarmiger italicus* Zone and Middle Fassanian *Ladinocampe multiperforata* zone frequent in the whole Eurasiatic Tethys. Rich occurrences of this subspecies are especially known from the upper subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone.

Remarks: *Triassocampe scalaris scalaris* DUMITRICĂ, KOZUR & MOSTLER displays at least in the first 3 posthoracic segments 2 distinct rings of nodes separated by a slight incision. The segments are therefore short cylindrical with slight median incision. In distal segments the proximal ring of nodes becomes stronger and is often fused to a nodose or even smooth ring. The distal nodose ring is replaced by more numerous, but lower nodes that are finally replaced by elevated, partly still nodose pore frames. These distal segments have an inversily trapezoidal outline.

In *Triassocampe deweveri* (NAKASEKO & NISHIMURA, 1979) the thorax is hoop-like, the abdomen cylindrical. All postabdominal segments are inversely trapezoidal with distinct proximal ring of nodes or with a distinct nodose/smooth proximal pore ring. No second ring of nodes, separated by a median incision from the proximal ring, is present.

In *Triassocampe scalaris baloghi* n. subsp. from the basal Fassanian the median incision of the abdomen and the first of 3 postabdominal segments is indistinct or missing.

Triassocampe scalaris baloghi n. subsp.
(Pl. 44, figs. 16, 17)

Derivatio nominis: In honour of Prof. Dr. K. BALOGH, Budapest

Holotypus: The specimen on pl. 44, fig. 16; rep.-no. Ko-Mo 1980 I-716

Locus typicus: Felsöörs (Balaton Highland, Hungary), Forráshegy section

Stratum typicum: Bed 100 D, lowermost limestone bed of the Buchenstein Formation, basal *"X." reitzi* Oppel Zone (*Kellnerites felsoeoersensis* Subzone)

Material: More than 100 specimens.

Diagnosis: Test conical, relatively short. Cephalis apically rounded conically, distally often subcylindrical. It is smooth and poreless. Thorax broader, but considerably lower than cephalis. The following segments become gradually broader, the fourth postabdominal segment and (if present) following segments are often again a little narrower. At least, they become not more broader than the foregoing segment. The height of the segments growths very slowly and even the highest distal postabdominal segments are not higher, often even somewhat shorter than the cephalis.

Thorax, abdomen and first postabdominal segments are hoop-like, the first postabdominal segment may be also cylindrical. Second mostly also third postabdominal segments cylindrical. The following segments are inversely trapezoidal.

The thorax displays one ring of low nodes (or it is nearly smooth) and on ring of small pores, mostly closed a layer of microgranular silica. Abdomen to third (sometimes only to second) postabdominal segment display distinct rings of nodes, situated at the proximal and distal ends of the segment. Beginning with the fourth, sometimes also with the third postabdominal segment, the proximal node ring is fused to a nodose or smooth ring. The nodes of the lower and upper node ring are mostly connected by ribs across the median part of the segments. Sometimes, there also a third node ring is intercalated. There is only an indistinct median incision in the abdomen and first 2 or 3 postabdominal segments. In the distal postabdominal segments the nodes below the proximal ring become lower and are replaced by high, often nodose pore frames. Abdomen and postabdominal segments display 2-3 rings of tiny pores, mostly closed by a layer of microgranular silica. The distal postabdominal segments display coarser outer pore frames arranged in 2, rarely 3 rings. The last segment displays small to moderately large pores arranged into 2-3 irregular pore rings. The surface below the proximal ring is smooth. Strictures smooth, narrow, moderately deep.

Dimensions:

Length of test = 235-305 µm

Maximium width of test = 87-95 µm

Occurrence: Basal Ladinian lower *"X." reitzi* Oppel Zone of the Tethys. Lower and middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone. Rarely still in the upper subzone of *S. italicus* Zone.

Remarks: *Triassocampe* scalaris *baloghi* n. subsp. is the oldest typical *Triassocampe* species of the *T. scalaris* group. The *T. scalaris* group belongs to the most typical and most frequent Nassellaria of the Ladinian. The appearence of this group at the originally used Anisian/Ladinian boundary strongly support the position of the Anisian/Ladinian boundary at the base of the *"X." reitzi* Oppel Zone (base of *Kellnerites* fauna = top of *Paraceratites trinodosus* Zone).

Triassocampe scalaris scalaris DUMITRICĂ, KOZUR & MOSTLER 1980 is distinguished by a distinct median incision between the proximal and distal ring of nodes in the abdomen and first 3 postabdominal segments. Moreover, the test is longer.

The Middle Fassanian *Triassocampe longicephalis* n. sp. is distinguished by its long, cylindrical cephalis, deeper strictures and larger pores.

Triassocampe striata n. sp.

(Pl. 45, fig. 8; pl. 47, fig. 1)

Derivatio nominis: According to the vertical ribs on the abdomen and first abdominal segment

Holotypus: The specimen on pl. 45, fig. 8; rep.-no. KoMo 1980 I-777

Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy)

Stratum typicum: Sample TT 3, lower subzone of the Middle Fassanian *Ladinocampe multiperforata* Zone

Material: 71 specimens.

Diagnosis: Test relatively short, conical with velum-like last chamber. Cephalis conical, distally cylindrical, smooth, poreless. Thorax subcylindrical, only a little wider and somewhat shorter than cephalis, proximally smooth, distally with short, mostly indistinct vertical ribs. Only few, widely scattered tiny pores are present. Abdomen with 2 rings of nodes that are connected by short, vertical ribs. Some of these ribs continue(under shallowing) until the distal part of the thorax. Other ones continue across the separating stricture until the first postabdominal segment, in which the proximal node ring is stronger than the distal one and the nodes of both rings are connected by vertical ribs as well. In the second to fourth postabdominal segments a strong proximal ring of nodes (second postabdominal segment), nodose ring (third postabdominal segment) and smooth or slightly nodose ring (fourth postabdominal segment) is present. The fifth postabdominal segment is long, velum-like, without sculpture. Abdomen to fourth postabdominal segment display 2-3 rings of tiny pores. The velum displays 4 or more rings of little pores. The strictures are narrow, poreless, in the apical part of test overgrown by the vertical ribs that cross the strictures. The stricture before the velum-like last segment is broader and shallower.

Dimensions:

Length of test = 250-269 µm

Maximum width of test = 85-94 µm

Occurrence: Lower subzone of Middle Fassanian *Ladinocampe multiperforata* Zone. Tethys.

Remarks: The distinct arrangement of the sculpture in irregular vertical ribs on the abdomen and first postabdominal segment remembers to *Striatotriassocampe* n. gen. that displays, however, always a long cylindrical test and the vertical ribs are strongest in the strictures, whereas the smooth ring in the median part of the segments are not crossed by these ribs. Moreover, at least on 8 postabdominal segments (and on the strictures between them) these vertical ribs or vertically arranged outer pore frames (in the more distal segments) are present.

The vertical ribs of *T. striata* n. sp. - strongest on the proximal part of abdomen and first postabdominal segments and crossing the node rings - are homeomorph with the ribs in *Striatotriassocampe* n. gen. This is still confirmed by the close relations to *T. deweveri velata* n. subsp. that has the same short-conical shape of test with velate last segment without sculpture. It is distinguished by coarse outer pore frames not distinctly vertically arranged.

Triassocampe transita n. sp.

(Pl. 44, fig. 15)

Derivatio nominis: According to the transitional position between the *T. deweveri* - and the *T. scalaris* group

Holotypus: The specimen on pl. 44, fig. 15; rep.-no. Ko-Mo 1980 I-755

Locus typicus: Passo della Gabiola section, Vicentinian Alps (Italy)

Stratum typicum: Sample MD 18, middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone

Material: 7 specimens.

Diagnose: Test conical. Cephalis conical, smooth, poreless. Thorax trapezoidal, broader, but shorter than cephalis with one ring of low nodes. Tiny pores mostly covered by a layer of microgranular silica. Abdomen somewhat broader, but not higher than thorax, short cylindrical, likewise with one ring of nodes and tiny pores, mostly closed by a layer of microgranular silica. Postabdominal segments high (higher than cephalis), subcylindrical. Their width increases continuously until the third postabdominal segment, than it decreases again. All postabdominal segments display a distinctly elevated proximal ring of nodes that is in the distal postabdominal segments fused to a smooth, rather broad ring. Until the third postabdominal segment also a distal node ring is present, distinctly lower than the proximal ring. Some of nodes of the 2 rings are connected by ridges across the broad median part of the segments, where often elevated coarser outer pore frames are present. The median part of the segments is only indistinctly incised. In the fourth postabdominal segment the distal pore ring consists only of small, low nodes, incorporated in the here stronger outer pore frames. The postabdominal segments display 3 rings of tiny pores and larger outer pore frames. Only the proximal pore ring is regular. The strictures are very narrow, smooth, poreless and shallow, distally somewhat deeper.

Dimensions:

Length of test = 298-330 μm

Maximum width of test = 97-103 μm

Occurrence: Middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone.

Remarks: *Triassocampe transita* n. sp. displays distinct, elevated proximal node rings (or smooth rings) as in the *T. deweveri* group. However, as in the *T. scalaris* group, it displays in the first 3 postabdominal segments also a distinct distal node ring that is, however, lower than the proximal ring. Therefore *T. transita* n. sp. is in its sculpture transitional between the *T. deweveri* and the *T. scalaris* group. Most similar is *T. scalaris baloghi* n. subsp. that is distinguished by a considerably narrower median part of the first 3 postabdominal segments in which the proximal and distal node rings have in the first 2 postabdominal segments the same high, whereas in the third one the proximal ring is a little higher.

Genus *Yeharaia* NAKASEKO & NISHIMURA, 1979
Type species: Yeharaia elegans NAKASEKO & NISHIMURA, 1979

Yeharaia annulata NAKASEKO & NISHIMURA, 1979

(Pl. 46, figs. 6-11, 13; pl. 47, figs. 4, 5)

1979 *Yeharaia annulata* NAKASEKO & NISHIMURA, n. sp. - NAKAESKO & NISHIMURA, p.10, figs. 1, 7; pl. 12, fig. 5

Occurrence: Lower and Middle Fassanian. Worldwide.

Remarks: This easily recognizable species is widely distributed (Japan, North America, Yugoslavia, Italy, Hungary) and occur only in a short stratigraphic interval in the Lower and Middle Fassanian. In our material the species is rather rare. It begins at the base of the *Xenoprotrachyceras reitzi* Oppel Zone.

In Japan this species is common and it occurs in the same stratigraphic level as in Europe. The original assignment of the strata with *Yeharaia* into the Upper Triassic was not correct. These beds contain Longobardian (N 13) and Lower Ladinian (SM 802, SM 803, MN 2311, IN 17) faunas (see KOZUR & MOSTLER, 1981, YAO, 1982, KOZUR, 1984, 1988 a, b, KOJIMA & MIZUTANI, 1987). In really Upper Triassic (Upper Carnian - Middle Norian) beds (MN 2301, MN 2302) *Yeharaia* is absent also in Japan

ISHIGA (1984), in turn, reported *Yeharaia annulata* from the Illyrian and Ladinian of China. However, *Yeharaia annulata* occurs there together with *Triassocampe scalaris* DUMITRICĂ, KOZUR & MOSTLER and *T. deweveri* (NAKASEKO & NISHIMURA) what excludes Illyrian. This age misinterpretation is based on erroneous determinations of accompanying conodonts.

BLOME et al (1986) accepted again an Upper Triassic (Early and Middle Carnian) age for radiolarian faunas with rich occurrences of *Yeharaia annulata* from western North America. However, the species from this association, figured on pl. 8.3., figs. 1-13, 15-18 belong to the typical Lower Ladinian association, well known from Europe and Japan.

Our rich Illyrian radiolarian fauna from the *Paraceratites trinodosus* Zone with more than 100 species does not contain *Yeharaia annulata* or any other *Yeharaia* species. Therefore the base of the *X. reitzi* Oppel Zone (*Parakellnerites* fauna) is seemingly the lowest level of the occurrence of *Yeharaia annulata.*

Yeharaia annulata and the whole genus *Yeharaia* is not more present in the Longobardian. In our rich material from the *Budurovignathus truempyi* conodont zone (upper Fassanian), *Yeharaia* is also missing. *Yeharaia* is a very good world-wide distributed guide form for the Fassanian.

Yeharaia lata n. sp.
(Pl. 46, fig. 5)

Derivatio nominis: latus (lat.) = broad
Holotypus: The specimen on pl. 46, fig. 5; rep.-no. KoMo 1980 I-700
Locus typicus: Road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy)
Stratum typicum: Sample TT 14, upper subzone of Middle Fassanian *Ladinocampe multiperforata* Zone
Material: 3 specimens.
Diagnosis: Test multicyrtid, broadly conical. Cephalis subhemispherical, smooth, poreless. Apical horn excentrical, moderately large. Collar stricture distinct, with some small pores. Thorax subhemispherical, distinctly broader, but not higher than cephalis. Abdomen and first postabdominal segment hoop-like, distinctly broader and somewhat higher than thorax, with small pores, arranged into 2 irregular rings. The second postabdominal segment is also hoop-like, broader, but not higher than the foregoing segment. It displays a smooth, not very distinct proximal ring and moderately large pores arranged in 2 irregular pore rings. The following postabdominal segments have about the same size. Their shape is inversely trapezoidal. They display a strong, smooth proximal ring followed by a ring of large pores. In the third postabdominal segment a second irregular ring of somewhat smaller pores is present. In the following postabdominal segments only few, widely scattered pores are present below the proximal pore ring. The strictures between all postabdominal segments are deep, smooth and poreless.
Dimensions:
Length of test = 196-204 µm
Maximum width of test = 79-85 µm
Occurrence: Upper part of Middle Fassanian, Southern Alps (Italy).
Remarks: *Yeharaia annulata* NAKASKEO & NISHIMURA, 1979 from the Lower and Middle Fassanian is slender conical to subcylindrical. Already the first postabdominal segment displays a proximal smooth ring. The postabdominal segments display in general one pore ring, only in the last postabdominal segments additional larger pores may be present.

Yeharaia transita n. sp.
(Pl. 46, figs. 1-4, 12)

? 1989 Yeharaia sp. A. - YEH, p. 77, pl. 2, fig. 6
Derivatio nominis: According to the transitional position between the genera *Triassocampe* DUMITRICĂ, KOZUR & MOSTLER and *Yeharaia* NAKASEKO & NISHIMURA
Holotypus: The specimen on pl. 46, figs. 3, 12; rep.-no. KoMo 1980 I-310
Locus typicus: Passo della Gabiola section, Vicentinian Alps (Italy)
Stratum typicum: Sample MD 13, middle subzone of Lower Fassanian *Spongosilicarmiger italicus* Zone
Material: 18 specimens.
Diagnosis: Test multicyrtid, conical. Cephalothorax conical, with very small apical horn. Cephalic part smooth, not or only indistinctly separated from the thoracic part that displays a ring of widely spaced nodes. The whole cephalothorax is poreless.

Abdomen hoop-like, distinctly broader, but lower than cephalothorax. It displays two rings of nodes. The small pores are mostly closed by a layer of microgranular silica.

The postabdominal segments become continuously broader, but only a little higher. Sometimes their height varies irregularly. All postabdominal segments have a proximal ring. In the first postabdominal segment or in the first two postabdominal segments the proximal ring is moderately high, smooth or somewhat nodose. In the following postabdominal segments the proximal ring is very high. All postabdominal segments display a pore ring below the proximal ring. The pores may be partly closed. Below this pore ring further tiny pores are present, only in the last segment these pores become larger.

The shape of the postabdominal segments is inversely trapezoidal. The strictures between these segments are very deep. They are sharply (vertically) separated from the proximal side, but only slightly separated from the distal ends of the segments.

Dimensions:
Length of test = 245-300 µm
Maximum width of test = 100-120 µm

Occurrence: Middle subzone of the Lower Fassanian *Spongosilicarmiger italicus* Zone up to lower part of Middle Fassanian of Southern Alps.

Remarks: *Yeharaia transita* is distinguished from the other *Yeharaia* species by its very small apical horn.

Within the genus *Triassocampe* DUMITRICĂ, KOZUR & MOSTLER several species display a proximal ring in the postabdominal or in the distal postabdominal segments. However, these species display never an apical spine and the proximal end of the cephalis is mostly rounded.

We place all forms with apical horn **and** proximal ring on the postabdominal segments into the genus *Yeharaia* NAKASEKO & NISHIMURA. Triassocampidae with distinct apical horn, but without proximal ring on the postabdominal segments are here placed into the genus *Pseudotriassocampe* n. gen.

IV. Biostratigraphic evaluation

IV.1. The position of the Anisian-Ladinian boundary

In the present paper, which is part of a monographic study on the taxonomy and biostratigraphic value of the Triassic radiolarians, only the biostratigraphic value of the Middle Anisian to Early Ladinian radiolarians is discussed in detail, but some remarks to the Scythian, Longobardian, Cordevolian, Julian and Rhaetian radiolarian biostratigraphy are made as well. Before the Anisian-Early Ladinian radiolarian biostratigraphy will be discussed, remarks to the position of the Pelsonian-Illyrian- and Anisian-Ladinian boundaries are necessary.

The Pelsonian-Illyrian boundary is not yet defined by ammonoids. The horizon with "*Paraceratites*" *binodosus* is placed by some authors in the Pelsonian, by others in the Illyrian.

All European conodont workers have placed the *Neogondolella bifurcata* fauna without *Neogondolella bulgarica* in the Illyrian. This fauna begins in the level of the classical ammonoid locality of Tiefengraben (*binodosus* fauna) that was therefore regarded as basal Illyrian by KOZUR (1972b). TATZREITER & VÖRÖS (1991) rejected this view, because in their new material several ammonoid horizons are present and *Paraceratites* and *Judicarites* are missing. However, the new artifical outcrops (Gutenstein Limestone) are situated morphologically above (*stratigraphically* below) the classical ammonoid locality in the Reifling Limestones placed by KOZUR (1972b) in the basal Illyrian.

KOZUR (1972b) pointed out that the classical Tiefengraben ammonoid horizon is according to its conodont fauna clearly younger than the Rahnbauerkogel horizon that was until this time correlated with the Tiefengraben horizon (SUMMESBERGER & WAGNER, 1972). This younger age of the Tiefengraben fauna was confirmed by TATZREITER & VÖRÖS (1991).

Our radiolarian fauna of the *Parasepsagon robustus* Zone has been derived from the basal Reifling Limestone of Großreifling, stratigraphically somewhat above a typical Pelsonian conodont fauna with *N. bulgarica* and *Nicoraella kockeli* and stratigraphically somewhat below the *N. bifurcata* fauna of the classical Tiefengraben ammonoid horizon. Most probably, it belongs to the Pelsonian *Bulogites zoldianus* horizon, because in the Aszófö section (Hungary) a similar radiolarian fauna was found in *Bulogites zoldianus*-bearing beds.

The Anisian-Ladinian boundary is according to the priority the clearest boundary within the Triassic. MOJSISOVICS; WAAGEN & DIENER (1985) introduced the Alpine Triassic Stage subdivision and placed the top of the newly introduced Anisian Stage at the top of the *Paraceratites trinodosus* Zone. The *Aplococeras avisianum*- and *Eoprotrachyceras curionii* Zone have been placed into the Fassanian Substage which was also introduced by these authors. The Fassanian is the lower Substage of the Ladinian Stage which was in this time still named as Norian Stage. Later the term Norian was replaced by the term Ladinian and the term Norian have been used then to replace the term Juvavian in the Stage subdivision originally used by MOJSISOVICS; WAAGEN & DIENER (1895).

The Fassanian was defined by the *Eoprotrachyceras curionii*- and *Aplococeras avisianum* Zone. The *E. curionii* Zone was used originally in a wider scope than today including also the later generally used "*Xenoprotra-*

chyceras" reitzi Zone. The *Aplococeras avisianum* Zone was placed originally above the *Eoprotrachyceras curionii* Zone in this wider sense.

The paper of MOJSISOVICS; WAAGEN & DIENER (1895) shows clearly that the original Anisian-Ladinian boundary was placed above the *Paraceratites trinodosus* Zone and that the *Aplococeras avisianum* Zone and the *Eoprotrachyceras curionii* Zone (including the *"Xenoprotrachyceras" reitzi* Zone) were originally placed into the Fassanian (Early Ladinian). This boundary was logical, because it is not only well recognizable in pelagic, ammonoid-bearing beds, but even in the thick shallow-water carbonate platform limestones and dolomites (Dasycladaceen limestones and -dolomites) that are widely distributed in the Alpine Triassic of Eurasia during the Anisian-Ladinian time interval. In this facies the Anisian-Ladinian boundary at the top of the *Paraceratites trinodosus* Zone is indicated by the first appearence of the dasycladacean species *Diplopora annulata*.

Later investigations have shown that this boundary is also recognizable by conodonts, e.g. first appearence of *Neogondolella mesotriassica* (KOZUR & MOSTLER), *Paragondolella alpina* (KOZUR & MOSTLER) and *P. ? trammeri praetrammeri* (KOZUR & MOSTLER) and especially by radiolarians as discussed below. We see therefore no reason to abandon this priority boundary.

After clear separation of the *"Xenoprotrachyceras" reitzi*- and *Eoprotrachyceras curionii*-Zone, the Anisian-Ladinian boundary have been placed in agreement with the original intentions by MOJSISOVICS; WAAGEN & DIENER (1895) between the *P. trinodosus*- and *"X." reitzi* Zone. As shown below, this boundary is roughly identical with the boundary between the *trinodosus*- and *avisianum* Zone.

The *"Xenoprotrachyceras" reitzi* Zone (MOJSISOVICS, 1892) was introduced and defined in the famous Forráshegy section near Felsöörs (Hungary) as an Oppel Zone comprising all the faunas of the there present pietra verde beds (see BÖCKH, 1872, LÓCZY, 1916, STÜRZENBAUM, 1875). Despite the fact that originally (MOJSISOVICS, 1882) no stratotype was designated for the *reitzi* Zone, later generally the Forráshegy section (type locality of *"X." reitzi*) was regarded as reference for the *reitzi* Zone. This is correct, because the South Alpine *"X.' reitzi* Zone sensu MOJSISOVICS comprised both the *reitzi* and *curionii* Zones, later together designated as *"Protrachyceras" curionii* Zone (MOJSISOVICS, WAAGEN & DIENER (1895). The *reitzi* Zone of the Balaton Highland was used as Oppel Zone in the same scope as today. Moreover, it was already used before MOJSISOVCIS (1882) as *reitzi* fauna (STÜRZENBAUM, 1875).

Below this fauna, only the *Paraceratites trinodosus* fauna was known. But between the *Paraceratites trinodosus* Zone and the *"Xenoprotrachyceras" reitzi* Oppel Zone there is still a thin horizon with *Parakellnerites* cf. *meriani*, *Paraceratites subnodosus, Hungarites* sp. and *"Reiflingites" ? camunus*. This horizon, for which especially *"Reiflingites" ? camunus* is very characteristic, is also known from other localities of the Balaton Highland exactly in the same position between the *Paraceratites trinodosus* Zone and the *"Xenoprotrachyceras" reitzi* Oppel Zone. For this distinct ammonoid fauna here the *"Reiflingites" ? camunus* subzone of the *P. trinodosus* Zone is used. Type locality is the Felöörs section in the Balaton Highland, where this zone is present in beds 91 (?), 94 to 99 A.

According to the newest results (VÖRÖS, SZABÓ, both lectures in Budapest, 1990) the lower part of the *"X." reitzi* Oppel Zone in the Felsöörs section and other sections in the Balaton Highland contains the *Kellnerites* fauna, the upper part an *Aplococeras-Halilucites* fauna. Therefore the *reitzi* Oppel Zone may be subdivided into two subzones, the *Kellnerites* Subzone below and the *Aplococeras avisianum* Subzone above. The *Kellnerites* Subzone is named as *Kellnerites felsoeoersensis* Subzone. The stratotype is the Felsöörs section, were this subzone occur from the base of the pietra verde to the stratigraphic level below the first appearence of *"X." reitzi*.

TORNQUIST (1901) recognized that the *"X." reitzi* Oppel Zone of the Balaton Highland corresponds to the Mte. Spitz Limestone and to the overlying so called "*nodosus* Formation" of the Southern Alps. This view, however, was not accepted by later authors. They placed the *X. reitzi* Zone (regarded as basal Ladinian) above the *Aplococeras avisianum* Zone (regarded as topmost Anisian), see ZAPFE (1974, referring to data of ASSERETO, KRYSTYN, URLICHS). Only KOZUR (1972b and later publications) placed the *A. avisianum* Zone into the Ladinian (following the original intentions by MOJSISOVICS; WAAGEN & DIENER, 1895) and equated it at least partly with the *"X." reitzi* Zone. This view was rejected by TOLLMANN (1976), who wrote: "Die Obergrenze des Anis wird heute ganz allgemein ...., im Gegensatz zur Auffassung von H. KOZUR ... über und nicht unter die *Avisianus*zone gelegt" (TOLLMANN, 1976, p. 65). "Die ladinische Stufe umfaßt das Fassan (*Reitzi*-Zone und *Curionii*-Zone)"...(TOLLMANN, 1976, p. 96). In contrast to KOZUR (1972b and later papers), TOLLMANN (1976) and almost all workers of the Alpine Triassic placed the Anisian-Ladinian boundary between the *avisianus*- and *reitzi* zones.

Our radiolarian data have shown that the correlation by TORNQUIST (1901) was correct. The Mte. Spitz Limestone is overlain after a short gap (karst surface) by the "Formacione a nodosus". The upper Mte. Spitz Limestone with *Diplopora annulata* belongs to the lower part of the *"X." reitzi* zone as already recognized by TORNQUIST (1901). We have studied radiolarians immediately above the Mte. Spitz Limestone. They have been never older than the middle part of the middle *Spongosilicarmiger italicus* Zone corresponding to the middle *"X." reitzi* Oppel Zone of the Felsöörs section. The middle and upper *"X." reitzi* Oppel Zone is therefore a time-equivalent of the lower Buchenstein Beds s.l. (in general pietra verde with different amounts of limestone) of the Recoarao area. This "Formacione a *nodosus*" and overlying pietra verde/limestone deposits have been in general placed into the *A. avisianum* Zone. This means that the lower *Aplococeras avisianum* Zone (as used in the Southern Alps) is contemporaneous to upper *X. reitzi* Oppel Zone of the Balaton Highland. The upper part of this *A. avisianum* Zone is even younger than the *"X." reitzi* Oppel Zone. The *A. avisianum* Zone is roughly the shallow-water to deep-neritic equivalent of the upper part of the fully pelagic *"X." reitzi* Zone and of beds immediately above it..

This yields a possible explanation, why MOJSISOVICS; WAAGEN & DIENER (1895) have placed the *A. avisianum* Zone above the *E. curionii* Zone. Their *curionii* Zone included the ammonoid faunas from the interval of the present day *"X." reitzi* Zone up to the *E. curionii* Zone or even up to the *P. gredleri* Zone. In shallowing upward sequences or in sequences with interfingering of neritic and pelagic deposits *Aplococeras avisianum* may be present above beds that contain pelagic ammonoid faunas of the *"X." reitzi* Zone (as part of the original *E. curionii* Zone s.l.).

The time-equivalence of the lower *A. avisianum* Zone (as used in the Southern Alps) with the upper *"X." reitzi* Oppel Zone (this *A. avisianum* Zone ranges above the *"X." reitzi* Oppel Zone of the Balaton Highland) excludes a position of the Anisian-Ladinian boundary between the "Anisian" *A. avisianum* Zone and the Ladinian *"X." reitzi* Zone as pointed out already by KOZUR (1972b and later papers).

In the last years some attempts have been made to redefine the Anisian-Ladinian boundary by ammonoids and conodonts. TOZER (1974) placed this boundary at the base of the *Eoprotrachyceras subasperum* Zone, a time-equivalent of the *E. curionii* Zone. This boundary is well recognizable by ammonoids (e.g. first appearence of the genus *Eoprotrachyceras*), but not by conodonts. *Metapolygnathus truempyi* appears only within this zone, but not yet at its base. In the radiolarian fauna this boundary is also not distinct (discussed by KOZUR & MOSTLER, in press).

The Anisian-Ladinian boundary proposed by TOZER is partly used in the Boreal realm, but in the Eurasiatic Tethys it was mostly rejected. Only BRACK & RIEBER (1986) followed him. This boundary is too far from the priority boundary[1)] and its application would drastically change the level of the Anisian-Ladinian boundary in the whole pelagic Tethys development in Eurasia as well as in the marginal seas of the Eurasiatic Tethys (like in the Germanic Basin, the type area of the Triassic system). In the widespread carbonate-platform deposits (*Diplopora* Limestone and -Dolomite) this boundary is not recognizable.

KRYSTYN (1983) proposed the placement of the Anisian-Ladinian boundary between his *Parakellnerites*- (rather *Kellnerites-)* and *Nevadites*- "Zones". Unfortunately, his ammonoid-conodont correlation is exclusively based on highly condensed sequences, like the *Epidaurus* section. This latter section yielded a lot of conodont ranges that are basically different from conodont ranges in uncondensed sections:

- First appearence of *Paragondolella ? trammeri* (KOZUR) simultaneously with the first appearence of the ammonoid genus *Nevadites* (discussed later).
- First appearence of *Budurovignathus hungaricus* (KOZUR & VÉGH) at the base of the *E. curionii* Zone. In uncondensed sequences this species begins only at the base of the next younger *Protrachyceras gredleri* Zone and in the upper *E. curionii* Zone only its forerunner *B. truempyi* (HIRSCH) is present.
- First appearence of *Paragondolella tadpole* (HAYASHI) considerably above the last occurrence of *Budurovignathus diebeli* (KOZUR & MOSTLER). In uncondensed sequences *P. tadpole* (HAYASHI) is already present in the upper part of the *B. diebeli* range zone. In thick uncondensed sequences of the Valăni Nappe (Northern Apuseni Mts. (Romania*)* *P. polygnathi-*

1) The term Ladinian was introduced by BITTNER (1892) for the Buchenstein and Wengen beds. The Buchenstein beds have been defined in this time with the "Trachyceras" reitzi and "T." curionii Zones, in MOJSISOVICS 81892) only with the "Protrachyceras" reitzi Zone comprising both zones.

formis (BUDUROV & STEFANOV), *P. tadpole* (HAYASHI), *B. diebeli* (KOZUR & MOSTLER), *B. mostleri* (KOZUR) and *Pseudofurnishius murcianus murcianus* (van den BOOGAARD) occur together. The indicated range of *P. tadpole* in the Epidaurus section is the more surprising as according to KRYSTYN *P. foliata* BUDUROV is a younger synonym of *P. tadpole*, an opinion that we cannot follow. *P. foliata* BUDUROV ranges according to BUDUROV & SUDAR (1990) from the higher Late Ladinian to the basal Cordevolian.

- *B. mostleri* (KOZUR) begins in the Epidaurus section only after *B. diebeli* (KOZUR & MOSTLER). In uncondensed sections, like in Köveskál (Balaton Highland, Hungary), Sosio Valley (western Sicily, Italy) and in several sections in the Alps and Western Carpathians *B. mostleri* (KOZUR) begins considerably before *B. diebeli* (KOZUR & MOSTLER) in the upper part of the *Protrachyceras archelaus* Zone.

The evaluation of all our rich conodont material from condensed Hallstatt Limestones of the Alps and other areas has shown that this facies is unsuitable for establishing exact conodont ranges and correlations between conodont- and ammonoid zonations. As we had awaited, also the conodont- and holothurian sclerite faunas from "uncondensed" ammonoid horizons may indicate strong condension. This fact is easily explanable. The ammonoid fauna of the Hallstatt Limestones is enriched in lenses or some beds. Over 90 % of the total amount of the Hallstatt Limestones is ammonoid-free. For this reason, the condension of ammonoid-bearing and ammonoid-free Hallstatt Limestone will be the normal case, condension of two or more different ammonoid faunas the exception. Because even condension of ammonoid faunas of different age is frequent, in the condensed Hallstatt facies nearly all seemingly uncondensed ammonoid faunas will be condension horizons of ammonoid-bearing with ammonoid-free Hallstatt Limestones. A condension horizon, however, in which only one level of the condensed limestones contains ammonoids, appears to the ammonoid workers as uncondensed. Because also the ammonoid-free Hallstatt Limestones are always rich in conodonts and other microfaunas, many uncondensed ammonoid faunas of the Hallstatt Limestone facies contain strongly condensed microfaunas. This may be an explanation for the "exotic" condont ranges (published by KRYSTYN, 1983) even in those parts of the condensed Epidaurus section, which contain uncondensed ammonoid faunas.

Some remarks are necessary to the condont taxonomy, published by KRYSTYN (1983). He established a *Gondolella eotrammeri* n. sp. which is similar to *Paragondolella ? trammeri praetrammeri* (KOZUR & MOSTLER, 1982), which has the priority. In both forms, the adults are larger, have a larger platform and smaller basal cavity as in typical *P. ? trammeri trammeri* (KOZUR), the holotype of which derives from a considerably higher stratigraphic horizon in the locality Köveskál. The arched upper surface of the carina is not diagnostic for primitive representatives of *P. ? trammeri* (KOZUR), as assumed by KOVÁCS et al. (1990), because this feature can be even found in very advanced *P. ? trammeri* from the Middle Longobardian. If the very tips of the denticles of the carina are broken away as in the holotype of *P. ? trammeri praetrammeri* (KOZUR & MOSTLER), a rather straight upper surface of the carina is indicated for forms that have in reality an arched upper surface of the carina, like the whole topotype material of *P. ? trammeri praetrammeri* (KOZUR & MOSTLER).

KRYSTYN (1983) did not give any differential diagnosis against *P. ? trammeri praetrammeri* (KOZUR & MOSTLER), but only pointed out that *"Gondolella" eotrammeri* is "surely different from *P. ? trammeri praetrammeri* (KOZUR & MOSTLER)". For supporting this view, KRYSTYN (1983) pointed out that the fauna of Fellbach, rich in *Parakellnerites* (det. Dr. TICHY), must belong to the *Nevadites* "Zone". ("In obiger Arbeit wird aus der angeblich durch *Parakellnerites* abgesicherten Probe FQ eine Conodontenfauna genannt, die verglichen mit Epidaurus und anderen Profilen ganz sicher für die *Nevadites* Zone und keinesweg für die *Parakellnerites*-Zone charakteristisch ist. ... Überflüssigerweise leider, weil *G. trammeri praetrammeri* KOZUR & MOSTLER eindeutig in die Synonymie von *G. trammeri* zu verweisen ist, während sie sich andererseits von *G. eotrammeri* n. sp. artlich sicher unterscheidet." KRYSTYN, 1983, p. 257). In his circular logic that *P. ? eotrammeri* should be restricted to the *Parakellnerites* "Zone", *P. ? trammeri* to the *Nevadites* "Zone", he found than the only, but for him decisive evidence for his conclusion that both taxa are surely not identical.

This statement was done without re-examination of the ammonoid- and conodont fauna of the Fellbach section. The conodont data provided by KRYSTYN (1983) does not support the placement of this fauna into the *Nevadites* "Zone". The Fellbach fauna is characterized by two gondolellid species, *Paragondolella alpina* (KOZUR & MOSTLER) and *P. ? trammeri praetrammeri* (KOZUR & MOSTLER). Both these taxa (the latter assigned to

Gondolella eotrammeri n. sp.) have been reported and figured by KRYSTYN (1983) only from the *Kellnerites* Subzone (*"X." reitzi* Oppel Zone). Even, if we do not regard the presence of *P. ? trammeri praetrammeri* (KOZUR & MOSTLER) because of different taxonomic opinions about this taxon, then according to the data by KRYSTYN (1983) the Fellbach fauna should belong to his *Parakellnerites* Zone, in which *P. alpina* (KOZUR & MOSTLER) occurs.[2)]

All present reports of *P. alpina* (KOZUR & MOSTLER) come from the lower part of the *"X." reitzi* Oppel Zone, but with exception of the Fellbach section and of the condensed Epidaurus section, there is no direct ammonoid control. In the Epidaurus section this species is definitely restricted to the *"X." reitzi* Oppel Zone. In Fellbach it occurs in beds with *Parakellnerites*, but KRYSTYN (1983) believed that these beds belong to the *Nevadites* "Zone" (see above).

In the section at the road San Ulderico-Pallé investigated by MIETTO & PETRONI (1979) for conodonts and by us for radiolarians (see fig. 5), *P. alpina* (determined as *Neogondolella acuta* by MIETTO & PETRONI) occurs immediately above the Mte. Spitz Limestone in the lower part of the so-called "Formacione a *nodosus*", placed into the basal *avisianum* Zone by MIETTO & PETRONI. The upper range of *P. alpina* (KOZUR & MOSTLER) is well known in this section, whereas its lower range cannot be determined, because the Mt. Spitz Limestone does not contain conodonts (with exception of few conodonts from the transition to the overlying "Formacione a *nodosus*").

P. alpina (KOZUR & MOSTLER) ends in this section far below the first appearence of *P. ? trammeri trammeri* (KOZUR) that begins only above the pietra verde, according to MIETTO & PETRONI (1979) about 2 m above the base of the overlying reddish nodular limestones. The specimens determined by MIETTO & PETRONI (1979) as *Neogondolella mombergensis media* (KOZUR) are primitive representatives of *P. ? trammeri trammeri* (KOZUR). These forms begin about 1 m above the base of the nodular limestone.

The same distribution pattern of *P. alpina* (KOZUR & MOSTLER) we have also found in several sections, where we have only conodont control for the age. In all cases *P. alpina* (KOZUR & MOSTLER) ends before *P. ? trammeri trammeri* (KOZUR) (= *G. trammeri* KOZUR sensu KRYSTYN) begins. Only in the Felsöörs section, *P. ? trammeri trammeri* begins according to KOVÁCS already in the upper subzone of the *"X." reitzi* Zone. Therefore the base for placing beds with *Parakellnerites* and with rich occurrences of *P. alpina* from the Fellbach section into the *Nevadites* "Zone" by KRYSTYN (1983) is entirely unclear, the more as KRYSTYN (1983) defined the base of the *Nevadites* "Zone" with the first appearence of *"Gondolella" trammeri.*

The section at the road San Ulderico-Pallé is also very interesting with respect to the position of the South Alpine *Aplococeras avisianum* Zone. Sample TT 1 (see fig. 5) from the very base of the reddish nodular limestone above the pietra verde and a sample given to us by Dr. P. MIETTO from the same stratigraphic level have yielded rich radiolarian associations of the topmost *Spongosilicarmiger italicus* Zone. Already sample TT 3 (fig. 5) belongs to the Middle Fassanian *Ladinocampe multiperforata* Zone. An identical radiolarian fauna is known from the uppermost part of the pietra verde and from the lowermost part of the overlying pink nodular cherty limestones (base of the Nemesvámos Limestone Formation) of the Felsöörs section, well above the last occurrence of *"Xenoprotrachyceras" reitzi*. So, these beds are younger than the *"X." reitzi* range Zone. However, the *"X." reitzi* Zone was always used as an Oppel zone, including all ammonoids from the pietra verde (Buchenstein Beds) of its reference section Felsöörs (Balaton Highland).

MIETTO & PETRONI (1979) placed the whole pietra verde of the section at the road San Ulderico-Pallé into the *Aplococeras avisianum* Zone and the boundary of this zone against the *"X." reitzi* Zone was discriminated within the lower part of the overlying pink nodular limestones. This was in agreement with the use of these two zones in the Southern Alps. Like many other authors, MIETTO & PETRONI (1979) placed this *avisianum* Zone into the Anisian and the assumed overlying *reitzi* Zone into the Ladinian referring to the general accepted Ladinian age of the *reitzi* Zone in the Balaton Highland. Our radiolarian data, however, have shown that the whole "*reitzi* Zone" of this section is younger than the *reitzi* Oppel Zone in the Balaton Highland, whereas the *avisianum* Zone of this section corresponds to the middle and upper *reitzi* Oppel

[2)] According to a personal communication by KRYSTYN after finishing the stratigraphic part of this paper, he has now re-studied the ammonoid and conodont material of the Fellbach section. KRYSTYN now support the view of KOZUR & MOSTLER (1982) that the Fellbach ammonoid fauna belongs to the *Kellnerites* fauna and that *P. ? trammeri praetrammeri* (KOZUR & MOSTLER) is not a synonym of *P. ? trammeri trammeri* (KOZUR), but a more primitive form.

Zone. It ranges in younger beds than the top of the true *reitzi* Oppel Zone in its type area.

This explains the fact, why the *avisianum* Zone contains the same early Ladinian faunas as the *"X." reitzi* Zone of the Balaton Highland as already stated by KOZUR (1972 b and later papers). Moreover, our radiolarian data have confirmed the splendid correlations of TORNQUIST (1901) that the time-equivalents of the true *reitzi* Zone of the Balaton Highland are situated in the Southern Alps in beds not higher than the Formacione a *nodosus*.

Our radiolarian data are supported by the conodont data of MIETTO & PETRONI (1979). *Neogondolella transita* (KOZUR), primitive representatives of *P. trammeri trammeri* (KOZUR), including *Neogondolella mombergensis media* sensu MIETTO & PETRONI [non ! *N. mombergensis media* (KOZUR)] begin only 1 m above the base of the pink nodular limestone within the lower *Ladinocampe multiperforata* Zone and are not yet present in the underlying pietra verde. The same can be observed in the Felsöörs section (Balaton Highland). Both very primitive forms of *P. ? trammeri trammeri* (KOZUR) and *N. transita* (KOZUR) begin here in the lower part (but not yet in the lowermost bed) of the Nemesvámos Formation overlying here likewise pietra verde with ammonoids of the *"X." reitzi* Oppel Zone (including the index species of this zone). Like in the Southern Alps, both conodont species begin here within the lower *Ladinocampe multiperforata* Zone, whereas they are missing in the underlying *Spongosilicarmiger italicus* Zone that is well dated by ammonoids as time-eqivalent of the *"X." reitzi* Oppel Zone in the Felsöörs section. Only the highest *S. italicus* Zone is somewhat younger that the *X. reitzi* Oppel Zone.

So, we have the curious situation that some geologists in the Southern Alps accept the traditional Anisian-Ladinian boundary at the base of the *X. reitzi* Oppel Zone, but because of the assumed time-relations between the *A. avisianum*- and *X. reitzi* Zone (*reitzi* Zone is said to be younger than the *avisianum* Zone which is in reality contemporaneous to slightly younger), this boundary is placed above the true *reitzi* Zone.

Scientifically delicate are the attempts of KOVÁCS in KOVACS et al. (1990) to support the "exotic" range data of conodonts in the condensed Epidaurus sequence by changing the known conodont data from uncondensed sequences in Hungary. The Italian co-authors in KOVÁCS et al. (1990) contributed, in turn, exact data to the distribution of conodonts and ammonoids in the Southern Alps. In the well dated Stabo Freso III section *Nevadites* occurs in a single horizon. *P. ? trammeri trammeri* (KOZUR) begins in this section clearly above the appearence of *Nevadites* and not with the first appearence of this ammonoid genus as KOVÁCS tried to prove. The first appearance of *P. ? trammeri trammeri* in the Tethys is facies related in an interval from the upper part of the *"X." reitzi* Zone up to a level above the *Nevadites* fauna. True, advanced *P. ? trammeri trammeri*, like the holotype, began only in the *E. curionii* Zone. The exact total range of *Nevadites* in the Southern Alps is unknown, but generally this genus is restricted to a narrow level in uncondensed sections of Tethyan Europe. In the condensed Epidaurus section *Nevadites* s. str. is even restricted to one layer ("Hauptlager" of *Nevadites* sensu KRYSTYN, 1983), following above a thick layer of manganese oxid indicating strong condension. The few representatives of *Nevadites* above this level do not belong to *Nevadites* s. str. according to KRYSTYN (1983). In all uncondensed ammonoid-controlled sections *P. ? trammeri trammeri* (KOZUR) begins clearly above the appearence of *Nevadites* s.str. and not with the first appearence of this genus. This is confirmed by the data of the Italian co-authors in KOVÁCS et al. (1990). *Nevadites* is reported even from the *"X." reitzi* Oppel Zone of Vászoly (Balaton Highland, lecture VÖRÖS, Budapest 1990, determinations confirmed by KRYSTYN) considerably below the first appearence of *P. ? trammeri trammeri* in this section.

Against the known data (for the last time published by KOZUR, 1980) KOVÁCS (in KOVÁCS et al., 1990) placed the top of the Nemesvámos Limestone Formation in the Felsöörs sections into the Late Fassanian *E. curionii* Zone. However, as pointed out by KOZUR (1980), the uppermost beds of the Nemesvámos Formation in the Felsöörs section yielded both *Budurovignathus hungaricus* (KOZUR & VÉGH) and *B. mungoensis* (DIEBEL). This association is characteristic for the Middle Longobardian part of the *Protrachyceras archelaus* Zone. With the assignment of *B. hungaricus* into the *curionii* Zone, KOVÁCS tried to prove the data from the condensed Epidaurus section (KRYSTYN, 1983) that *B. hungaricus* began at the base of the *curionii* Zone. However, as shown in the ammonoid-bearing uncondensed section of Köveskál (Balaton Highland) the *E. curionii* Zone (with the index species *E. curionii) is characterized by B. truempyi* (HIRSCH) that is replaced near the base of the *Protrachyceras gredleri* Zone by primitive *B. hungaricus* (KOZUR & VÉGH). Joint occurrences of *B. hungaricus* (KOZUR & VÉGH) and *B. mungoensis* (DIEBEL) indicate even in the condensed Epidaurus section the presence of the *P. archelaus* Zone that is two ammonoid zones younger than the *E. curionii* Zone (see KRYSTYN, 1983).

To "prove" the simultaneous first appearence of *Nevadites* and *P. ? trammeri trammeri* (KOZUR), KOVÁCS et al. (1990) changed the taxonomy of *P. ? trammeri.* They wrote "...the holotype of their *G. praetrammeri* (see MOSTLER & KOZUR, 1982, pl. 5, Figs. 5a-b), is a true *G. trammeri* specimen ... Consequently *"G. praetrammeri"* KOZUR & MOSTLER, 1982, should be treated as a junior synonym of *G. trammeri* KOZUR, 1972." (KOVACS et al., 1990, p. 188). The quoted paper is KOZUR & MOSTLER (1982), not MOSTLER & KOZUR (1982). These authors did not introduce a species *G. praetrammeri*, but a subspecies *G. trammeri praetrammeri*.

This taxonomic revision of *P. ? trammeri praetrammeri* by KOVÁCS et al. (1990) was obviously influenced by the polemic and self-confident manner, in which KRYSTYN (1983) placed the *Parakellnerites* fauna of the Fellbach section with *P. ? trammeri praetrammeri* in the *Nevadites* fauna ("ganz sicher für die *Nevadites* Zone und keineswegs für die *Parakellnerites* Zone charakteristisch ..." KRYSTYN, 1983, p. 257). To prove the first appearence of *P. ? trammeri* with the first appearence of *Nevadites*, KOVÁCS et al. (1990) had therefore to change *P. ? trammeri praetrammeri* of the assumed *Nevadites* fauna of Fellbach in a typical *P. ? trammeri* as KRYSTYN (1983) did.

However, the Fellbach fauna is both according to the ammonoids *(Parakellnerites)* and according to the conodonts *(Paragondolella alpina = G. szaboi; P. ? trammeri praetrammeri)* a typical fauna of the *"X." reitzi* Zone. This is insofar interesting as all 3 conodonts workers (KOVÁCS, KRYSTYN, NICORA) which favours the Ladinian base with the first appearence of *P. ? trammeri trammeri* have regarded *P. ? trammeri praetrammeri* as typical *P. ? trammeri* and indicative for Ladinian (KOVÁCS et al., 1990, KRYSTYN, 1983). So, if the ammonoids seems to indicate *Nevadites* faunas of Ladinan age, these conodont workers placed the conodonts definitely in the Ladinian, even if the ammonoids belong in reality to the *"X." reitzi* Zone. We agree, of course, with the Ladinian age of the *"X." reitzi* Zone!

As authors of both *P. ? trammeri trammeri* (KOZUR, 1972) and *P. ? trammeri praetrammeri* (KOZUR & MOSTLER, 1982) we state that the first appearence of *P. ? trammeri praetrammeri* in the lower *"X." reitzi* Zone is a distinct conodont event, roughly contemporaneous with the first appearence of *Paragondolella alpina* (KOZUR & MOSTLER, 1982) (= *Gondolella szaboi* KOVÁCS, 1983)[3)] and *Neogondolella mesotriassica* (KOZUR & MOSTLER). The evolution of *P. ? trammeri trammeri* from *P. ? trammeri praetrammeri* is a minor evolutionary step within a species, unsuitable for definition of a stage boundary as well demonstrated by the misinterpretation of the latter subspecies as typical *P. ? trammeri (trammeri)* by KOVÁCS, KRYSTYN and NICORA (in KRYSTYN, 1983 and KOVÁCS et al. 1990).

Summarizing the data about the ammonoid-, conodont- and Radiolaria distribution near the Anisian-Ladinian boundary in uncondensed sequences, we point out the following:

(1) Interval between the *P. trinodosus*- and *"X." reitzi* Zone

- *Neogondolella mesotriassica* (KOZUR & MOSTLER) (= *Gondolella constricta*, morphotype γ, pars) began near the base of the *"X." reitzi* Oppel Zone. It evolved from *Neogondolella constricta* (MOSHER & CLARK). Transitional forms can be found in the *"Reiflingites" ? camunus* Subzone of the *P. trinodosus* Zone. In the same level or a little higher, *P. alpina and P. ? trammeri praetrammeri* have their first appearence.
- Drastic changes in the radiolarian faunas occurred between the top of the *Paraceratites trinodosus* Zone and the *"Xenoprotrachyceras" reitzi* Oppel Zone. Including still undescribed species more than 30 species disappeared and about 20 taxa appeared, among them decisive, easily recognizable and world-wide distributed Fassanian taxa, like the genera Oertlispongus DUMITRICĂ; KOZUR & MOSTLER, *Yeharaia* NAKASEKO & NISHIMURA, 1979, *Triassocampe deweveri* NAKSEKO & NISHIMURA, 1979, *T. scalaris* DUMITRICĂ; KOZUR & MOSTLER, 1980.

The thin, but significant ammonoid horizon with *"Reiflingites" ? camunus* between the originally defined *P. trinodosus*- Zone and *X. reitzi* Oppel Zone has yielded poor radiolarian faunas.

3) KOVÁCS (1983) selected a juvenile specimen as holotype, KOZUR & MOSTLER (1982) an adult specimen with especially strong reduction of the anterior platform. Identical juvenile forms and such slender adult forms figured by KOVÁCS (1983) as *Gondolella szaboi* are also frequent in our type material of *P. alpina.* As in our type material, *"G. szaboi"* is accompanied by *P. ? trammeri praetrammeri*, determined by KOVÁCS (1983) as *G. trammeri* n. subsp.

(2) Base of the *Nevadites* Zone

- No conodont species appears or disappears exactly in this level. *Neogondolella transita* begins somewhat later.
- The changes in the radiolarian faunas somewhat below this level are not pronounced (appearence of few species at the base of the *Ladinocampe multiperforata* Zone). The Early Fassanian guideform *Spongosilicarmiger italicus* disappeared a little later. Few changes can be also observed among the Oertlispongidae KOZUR & MOSTLER. However, Oertlispongids with differentiated polar spines, the most characteristic radiolarian group of the Ladinian, appeared near the base of the lower Subzone of the *Spongosilicarmiger italicus* Zone near the base of the *"X." reitzi* Oppel Zone. From this level all important guideforms of the Ladinian are present and all later changes in the Ladinian radiolarian faunas have only modified this Ladinian radiolarian complex, with exception of the distinct change at the base of the Longobardian *B. mungoensis* Zone.

(3) Base of the *E. curionii* Zone

- Near the base of the *E. curionii* Zone, no distinct change in the conodont fauna occurred. The first appearence of the genus *Budurovignathus* with its most primitive species, *B. truempyi* (HIRSCH) occurs within the *E. curionii* Zone.
- The rich radiolarian faunas of the *E. curionii* - and *P. gredleri* Zone are still under investigation. Their differences to the underlying faunas seem to be distinct, but no distinct changes in the radiolarian fauna occur at the base of the *E. curionii* Zone.

Regarding the radiolarian faunas, the most distinct changes occur at the base and within the lower *reitzi* Oppel Zone. With the first appearence of *"X." reitzi* in the middle part of the *reitzi* Oppel Zone a characteristic Ladinian radiolarian fauna is present, entirely different from the radiolarian fauna of the Late Anisian *Paraceratites trinodosus* Zone. Only gradual changes of this complex occurs until the base of the *Budurovignathus mungoensis* A.Z.

The *Kellnerites felsoeoersensis* subzone of the *reitzi* Oppel Zone has somewhat transitional character. The Nassellaria fauna displays already distinct Ladinian character (*Triassocampe deweveri, T. scalaris, Yeharaia annulata*). However, Oertlispongids with differentiated polar spine are still rare. According the radiolarian data either the *"X." reitzi* Zone s.l. (Oppel Zone including the Kellnerites *felsoeoersensis* subzone) or the *"X." reitzi* Zone s. str. (Oppel Zone excluding the K. felsoeoersensis Subzone starting with the appearence of *"X." reitzi* above this subzone) are most suitable for the definition of the Anisian-Ladinian boundary. The base of the *"X." reitzi* Oppel Zone is also recognizable by conodonts (KOZUR & MOSTLER, in press).

Also in the wide-spread dasycladacean limestones and -dolomites of the Tethyan carbonate platforms the *"X." reitzi* Oppel Zone is well recognizable by the first appearence of *Diplopora annulata.* For this reasons and for priority reasons the Anisian-Ladinian boundary between the *P. trinodosus* and *"X." reitzi* Zone is here favoured.

IV. 2. Radiolarian zonation of the Triassic

The assumed oldest Triassic radiolarians have been reported by SASHIDA (1983). They were obtained from an olistolith or tectonic block in a Jurassic olistostrome or tectonic melange. The Scythian age was assumed on the base of the conodont *Neospathodus* sp. However, the genus *Neospathodus* is still frequent in the lower part of the Early Anisian. So, the age of this fauna cannot be given more precisely than Scythian to Early Anisian. So far, only the spicular radiolarians of this fauna have been described (*Archaeosemantis venusta* SASHIDA, 1983 and *Parentactinia nakatsugawaensis* SASHIDA, 1983). According to the data by SASHIDA (1983), Nassellaria are seemingly missing from this fauna.

MARSELLA, KOZUR & D'ARGENIO (in press) found a latest Olenekian (latest Scythian) radiolarian fauna in the Lagonegro Basin of Southern Italy. This fauna is well dated by the conodonts *Neospathodus homeri* (BENDER), *N. triangularis* (BENDER), *Gladigondolella* cf. *tethydis* (HUCKRIEDE), transitional forms to *G. carinata* (BENDER). The radiolarian fauna of these beds consists exclusively of Entactinaria and Spumellaria. The description of this fauna is in preparation.

The oldest well described, but not diverse radiolarian fauna was found in the Pelsonian of the Alps (KOZUR & MOSTLER, 1981). Immediately underlying beds have yielded a Pelsonian conodont fauna with *Nicoraella germanica* (KOZUR), *N. kockeli* (TATGE) and *Neogondolella bulgarica* BURDUROV & STEFANOV, overlying beds contain an Early Illyrian conodont fauna with *Paragondolella bifurcata* BUDUROV & STEFANOV without *N. bulgarica* BUDUROV & STEFANOV. The radiolarian-bearing horizon themselves yielded only a few, stratigraphically unspecific conodonts.

Also this radiolarian fauna (for which here the *Parasepsagon robustus* Zone is introduced) consists of Entactinaria and Spumellaria, whereas Nassellaria are missing. However, this absence of Nassellaria is surely facies-controlled, because in the Late Illyrian already very diverse Nassellaria associations are known and in the Pelsonian of Romania monocyrtid and multicyrtid Nassellaria are known (DUMITRICĂ, 1982b[4]). Despite the fact that the radiolarian-bearing deposits contain a pelagic conodont fauna, the low diversity of the radiolarian fauna indicates rather shallow depositional water depth.

Parasepsagon robustus Zone

Definition: Joint occurrence of *Parasepsagon robustus* KOZUR & MOSTLER, 1981, *P. asymmetricus asymmetricus* KOZUR & MOSTLER, 1981 and *Plafkerium ? anisicum* KOZUR & MOSTLER, 1981.
Lower boundary: Not yet fixed, because the underlying beds have not yielded radiolarians. However, in the latest Scythian none of the above mentioned species are present. *Pentaspongodiscus anisicus* KOZUR & MOSTLER, 1981 which is frequent in the *P. robustus* Zone, is missing in the latest Scythian radiolarian faunas as well.
Upper boundary: Disappearence of *Parasepsagon robustus* KOZUR & MOSTLER, 1981, *P. asymmetricus asymmetricus* KOZUR & MOSTLER, 1981 and *Plafkerium ? anisicum* KOZUR & MOSTLER, 1981. First appearence of *Parasepasagon asymmetricus praetetracanthus* n. subsp., *Tiborella anisica* n. sp. and of first primitive representatives of the genus *Triassocampe* DUMITRICĂ; KOZUR & MOSTLER, 1980.
Type locality: Großreifling, Austria.
Distribution: Until now only known from the Alps. Similar, largely undescribed faunas are known from the Pelsonian of the Balaton Highland (Hungary) and of Romania.
Remarks: The Late Illyrian radiolarian fauna of the Balaton Highland and of the Lagonegro Basin (southern Italy) is by far richer in species. Therefore the first appearence of more than 50 taxa in the Late Illyrian reflects to a large part the insufficient knowledge of the older faunas. Therefore only the disappearence of *Parasepsagon robustus* KOZUR & MOSTLER, 1981, *P. asymmetricus asymmetricus* KOZUR & MOSTLER, 1981 and *Plafkerium ? anisicum* KOZUR & MOSTLER, 1981 and the first appearence of *Parasepsagon asymmetricus praetetracanthus* n. subsp. in the overlying Late Illyrian *Tetraspinocyrtis laevis* Zone can be used for the moment to differentiate these two faunas. The latter subspecies is a transitional form between *P. asymmetricus asymmetricus* KOZUR & MOSTLER, 1981 from the *Parasepsagon robustus* Zone to the Early Ladinian *P. tetracanthus* DUMITRICĂ ; KOZUR & MOSTLER, 1980. The rare occurrence and the very primitive character of the first representatives of the genus *Triassocampe* DUMITRICĂ; KOZUR & MOSTLER, 1980 in the Late Illyrian *Tetraspinocyrtis* laevis Zone indicate that this genus may not yet be present in the time-interval of the *P. robustus* Zone.

Tetraspinocyrtis laevis Zone

Definition: Joint occurrence of several *Tetraspinocyrtis* species (*T. anisica* n. sp., *T. annuloperforata* n. sp., *T. laevis* n. sp.), *Hozmadia rotunda* (NAKASEKO & NISHIMURA, 1979) and *Tiborella anisica* n. sp. together with dominating Entactinaria (especially frequent *Parasepsagon* DUMITRICĂ, 1978, and *Pseudosepsagon* n. gen.), frequent and divers *Archaespongoprunum* (Spumellaria) and - for the first time in the radiolarian history - with a rich and highly diversified Nassellaria fauna, dominated by primitive monocyrtid forms, and among the multicyrtid forms by diverse species of *Planispinocyrtis* KOZUR & MOSTLER, 1981, several species of *Tetraspinocyrtis*, n. gen., primitive representatives of *Anisicyrtis* KOZUR & MOSTLER, 1981, *Silicarmiger* DUMITRICĂ; KOZUR & MOSTLER, 1980 and *Spongosilicarmiger* KOZUR, 1984.
Lower boundary: Disappearence of *Parasepsagon asymmetricus asymmetricus* KOZUR & MOSTLER, *P. robustus* KOZUR & MOSTLER, 1981 and *Plafkerium ? anisicum* KOZUR & MOSTLER, 1981. First appearence of *Parasepsagon asymmetricus praetetracanthus* n. subsp., *Tiborella anisica* n. sp. and of first primitive representatives of the genus *Triassocampe* DUMITRICĂ; KOZUR & MOSTLER, 1980.
Upper boundary: Disappearence of *Tiborella anisica* n. sp. and of several primitive representatives of the Entactinaria and of the Nassellaria. First appearence of the typical Early Fassanian Nassellaria association with the genera Oertlispongus DUMITRICĂ; KOZUR & MOSTLER, 1980, *Yeharaia* NAKASEKO & NISHIMURA, 1979 and with diverse *Triassocampe* species among them the most characteristic Fassanian species *T. deweveri* (NA-

[4]) An Illyrian age cannot be excluded for this fauna.

KASEKO & NISHIMURA, 1979) and *T. scalaris* DUMITRICĂ; KOZUR & MOSTLER, 1980.

Important species: More than 30 important and often frequent species and subspecies have been described in the present paper from the type locality Felsöörs (see taxonomic part). Additionally the following former described species are present: *Archaeospongoprunum bispinosum* KOZUR & MOSTLER, 1981, *A. mesotriassicum asymmetricum* KOZUR & MOSTLER, 1981, *A. mesotriassicum mesotriassicum* KOZUR & MOSTLER, 1981, *Parentactinia pugnax* DUMITRICĂ, 1978, *Pentactactinorbis awaensis* (NAKASEKO & NISHIMURA, 1979), *Pseudostylosphaera coccostyla compacta* (NAKASEKO & NISHIMURA, 1979), *Anisicyrtis hungarica* KOZUR & MOSTLER, 1981, *Baratuna excentrica* KOZUR & MOSTLER, 1981, *Eonapora robusta* KOZUR & MOSTLER, 1981, *Eptinigum manfredi japonicum* (NAKASEKO & NISHIMURA, 1979), *Goestlingella anisica* KOZUR, 1984, *Hozmadia rotunda* (NAKASEKO & NISHIMURA, 1979), *Nabolella illyrica* (KOZUR & MOSTLER, 1981), *Neopylentonema mesotriassica* KOZUR, 1984, *Planispinocyrtis baloghi* KOZUR & MOSTLER, 1981, *Silicarmiger costatus anisicus* KOZUR & MOSTLER, 1981, *Spinotriassocampe hungarica* KOZUR, 1984, *Triassobipedis balatonica* KOZUR, 1984.

Type locality: Forráshegy section of Felsöörs, Balaton Highland (Hungary). Radiolarians of the *Tetraspinocyrtis laevis* Zone were found in the beds 85–90, rarely in beds 91–99; especially well preserved forms occur in the limestone bed 87 inside a tuffitic layer. This bed contain all hitherto described about 50 species of the *T. laevis* Zone, some of which are also known from the Lagonegro Basin (southern Italy) and from Japan.

Age: The age of the *T. laevis* Zone from the Felsöörs section is well controlled by ammonoids. The present ammonoids, including *Paraceratites trinodosus*, the index species of the *trinodosus* Zone, are listed in KOZUR (1970). The same horizon contains also some conodonts, exclusively *Neogondolella cornuta* BUDUROV & STEFANOV and very rich paleopsychrospheric ostracod faunas (KOZUR, 1970). In the Lagonegro Basin, the *T. laevis* Zone occurs in beds that can be placed by conodonts into the *Neogondolella constricta* A.Z. which corresponds to the *Paraceratites trinodosus* Zone according to KOZUR (1980).

Distribution: Balaton Highland (Hungary), Lagonegro Basin (southern Italy), Japan, Philippines.

Remarks: The *Tetraspinocyrtis laevis* Zone is the oldest known highly divers Triassic radiolarian fauna. Including the here described new species, so far about 50 species have been described from this Late Illyrian fauna and the description of further taxa is in press.

The richest association from the Forráshegy section of Felsöörs (Balaton Highland, Hungary) contains all species, so far known from this zone. The high diversity (nearly 80 species) in bed 87 (see fig. 3) and the presence of many Nassellaria taxa indicate rather great water depth. This is also indicated by the very rich paleopsychrospheric ostracod fauna from the same stratigraphic level of this section. They indicate water depth below 500 m (KOZUR, 1972c, 1991).

The highly interesting *Tetraspinocyrtis* species, by DEWER et al. (1990) misinterpreted in the Lagonegro Basin as Permian Albaillellacea (see taxonomic part), yielded a good link of the Balaton Highland Late Illyrian radiolarian fauna with contemporaneous associations in the Lagonegro Basin.

Eptingium manfredi japonicum (NAKASEKO & NISHIMURA, 1979), *Pentactinorbis awaensis* (NAKASEKO & NISHIMURA, 1979) *Pseudostylosphaera coccostyla compacta* (NAKASEKO & NISHIMURA, 1979) and *Hozmadia rotunda* (NAKASEKO & NISHIMURA, 1979) indicate the presence of the *T. laevis* Zone in the Late Illyrian of Japan. These Japanese radiolarian fauna and also Early and Late Ladinian faunas of the same region have been erroneously placed into the Late Triassic by NAKASEKO & NISHIMURA (1979). Especially important in the Late Illyrian radiolarian fauna of Japan is the frequent *Hozmadia rotunda* (NAKASEKO & NISHIMURA, 1979) that is restricted to the *T. laevis* Zone. *Eptingium manfredi japonicum* (NAKASEKO & NISHIMURA, 1979) and *Pentactinorbis awaensis* (NAKASEKO & NISHIMURA, 1979) may be also restricted to this zone.

Many Nassellaria of the *T. laevis* Zone are primitive monocyrtid forms (8 of 18 known genera of this zone). The more advanced monocyrtid genus *Sanfilippoella* KOZUR & MOSTLER, 1979 is only present by a rare and primitive species.

The multicyrtid Nassellaria are mostly represented by primitive forms. For instance, the genus *Triassocampe* DUMITRICĂ; KOZUR & MOSTLER, 1980 s. str., with several species the most characteristical and frequent Nassellaria genus of the Early Ladinian, is in the *T. laevis* zone very rare and only represented by one primitive species. Also the most other multicyrtid genera are only represented by one species (e. g. *Goestlingella* KOZUR & MOSTLER, 1979, *Nabolella* PETRUŠHEVSKAJA, 1980, *Spinotriassocampe* KOZUR, 1984, *Annulotriassocampe* KOZUR, n. gen.), mostly distinctly more primitive than the Ladinian representatives of the same genera.

Two or more species are present among the multicyrtid genera *Anisicyrtis* KOZUR & MOSTLER, 1981, *Planispinocyrtis* KOZUR & MOSTLER, 1981, *Paratriassocampe* n. gen. und *Tetraspinocyrtis* n. gen. The latter genus represents primitive Nassellaria with mostly indistinct outer and inner segmentation. In the Early Ladinian only one rare species of this genus is present, before it finally disappeared. The three other genera are represented in the Ladinian by several, but more advanced species.

The rich Entactinaria fauna of the Late Illyrian *T. laevis* Zone is rather different from the likewise rich Ladinian Entactinaria fauna. *Pentactinocarpus* DUMITRICĂ, 1978 and the advanced Entactinaria families Eptingiidae DUMITRICĂ, 1978 and Hindeosphaeridae KOZUR & MOSTLER, 1981 are only represented by few species: very rare *Pentactinocarpus illyricus* n. sp., very rare *Eptingium manfredi japonicum* (NAKASEKO & NISHIMURA, 1979), very rare *E. nakasekoi* n. sp., rare *Hindeosphaera balatonica* n. sp., partly frequent *Pseudostylosphaera coccostyla* compacta (NAKASEKO & NISHIMURA, 1979). In the Early Ladinian *Spongosilicarmiger italicus* Zone these genera are frequent and represented by numerous species. On the other hand, *Parentactinia* DUMITRICĂ, 1978 and *Pentactinorbis* DUMITRICĂ, 1978, rare in the Early Ladinian, are frequent in the Late Anisian *T. laevis* Zone and represented there by several species.

Only *Parentactinia pugnax* DUMITRICĂ, 1978 ranges from the Late Anisian to the Early Ladinian. All other Illyrian species or subspecies of the genera *Eptingium* DUMITRICĂ, 1979, *Hindeosphaera* KOZUR & MOSTLER, 1979, *Parentactinia* DUMITRICĂ, 1978, *Pentactinocarpus* DUMITRICĂ, 1979, *Pentactinorbis* DUMITRICĂ, 1978 and *Pseudostylosphaera* KOZUR & MOSTLER, 1981 disappeared at the top of the Late Anisian *Paraceratites trinodosus* Zone or they have been replaced by other species in the *"X." reitzi* Oppel Zone.

The Illyrian genus *Pseudosepsagon* n. gen. is not more present in the Fassanian *"X." reitzi* Oppel Zone, whereas *Sepsagon* DUMITRICĂ; KOZUR & MOSTLER, 1980 (very frequent in the Ladinian and Carnian) is not yet present in the Late Illyrian *T. laevis* Zone.

Parasepsagon is both in the Late Anisian and in the Early Ladinian frequent, but represented by different species in these substages.

Spongosilicarmiger italicus Zone

Definition: Occurrence of *Spongosilicarmiger* KOZUR, 1984 without *Ladinocampe multiperforata* KOZUR, 1984. Common occurrence of *Triassocampe deweveri* (NAKASEKO & NISHIMURA, 1979), *T. scalaris* DUMITRICĂ; KOZUR & MOSTLER, 1980 and other species of the genus *Triassocampe* s. str. as well as of the genera Oertlispongus DUMITRICĂ; KOZUR & MOSTLER and *Yeharaia* NAKASEKO & NISHIMURA, 1979. With exception of the lower subzone frequent occurrence of Oertlispongidae, Gomberellidae (with primitive respresentatives rarely present since the Late Anisian) and Intermediellidae.

Lower boundary: First appearence of *Spongosilicarmiger italicus* KOZUR, 1984, *Triassocampe deweveri* (NAKASEKO & NISHIMURA, 1979), *T. scalaris* DUMITRICĂ; KOZUR & MOSTLER, 1980, *Yeharaia annulata* (NAKASEKO & NISHIMURA, 1979), *Oertlispongus* sp.

Upper boundary: First appearence of *Ladinocampe multiperforata* KOZUR, 1984, advanced species of *Anisicyrtis* (*A. alpina* n. sp., *A. nodosa* n. sp., *A. spinosa* n. sp., *A. trettoensis* n. sp.) and of *Planispinocyrtis multiporata* n. sp.

Important species: See under the subzones.

Type locality: Passo della Gabiola section, Vicentinian Alps (Italy). Samples MD 1-MD 28 (see fig. 6). In this section the middle and upper subzone of the *S. italicus* Zone are exposed and documented by mass occurrences of well preserved radiolarians in all layers.

Age: Early Fassanian *"X." reitzi* Oppel Zone, well dated in the Felsöörs section. The uppermost part of the *S. italicus* Zone is a little younger than the *"X." reitzi* Oppel Zone.

Distribution: Worldwide.

Remarks: The index species *S. italicus* KOZUR, 1984 ranges a little into the overlying *Ladinocampe multiperforata* Zone.

The *S. italicus* Zone, especially its upper subzone, yielded worldwide very rich and diverse radiolarian faunas with many distinctive Spumellaria, Entactinaria and Nassellaria species. This fauna is very different from the radiolarian associaton of the underlying *T. laevis* Zone from the Late Illyrian (in the sense of the *Paraceratites trinodosus* Zone).

The *S. italicus* Zone can be well correlated with the ammonoid zonation in the Felsöörs section (Balaton Highland, Hungary). The *"X." reitzi* Oppel Zone (type locality in this section) and the *S. italicus* Zone are almost perfectly contemporaneous. Only the topmost part of the *S. itali-*

cus Zone is younger than the *X. reitzi* Oppel Zone. The overlying *Ladinocampe multiperforata* Zone begins in the Felsöörs section somewhat below the base of the *Neogondolella transita* conodont zone a little after the top of the *"X." reitzi* Oppel Zone. By conodont control, exactly the same upper range (somewhat below the base of the *N. transita* Zone) is indicated in the Southern Alps.

The lower subzone of the *S. italicus* Zone is not documented by radiolarians in the Vicentinian Alps (Southern Alps), because its time-equivalents are here situated within the radiolarian-free Mte. Spitz Limestone (shallow-water limestone) or in a gap above the Mte. Spitz Limestone. Therefore the boundary stratotype for the lower boundary of the *S. italicus* Zone should be in the Felsöörs section (Balaton Highland, Hungary), where not only the basal Fassanian lower Subzone of the *S. italicus* Zone, but also the underlying Late Illyrian *T. laevis* Zone are well documented by rich, excellently preserved radiolarian faunas. In this section the lower and upper Subzones of the *S. italicus* Zone are well documented, whereas the middle subzone yielded only rather poor radiolarian faunas. Because well preserved radiolarians are in the Felsöörs section during the lower part of the Early Ladinian restricted to the subordinate limestone beds within the predominant pietra verde deposits, the Passo della Gabiola section (Vicentinian Alps) is better suitable as stratotype for the *S. italicus* Zone than the Felsöörs section (Balaton Highland).

Lower Subzone of the *Spongosilicarmiger italicus* Zone (*Spongosilicarmiger italicus transitus* Subzone)

Definition: Occurrence of *Spongosilicarmiger italicus transitus* n. subsp. together with *Triassocampe deweveri* (NAKASEKO & NISHIMURA, 1979). *T. kahleri* n. sp., *T. scalaris baloghi* n. subsp., *T. scalaris scalaris* DUMITRICĂ; KOZUR & MOSTLER, 1980 and *Yeharaia annulata* NAKASEKO & NISHIMURA, 1979. Oertlispongidae with differentiated polar spines are rare and Interdiellidae not yet present.

Lower boundary: First appearence of *Spongosilicarmiger italicus transitus* n. subsp., *Paratriassocampe postornata* n. sp., *Triassocampe deweveri* (NAKASEKO & NISHIMURA, 1979), *T. kahleri* n. sp., *T. scalaris baloghi* n. subsp., *T. scalaris scalaris* DUMITRICĂ; KOZUR & MOSTLER, 1980 and *Yeharaia annulata* NAKASEKO & NISHIMURA, 1979.

Upper boundary: First appearence of *Oertlispongus primitivus* n. sp. (and of other *Oertlispongus* species), *Baumgartneria bifurcata* DUMITRICĂ, 1982 and of *Spongosilicarmiger italicus italicus* KOZUR, 1984.

Important species: *Paratriassocampe postornata* n. sp., *Spongosilicarmiger italicus transitus* n. subsp., *Triassocampe deweveri* (NAKASEKO & NISHIMURA, 1979), *T. kahleri* n. sp., *T. scalaris baloghi* n. subsp., *T. scalaris scalaris* DUMITRICĂ; KOZUR & MOSTLER, 1980, *Yeharaia annulata* NAKASEKO & NISHIMURA, 1979.

Type locality: Forráshegy section of Felsöörs (Balaton Highland, Hungary). Lower part of the Buchenstein Formation (pietra verde with few limestone intercalations) up to limestone bed 100 (see fig. 3).

Age: *Kellnerites felsoeoersensis* Subzone of the *"X." reitzi* Oppel Zone. Well dated by ammonoids in the Felsöörs section and by conodonts in the Buchberg section near Göstling.

Distribution: Austria, Balaton Highland (Hungary), Lagonegro Basin (southern Italy), Japan, Philippines.

Remarks: By the presence of *Oertlispongus* sp., *Spongosilicarmiger italicus* KOZUR, 1984, *Triassocampe deweveri* (NAKASEKO & NISHIMURA, 1979), *T. scalaris* DUMITRICĂ; KOZUR & MOSTLER, 1980 and *Yeharaia annulata*, the *S. italicus transitus* Subzone is clearly connected to the remaining part of the *S. italicus* Zone. *S. italicus transitus* n. subsp. is a transitional form between the Late Illyrian *S. priscus* n. sp. and the Fassanian *S. italicus* KOZUR, 1984. It is closer related to the latter species. *T. deweveri* (NAKASEKO & NISHIMURA, 1979), *T. scalaris* DUMITRICĂ; KOZUR & MOSTLER, 1980 and *Yeharaia annulata* NAKASEKO & NISHIMURA, 1979 belong to the most characteristical, most frequent and widest distributed Fassanian radiolarian species. Oertlispongus DUMITRICĂ; KOZUR & MOSTLER is the most characteristic Ladinian radiolarian genus.

There are only few long-ranging species in common with the Late Anisian *T. laevis* Zone, but they are generally also present in the higher part of the *S. italicus* Zone or even in the Middle Fassanian *L. multiperforata* Zone, like *Parentactinia pugnax* DUMITRICĂ, 1978, *Triassobipedis balatonica* KOZUR, 1984 and primitive representatives of *Annulotriassocampe* KOZUR, n. gen.

Most of the frequent Spumellaria and Entactinaria of the *S. italicus transitus* subzone cannot yet been used for stratigraphic purposes, because their detailed description is not yet possible (insufficient knowledge of their inner structures). Most of them have a long stratigraphic range throughout the Ladinian and partly Anisian and/or Late Triassic, but this range may be drastically reduced after better knowledge of possibly different inner structures. However, the first appearance of the genus *Oertlispongus* is an important stratigraphic marker. This genus begins in the Buchberg section near Göstling, Austria (published in a separate paper) together with the first Ladinian conodonts *Neogondolella mesotriassica* (KOZUR & MOSTLER), *N. balcanica* BUDUROV & STEFANOV and *N. longa* BUDUROV & STEFANOV that appear in the Felsöörs section and in the Southern Alps at the base of the *Kellnerites felsoeoerensis* Subzone of the *reitzi* Zone. *Oertlispongus* n.sp. is the most primitive *Oertlispongus* species transitional to the forerunner genus from the *P. trinodosus* Zone, but already a typical *Oertlispongus* with slightly curved to slightly recurved distal part of the main spine.

Middle subzone of the *Spongosilicarmiger italicus* Zone (*Oertlispongus primitivus* Subzone)

Definition: Joint occurrence of *Spongosilicarmiger italicus italicus* KOZUR, 1984 with *S. gabiolaensis* n. sp., primitive *Oertlispongus* species (*O. aspinosus* n. sp., *O. bispinosus* n. sp., *O. primitivus* n. sp.), without *Oertlispongus inaequispinosus inaequispinosus* DUMITRICĂ; KOZUR & MOSTLER, 1980.

Lower boundary: First appearence of *Spongosilicarmiger italicus italicus* KOZUR, 1984, *S. gabiolaensis* n. sp., *Oertlispongus primitivus* n. sp. (and other primitive *Oertlispongus* species), *Baumgartneria bifurcata* DUMITRICA, 1982, *B. recurvata* DUMITRICĂ, 1982.

Upper boundary: Disappearence of *Spongosilicarmiger gabiolaensis* n. sp. First appearence of *Oertlispongus inaequispinosus inaequispinosus* DUMITRICĂ; KOZUR & MOSTLER, 1980 and of *Falcispongus falciformis* DUMITRICĂ, 1982.

Important species: Most species of this subzone are new (see taxonomic part). Most important among these species are *Spongosilicarmiger gabiolaensis* n. sp. (frequent and restricted to this subzone) and primitive *Oertlispongus* species (frequent and very characteristic for this subzone; partly restricted to it).

Important representatives of the *O. primitivus* Subzone among the formerly described species are: *Baumgartneria bifurcata* DUMITRICĂ, 1982, *B. retrospinosa* DUMITRICĂ, 1982, *B. stellata* DUMITRICĂ, 1982, *Falcispongus calcaneus* DUMITRICĂ, 1982, *Eptingium manfredi manfredi* DUMITRICĂ, 1978, *Pentactinocarpus fusiformis* DUMITRICĂ, 1978, *Tiborella magnidentata* DUMITRICĂ; KOZUR & MOSTLER, 1980, *Hozmadia reticulata* DUMITRICĂ; KOZUR & MOSTLER, 1980, *Spongosilicarmiger italicus* KOZUR, 1984, *Triassocampe deweveri* (NAKASEKO & NISHIMURA, 1979), *T. scalaris* DUMITRICĂ; KOZUR & MOSTLER, 1980, *Yeharaia annulata* NAKASEKO & NISHIMURA, 1979.

All these species are also present in the upper Subzone of the *S. italicus* Zone, several species also in the lower Subzone of this Zone, some range up to the Middle Fassanian *Ladinocampe multiperforata* Zone or even to stratigraphically still younger levels.

Type locality: Passo della Gabiola section, Vicentinian Alps (Italy). Samples MD 1 - MD 20 (see fig. 6).

Age: In the Öfenbach section (Austria) this fauna begins according to the condont fauna in the middle part of the "*X.*" *reitzi* Oppel Zone (sample OB 45, situated 6,50 m above the Illyrian crinoid sparites). In the Felsöörs section the *O. primitivus* Subzone begins in the middle part of the *reitzi* Oppel Zone documented by ammonoids and conodonts. There it ends within the upper "*X.*" *reitzi* Oppel Zone.

Distribution: Austria, Balaton Highland (Hungary), Romania, Yugoslavia, Italy, Japan, Philippines.

Remarks: Within this Subzone still further subdivisions are possible. In its lowermost part *Poulpus curvispinus praecurvispinus* n. subsp. occurs (in the type locality in samples MD 1-MD 6, see fig. 6). Above this horizon, only *P. curvispinus curvispinus* DUMITRICĂ; KOZUR & MOSTLER, 1980 is present. Still higher *Baumgartneria trifurcata* n. sp. and *Oertlispongus inaequinosus longispinosus* n. subsp. appear. So, at least 3 slightly different associations can be observed within the *O. primitivus* Subzone.

Upper subzone of the *Spongosilicarmiger italicus* Zone (*Oertlispongus inaequispinosus* Subzone)

Definition: Joint occurrence of *Spongosilicarmiger italicus* KOZUR, 1984, *Oertlispongus inaequispinosus inaequispinosus* DUMITRICĂ; KOZUR & MOSTLER, 1980 and primitive *Falcispongus falciformis* DUMITRICĂ, 1982 without *Ladinocampe multiperforata* KOZUR, 1984.

Lower boundary: Disappearence of *Spongosilicarmiger gabiolaensis* n. sp.; appearence of *Oertlispongus inaequispinosus inaequispinosus* DUMITRICĂ; KOZUR &

MOSTLER, 1980 and of primitive representatives of *Falcispongus falciformis* DUMITRICĂ, 1982.

Upper boundary: Appearence of *Ladinocampe multiperforata*, KOZUR, advanced species of *Anisicyrtis* (*A. alpina* n. sp., *A. nodosa* n. sp., *A. spinosa* n. sp., *A. trettoensis* n. sp.) and *Planispinocyrtis multiporata* n. sp.

Important species: Some stratigraphic important new species of the *O. inaequispinosus* Subzone have been described in the present paper (see taxonomic part), but most of the species of this subzone have been already described in previous papers. All species described by DUMITRICĂ (1978 a, b), DUMITRICĂ; KOZUR & MOSTLER, 1980 as well as all species, described from sample VCB in KOZUR & MOSTLER (1981), all species reported by LAHM (1984) from the upper third of the Passo della Gabiola section and most species reported by GORIČAN (1990) from the Early Fassanian of Yugoslavia are derived from the upper Subzone of the *S. italicus* Zone or are also present in this subzone. Additionally, *Baumgartneria bifurcata* DUMITRICĂ, 1982, *B. retrospinosa* DUMITRICĂ, 1982, *B. stellata* DUMITRICĂ, 1982, *Falcispongus calcaneus* DUMITRICĂ, 1982 and primitive representatives of *F. falciformis* DUMITRICĂ, 1982 are rather frequent in this Subzone.

Type locality: Passo della Gabiola section (Vicentinian Alps, Italy), samples MD 21-MD 28 (see fig. 6).

Age: The *O. inaequispinosus* Subzone of the *S. italicus* Zone can be well dated by ammonoids in the Felsöörs section (Balaton Highland, Hungary). It corresponds here to the upper part of the "*X.*" *reitzi* Oppel Zone and to the basal part of the overlying Nemesvámos Limestone Formation before the first appearence of *Neogondolella transita* (KOZUR & MOSTLER).

Distribution: Worldwide. One of the best described Triassic radiolarian faunas of the world.

Remarks: None of numerous species of the *O. inaequispinosus* Subzone of the S. italicus Zone are restricted to this subzone. Despite this fact, the *O. inaequispinosus* Subzone can be well distinguished both from the underlying *O. primitivus* Subzone and from the overlying *Ladinocampe multiperforata* Zone. The majority of the species is identical with the middle and partly also with the lower Subzone of the *S. italicus* Zone. Some of these species disappeared at the top of the *O. inaequispinosus* Subzone (= top of the *S. italicus* Zone). On the other hand, all species that appeared at the base or inside the *O. inaequispinosus* Subzone continue into the overlying *Ladinocampe multiperforata* Zone, e.g. *Oertlispongus inaequispinosus inaequispinosus* DUMITRICĂ; KOZUR & MOSTLER, 1980 and *Falcispongus falciformis* DUMITRICĂ, 1982. Also many other species, known since the lower and middle subzone of the *S. italicus* Zone, continue into the *Ladinocampe multiperforata* Zone. However, this zone is distinguished from the upper Subzone of the *S. italicus* Zone by the first appearence of some species, e.g. *Ladinocampe multiperforata* KOZUR, 1984, advanced species of *Anisicyrtis* KOZUR & MOSTLER, 1981 and of *Planispinocyrtis* KOZUR & MOSTLER, 1981.

Within the upper Subzone of the *S. italicus* Zone a further detailed subdivision is possible, e.g. by the development within the genus *Oertlispongus* DUMITRICĂ; KOZUR & MOSTLER, 1980. In the lower part of the *O. inaequispinosus* Subzone (samples MD 21-MD 24 in the Passo della Gabiola type section, see fig. 6) primitive *Oertlispongus* species and *O. inaequispinosus longispinosus* n. subsp. are still present beside the advanced, increasingly frequent *O. inaequispinosus inaequispinosus* DUMITRICĂ; KOZUR & MOSTLER, 1980. Then an interval follows, where the only representative of the genus *Oertlispongus* is *O. inaequispinosus inaequispinosus* DUMITRICĂ; KOZUR & MOSTLER, 1980 and in the topmost part of this Subzone additionally *O. inaequispinosus tumidospinus* n. sp. is present. Similar subdivisions are possible by evaluation of the phylomorphogenetic development within a few other genera.

If the radiolarian faunas are very rich, the evaluation of the phylomorphogenetic lines within some spumellarian and nassellarian genera allows in this time-interval nearly a bed by bed correlation of different South Alpine sections, but also of these sections with sections in the Balaton Highland. For instance, the samples MD 26, MD 27 of the type locality Passo della Gabiola (see fig. 6) with mass occurrences of *O. inaequispinosus inaequispinosus* DUMITRICĂ; KOZUR & MOSTLER, 1980 without other *Oertlispongus* species corresponds to the sample VCB (Val di Creme), TT 1 (road cut between San Ulderico and Pallé, see fig. 5), sample FD 1 (section No. 2 of the Mte. Fallison outcrops, see fig. 7) and samples FD 5-7 (section Nr. 3 of the Mte. Fallison outcrops, see fig. 7). More than 50 identical species are present in all these samples, some of them are not known from the under- and overlying beds that contain also some species not present in the mentioned samples.

The stratigraphic level of samples MD 21-22 of the Passo della Gabiola section (see fig. 6) corresponds to the stratigraphic level of sample FÖ 110 of the Felsöörs section in the Balaton Highland (see fig. 3). Below this horizon *O. inaequispinosus inaequispinosus* DUMITRICĂ; KOZUR & MOSTLER, 1980 is not yet present, above it this subspecies is dominant and a little higher all less advanced species and subspecies of *Oertlispongus* DUMITRICĂ; KOZUR & MOSTLER, 1980 disappeared.

Ladinocampe multiperforata Zone

Definition: Occurrence of *Ladinocampe multiperforata* KOZUR, 1984, advanced *Anisicyrtis* species (*A. alpina* n. sp., *A. nodosa* n. sp., *A. spinosa* n. sp., *A. trettoensis* n. sp.) and *Planispinocyrtis multiporata* n. sp.

Lower boundary: First appearence of *Ladinocampe multiperforata* KOZUR, 1974, advanced *Anisicyrtis* species (*A. alpina* n. sp., *A. nodosa* n. sp., *A. spinosa* n. sp., *A. trettoensis* n. sp.) and of *Planispinocyrtis multiporata* n. sp.

Upper boundary: Not yet definitely fixed, but within the *E. curionii* ammonoid zone several species appeared that have to be still described (KOZUR & MOSTLER, in press). To avoid the use of nomina nuda, the final definition of the upper boundary of the *L. multiperforata* Zone will be given only in this forthcoming paper.

From previously described taxa, the genus *Hungarosaturnalis* KOZUR & MOSTLER, 1983 appeared in the overlying radiolarian zone, but remains rare until the base of the *Muelleritortis cochleata* Zone (Middle and Late Longobardian).

Important species: Most species of the upper subzone of the underlying *Spongosilicarmiger italicus* Zone continue into the *Ladinocampe multiperforata* Zone. Among the frequent and distinct species of the upper *S. italicus* Zone only the following species disappeared near the base of the *L. multiperforata* Zone: *Spongosilicarmiger italicus* KOZUR, 1984 (still rarely present in the lower part of the *L. multiperforata* Zone), *Baumgartneria bifurcata* DUMITRICĂ, 1982, *B. stellata* DUMITRICĂ, 1982, and *B. trifurcata* DUMITRICĂ, 1982.

Some species appeared at the base and inside the *L. multiperforata* Zone (see taxonomic part) which allow a distinction to the underlying zone. The frequency of other species, like *Oertlispongus inaequispinosus* DUMITRICĂ; KOZUR & MOSTLER, 1980 has considerably dropped within the *L. multiperforata* Zone.

Type locality: Road cut between San Ulderico and Pallé (Vicentinian Alps, Italy), interval from samples TT 3 - TT 18 (see fig. 5).

Age: Interval between the *"Xenoprotrachyceras" reitzi* Oppel Zone and the upper *Eoprotrachyceras curionii* Zone (only the very base of this interval belongs to the uppermost part of the underlying *S. italicus* Zone).

Radiolarians of the *L. multiperforata* Zone begin in the Felsöörs section (Balaton Highland, Hungary) somewhat below the base of the *Neogondolella transita* Zone a little above the top of the ammonoid faunas of the *"X." reitzi* Oppel Zone. In the Köveskál section (Balaton Highland, Hungary), the *L. multiperforata* Zone ends below the ammonoid- and conodont-proven upper *E. curionii* Zone with *Budurovignathus truempyi*. The lower boundary of the *L. multiperforata* Zone can not be defined in this section because of the bad outcrop conditions below the upper Fassanian.

In the type locality of the *L. multiperforata* Zone (see above) the very rich and well-preserved radiolarian fauna of this zone occurs in conodont-bearing limestones that can be placed in the *Neogondolella transita* Zone. They contain *N. transita* (KOZUR & MOSTLER) and primitive representatives of *Paragondolella ? trammeri trammeri* (KOZUR). Only in the lowermost 80 cm of the *L. multiperforata* Zone these conodonts are still missing. Because this conodont fauna, accompanied by the radiolarian fauna of the *L. multiperforata* Zone, begins in the Felsöörs section a little above the top of the *X. reitzi* Oppel Zone and ends in the Köveskál section below the ammonoid- and conodont- proven upper *E. curionii* Zone, both the *N. transita* Zone and the *L. multiperforata* belong to the interval between the *"X." reitzi* Oppel Zone and the upper *E. curionii* Zone.

Remarks: In the lower part of the *L. multiperforata* Zone, *Spongosilicarmiger italicus* KOZUR, 1984 is still rarely present. This short stratigraphic level is only documented in the samples FD 2-4 (section 1 of the Mte. Fallison outcrops, see fig. 7).

L. multiperforata KOZUR, 1984 is accompanied in the lower subzone by *L. annuloperforata* n. sp., in the upper subzone by *L. vicentinensis* n. sp.

Ladinocampe annuloperforata Subzone

Definition: Occurrence of *Ladinocampe annuloperforata* n. sp. together with advanced *Anisicyrtis* species (*A. alpina* n. sp., *A. nodosa* n. sp., *A. spinosa* n. sp., *A. trettoensis* n. sp.), *Conospongocyrtis conica* n. sp. and *Triassospongocyrtis longispinosa* n. sp.

Lower boundary: See lower boundary of the zone.

Upper boundary: Disappearence of *Conospongocyrtis conica* n. sp., *Ladinocampe annuloperforata* n. sp. and *Triassocampe longispinosa* n. sp. Appearence of *Conospongocyrtis cephaloconica* n. sp., *Ladinocampe vicentinensis* n. sp. and *Spongolophophaena longa* n. sp.

Important species: The Entactinaria fauna is nearly identical with that of the underlying upper subzone of the *S. italicus* Zone.

Moderate changes occurred within the Spumellaria faunas. Among the stratigraphically important Oertlispongidae KOZUR & MOSTLER, 1980 *Baumgartneria bifurcata* DUMITRICĂ, 1982, *B. stellata* DUMITRICĂ, 1982 and *B. trifurcata* DUMITRICĂ disappeared and *Falcispongus postcalcaneus* n. sp. appeared. *Oertlispongis inaequispinosus* DUMITRICĂ; KOZUR & MOSTLER, 1980 continued into the *L. annuloperforata* Subzone and is in the lower part of this subzone still frequent. Then its frequency clearly dropped. *Falcispongus calcaneus* DUMITRICĂ, 1982, *F. praefalciformis* n. sp., *Oertlispongus inaequispinosus* tumidospinosus n. sp., *Paroertlispongus multinodosus* KOZUR & MOSTLER, 1981 and *P. weddigei* (LAHM, 1984) continued only into the lower part of the *L. annuloperforata* Subzone. *Falcispongus falciformis* DUMITRICĂ, 1982 remained in the whole subzone frequent.

Among the Nassellaria some typical and frequent Fassanian guideforms, such as *Poulpus curvispinus* DUMITRICĂ; KOZUR & MOSTLER, 1980, *Silicarmiger costatus costatus* DUMITRICĂ; KOZUR & MOSTLER, 1980, *Triassocampe scalaris* DUMITRICĂ; KOZUR & MOSTLER, 1980, *Triassospongocyrtis longispinosa* n. sp. and *Yeharaia annulata* NAKASEKO & NISHIMURA, 1979 continued from the *S. italicus* Zone into the *L. annuloperforata* Subzone of the *L. multiperforata* Zone. On the other hand, typical Early Fassanian guideforms, like *Spongosilicarmiger italicus* KOZUR, 1984 disappeared at or a little above the base of the *L. annuloperforata* Subzone.

The characteristic Middle Fassanian genus *Ladinocampe* KOZUR, 1984 becomes frequent. *L. multiperforata* KOZUR, 1984 appeares. *L. annuloperforata* appears already in the middle subzone of the *Spongosilicarmiger italicus* Zone, but remains very rare throughout most of this zone. Only in the uppermost S. italicus Zone *L. annuloperforata* becomes common.

Distinct changes occurred within the genus *Anisicyrtis* KOZUR & MOSTLER, 1981. Some species, like *A. deweveri* n. sp. and *A. italicus* n. sp. continued from the *S. italicus Zone* into the *L. annuloperforata* Subzone, but several advanced species, like *A. alpina* n. sp., *L. nodosa n. sp., A. spinosa* n. sp. and *A. trettoensis* n. sp. appeared within the *L. annuloperforata* Subzone.

A distinct change in the species composition occurred within the Monicastericidae n. fam. *Monicasterix prisca* n. sp. and *Tubotriassocyrtis annulata* n. sp. disappeared and *M. alpina* n. sp., *M. brevituba* n. sp., and *T. latituba* n. sp. appeared. However, the exact range of these rare species is difficult to recognize.

The genus *Planispinocyrtis* KOZUR & MOSTLER, 1981 is represented in the *L. annuloperforata* Subzone by some new species. Especially important is the appearence of the frequent *P. multiporata* n. sp.

Within the Spongotriassocyrtidae n. fam. some changes can be observed. On one side, *Triassospongocyrtis longispinosa* n. sp. continued from the *S. italicus* Zone into the *L. annuloperforata* Subzone of the *L. multiperforata* Zone. On the other hand, *Conospongocyrtis conica* n. sp., and *Spongolophophaena parvispinosa* n. sp. appeared in this subzone.

Type locality: Road cut San Ulderico-Pallé (Vicentinian Alps, Italy). Interval from samples TT 3 - TT 8 (see fig. 5).

Age: See under the *L. multiperforata* Zone. The *L. annuloperforata* Subzone corresponds to the lower part of the interval between the *"X." reitzi* Oppel Zone and the upper *E. curionii* Zone.

Distribution: Southern Alps (Italia), Yugoslavia, Balaton Highland (Hungary), Asiatic Tethys.

Remarks: Within the *L. annuloperforata* Subzone two different associations can be distinguished. In the lower part of this subzone *Falcispongus calcaneus* DUMITRICĂ, 1982, *F. praefalciformis* n. sp., *Paroertlispongus multinodosus* KOZUR & MOSTLER, 1981, *Oertlispongus inaequispinosus tumidospinosus* n. subsp., *Paroertlispongus weddigei* (LAHM, 1984) and *Spongosilicarmiger italicus* KOZUR, 1984 are still present. Moreover, in the lower part of the subzone *Oertlispongus inaequispinosus inaequispinosus* DUMITRICĂ; KOZUR & MOSTLER, 1980 is still very frequent. The radiolarian fauna of this lower part of the *L. annuloperforata* Subzone is rather different from the remaining Subzone and displays transitional character to the radiolarian fauna of the underlying upper subzone of the *S. italicus* Zone. However, this interval is so short, that a discrimination of a further Subzone seems not to be necessary. On the other hand, these subdivisions within the *L. annuloperforata* Subzone allow also for this Subzone such a bed by bed correlation for rich radiolarian faunas of the Southern Alps and the Balaton Highland as in the upper subzone of the *S. italicus* Zone (see there).

Ladinocampe vicentinensis Subzone

Definition: Joint occurrence of *Ladinocampe vicentinensis* n. sp., *L. multiperforata* KOZUR, 1984 and *Conospongocyrtis cephaloconica* n. sp.
Lower boundary: Disappearence of *Conospongocyrtis conica* n. sp., *Ladinocampe annuloperforata* n. sp., *Spongolophophaena parvispinosa* n. sp., *Triassospongocyrtis longispinosa* n. sp. Appearence of *Conospongocyrtis cephaloconica* n. sp., *Ladinocampe vicentinensis* n. sp., *Spongolophopaena longa* n. sp.
Upper boundary: See under upper boundary of the *L. multiperforata* Zone.
Important species: Most species of the *L. annuloperforata* Subzone continued into the *L. vicentinensis* Subzone. However, *Conospongocyrtis conica* n. sp., *Ladinocampe annuloperforata* n. sp., *Monicasterix alpina* n. sp., *M. brevituba* n. sp., *Spongolophophaena parvispinosa* n. sp. and *Triassospongocyrtis longispinosa* n. sp. disappeared near the top of the *L. annuloperforata* Subzone. *Conospongocyrtis cephaloconica* n. sp., *Ladinocampe vicentinensis* n. sp., *Triassocampe longicephalis* n. sp. and *Triassospongocyrtis ruesti* n. sp. appeared at the base or inside the *L. vicentinensis* Subzone.
Type locality: Road cut San Ulderico-Palle, interval of samples TT 10 (?), TT 12 - TT 18 (see fig. 5).
Age: See under *L. multiperforata* Zone. The *L. vicentinensis* Subzone corresponds probably to the lower *E. curionii* Zone but neither the ammonoid/ nor conodont control is good.
Distribution: Southern Alps and Lagonegro Basin (Italy), Yugoslavia, Balaton Highland (Hungary), Asiatic Tethys.

Late Fassanian to Early Longobardian interval

Two clearly separable radiolarian zones are present in this interval. Because the species that we have choicen as index species for these zones have not yet been described, we will establish these zones in an other paper together with the description of the stratigraphically important species of these zones (KOZUR & MOSTLER, in press).

Muelleritortis cochleata Zone

Definition: Dominant occurrence of *Muelleritortis cochleata* (NAKASEKO & NISHIMURA, 1970) against *Tritortis kretaensis* (KOZUR & KRAHL, 1984). Frequent representatives of *Hungarosaturnalis* KOZUR & MOSTLER, 1983.
Lower boundary: First appearence of *Muelleritortis cochleata* NAKASEKO & NISHIMURA, 1979).
Upper boundary: Beginning of the *Tritortis kretaensis* dominance against *Muelleritortis cochleata* (NAKASEKO & NISHIMURA, 1979).
Important species: Most of the species of this zone will be described in forthcoming papers (KOZUR, in press, KOZUR & MOSTLER, in press). However, none of these species are better suitable as index species as the already described *Muelleritortis cochleata* (NAKASEKO & NISHIMURA, 1979) which is very frequent, world-wide distributed and easily recognizable. The hungarosaturnalids are other important guide forms, but they begin already before this Zone and continue in the overlying Zone. However, they are only frequent in the *M. cochleata* Zone.
Type locality: Outcrop at the cemetery of Köveskál (Balaton Highland, Hungary).
Age: *Muelleritortis cochleata* (NAKASEKO & NISHIMURA, 1979) begins simultaneously with the conodont species *Budurovignathus mungoensis* (DIEBEL). This stratigraphic level corresponds to the base of the Middle Longobardian (base of the *Protrachyceras archelaus* Zone).

The upper boundary of the *M. cochleata* Zone is only known from the Dallapuszta section in the Darnóhegy area (northern Hungary). The conodont fauna of the boundary level is rather unspecific. In higher parts of the overlying *Tritortis kretaensis* Zone a Cordevolian conodont fauna with *Budurovignathus mirautae* (KOVÁCS & KOZUR), *Paragondolella foliata foliata* BUDUROV, *P. foliata inclinata* (KOVÁCS) and very primitive *P. tadpole* (HAYASHI) is present. Therefore the boundary between the *M. cochleata*- and the *T. kretaensis* Zone corresponds either to the Longobardian-Cordevolian boundary or it lies within the highest Longobardian.
Distribution: Worldwide.
Remarks: The lower boundary is defined by the appearence of *Muelleritortis cochleata* (NAKASEKO & NISHIMURA, 1979) within a well documented phylomorphogenetic line. The still undescribed forerunner of this species occurs in the Early Longobardian, immediately below the first appearence of *M. cochleata* (NAKASEKO & NISHIMURA, 1979). Therefore the lower boundary of the *M. cochleata* Zone is not a facies boundary as it could be concluded from the sudden appearence of numerous specimens of *M. cochleata* (NAKASEKO & NISHIMURA, 1979).

The *M. cochleata* Zone can be well correlated with the conodont- and ammonoid stratigraphy in the Balaton Highland, especially in the Köveskál section (base of the *Budurovignathus mungoensis* A.Z. = base of the *Protrachyceras archelaus* Zone).

In the lower part of the *M. cochleata* Zone the genus *Tritortis* KOZUR, 198 is missing or very rare. It is represented by a different species (*T. balatonica* KOZUR, 1988) then in the overlying *T. kretaensis* Zone. In the highest part of the *M. cochleata* Zone the genus *Tritortis* became more frequent, but the genus *Muelleritortis* KOZUR, 1988 dominates still against the genus *Tritortis* KOZUR, 1988. *Tritortis kretaensis* (KOZUR & KRAHL, 1984) appeared in this level, but still with the subspecies *T. kretaensis subcylindrica* KOZUR, 1988. The typical *T. kretaensis kretaensis* (KOZUR & KRAHL, 1984) appeared only immediately before the base of the *T. kretaensis* Zone that is characterized by a sudden increase in frequency of *T. kretaensis* (KOZUR & KRAHL, 1984) and a simultaneous drop in frequency of *M. cochleata* (NAKASEKO & NISHIMURA, 1979). After this event *M. cochleata* (NAKASEKO & NISHIMURA, 1979) is very rare (about 1 specimen per 500–1000 specimens of *T. kretaensis*) and it disappeared still within the lower *T. kretaensis* Zone. The rather abrupt change in the *Muelleritortis cochleata-Tritortis kretaensis* ratio is not facies-controlled, because it occurs in the Dallapuszta section in a level without facies changes (within red radiolarites) and both species have been found in different facies (red, green and gray radiolarites, red, gray and black cherty or chert-free limestones) and do not seem facies-controlled other than their restriction to pelagic rocks.

Tritortis kretaensis Zone

Definition: Dominant occurrence of *Tritorits kretaensis* (KOZUR & KRAHL, 1984) against *Muelleritortis cochleata* (NAKASEKO & NISHIMURA, 1979).
Lower boundary: Beginning of the clear dominance of *Tritortis kretaensis* (KOZUR & KRAHL, 1984) against *Muelleritortis cochleata* (NAKASEKO & NISHIMURA, 1979) immediately after the first appearence of *T. kretaensis kretaensis* (KOZUR & KRAHL, 1984).
Upper boundary: Disappearence of *Tritortis kretaensis* (KOZUR & KRAHL, 1984).
Important species: Most species of this zone are still undescribed and will be published in a separate paper (KOZUR, in press). The most important species of this zone is *T. kretaensis* (KOZUR & KRAHL, 1984). Advanced Oertlispongidae KOZUR & MOSTLER, 1980 (*Spongoserrula* DUMITRICĂ, 1982) and *Hungarosaturnalis* KOZUR & MOSTLER, 1983 were still present, but also the first primitive true saturnalids (*Palaeosaturnalis* DONOFRIO & MOSTLER, 1978) were rarely present. The immediate forerunner of the genus *Xiphotheca* DE WEVER, 1979 is frequent in deep-water deposits (red radiolarites).
Type locality: Dallapuszta (Darnóhegy region, northern Hungary). Block of red bedded Ladinian-Cordevolian radiolarites in a melange of Jurassic age.
Age: The higher part of the *T. kretaensis* Zone belongs according to its conodont fauna with *Budurovignathus mirautae* (KOVÁCS & KOZUR), *Paragondolella foliata foliata* BUDUROV, *P. foliata inclinata* (KOVÁCS) and primitive *P. tadpole* (HAYASHI) to the Cordevolian. In the lower part of this zone only very few juvenile specimens of *P. foliata foliata* BUDUROV and *P. foliata inclinata* (KOVÁCS) are present. This fauna belongs either to the highest Longobardian or to the basal Cordevolian.
Distribution: Hungary, Greece, Asiatic Tethys.
Remarks: No section is known, where the *T. kretaensis* Zone is directly overlain by the Middle Carnian *Tetraporobrachia haeckeli* Zone. Between both zones extreme changes in the radiolarian faunas occurred. Nearly 100 species, many genera and some families appeared for the first time in the *Pseudosaturniforma carnica* Zone. For this reason it is probably that still a further zone is present between these two zones.

Tetraporobrachia haeckeli Zone

Definition: Joint occurrence of *Palaeosaturnalis triassicus* (KOZUR & MOSTLER, 1972), *Parapoulpus oertlii* KOZUR & MOSTLER, 1979, *Pseudosaturniforma carnica* KOZUR & MOSTLER, 1979, *Spongostylus carnicus* KOZUR & MOSTLER, 1979, *Tetraporobrachia haeckeli* KOZUR & MOSTLER, 1979, and several species of *Veghicyclia*, e.g. *V. austriaca* KOZUR & MOSTLER, 1972.
Lower boundary: Appearence of *Spongostylus carnicus* KOZUR & MOSTLER, 1979, *Tetraporabrachia haeckeli* KOZUR & MOSTLER, 1979 and many other species of the *T. haeckeli* Zone.
Upper boundary: Not yet fixed, because the next younger radiolarian faunas are poor, the next younger rich faunas are of Early Norian age.

Important species: Almost all species of the *T. haeckeli* Zone have been described by KOZUR & MOSTLER (1972, 1978, 1979, 1981) from the localities Göstling and Großreifling (Northern Calcareous Alps, Austria) and KOZUR & MOCK in KOZUR & MOSTLER (1981) from the Pieninic Klippen Belt (Western Carpathians, ČSFR). Only very few additional taxa have been described by KOZUR & MOSTLER (1983) and LAHM (1984) from the above mentioned localities in Austria.

In the Southern Tethys (Western Sicily, Greece) *Xiphotheca karpenissionensis* DE WEVER, 1979 is additionally present and very frequent.

Type locality: Großreifling, Austria.

Age: Julian (Middle Carnian). See also discussion about the age of this fauna in chapter 2.

Distribution: Worldwide.

Remarks: The *T. haeckeli* Zone of the Southern Tethys contains some additional species that are not present in the Northern Tethys, like *Xiphotheca karpenissionensis* DE WEVER, 1979 and some new *Veghicyclia* species. The accompanying conodont fauna indicates for these faunas the same Julian age as for the typical assemblages in the Northern Tethys. The Southern Tethys displays seemingly during the Ladinian and Carnian somewhat different radiolarian faunas than the Northern Tethys. Similar or still considerably stronger differences display the Ladinian - Middle Carnian North- and South Tethyan conodont-, holothurian- and ostracod faunas.

Nakasekoellus inkensis Zone

Definition: Range of *Nakasekoellus inkensis* KOZUR, n. sp.

Lower boundary: First appearence of *Nakasekoellus inkensis* KOZUR n. sp.

Upper boundary: Disappearence of *Nakasekoellus inkensis* KOZUR n. sp.

Important species: The few known species of this zone have been described in the appendix to this paper. Some of the species are described in open nomenclature.

Type locality: Borehole Inke-1, SW Hungary.

Age: The presence of the genera *Nakasekoellus* KOZUR, 1984 and *Pachus* BLOME, 1984 indicate that this fauna is younger than the *S. carnicus* Zone. On the other hand, *N. inkensis* KOZUR n. sp. is more primitive than the Norian representatives of *Nakasekoellus*. For this reason a Late Carnian age is indicated, but a late Middle Carnian age cannot be excluded.

Distribution: All present genera have worldwide distribution, but they are represented outside Hungary by other (stratigraphically younger) species. For this reason, we can assume a worldwide distribution of this zone, but radiolarians of this stratigraphic level have been so far only found in the borehole Inke-1.

Capnodoce ruesti Zone

Definition: Range of *Capnodoce ruesti* KOZUR & MOCK, 1981.

Lower boundary: Appearence of *Capnodoce ruesti* KOZUR & MOCK, 1981 and *Kahlerosphaera norica* KOZUR & MOCK, 1981

Upper boundary: Disappearence of *Capnodoce ruesti* KOZUR & MOCK, 1981.

Important species: *Capnodoce fragilis* BLOME, 1983, *C. malaca* BLOME, 1983, *C. ruesti* KOZUR & MOCK, 1981, *C. sarisa* DE WEVER, 1979, *Capnuchosphaera carpathica* KOZUR & MOCK, 1981, *C. deweveri* KOZUR & MOSTLER, 1979, *C. triassica* DE WEVER, 1979, *Kahlerosphaera ? aspinosa* KOZUR & MOCK, 1981, *K. norica* KOZUR & MOCK, 1981, *Nakasekoellus striatus* (BLOME, 1984), *Pachus firmus* BLOME, 1984, *Paronaella norica* KOZUR & MOCK, 1981, *Poulpus noricus* (KOZUR & MOCK, 1981), *P. piabyx* DE WEVER, 1979, *Sulovella constricta* KOZUR & MOCK, 1981, *Syringocapsa batodes* DE WEVER, 1979, *Triarcella arcuata* KOZUR & MOCK, 1981, *T. sulovensis* KOZUR & MOCK, 1981, *Veghia sulovensis* KOZUR & MOCK, 1981, *Vinassaspongus transitus* KOZUR & MOCK, 1981, *Xiphotheca longa* KOZUR & MOCK, 1981, numerous saturnalids (e.g. *Palaeosaturnalis raridenticulatus* KOZUR & MOCK, 1981), and numerous undescribed Nassellaria.

Type locality: Road cut at Mte. Fatocchio near Palazzo Adriano, Sicily (Italy).

Age: Lower Norian.

Distribution: Worldwide.

Remarks: Only a small part of the radiolarians of this zone has been described. A further subdivision of this zone seems to be possible.

Livarella densiporata Zone

Definition: Range of *Livarella densiporata* KOZUR & MOSTLER, 1981.
Lower boundary: First appearence of *Livarella densiporata* KOZUR & MOSTLER, 1981.
Upper boundary: Disappearence of *Livarella densiporata* KOZUR & MOSTLER, 1981. Appearence of *Relanus hettangicus* KOZUR & MOSTLER, 1991.
Important species: This zone is characterized by *Canoptum rhaeticum* KOZUR & MOSTLER, 1981, *Livarella densiporata* KOZUR & MOSTLER, 1981, *Praecitriduma mostleri* KOZUR, 1984 and by several frequent species of the genus *Saturnosphaera* TICHIMIROVA, 1975. Type locality: Zlambachgraben (Austria).
Age: Rhaetian proven by *Misikella posthernsteini* KOZUR & MOCK and other Rhaetian conodonts.
Distribution: Worldwide.
Remarks: Only a small part of the species has been described. Investigations of continuous Rhaetian sections from the Lagonegro Basin yielded rich radiolarian faunas, especially *Canoptum rhaeticum* KOZUR & MOSTLER, 1981 and early saturnalids (KOZUR, in prep.). However, even very rich radiolarian faunas of the *L. densiporata* zone from radiolarites and cherty limestones yielded in general only few species represented by very much specimens.

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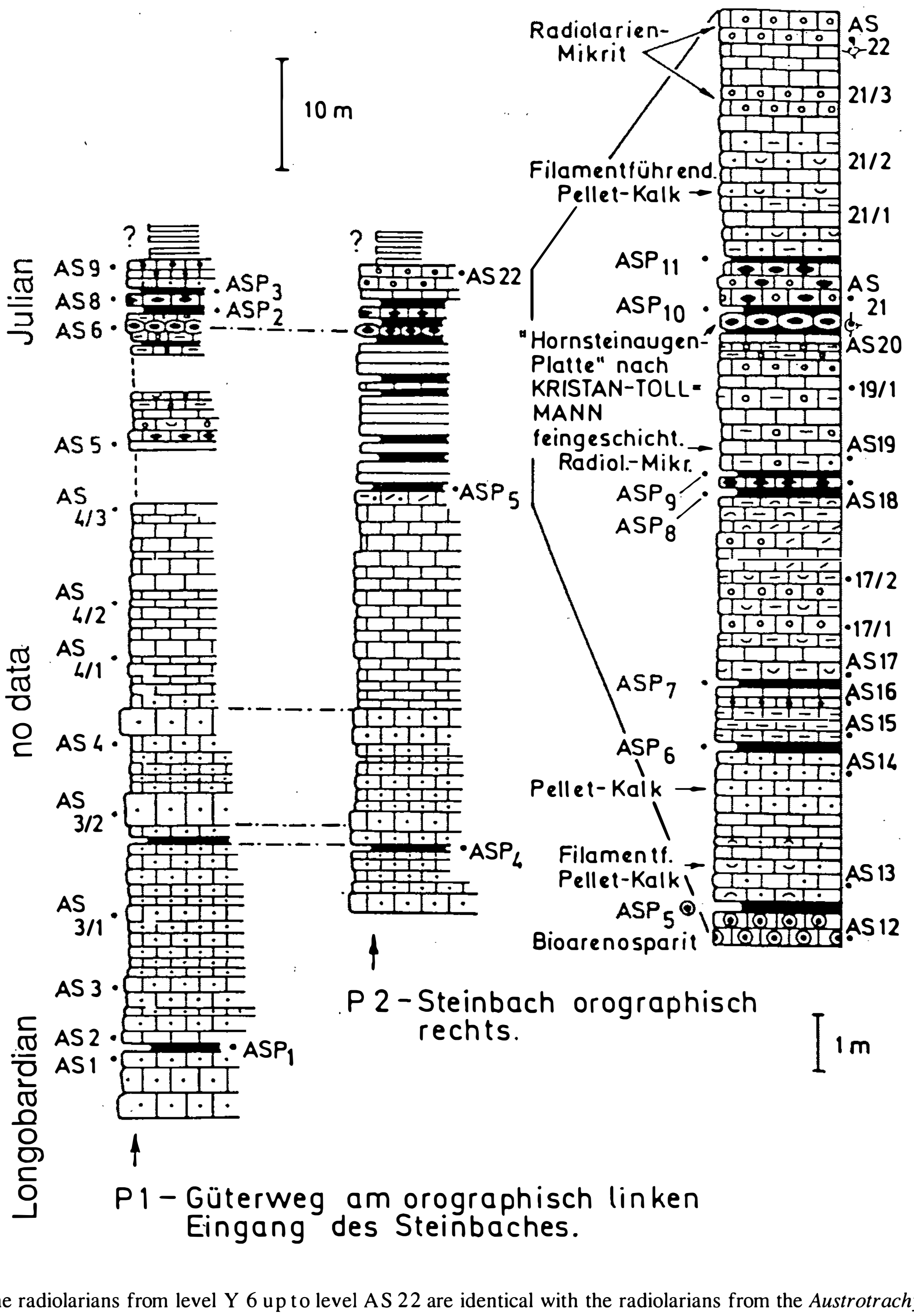


Fig. 1: The radiolarians from level Y 6 up to level AS 22 are identical with the radiolarians from the *Austrotrachyceras austriacum* Zone of the Großreifling (Scheiblinggraben) section, the type section of the *Tetraporobrachia haeckeli* Zone.
Conodont zones of this and following figures after KOZUR (1980, 1989). The *Gladigondolella tethydis* Interval Zone is replaced by the term *Gladigondolella tethydis – Paragondolella polygnathiformis* Interval Zone without changes of its definition, stratigraphic range and correlation. This Zone is characterized by the Unitary Association of *Gladigondolella tethydis* (HUCKRIEDE) and *Paragondolella polygnathiformis* (BUDUROV). Below this zone, *Budurovignathus* species are additionally present. Above this zone, *Gladigondolella* is missing.

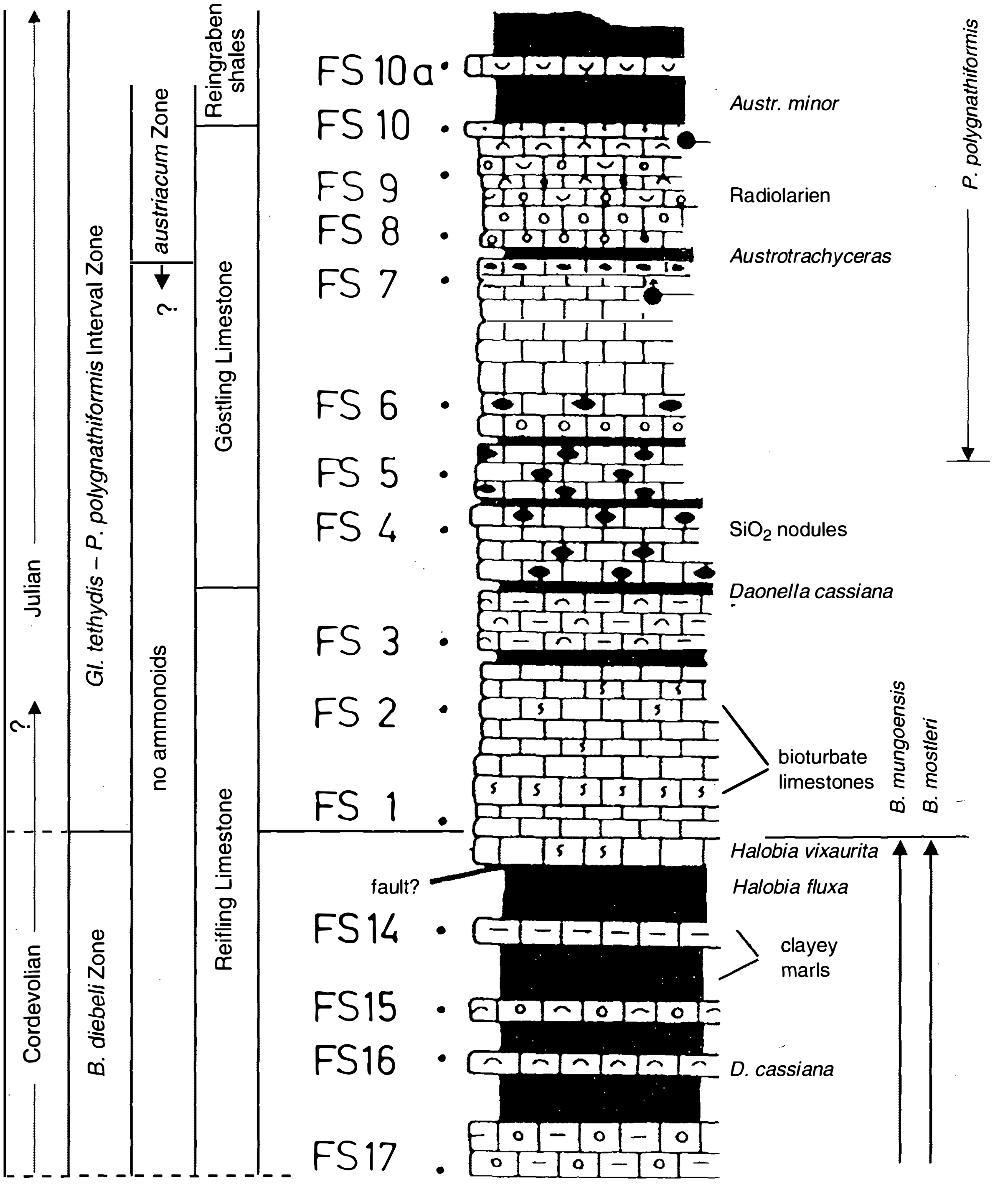


Fig. 2 (explanation on page 177)

Fig. 2: This section is the type section of the *Tetraporobrachia haeckeli* Zone. It was for the first time published (with conodont-, holothurian- and roveacrinid data) by MOSTLER & SCHEURING (1974), later re-studied by KRYSTYN (1978).

The radiolarians of this section have been published by KOZUR & MOSTLER (1972, 1978, 1979 a, b, 1980, 1981, 1983). Later, the radiolarians of the same level (only sample Gβ 1, level FS 8) have been listed and re-described by LAHM (1984). Using the sample data of MOSTLER & SCHEURING (1974), KRYSTYN (1991) pubished this section under "supplemented and changed after KRYSTYN, 1978, radiolarian faunas after LAHM, 1984".

A detailed ammonoid zonation was given by KRYSTYN (1991) despite the fact that ammonoids begin begin only 0.60 m below the Reingraben Beds (Raingraben Beds sensu KRYSTYN, 1991). The conodont data of KRYSTYN (1991) are in contrast both to the data of MOSTLER & SCHEURING (1974) and of LAHM (1984). The first authors reported *Budurovignathus mungoensis* (DIEBEL) and *B. mostleri* (KOZUR) up to level FS 1 in the middle part of beds that KRYSTYN (1991) placed without ammonoid data in the *aonoides* Subzone of his aonoides Zone s.l. (including the *aon* Zone).

LAHM (1984) reported from his sample Gβ 3 (by KRYSTYN erroneously desoignated as sample Gβ 2 that was not mentioned by LAHM) of level FS 1 *Budurovignathus mungoensis* (? perhaps *B. mostleri*, in any case surely *Budurovignathusus*) and *Neocavitella tatrica* (ZAWIDZKA).

KRYSTYN (1991) however, reported the stratigraphically youngest *Budurovignathus* (*B. mostleri*) from sample FS 17 (upper part of his *aon* Subzone), about 5 m below sample FS 1 and Gβ 3 (*B. mungoensis* was not reported by KRYSTYN, 1991). The coinciding conodont data of both MOSTLER & SCHEURING (1974) and LAHM (1984) have been changed by KRYSTYN (1991), obviously to fit the conodont data in his "ammonoid" zonation that was established between level FS 17 and FS 7 without the occurrence of any ammonoids. The base of his aon **ammonoid** Subzone was defined by the first appearence of the **conodont** *Paragondolella polygnathiformis* despite the fact that this species begins in ammonoid- and conodont-bearing samples near the base of the *Frankites sutherlandi* Zone (= *F. regoledanum* Zone) that KRYSTYN (1991) placed (likewise without ammonoid data) below his *aon* Subzone. The upper boundary of his *aon* Subzone was placed at the beginning of thick clayey marls, the base of the *austriacum* Zone at the boundary between Reif= ling- and Göstling Limestone. None of these lithologic boundaries is confirmed by any paleontologic data.

Our radiolarian fauna from the uppermost part of the Göstling Limestone (samples FS 8, 9) occurs above the level of *Austrotrachyceras patrodum*, reported by KRYSTYN (1991) from the first shale intercalation below the Reingraben Beds. This radiolarian fauna belongs therefore to the *Austrotrachyceras austriacum* Zone of the Middle Carnian. The same age is indicated by correlation with the radiolarian fauna from the Middle Carnian of Sosio Valley (Sicily, Italy).

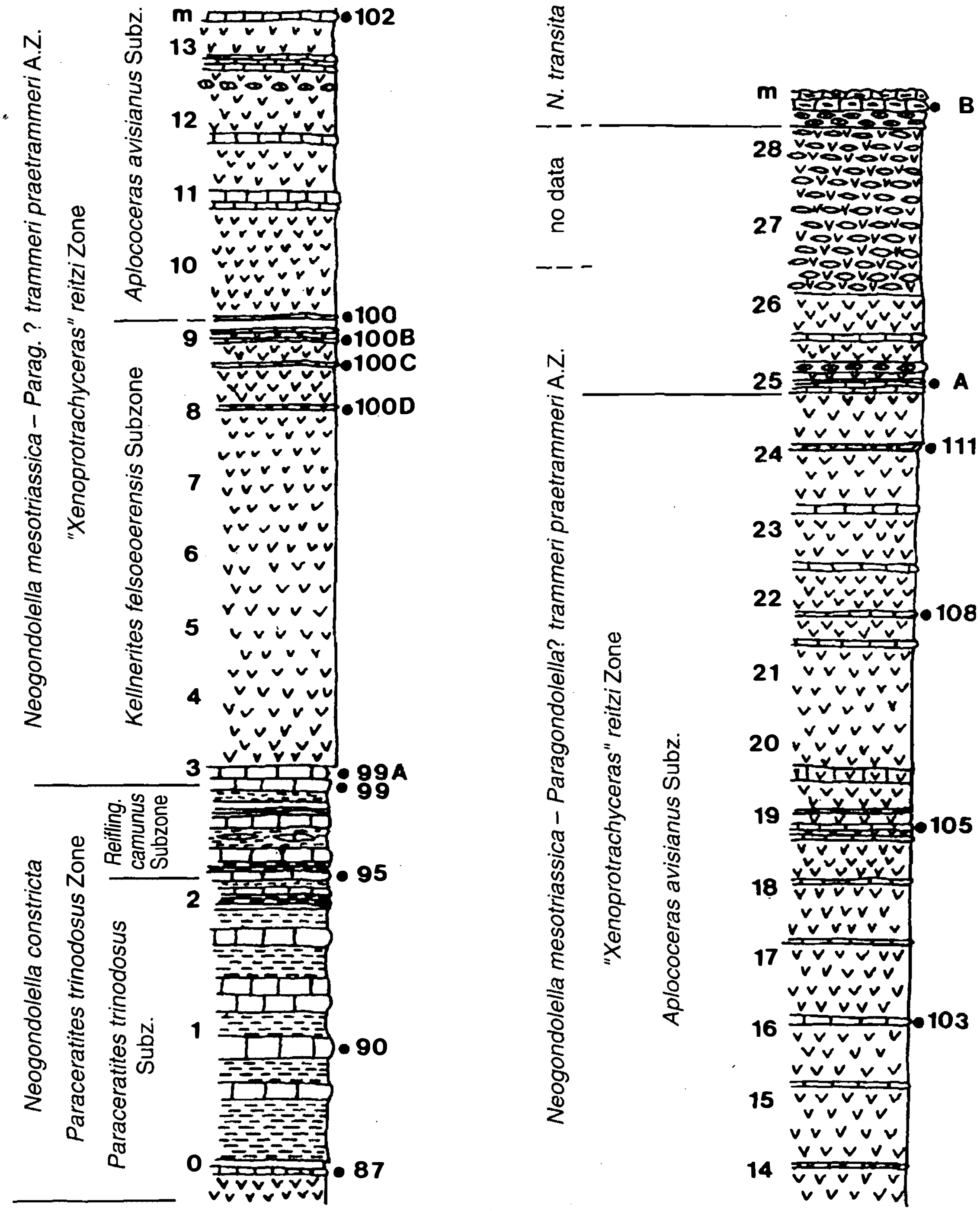
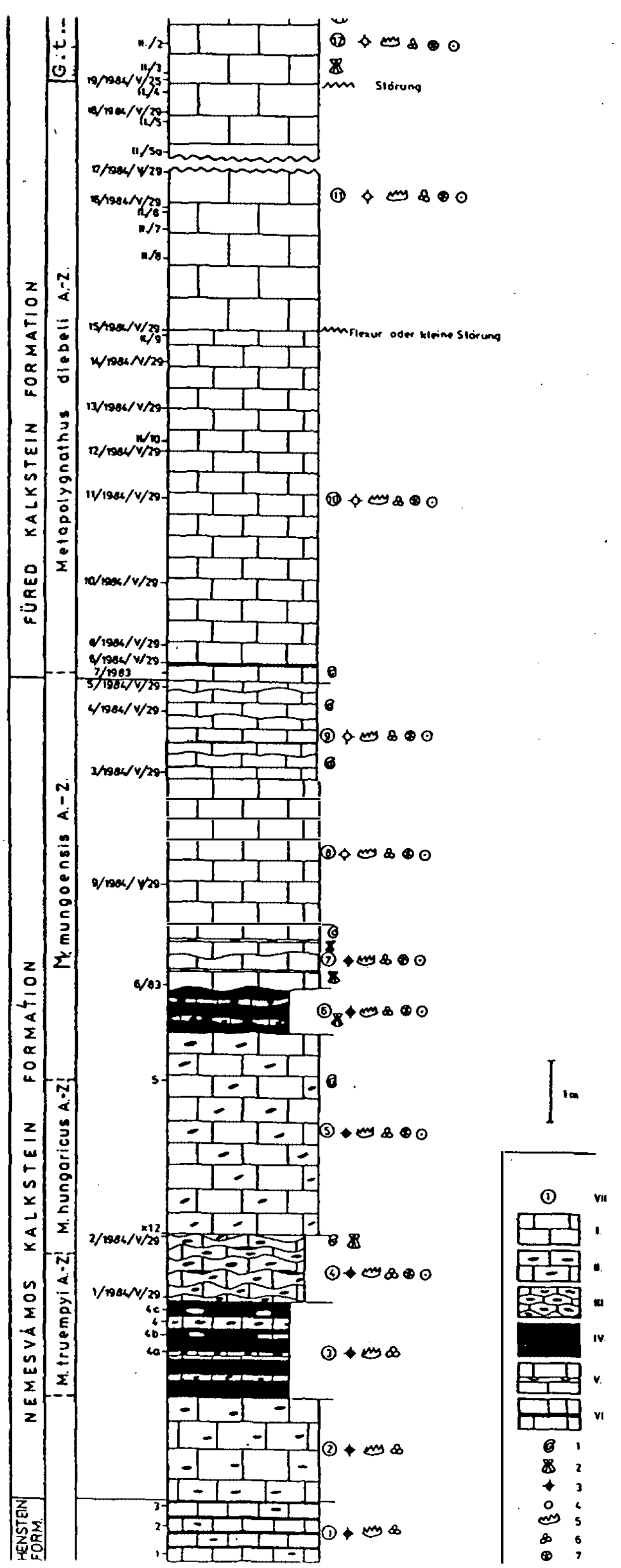


Fig. 3: The Forráshegy section near Felsöörs (Balaton Highland, Hungary) is the type locality of "*Xenoprototrachyceras*" *reitzi* and the reference section for the *reitzi* Oppel Zone. it is the type section of the lower *Spongosilicarmiger italicus* Zone (*S. italicus transitus* Subzone). The samples FÖ 87 – FÖ 111 correspond to the bed numbers.



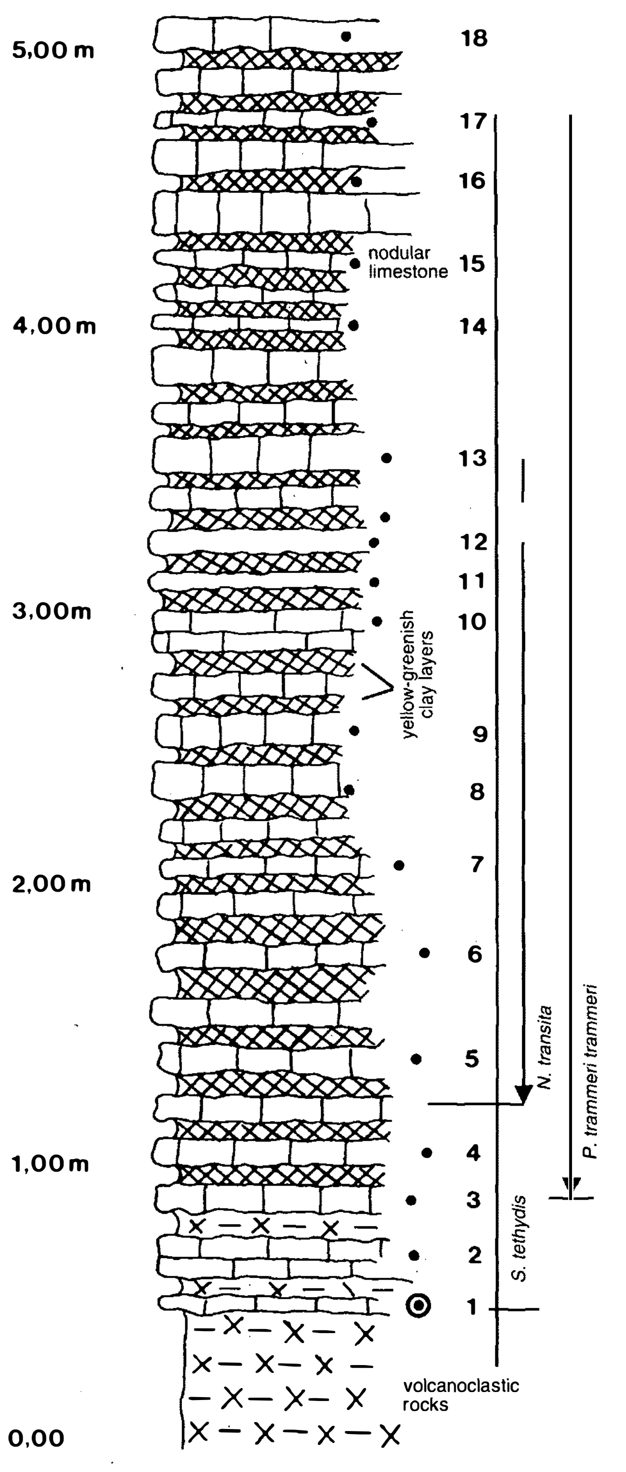


Fig. 4: Section at the cemetery of Köveskál (Balaton Highland, Hungary). Type section of the Muelleritortis cochleata Zone.I: Light yellowish-gray or pinkish-gray thick-bedded micritic limestones (Füred Limestone Formation and similar limestone [beds 8] in the uppermost Nemesvámos Formation. II: Thick-bedded, brownish, pink, pinkish-gray or yellowish-gray micritic limestone with brownish, yellowish-brownish, rarely reddish cherty nodules. III: Pink, pinkish-gray, reddish, brownish or brownish-violet nodular limestone. If indicated, with reddish cherty nodules. IV: Greenish tuffites. V: Violet-brownish bedded limestone with thin marly or tuffitic intercalations. VI: Gray, partly siliceous bedded limestones, separated by thin layers of greenish tuffites. VII: Bed numbers. 1–8: Fossils; 1: ammonoids, 2: bivalves, 3: radiolarians, not calcified, 4: radiolarians, calcified, 5: conodonts, 6: foraminifers, 7: holothurian sclerites, 8: crinoids, including roveacrinids. G.t. – P.p. = *Gladigondolella tethydis – Paragondolella polygnathiformis* Interval Zone.

Fig. 5: San Ulderico section, position of samples TT 1 – TT 18.

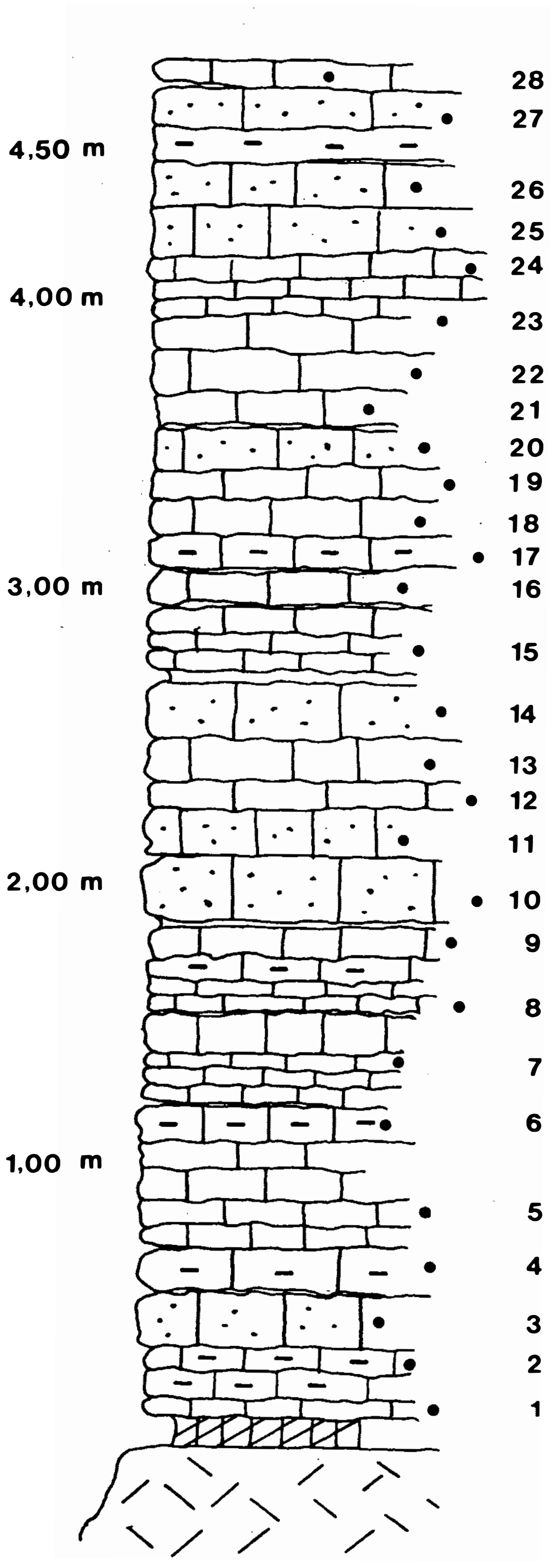


Fig. 6 Recoaro (Passo della Gabiola) section, position of samples MD 1 – MD 28.

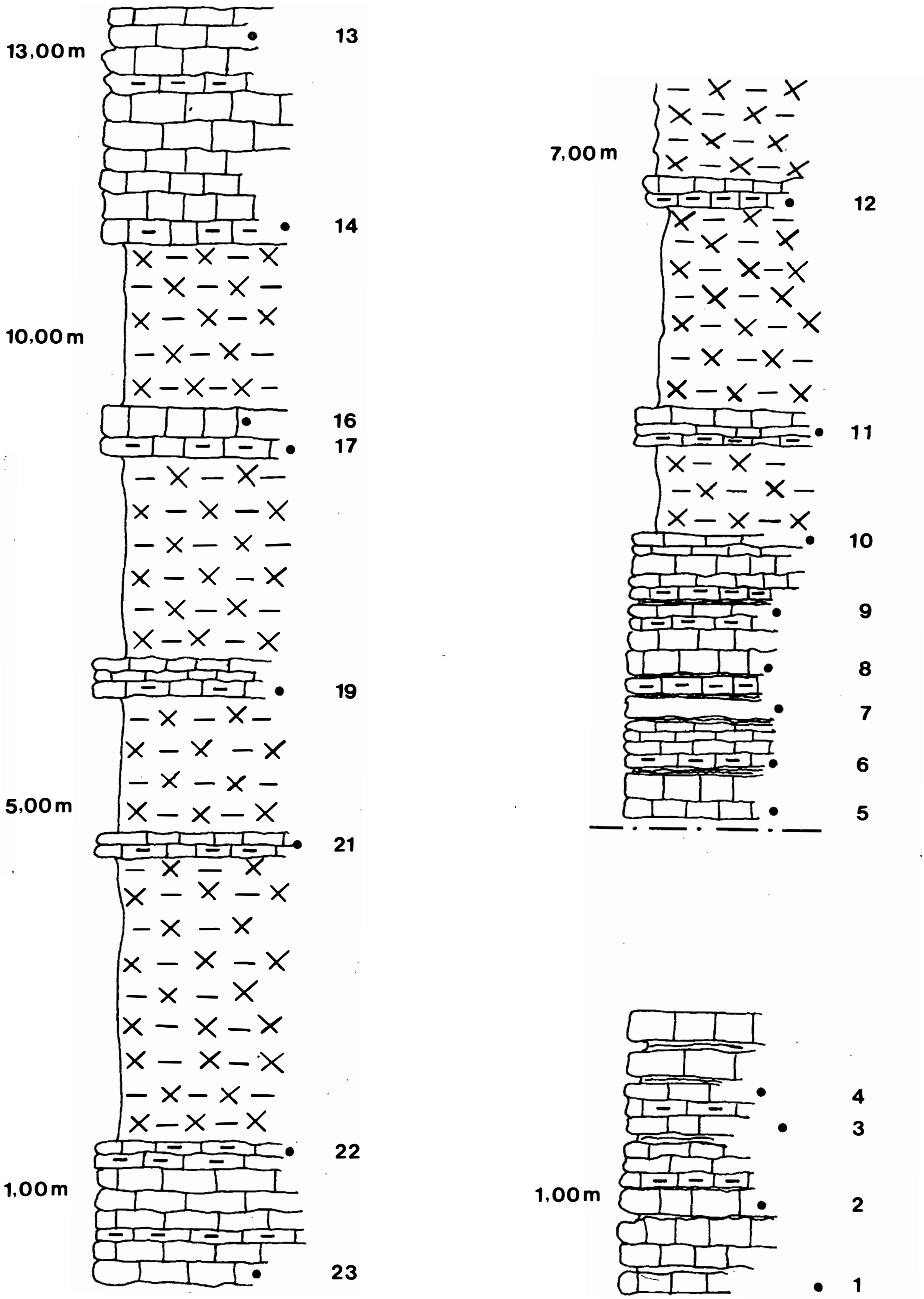


Fig. 7: Outcrops along the road Mte. Spitz – Mte. Fallison, position of samples FD 1 – FD 23.

System	Series	Stage	Lithology - Fossils	
TRIASSIC	Upper Triassic	Rhaetian	Pelagic, whitish to light-gray calcilutites, some greenish-gray marls. Conodonts.	
		Norian	Pelagic, gray, cherty, calcilutites and calcare= nites, partly with slump-breccias. Halobia, Monotis, ammonoids, conodonts, radiolarians.	▌
		Carnian Upper / Middle	Pelagic, gray or brown calcarenites, calcirudites, gray shales. Halobia, conodonts, radiolarians, ostracods, trace fossils.	▌
	Upper Triassic / Middle Triassic	Carnian Lower / Ladinian Upper	Pelagic greenish-gray to pink nodular limestones, greenish-gray, reddish, rarely violet shales and marls, very few thin red radiolarites."Posidonia" wengensis, Daonella, ammonoids, conodonts (Gladigondolella, Paragondolella trammeri, Budurovignathus spp., Pseudofurnishius spp.).	▌
	Middle Triassic	Ladinian Lower	Pelagic, greenish-gray to pink nodular, siliceous to cherty limestones, greenish tuffites, in the lower part greenish to gray radiolarites. Conodonts, radiolarians.	▌
		Anisian	unknown	
	Lower Triassic	Olenekian - Brahmanian	unknown	
PERMIAN	Upper Permian = Lopingian	Changxingian / Dzhulfian	Red, above all in the lower part also light-gray, deep-water claystones, with few thin intercalati= ons of calcarenites. Claystones with albaillellid radiolarians, deep-water sponge spicules, paleopsychrospheric ostracods and few conodonts. Calcarenites with mass occurrences of pelagic conodonts, deep-water sponge spicules, paleo= psychrospheric deep-water ostracods.	▌
	Middle Permian = Guadalupian	Capitanian	unknown	
		Wordian	Gray, yellowish weathering claystones. Conodonts (M. siciliensis), radiolarians.	▌
		Roadian	Olistostrome Unit: Matrix of gray claystone with reworked sand and garnet grains. Olistoliths up to 1 m diameter consisting of turbiditic sand= stones, siltstones (often with flute casts and plant debris) and rarely of sandy calcarenites. Matrix with conodonts (Mesogondolella phosphori= ensis, Sweetognathus subsymmetricus), albaillel= lid radiolarians and sporomorphs. Olistoliths with conodonts (M. idahoensis, M. intermedia), albaillellid radiolarians and sporomorphs.	▌
	Lower Permian	Cathedralian / Artinskian	Gray and red flyschoid turbidites: Graded sand= stones, partly fine-conglomeratic, siltstones, shales and few calcarenites. Agglutinating fora= minifers, conodonts, deep-water trace fossils, in calcarenites also fusulinids, ammonoids, trilobi= tes, brachiopods, bryozoans, calcareous algae.	▌

Fig. 8 a: Deep basin sequence of the Sicanian paleogeographic unit of western Sicily. ▌ = Radiolarian-bearing parts of the sequence.

	Series	Stage	Lithology - Fossils
TRIASSIC	Upper Triassic	Norian	Pelagic, gray, cherty, calcilutites and calcare= nites, spotty marls. Conodonts, radiolarians.
		Carnian Upper	
		Carnian Middle	Pelagic, gray-brown calcarenites, calcirudites, mudstones. Conodonts, radiolarians, ostracods.
		Carnian Lower	Pelagic gray and reddish limestones. Conodonts, radiolarians.
	Middle Triassic	Ladinian Upper	Pelagic, red, partly gray limestones with basic volcanics. Conodonts (Gladigondolella, Paragondolella trammeri, Budurovignathus spp.), radiolarians.
		Ladinian Lower	Pelagic, red, strongly siliceous limestones. Conodonts, radiolarians.
		Anisian Upper	Pelagic, filamentous, greenish-grey, tuffitic limestones. Conodonts, radiolarians.
		Anisian Middle -Lower	Pelagic, micritic pink and gray limestones. Conodonts. Calcified radiolarians.
	Lower Triassic = Scythian	Olenekian	Pelagic, reddish, marly micritic limestones, variegated limestone conglomerates. Conodonts, foraminifers, few calcified radiolarians.
		Olenekian	Siltstones, finesandstones, few marly or redepo= sited limestones. Conodonts, including reworked Permian shallow-water and pelagic conodonts.
		Brahmanian	Pyritic marls, siltstones, redeposited limesto= nes. Pelagic and shallow-water conodonts, rewor= ked Permian pelagic and shallow-water conodonts.
		Brahmanian	Redeposited, graded, fineconglomeratic to calc= arenitic pyritic limestones. Pelagic and shallow- water conodonts, including reworked Permian ones.
		Brahmanian	Gray, weathered yellowish-brown, laminated, pyri= tic claystones with thin, marly, laminated limestones. Conodonts (Hindeodus parvus).
PERMIAN	Upper Permian = Lopingian	Changxingian ? Dzhulfian	Red mudstones with deep-water fauna (e.g. forami= fers with Bathysiphon, paleopsychrospheric ostra= cods, pelagic conodonts), subordinately gray mud= stones with the same fauna, thick redeposited calcareous sandstones and calcarenites with pela= gic and shallow-water fauna (conodonts, fusuli= nids, sponge spicules).
	Guadalupian	Capitanian - Roadian	Megabreccias, matrix-supported olistostromes with shallow-water, slope and base of slope limesto= nes. Shallow-water and pelagic fossils, ammonoids fusulinids, sponges, echinoderms, conodonts etc.
	Lower Permian	Cathedralian	Megabreccias, matrix-supported olistostromes with shallow-water, slope and base of slope limesto= nes. Shallow-water and pelagic fossils, ammonoids fusulinids, sponges, echinoderms, conodonts etc.
	Lower Permian	Artinskian	Pelagic dark-gray siliceous limestones and marls. Albaillellacean radiolarians, conodonts.

Fig. 8 b: Permian slope facies and its cover of the Sicanian paleogeographic realm in western Sicily. █ = Radiolarian-bearing deposits.

Stage/ Subst.		Ammonoid Zone	Conodont Zone	Radiolarian Zone	Conodont events	Radiolarian events
CARNIAN	Cordevol.	Trachyceras aon	G. tethydis I.Z.	?		
		Frankites sutherlandi	Budurovignathus diebeli	Muelleritortis kretaensis	*—P. tadpole *—P. polygnathiformis noah P. polygnathiformis polygnathiformis B. diebeli *	♦♦♦ * Paleosaturnalis
LADINIAN	Longob.	Protrachyceras archelaus	Budurovignathus mungoensis	Muelleritortis cochleata	*-B. mostleri +-B. hungaricus * B. mungoensis	*-T. kretaensis kretaensis ♦♦♦ * Muelleritortis cochleata
		Protrachyceras gredleri	Budurovignathus hungaricus		* B. hungaricus	
	Fassanian	Eoprotrachyc. curionii	Budurovignathus truempyi		*-B. truempyi	† *-Hungarosaturnalis + Ladinocampe
		Nevadites fauna	Neogondolella transita	Ladinocampe multiperforata (upper, lower)	*-N. transita	+ *-Ladinocampe vicentinensis Ladinocampe annuloperforata +-Spongosilicarmiger italicus *-Ladinocampe multiperforata
		"Xenoprotr." reitzi	Neogondolella mesotriassica - Paragondolella ? trammeri praetrammeri	Spongosilicarmiger italicus (upper, middle, lower)	† *-P. alpina ↓ * N. mesotriassica	*-O. inaequispinosus inaequispinosus Falcispongus falciformis ♦♦♦ * Intermediellidae, Monicastericidae, Ladinocampe, S. italicus italicus, Oertlispongus primitivus, Falcispongus calcaneus, Baumgartneria, Falcispongus ♦♦♦ * Oertlispongus, Yeharaia; Triassocampe deweveri, T. scalaris; Silicarmiger italicus transitus
ANISIAN	Illyrian	Paraceratites trinodosus	Neogondolella constricta	Tetraspinocyrtis laevis	P. ? t. praetrammeri +-P. bifurcata	+ Pseudosepsagon, Parentactinia lata, Pentactinocarpus awaensis, Pentactinorbis dumitricai, Tetraspinocyrtis levis ♦♦♦ * primitive Triassocampe and several other Nassellaria
	Pel.	Bulogites zoldianus fauna	Neog. bulgarica Nicor. germanica	Parasepsagon robustus	+ Neogon. bulgarica Nicoraella germanica	+ Parasepsagon robustus

Fig. 9: Illyrian-Cordevolian conodont and radiolarian zonations and their mutual correlations.
Vertical distances not time-related. *: First appearence of a taxon. +: Disappearence of a taxon.
♦♦♦: Worldwide recognizable first order event in Triassic radiolarian evolution.

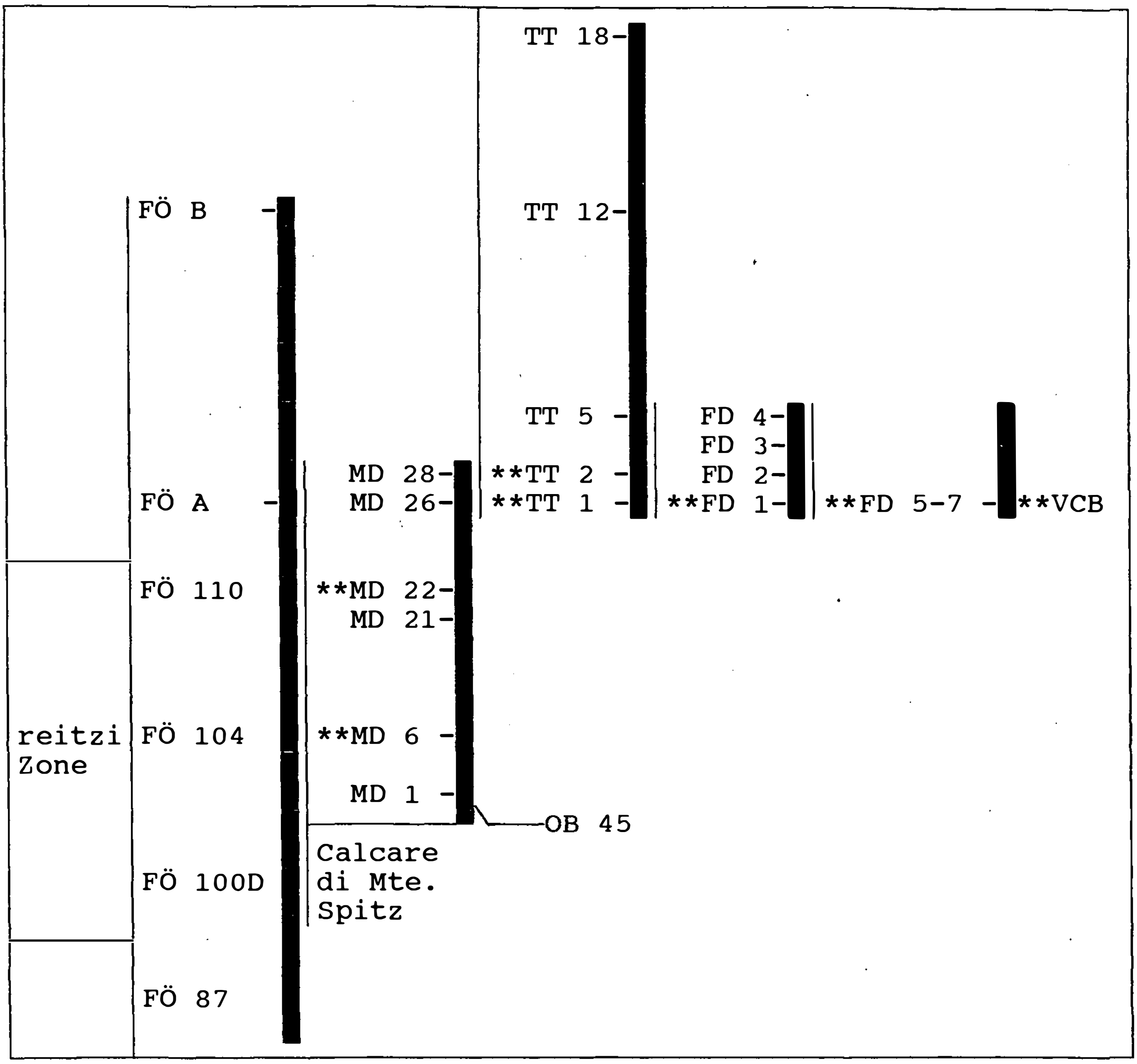


Fig. 10: Corelation of some levels of the investigated Late Anisian-Early Ladinian sections. Vertical distances not time- or thickness-related. ▮ = radiolarian-bearing intervals. Samples drawn in the same horizontal level have the same age (subzone, level within a subzone), but samples some centimeters below and above these samples may have the same fauna. ** Detailed correlations in sample level possible. In these cases some centimeters above or below the correlated samples somewhat different faunas (age-related differences) are present. The level of the upper boundary of the Calcare Mte. Spitz is indicated. The range of the *reitzi* Zone in its type section in Felsöörs is shown.

Explanation of plates

Plate 1

Figs. 1, 2: *Eptingium manfredi robustum* KOZUR & MOSTLER, 1981, sample MD 27, x 160, rep.-no. KoMo 1994 I-335, fig. 1: equatorial view, fig. 2: oblique lateral view.
Fig. 3: *Eptingium manfredi manfredi* DUMITRICĂ, 1978, sample FD 6, x 160, rep.-no. KoMo 1994 I-368.
Fig. 4: *Eptingium manfredi japonicum* (NAKASEKO & NISHIMURA, 1979), sample FÖ 87, x 300, rep.-no. KoMo 1994 I-561.
Fig. 5: *Eptingium nakasekoi* n. sp., holotype, sample FÖ 87, x 300, rep.-no. KoMo 1994 I-138.
Fig. 6: *Polystephanidium clavator* DUMITRICĂ, 1978, sample TT 3, x 300, rep.-no. KoMo 1994 I-900.
Fig. 7: *Hindeodsphaera ? balatonica* n. sp. holotype, sample FÖ 87, x 300, rep.-no. KoMo 1994 I-112.
Fig. 8: *Pseudostylosphaera coccostyla compacta* (NAKASEKO & NISHIMURA, 1979), sample FÖ 87, x 130, rep.-no. KoMo 1994 I-124.
Fig. 9: *Pseudostylosphaera postjaponica* n. sp. holotype, sample MD 18, x 100, rep.-no. KoMo 1994 I-588.
Fig. 10: *Pseudostylosphaera postjaponica* n. sp. sample MD 13, x 150, rep.-no. KoMo 1994 I-589.
Figs. 11, 12: *Pentactinia pygnax* DUMITRICĂ, 1978, different views of the same specimen, sample FÖ 87, x 500, rep.-no. KoMo 1994 I-103

Plate 2

Fig. 1: *Pentactinia lata* n. sp., holotype, sample FÖ 87, x 540, rep.-no. KoMo 1994 I--104.
Fig. 2: *Pentactinocapsa quadripes* DUMITRICĂ, 1978, sample MD 22, x 260, rep.-no. KoMo 1994 I-323.
Figs. 3, 5: *Pentactinocarpus acanthicus* DUMITRICĂ, 1978; Fig. 3: sample TT 16, x 150, rep.-no. KoMo 1994 I-351; fig. 5: sample FD 17, x 180, rep.-no. KoMo 1994 I-370.
Fig. 4: *Pentactinocarpus fusiformis* DUMITRICĂ, 1978, sample FD 5, x 150, rep.-no. KoMo 1994 I-336.
Figs. 6, 7: *Pentactinocarpus tetracanthus* DUMITRICĂ, 1978; fig. 6: sample MIETTO, red nodular limestones immediately above the pietra verde of the San Ulderico section (MIETTO & PETRONI, 1979), x 150, rep.-no. KoMo 1994 I-550; fig. 7: sample B, x 180, rep.-no. KoMo 1994 I-164.
Figs. 8, 9: *Heptacladus crassispinosus* DUMITRICĂ, KOZUR & MOSTLER, 1980; fig. 8: sample VCB, x 350, rep.-no. KoMo 1994 I-901; fig. 9: sample FÖ 87, x 350, rep.-no. KoMo 1994 I-98.
Figs. 10, 11: *Pentactinocapsa awaensis* (NAKASEKO & NISHIMURA, 1979), sample FÖ 87, x 300, rep.-no. KoMo 1994 I-107.

Plate 3

Figs. 1, 2: *Pentactinocarpus illyricus* n. sp., holotype, sample FÖ 87, x 320, rep.-no. KoMo 1994 I-557.
Fig. 3: *Heptacladus crassispinus* DUMITRICA, KOZUR & MOSTLER, 1980, sample VCB, x 150, rep.-no. KoMo 1994 I-173.
Figs. 4, 5: *Pentactinorbis dumitricai* n. sp., holotype, upper view, stereo pictures, sample FÖ 87, x 300, rep.-no. KoMo 1994 I-99.
Figs. 6, 7: *Pentactinorbis dumitricai* n. sp., lateral view, stereo pictures, sample FÖ 87, x 300, rep.-no. KoMo 1994 I-100.
Fig. 8: *Heptacladus crassispinus* DUMITRICA, KOZUR & MOSTLER, 1980, sample FÖ 87, x 350, rep.-no. KoMo 1994 I-902.

Plate 4

Figs. 1, 2: *Pentactinorbis kozuri* DUMITRICA, 1978, sample MD 25, x 300, rep.-no. KoMo 1994 I-332.
Figs. 3, 4: *Pentactinorbis pessagnoi* n. sp., holotype, lateral view, sample FÖ 87, x 360, rep.-no. KoMo 1994 I-104.
Figs. 5–9: *Sepsagon ladinicus* n. sp.; fig. 5: x 100, , sample VCB, rep.-no. KoMo 1994 I-558; figs. 6, 7: sample VCB, rep.-no. KoMo 1994 I-904, fig. 6: x 100, fig. 7: detail of the same specimen, x 300; fig. 8: inner

shell visible, x 130, sample MD 8, rep.-no. KoMo 1994 I-554; fig. 9: holotype, x 130, sample VCB, rep.-no. KoMo 1994 I-555.

Fig. 10: *Sepsagon robustus* LAHM, 1984, sample MD 28, 150 x, rep.-no. KoMo 1994 I-559.

Plate 5

Fig. 1: *Sepsagon robustus* LAHM, 1984, sample VCB, 320 x, rep.-no. KoMo 1994 I-556.

Fig. 2: *Sepsagon longispinosus* (KOZUR & MOSTLER, 1979), sample FS 8, x 320, rep.-no. KoMo 1994 I-547.

Fig. 3: *Parasepsagon asymmetricus* praetetracanthus n. subsp., holotype, sample FÖ 87, rep.-no. KoMo 1994 I-137.

Figs. 4, 5: *Parasepsagon tetracanthus* DUMITRICĂ, KOZUR & MOSTLER, 1980, sample VCB, x 100; fig. 4: rep.-no. KoMo 1994 I-546; fig. 5: rep.-no. KoMo 1994 I-559.

Fig. 6: *Sepsagon robustus* LAHM, 1984, x 180, sample MD 28, rep.-no. KoMo 1994 I-905.

Figs. 7–9: *Pseudosepsagon pentaspinosus* n. gen. n. sp., holotype, sample FÖ 87, rep.-no. KoMo 1994 I-108, fig. 7, x 200, enlarged shell, stereo pictures, x 600.

Plate 6

Fig. 1: *Pseudosepsagon illyricus* n. sp., holotype, sample FÖ 87, x 360, rep.-no. KoMo 1994 I-109.

Figs. 2, 4: *Tiborella florida tortilis* n. subsp., holotype, sample TT 13, rep.-no. KoMo 1994 I-607, fig. 2: x 260, fig. 4: detail of the shell, x 660.

Fig. 3: *Tiborella anisica* n. sp., inner structure well visible, x 200, sample FÖ 87, rep.-no. KoMo 1994 I-87.

Fig. 5: *Tiborella* cf. *anisica* n. sp., x 320, sample FÖ 87, , rep.-no. KoMo 1994 I-906.

Fig. 6: *Tiborella anisica* n. sp., inner layer of shell visible, x 300, sample FÖ 87, , rep.-no. KoMo 1994 I-608.

Figs. 7, 8: *Tiborella anisica* n. sp., holotype, stero pictures, x 300, sample FÖ 87, , rep.-no. KoMo 1994 I-86.

Plate 7

Figs. 1, 2: *Archaeospongoprunum bispinosum* KOZUR & MOSTLER, 1981, sample FÖ 87; fig. 1: x 150, rep.-no. KoMo 1994 I-90; fig. 2: x 200, rep.-no. KoMo 1994 I-32.

Fig. 3: *Archaeospongoprunum mesotriassicum mesotriassicum* KOZUR & MOSTLER, 1981, x 150, rep.-no. KoMo 1994 I-33.

Fig. 4: *Archaeospongoprunum mesotriassicum asymmetricum* KOZUR & MOSTLER, 1981, x 150, sample FÖ 87, rep.-no. KoMo 1994 I-31.

Fig. 5: *Archaeospongoprunum brevispinosum* n. sp., holotype, x 220, sample FÖ 110, rep.-no. KoMo 1994 I-89.

Fig. 6: *Archaeospongoprunum tetraspinosus* n. sp., holotype, x 190, sample FÖ 87, rep.-no. KoMo 1994 I-93.

Figs. 7, 8: *Archaeospongoprunum trispinosum* n. sp., sample FÖ 87; fig. 7: holotype, x 220, rep.-no. KoMo 1994 I-91; fig. 8: x 300, rep.-no. KoMo 1994 I-92.

Fig. 9: *Tamonella rarispinosa* n. sp., holotype, x 260, sample MD 22, rep.-no. KoMo 1994 I-325.

Fig. 10: *Gomberellus longobardicus* n. sp., x 100, sample 7/29/12/87, rep.-no. CK 1188 VII-79.

Fig. 11: *Gomberellus unispinosus* n. sp., holotype, x 260, rep.-no. KoMo 1994 I-730.

Figs. 12–14: *Gomberellus hircicornus* DUMITRICĂ, KOZUR & MOSTLER, 1980; fig. 12: x 240, sample MD 22, rep.-no. KoMo 1994 I-327; figs. 13, 14: sample TT 7, rep.-no. KoMo 1994 I-260, fig. 13: lateral view, x 340, fig. 14: oblique lateral-polar view, x 430.

Plate 8

Figs. 1, 3, 6: *Gomberellus longobardicus* n. sp., section Köveskál, cemetery, fig. 1: sample 6, x 320, rep.-no. KoMo 1994 I-733; fig. 3: 65 cm below sample 6, x 260, rep.-no. KoMo 1994 I-732; fig. 6: holotype, x 200, sample 7/29/12/87, rep.-no. CK 1 88 VII-65.

Fig. 2: *Gomberellus trispinosus posterus* n. subsp., holotype, x 260, sample TT 7, rep.-no. KoMo 1994 I-731.

Figs. 4, 5, 7: *Gomberellus trispinosus trispinosus* n. sp., holotype, sample MD 11, rep.-no. KoMo 1994 I-300, fig 4: lateral view, x 200, fig. 5: upper view, x 320, fig. 7: oblique lateral view, x 200.

Figs. 8–10: *Gomberellus fissus* n. sp., holotype, sample MD 9, rep.-no. KoMo 1994 I-296, fig. 8 oblique upper view, x 300, fig. 9: lower view, x 320, fig. 10: lateral view, x 200.

Plate 9

Figs. 1, 2: *Karnospongella transita* n. sp., x 260; fig. 1: holotype, sample TT 7, rep.-no. KoMo 1994 I-263; fig. 2: sample MD 18, rep.-no. KoMo 1994 I-735.

Fig. 3: *Kulacella recoaroensis* KOZUR & MOSTLER, 1981, x 260, sample VCB, rep.-no. KoMo 1994 I-91.

Figs. 4, 5: *Cryptostephanidium verrucosum* DUMITRICĂ, 1978, x 180, sample VCB, rep.-no. KoMo 1994 I-122, fig. 4: equatorial view, fig. 5: lateral view.

Fgis. 6, 8: *Praegomberellus pulcher* n. gen. n. sp., sample FÖ 87; fig. 6: x 300, rep.-no. KoMo 1994 I-129; fig. 8: holotype, x 180, rep.-no. KoMo 1994 I-rep.-no. KoMo 1994 I-128.

Fig. 7: *Pentaspongodiscus mesotriassicus* DUMITRICĂ, 1978, x 160, sample VCB, rep.-no. KoMo 1994 I-166.

Fig. 8: *Pentaspongodiscus ladinicus* DUMITRICĂ, 1978, x 160, sample VCB, rep.-no. KoMo 1994 I-544.

Fig. 10: *Pentaspongodiscus ruesti* KOZUR & MOSTLER, 1981, x 200, sample VCB, rep.-no. KoMo 1994 I-167.

Plate 10

Fig. 1, 4, 7, 13: *Oertlispongus inaequispinosus inaequispinosus* DUMITRICĂ, KOZUR & MOSTLER, 1980, sample VCB; fig. 1: x 150, rep.-no. KoMo 1994 I-402 C; fig. 4: specimen with curved second polar spine, x 130, rep.-no. KoMo 1994 I-402 A; fig. 7: x 150, rep.-no. KoMo 1994 I-402 D.; fig. 13: transitional form to *O. inaequispinosus longispinosus* n. subsp., x 180, rep.-no. KoMo 1994 I-402 B.

Figs. 2, 3: *Oertlispongus inaequispinosus unispinosus* n. subsp., sample VCB; fig. 2: x 200, rep.-no. KoMo 1994 I-622 A; fig. 3: holotype, x 150, rep.-no. KoMo 1994 I-622.

Fig. 5: *Oertlispongus* cf. *inaequispinosus longispinosus* n. subsp., x 150, sample MD 25, rep.-no. KoMo 1994 I-400.

Fig. 6: *Oertlispongus inaequispinosus tumidospinosus* n. subsp., holotype, x 200, sample MD 27, rep.-no. KoMo 1994 I-390.

Fig. 8: *Oertlispongus* sp., x 130, sample MD 22, rep.-no. KoMo 1994 I-620.

Fig. 9: *Oertlispongus aspinosus aspinosus* n. sp., holotype, x 130, sample MD 1, rep.-no. KoMo 1994 I-392 B.

Fig. 10: *Paroertlispongus hermi* (LAHM, 1984), x 100, sample MD 1, rep.-no. KoMo 1994 I-171.

Fig. 11: *Oertlispongus inaequispinosus longispinosus* n. subsp., holotype, x 180, sample MD 18, rep.-no. KoMo 1994 I-397.

Fig. 12: *Oertlispongus aspinosus curvatus* n. subsp., holotype, x 130, sample MD 1, rep.-no. KoMo 1994 I-394.

Plate 11

Fig. 1: *Oertlispongus bispinosus* n. sp., holotype, x 200, sample MD 1, rep.-no. KoMo 1994 I-624.

Fig. 2, 6: *Oertlispongus inaequispinosus longispinosus* n. subsp.; fig. 2: x 200, sample FD 6, rep.-no. KoMo 1994 I-403; x 150, sample MD 22, rep.-no. KoMo 1994 I-398.

Figs. 3, 5: *Paroertlispongus hermi* (LAHM, 1984), x 110; fig. 3: sample MD 25, rep.-no. KoMo 1994 I-727; fig 5: sample FD 17, rep.-no. KoMo 1994 I-377.

Fig. 4, 10: *Oertlispongus primitivus* n. sp., sample MD 1; fig. 4: x 200, rep.-no. KoMo 1994 I-392 A; fig. 10: holotype, x 150, rep.-no. KoMo 1994 I-392 C.

Fig. 7: *Oertlispongus* cf. *inaequispinosus longispinosus* n. subsp., x 130, sample MD 1, rep.-no. KoMo 1994 I-394.

Fig. 8: *Paroertlispongus obliquus* n. sp., holotype, x 160, sample T13, rep.-no. KoMo 1994 I-729.

Fig. 9: *Oertlispongus inaequispinosus tumidospinosus* n. subsp., x 200, sample MD 28, rep.-no. KoMo 1994 I-391.

Fig. 11: *Oertlispongus* cf. *inaequispinosus longispinosus* n. subsp., x 150, sample MD 22, rep.-no. KoMo 1994 I-398

Plate 12

Figs. 1, 4–6, 8, 9: *Baumgartneria retrospina* DUMITRICĂ, 1978; fig. 1: x 120, sample TT 2, rep.-no. KoMo 1994 I-343; fig. 4: x 180, sample TT 7, rep.-no. KoMo 1994 I-264; Fig. 5: 150, sample FD 5, rep.-no. KoMo 1994 I-365; fig. 6: x 150, sample TT 7, rep.-no. KoMo 1994 I-241; fig. 8: x 200, sample TT 5, rep.-no. KoMo 1994 I-369; fig. 9: x 150, sample MD 1, rep.-no. KoMo 1994 I-169.

Figs. 2, 11: *Baumgartneria yehae* n. sp.; fig. 2: x 100, sample MIETTO, red nodular limestones immediately above the pietra verde of the San Ulderico section (MIETTO & PETRONI, 1979), rep.-no. KoMo 1994 I-549; fig. 11: holotype, x 200, sample FD 17, rep.-no. KoMo 1994 I-371.

Fig. 3: *Baumgartneria retrospina semicircularis* n. subsp., x 120, sample TT 4, rep.-no. KoMo 1994 I-345.

Fig. 7: *Paroertlispongus rarispinosus* KOZUR & MOSTLER, 1981, x 120, sample T 7, rep.-no. KoMo 1994 I-264.

Fig. 10: *Paroertlispongus multispinosus* KOZUR & MOSTLER, 1981, x 120, sample TT 7, rep.-no. KoMo 1994 I-723.

Figs. 12–14: *Paroertlispongus weddigei* LAHM, 1984; fig. 12: x 100, sample MIETTO, red nodular limestones immediately above the pietra verde of the San Ulderico section (MIETTO & PETRONI, 1979), rep.-no. KoMo 1994 I-548; fig. 13: x 60, sample MIETTO, red nodular limestones immediately above the pietra verde of the San Ulderico section (MIETTO & PETRONI, 1979), rep.-no. KoMo 1994 I-550; fig. 14: x 100, MD 28, rep.-no. KoMo 1994 I-725.

Plate 13

Fig. 1: *Baumgartneria stellata* DUMITRICĂ, 1978, x 200, sample MD 9, rep.-no. KoMo 1994 I-637.

Figs. 2, 9: *Baumgartneria transita* n. sp.; fig. 2: x 200,, sample MD 22, rep.-no. KoMo 1994 I-319; fig.: holotype, x 300, sample MD 21, rep.-no. KoMo 1994 I-331.

Figs. 3, 5, 6, 10: *Baumgartneria bifurcata* DUMITRICĂ, 1978; fig. 3: x150, sample MD 1, rep.-no. KoMo 1994 I-170; fig. 5: x 240, sample MD 19, rep.-no. KoMo 1994 I-314; fig. 6: x 300, sample MD 27, rep.-no. KoMo 1994 I-333; ig. 10: x 220, sample MD 18, rep.-no. KoMo 1994 I-312.

Figs. 4, 11: *Paroertlispongus multispinosus* KOZUR & MOSTLER, 1981, sample VCB; fig. 4: x 200, rep.-no. KoMo 1994 I-792; fig. 11: x 140, rep.-no. KoMo 1994 I-194.

Fig. 7: *Baumgartneria trifurcata* DUMITRICĂ, 1978, x 320, sample MD 18, rep.-no. KoMo 1994 I-638.

Fig. 8: *Turospongus trispinosus* n. gen. n. sp., upper view, holotype, x 100, sample TT 7, rep.-no. KoMo 1994 I-262 (lateral view of the same specimen on pl. 14, fig. 10).

Plate 14

Fig. 1: *Falcispongus praefalciformis* n. sp., advanced forms, transitionalo to F. falciformis DUMITRICĂ, 1978, x 130, sample MD 22, rep.-no. KoMo 1994 I-632.

Figs. 2, 12: *Falcispongus falciformis* DUMITRICĂ, 1978, primitive forms; fig. 2: x 200, sample TT 8, rep.-no. KoMo 1994 I-347; fig. 12: x 300, sample TT 3, rep.-no. KoMo 1994 I-626.

Figs. 3, 4, 7, 11: *Falcispongus priscus* n. sp., x 200; fig. 3: holotype, sample MD 1, rep.-no. KoMo 1994 I-625; fig. 4: sample TT 7, rep.-no. KoMo 1994 I-633; fig. 7: sample TT 7, rep.-no. KoMo 1994 I-358; fig. 11: sample TT 7, rep.-no. KoMo 1994 I-324.

Figs. 5, 8, 9: *Falcispongus postcalcaneus* n. sp., x 150; fig. 5: primitive form, sample TT 14, rep.-no. KoMo 1994 I-628; fig. 8: holotype, sample TT 7, rep.-no. KoMo 1994 I-627; fig. 9: sample TT 14, rep.-no. KoMo 1994 I-650.

Fig. 6: Transitional form between *Falcispongus praefalciformis* n. sp. and *F. falciformis* DUMITRICĂ, 1978, x 120, sample MD 22, rep.-no. KoMo 1994 I-320.

Fig. 10: *Turospongus trispinosus* n. gen. n. sp., lateral view, holotype, x 200, sample TT 7, rep.-no. KoMo 1994 I-262 (upper view of the same specimen on pl. 13, fig. 8).

Plate 15

Figs. 1, 8: *Paurinella curvata* spinosa n. subsp.; fig. 1: holotype, x 160, sample TT 2, rep.-no. KoMo 1994 I-339; fig. 8: x 150, sample VCB, rep.-no. KoMo 1994 I-197.
Figs. 2, 3: *Paurinella curvata tenuispinosa* n. subsp., sample MD 32; fig. 2: holotype, x 180, rep.-no. KoMo 1994 I-338; fig. 3: equatorial view, third spine not visible, x 160, rep.-no. KoMo 1994 I-793.
Fig. 4: *Paurinella latispinosa* n. sp., holotype, x 300, sample Köveskál 6, rep.-no. KoMo 1994 I-792.
Figs. 5, 6: *Neopaurinella ladinica* n. sp., sample FD 17, rep.-no. KoMo 1994 I-404, fig. 5: oblique equatorial-lateral view, x 130, fig. 6: lateral view, x 110.
Fig. 7: *Paurinella mesotriassica* KOZUR & MOSTLER, 1981, holotype (see also pl. 16, fig. 4), x 150, sample VCB, rep.-no. KoMo 1980 I-23.
Figs. 9, 11: *Paurinella aequispinosa* KOZUR & MOSTLER, 1981, sample VCB; fig. 9: x 200, rep.-no. KoMo 1994 I-913; fig. 11: x 180, rep.-no. KoMo 1994 I-196.
Fig. 10: *Paurinella balatonica* n. sp., holotype, x 180, sample FÖ 104, rep.-no. KoMo 1994 I-86.
Fig. 12: *Tetrapaurinella tetrahedrica* n. sp., x 150, sample MD 5, rep.-no. KoMo 1994 I-285.
Figs. 13, 14: *Paurinella ? inaequispinosa* n. sp., x 160, sample VCB; fig. 13: rep.-no. KoMo 1994 I-915; fig. 14: holotype, rep.-no. KoMo 1994 I-200.
Fig. 15: *Paurinella trettoensis* n. sp., holotype, x 130, sample TT 13, rep.-no. KoMo 1994 I-791.

Plate 16

Fig. 1: *Paurinella ? longispinosa* n. sp. holotype, x 180, sample MD 6, rep.-no. KoMo 1994 I-186.
Fig. 2: *Paurinella* cf. *mesotriassica* KOZUR & MOSTLER, 1981, x 180, sample VCB, 797.
Fig 3: *Paurinella tornata* n. sp., holotype, x 180, sample MD 13, rep.-no. KoMo 1994 I-11.
Fig. 4: *Paurinella mesotriassica* KOZUR & MOSTLER, 1981, holotype (see also pl. 15, fig. 7), x 150, rep.-no. KoMo 1980 I-23.
Fig. 5: *Paurinella acutispinosa* n. sp., holotype, x 130, sample Köveskál 6, rep.-no. KoMo 1994 I-790.
Fig. 6: *Neopaurinella ladinica* n. sp., holotype, x 100, sample VCB, rep.-no. KoMo 1994 I-198.
Fig. 7: *Neopaurinella tumidospina* n. sp., holotype, x 200, sample VCB, rep.-no. KoMo 1994 I-199.
Fig. 8: *Katorella bifurcata* KOZUR & MOSTLER, 1981, x 200, sample VCB, rep.-no. KoMo 1980 I-20.
Fig. 9: *Tetrapaurinella discoidalis* n. sp., holotype (see also pl. 17, fig. 4, x 200, sample VCB, rep.-no. KoMo 1994 I-201.
Figs. 10, 12: *Katorella trifurcata* n. sp.; fig. 10: holotype, x 200, sample VCB, rep.-no. KoMo 1994 I-210; fig. 12: x 300, sample Köveskál 6, rep.-no. KoMo 1994 I-792.
Fig. 11: *Discokatorella tetraspina* n. sp., holotype, x 200, sample MD 1, rep.-no. KoMo 1994 I-172.

Plate 17

Figs. 1, 2: *Paurinella trispinosa* (LAHM, 1984), x 250, sample VCB, rep.-no. KoMo 1994 I-203, fig. 1: lateral view, fig. 2: oblique equatorial view.
Figs. 3, 5: *Tetrapaurinella tetrahedrica* n. sp., x 180, sample VCB; fig. 3: holotype, rep.-no. KoMo 1994 I-202; fig. 5: rep.-no. KoMo 1994 I-202.
Fig. 4, 6: *Tetrapaurinella discoidalis* n. gen. n. sp., sample VCB; fig. 4: holotype, oblique equatorial view (see also pl. 16, fig. 9), x 200, rep.-no. KoMo 1994 I-201; fig. 6: x 160, rep.-no. KoMo 1994 I-796.
Figs. 7, 8: *Sarla ? anisica* n. sp., FÖ 87; fig. 7: x 180, rep.-no. KoMo 1994 I-155; fig. 8: x 200, rep.-no. KoMo 1994 I-928.
Figs. 9, 10: *Anisicyrtis hungarica* KOZUR & MOSTLER, 1981, sample FÖ 87, rep.-no. KoMo 1994 I-929, fig. 9: x 300, fig. 10: spicular system, x 1200.
Fig. 11: *Anisicyrtis mocki* n. sp., holotype, x 440, sample FÖ 87, rep.-no. KoMo 1994 I-56.

Plate 18

Figs. 1–4, 8: *Anisicyrtis hungarica* KOZUR & MOSTLER, 1981, sample FÖ 87; fig. 1: x 360, rep.-no. KoMo 1994 I-53; fig. 2: x 320, rep.-no. KoMo 1994 I-54; fig. 3: x 360, rep.-no. KoMo 1994 I-55; fig. 4: spicular system, x 2000; fig. 8: holotype, oblique upper-lateral view, x 600, rep.-no. KoMo 1980 I-93.

Figs. 5, 6: *Anisicyrtis foremanae* n. sp., x 260; fig. 5: sample 6, rep.-no. KoMo 1994 I-471; fig. 6: holotype, sample TT 8, rep.-no. KoMo 1994 I-357.

Fig. 7, 10: *Anisicyrtis mocki* n. sp., sample FÖ 87; fig. 7: x 260, rep.-no. KoMo 1994 I-55 B; fig. 10: x 540, rep.-no. KoMo 1994 I-58, Because of the oblique lateral view, only the elevated basal part of the cephalis below horn V is visible. The remaining part of the moderately large cephalis is so dark in the photo that it will not be visible after printing; its outline is therefore indicated by a white line.

Fig. 9: *Anisicyrtis goricanae* n. sp., holotype, x 300, sample FD 6, rep.-no. KoMo 1994 I-457.

Fig. 11: *Anisicyrtis* cf. *foremanae* n. sp., x 300, sample FÖ 110, rep.-no. KoMo 1994 I-462.

Fig. 12: *Anisicyrtis conica* n. sp., holotype, x 200, sample FÖ 87, rep.-no. KoMo 1994 I-77.

Fig. 13: *Anisicyrtis mocki* n. sp., spicular system, x 1600, sample FÖ 87, rep.-no. KoMo 1994 I-57.

Plate 19

Figs. 1, 2: *Anisicyrtis goricanae* n. sp.; fig. 1: x 300, sample 110, rep.-no. KoMo 1994 I-462; fig. 2: x 360, sample MD 18, rep.-no. KoMo 1994 I-463.

Fig. 3: *Anisicyrtis* cf. *nodosa* n. sp., transitional form to *A. italica*, x 260, sample TT 3, rep.-no. KoMo 1994 I-468.

Fig. 4: *Anisicyrtis postillyrica* n. sp., holotype, x 260, sample FÖ 100 D, rep.-no. KoMo 1994 I-76.

Figs. 5, 7: *Anisicyrtis italica* n. sp., sample MD 12; fig. 5: holotype, x 260, rep.-no. KoMo 1994 I-455; fig. 7: x 260, rep.-no. KoMo 1994 I-473.

Figs. 6, 8, 9: *Anisicyrtis nodosa* n. sp.; fig. 6: holotype, x 340, sample TT 5, rep.-no. KoMo 1994 I-450; fig. 8: x 240, sample T 12, rep.-no. KoMo 1994 I-278; fig. 9: x 220, sample TT 3, rep.-no. KoMo 1994 I-455.

Fig. 10: *Anisicyrtis trettoensis postera* n. subsp., holotype, x 260, sample TT 16, rep.-no. KoMo 1994 I-453.

Figs. 11–14: *Anisicyrtis spinosa* n. sp.; fig. 11: x 320, sample TT 7, rep.-no. KoMo 1994 I-244; fig. 12: x 260, sample TT 5, rep.-no. KoMo 1994 I-478; fig. 13: x 320, sample TT 7, rep.-no. KoMo 1994 I-245; fig. 14: x 300, sample TT 5, rep.-no. KoMo 1994 I-481.

Fig. 15: *Anisicyrtis trettoensis trettoensis* n. sp., holotype, x 200, sample TT 7, rep.-no. KoMo 1994 I-247.

Plate 20

Figs. 1, 2: *Anisicyrtis trettoensis trettoensis* n. sp., sample TT 7; fig. 1: holotype, x 230, rep.-no. KoMo 1994 I-246; fig. 2: x 260, rep.-no. KoMo 1994 I-247 A..

Fig. 3: *Anisicyrtis recoaroensis deweveri* n. subsp., holotype, x 300, sample TT 7, rep.-no. KoMo 1994 I-243.

Figs. 4, 5: *Anisicyrtis recoaroensis recoaroensis* n. sp.; fig. 4: holotype, x 300, sample VCB, rep.-no. KoMo 1994 I-161; fig. 5: x 320, sample MD 12, rep.-no. KoMo 1994 I-470.

Figs. 6, 7: *Goestlingella toempeae* n. sp., holotype, sample MD 8, rep.-no. KoMo 1994 I-252, fig. 6: spicular system, x 2200; fig. 7: x 300.

Figs. 8, 10–12: *Monicasterix prisca* n. sp., sample VCB; fig. 8, 12: rep.-no. KoMo 1994 I-529, fig. 8: x 260, fig. 12: lower side ofthe same specimen, x 720; figs. 1O, 11: holotype, rep.-no. KoMo 1994 I-528, fig. 10: lower side, x 860, fig. 11: lateral view, x 440.

Fig. 9: *Monicasterix brevituba* n. sp., holotype, x 400, sample TT 3, rep.-no. KoMo 1994 I-526.

Plate 21

Figs. 1–3, 5, 7: *Monicasterix alpina* n. gen. n. sp., holotype, sample TT 7, rep.-no. KoMo 1994 I-253, fig. 1: lateral view, x 360, fig. 2: somewhat oblique lateral view, x 400, fig. 3: detail of the upper part, x 600, fig. 5: lower view, x 720, fig. 7: spicularsystem, x 1500.

Figs. 4, 6: *Monicasterix gabiolaensis* n. sp., holotype, sample MD 9, ig. 4: x 320, fig. 6: lower view, x 780.

Figs. 8, 10: *Tubotriassocyrtis latotuba* n. sp., holotype, sample TT 3, rep.-no. KoMo 1994 I-531, fig. 8: lateral view, fig. 1O: oblique lower view, x 800.

Fgis. 9, 11: *Tubotriassocyrtis annulata* n. sp., holotype, sample VCB, rep.-no. KoMo 1994 I-532, fig. 8L lower view, x 780, fig. 11: lateral view, x 480.

Plate 22

Fig. 1: *Tubotriassocyrtis angustituba* n. gen. n. sp., holotype, x 300, sample TT 3, rep.-no. KoMo 1994 I-530.

Figs. 2, 4–9: *Ladinocampe annuloperforata* n. sp.; fig. 2: x 240, sample TT 3, rep.-no. KoMo 1994 I-501; figs. 4-6: holotype, sample TT 5, rep.-no. KoMo 1994 I-491, fig. 4: x 200, fig. 5: detail of the upper part of the test, x 600, fig. 6: detail of the middle part of the test, x 600; fig. 7: x 200, sample TT 3, rep.-no. KoMo 1994 I-498; fig. 8: transitional form to *L. multiperforata* KOZUR, 1984, x 240, sample T 3, rep.-no. KoMo 1994 I-500; fig. 9: view from the opposite side of the columella, x 260, sample TT 7, rep.-no. KoMo 1994 I-232.

Figs. 3, 11–14: *Ladinocampe multiperforata* KOZUR, 1984; fig. 3: x 180, sample TT 3, rep.-no. KoMo 1994 I-581; figs. 11, 12: two different lateral views of the same specimen, x 220, sample T 7, rep.-no. KoMo 1994 I-230; figs. 13, 14: sample TT 7, rep.-no. KoMo 1994 I-231, fig. 13: oblique lower view, x 600, fig. 14: lateral view, x 240.

Fig. 10: *Ladinocampe latiannulata* n. sp. , holotype, x 200, sample TT 3, rep.-no. KoMo 1994 I-492.

Plate 23

Figs. 1, 2: *Ladinocampe multiperforata* KOZUR, 1984; fig. 1: x 220, sample TT 7, rep.-no. KoMo 1994 I-231; fig. 2: x 200, sample TT 16, rep.-no. KoMo 1994 I-505.

Fig. 3: *Ladinocampe* cf. *vicentinensis* n. sp., x 220, sample TT 10, rep.-no. KoMo 1994 I-360.

Figs. 4, 5: *Ladinocampe vicentinensis* n. sp.; fig. 4: x 240, sample TT 18, rep.-no. KoMo 1994 I-494; fig. 5: holotype, x 300, sample TT 16, rep.-no. KoMo 1994 I-495.

Figs. 6–9, 12: *Planispinocyrtis baloghi* KOZUR & MOSTLER, 1981, sample FÖ 87; figs. 6, 7, 12: holotype, rep.-no. KoMo 1980 I-75, fig. 6: upper view, x 600, figs. 7, 12: two different, somewhat oblique lateral views, x 400; figs. 8, 9: rep.-no. KoMo 1994 I-48, fig. 8: lower view, spicular system, x 720, fig. 9: lateral view, x 300.

Figs. 10, 11: *Planispinocyrtis ? annulata* n. sp., sample TT 13; fig. 10: x 220, rep.-no. KoMo 1994 I-566; fig. 11: holotype, x 200, rep.-no. KoMo 1994 I-567.

Fig. 13: *Planispinocyrtis ? gabiolaensis* n. sp., holotype, x 260, sample MD 1, rep.-no. KoMo 1994 I-568.

Fig. 14: *Planispinocyrtis brevis* n. sp., holotype, x 360, sample FÖ 87, rep.-no. KoMo 1994 I-46.

Plate 24

Figs. 1-3: *Planispinocyrtis haeckeli* n. sp., sample TT 7,; figs. 1, 3: holotype, rep.-no. KoMo 1994 I-236, fig. 1: lateral view, x 240, fig. 3: oblique lateral-lower view, x 360; fig. 2: x 220, rep.-no. KoMo 1994 I-237.

Figs. 4-7: *Planispinocyrtis illyrica* n. sp., sample FÖ 87; figs. 4, 6: holotype, rep.-no. KoMo 1994 I-43, fig. 4: lateral view, x 260, fig. 6: lower view, spicular system, x 600; fig. 5: x 400, rep.-no. KoMo 1994 I-44.

Figs. 8, 10, 11: *Planispinocyrtis ? longispinosa* n. sp., holotype, sample Köveskál 4 B, 0,1 m below sample Köveskál 4, rep.-no. KoMo 1994 I-571, fig. 8: lateral view, x 260, fig. lowerr view, spicular system, x 600, fig. 11: oblique lateral view, x 320.

Figs. 9, 12: *Planispinocyrtis macrocephalis* n. sp., holotype, sample FÖ 87, rep.-no. KoMo 1994 I-47, fig. 9: lateral view, x 400, fig. 12: lower view, spicular system, x 730.

Plate 25

Figs. 1, 6: *Planispinocyrtis multiporata annuloporata* n. subsp., fig. 1: holotype, x 300, sample TT 7, rep.-no. KoMo 1994 I-239; fig. 6: x 260, sample TT 16, rep.-no. KoMo 1994 I-360.

Fgis. 2, 4, 8: *Planispinocyrtis pulchra globulata* n. subsp., holotype, sample FÖ 87, rep.-no. KoMo 1994 I-42, fig 2: lateral view, x 260, fig. 4: oblique lateral-lower view, x 440, fig. 8: lower view, x 400.

Figs. 3, 5, 9: *Planispinocyrtis multiporata multiporata* n. sp., sample TT 7; fig. 3: lateral view, x 300, rep.-no. KoMo 1994 I-238; figs. 5, 9: holotype, rep.-no. KoMo 1994 I-540, fig. 5: oblique lateral-lower view, x 300, fig. 9: spicular system, x 2000.

Figs. 7, 14: *Planispinocyrtis praecursor* n. sp., sample FÖ 100 D, fig. 7: holotype, x 260, rep.-no. KoMo 1994 I-74; fdig. 14: x 300, rep.-no. KoMo 1994 I-75.

Figs. 10, 11: *Planispinocyrtis ? nishimurai* n. sp.; fig. 10: x 320, sample TT 3, rep.-no. KoMo 1994 I-569; fig. 11: holotype, x 300, sample T 6, rep.-no. KoMo 1994 I-570.

Fig. 12: *Planispinocyrtis pelsoensis* n. sp., holotype, x 320, sample FÖ 110, rep.-no. KoMo 1994 I-533.

Fig. 13: *Planispinocyrtis* cf. *praecursor* n. sp., x 260, sample TT 3, rep.-no. KoMo 1994 I-541.

Plate 26

Fig. 1: *Planispinocyrtis paronai* n. sp., holotype, x 320, sample TT 13, rep.-no. KoMo 1994 I-571.

Fig. 2: *Planispinocyrtis pulchra pulchra* n. sp., holotype, x 300, sample FÖ 87, rep.-no. KoMo 1994 I-41.

Figs. 3, 4, 9: *Planispinocyrtis ? thoraciglobulosa* n. sp., holotype, sample TT 16, rep.-no. KoMo 1994 I-362, fig. 3: lateral vie, x 260, fig. 4: other lateral view, x 300, fig. 9: lower view, x 400.

Figs. 5, 6, 10: *Planispinocyrtis ? truempyi* n. sp., holotype, sample MD 1, rep.-no. KoMo 1994 I-173, fig. 5: lateral view, x 260, fig. 6: detail of the apical part, x 690, fig. 10: other lateral view, x 230.

Fig. 7: *Spinotriassocampe carnica* n. sp., holotype, x 100, Rupe del Passo di Burgio (Sosio Valley area), sample S 8, rep.-no. CK 1188 VII-82.

Figs. 8, 11, 12, 14: *Spinotriassocampe longobardica* n. sp.; fig. 8: x 180, sample 7/29/12/87, rep.-no. CK 1188 VII-87; figs. 11, 12: holotype (see also pl. 27, figs. 6, 8), 0.65 cm below sample Köveskál 6/83, rep.-no. KoMo 1994 I-615, fig. 11: x 160, fig. 12: detail from the lower part of the test, x 600; fig. 14: x 240, 0.65 cm below sample Köveskál 6/83, rep.-no. KoMo 1994 I-617.

Fig. 13: *Spinotriassocampe mesofassanica* n. sp., holotype (see also pl. 27, figs. 2, 9), x 160, sample TT 3, rep.-no. KoMo 1994 I-228.

Plate 27

Figs. 1, 2, 5, 9: *Spinotriassocampe mesofassanica* n. sp.; fig. 1: x 230, sample TT 7, rep.-no. KoMo 1994 I-619; figs. 2, 9: holotype (see also pl. 26, fig. 13), sample TT 3, rep.-no. KoMo 1994 I-228, fig. 2: detail of the middle part, x 580, fig. 9: detail of the apical part. x 960; fig. 5: detail of the distal part of an other specimen , sample TT 7, rep.-no. KoMo 1994 I-619.

Fig. 3: *Spinotriassocampe eofassanica* n. sp., holotype, x 200, sample MD 12, rep.-no. KoMo 1994 I-613.

Figs. 4, 6, 8: *Spinotriassocampe longobardica* n. sp., 0.65 cm below sample Köveskál 6/83; fig. 4: x 200, rep.-no. KoMo 1994 I-616; figs. 6, 8: holotype (see also pl. 26, figs. 11, 12), x 600, rep.-no. KoMo 1994 I-615, fig. 6: detail from the middle part of the test, fig. 8: detail of the apical part.

Fig. 7: *Spinotriassocampe transita* n. sp., holotype, x 260, sample TT 5, rep.-no. KoMo 1994 I-618.

Plate 28

Figs. 1-4, 9, 11: *Pararuesticyrtium mediofassanicum* n. sp.; figs. 1, 11: sample TT 7, rep.-no. KoMo 1994 I-227, fig. 1: x 260, fig. 11: detail of the distal part of the test, x 520; fig. 2: primitive form, x 260, sample TT 2, rep.-no. KoMo 1994 I-933; fig. 3: x 260, sample TT 7, rep.-no. KoMo 1994 I-759; fig. 4: holotype, x 260, sample T 13, rep.-no. KoMo 1994 I-758; fig. 9: advanced form, x 260, sample TT 18, rep.-no. KoMo 1994 I-757.

Figs. 5, 6, 10, 12: *Pararuesticyrtium eofassanicum* n. sp.; fig. 5: x 260, sample MD 18, rep.-no. KoMo 1994 I-317;

figs. 6, 10: holotype, sample MD 21, rep.-no. KoMo 1994 I-330, fig. 6: x 260, fig. 10: lower view, x 500; fig. 12: x 260, sample MD 21, rep.-no. KoMo 1994 I-821.

Figs. 7, 8: *Pararuesticyrtium constrictum* n. sp., holotype, sample TT 16, rep.-no. KoMo 1994 I-760, fig. 7: detail from the middle part of the test, x 600, fig. 8: entire specimen, x 260.

Plate 29

Figs. 1, 2: *Sanfilipoella laevis* n. sp., holotype, sample FÖ 87, rep.-no. KoMo 1994 I-17, fig. 1: lateral view, x 300, fig. 2: lower view, spicular system, x 540.

Figs. 3, 4, 7: *Hozmadia rotunda* (NAKASEKO & NISHIMURA, 1979), sample FÖ 87, fig. 3: lateral view, x 230, rep.-no. KoMo 1994 I-4; figs. 4, 7: rep.-no. KoMo 1994 I-15, fig. 4: somewhat oblique lateral view, x 200, fig. 7: lower view of the same specimen, x 600.

Figs. 5, 6: *Hozmadia longicephalis* n. sp., holotype, sample FÖ 87, rep.-no. KoMo 1994 I-525, fig. 5: lateral view, x 540, fig. 6: lower view, x 1000.

Figs. 9–10: *Poulpus illyricus* n. sp., sample FÖ 87; fig. 8: somewhat oblique lateral view, x 540, rep.-no. KoMo 1994 I-7; figs. 9, 10: rep.-no. KoMo 1994 I-8, fig. 9: lower view, spicular system, x 540, fig. 10: lateral view, x 450.

Plate 30

Figs. 1–3, 5: *Eonapora fassanica* n. sp.; figs. 1, 5: holotype, sample MD 3, rep.-no. KoMo 1994 I-178, fig. 1: lateral view, x 200, fig. 5: lower view, spicular system, x740; figs. 2, 3: sample MD 1, rep.-no. KoMo 1994 I-174, fig. 2:lower view, spicular system, x 360, fig. 3: lateral view, x 220.

Figs. 4, 7: *Hozmadia spinosa* n. sp. holotype, sample FÖ 87,, rep.-no. KoMo 1994 I-10, fig. 4: lateral view, x 400, fig. 7: lower view, spicular system, x 450.

Figs. 6, 9: *Eonapora longispinosa* n. sp.; fig. 6: holotype, sample T 5, x 240, rep.-no. KoMo 1994 I-606, fig. 9: x 150, sample TT 7, rep.-no. KoMo 1994 I-574.

Figs. 8, 11: *Eonapora robusta* KOZUR & MOSTLER, 1981, x 360, sample FÖ 87; fig. 8: damaged specimen, cephalic spicular system and arches well visible in lateral view, rep.-no. KoMo 1994 I-11; fig. 11: velum short, fragile, rep.-no. KoMo 1994 I-940.

Fig. 10: *Eonapora transita* n. sp., holotype, x 250, sample TT 12, rep.-no. KoMo 1994 I-250.

Plate 31

Figs. 1, 2, 5–10: *Hozmadia costata* n., sp., sample FÖ 87; fig. 1: x 360, rep.-no. KoMo 1994 I-2, figs. 2, 8, 9, 10: holotype, rep.-no. KoMo 1994 I-1, fiug. 2: lower view, spicular system, x 540, fig. 7: lateral view, x 360, fig. 8: other lateral view, x 360, fig. 9: lower view, x 400, fig. 10: detail of the spicular system, x 1000.

Fig. 3: *Hozmadia koeveskallensis* n. sp., holotype, x 180, sample Köveskál 4 B, 0,1 m below sample Köveskál 4, rep.-no. KoMo 1994 I-612.

Fig. 4: *Hozmadia reticulata* DUMITRICĂ, KOZUR & MOSTLER, 1980, x 320, sample FÖ 110, rep.-no. KoMo 1994 I-82.

Plate 32

Figs. 1, 2, 4: *Poulpus illyricus* n. sp., x 400, sample FÖ 87; figs. 1, 2. specimen with corroded wall, horns in prolongation of V and 2 l present, rep.-no. KoMo 1994 I-9a; fig. 4: holotype, rep.-no. KoMo 1994 I-7.

Figs. 5, 8: *Poulpus curvispinus curvispinus* DUMITRICĂ, KOZUR & MOSTLER, 1980; fig. 5: primitive form, x 400, sample MD 9, rep.-no. KoMo 1994 I-610; fig. 8: x 200, sample Köveskál 4 B, 0,1 m below sample Köveskál 4, rep.-no. KoMo 1994 I-610.

Figs. 3, 6, 7: *Poulpus curvispinus praecurvispinus* n. subsp.; fig. 3: x 320, sample MD 5, rep.-no. KoMo 1994 I-282; figs. 6, 7: holotype, x 360, sample MD 2, rep.-no. KoMo 1994 I-277, fig. 6: oblique lateral-upper view, fig. 7. lateral view.

Fig. 9, 12: *Poulpus gracilis* n. sp., holotype, sample FÖ 87, , rep.-no. KoMo 1994 I-18, fig. 9: lateral view, x 300, fig. 12: lower view, x 400.

Figs. 10, 11: *Poulpus longicephalis* n. sp., holotype, x 260, sample FÖ 87, rep.-no. KoMo 1994 I-6, fig. 10: lower view, spicular system, fig. 11: oblique lateral-lower view.

Plate 33

Figs. 1–5, 7–9, 13: *Silicarmiger costatus anisicus* KOZUR & MOSTLER, 1981, sample FÖ 87; fig. 1: x 200, rep.-no. KoMo 1994 I-33; fig. 2: x 200, rep.-no. KoMo 1994 I-33 C; fig. 3: x 200, rep.-no. KoMo 1994 I-33 B, figs. 4, 7, 13: x 200, rep.-no. KoMo 1994 I-33 A, fig. 4: lower view, spicular system, fig. 7: somewhat oblique lateral view, fig. 13: lateral view; fig. 5, 9: rep.-no. KoMo 1994 I-33, fig. 5. lateral view, x 200, fig. 9: lower view, spicular system, x 1000; Fig. 8, x 200, rep.-no. KoMo 1994 I-33 D.

Figs. 6, 15, 16: *Silicarmiger costatus costatus* DUMITRICĂ, KOZUR & MOSTLER, 1980; fig. 6: x 100, sample MIETTO, red nodular limestones immediately above the pietra verde of the San Ulderico section (MIETTO & PETRONI, 1979), rep.-no. KoMo 1994 I-552, figs. 15, 16: sample TT 16, rep.-no. KoMo 1994 I-354, fig. 15: x 200, fig. 16: x 600.

Fig. 10: *Silicarmiger costatus magnicornus* n. subsp., x 300, sample T 16, rep.-no. KoMo 1994 I-360.

Figs. 11, 12, 14: *Silicarmiger curvatus* KOZUR & MOSTLER, 1979, fig. 11: x 200, Köveskál cemetery, 0.65 m below sample 6/83, rep.-no. KoMo 1994 I-580; figs. 12, 14: sample S 8, rep.-no. KoMo 1994 I-574, fig. 12: x 250, fig. 14: detail, x 550.

Plate 34

Figs. 1, 2: *Silicarmiger latus mediospinosus* n. subsp., sample TT 6, rep.-no. KoMo 1994 I-358 a; fig. 1: lateral view, x 260, fig. 2: lower view, spicular system, x 360.

Figs. 3, 4, 9: *Silicarmiger latus latus* n. sp.; figs. 3, 4: primitive form, sample Köveskál 4 B, 0,1 m below sample Köveskál 4, , rep.-no. KoMo 1994 I-584, fig. 3: lower view, x 260, fig. 4: lateral view, x 200; fig. 9: holotype, x 160, Köveskál cemetery section, 0.65 m below 6/83, rep.-no. KoMo 1994 I-578.

Figs. 5, 6, 10: *Nofrema trispinosa* DUMITRICĂ, KOZUR & MOSTLER, 1980, sample MD 27, rep.-no. KoMo 1994 I-334, fig. 5: lower view, x 260, fig. 6: detail of the apical part, x 560, fig. 1o: lateral view, x 160.

Fig. 7: *Silicarmiger costatus magnicornus* n. subsp., holotype, x 150, sample TT 7, rep.-no. KoMo 1994 I-576.

Fig. 8: *Silicarmiger costatus costatus* DUMITRICĂ, KOZUR & MOSTLER, 1980, x 200, sample TT 16, rep.-no. KoMo 1994 I-575.

Plate 35

Fig. 1: DUMITRICĂ n. subsp., holotype, x 200, sample TT 14, rep.-no. KoMo 1994 I-577.

Figs. 2, 5: *Silicarmiger latus latus* n. sp., Köveskál cemetery section, 0.65 cm below sample 6/83; fig. 2: x 200, rep.-no. KoMo 1994 I-583, fig. 5: x 150, rep.-no. KoMo 1994 I-585.

Figs. 3, 6, 9, 11: *Spongosilicarmiger gabiolaensis curvatospinus* n. subsp.; fig. 3: x 160, sample MD 1, rep.-no. KoMo 1994 I-597; fig. 6: x 220, sample MD 18, rep.-no. KoMo 1994 I-595; figs. 9, 11: holotype, sample MD 1, rep.-no. KoMo 1994 I-592, fig. 9: detail of the apical spine, x 400, fig. 11: lateral view, x 180.

Fig. 4: *Silicarmiger latus mediospinosus* n. subsp., holotype, x 100, sample TT 16, rep.-no. KoMo 1994 I-358.

Fig. 7: *Spongosilicarmiger italicus italicus* KOZUR, 1984, x 150, sample MD 12, rep.-no. KoMo 1994 I-378.

Fig. 8: *Spongosilicarmiger gabiolaensis gabiolaensis* n. sp., x 130, sample MD 19, rep.-no. KoMo 1994 I-591.

Fig. 10: *Spongosilicarmiger italicus transitus* n. subsp., x 150, sample FÖ 100 D, rep.-no. KoMo 1994 I-383.

Figs. 12, 13: *Spongosilicarmiger posterus* n. sp., sample MD 28, rep.-no. KoMo 1994 I-601, fig. 12: x 250, fig. 13: detail of the apical part, x 540.

Plate 36

Fig. 1: *Spongosilicarmiger* cf. *gabiolaensis gabiolaensis* n. sp., transitional form to *Spongosilicarmiger italicus* KOZUR, 1984, x 200, sample MD 1, rep.-no. KoMo 1994 I-585.

Figs. 2, 3: *Spongosilicarmiger posterus* n. sp., holotype, sample _28, rep.-no. KoMo 1994 I-600, fig. 2: detail of the apical part, x 440, fig. 3: lateral view, x 180.

Figs. 4, 5, 7, 8, 10: *Spongosilicarmiger gabiolaensis gabiolaensis* n. sp., figs. 4, 5, 8: holotype, sample MD 20, rep.-no. KoMo 1994 I-386, fig. 4: x 200, fig. 5: detail of the distal part, x 500, 8: detail of the apical part, x 550; figs. 7, 10: sample MD 18, rep.-no. KoMo 1994 I-593, fig. 7: detail of the apical part, x 480, fig. 10: x 180.

Fig. 6: *Spongosilicarmiger italicus transitus* n. subsp., holotype, x 150, sample 100 D, rep.-no. KoMo 1994 I-384.

Figs. 9, 11: *Spongosilicarmiger priscus* n. sp., holotype, sample FÖ 87, rep.-no. KoMo 1994 I-385, fig. 9: oblique lower view, x 250, fig. 11: 160 x.

Plate 37

Figs. 1, 5, 6, 9, 10: *Spongosilicarmiger italicus italicus* KOZUR, 1984; fig. 1: x 220, sample MD 25, rep.-no. KoMo 1994 I-586; figs. 5, 6. sample MD 1, rep.-no. T 5822, fig. 5. detail of the distal part, x 400, fig. 6: lower view, x 300; figs. 9, 10: sample MD 9, rep.-no. KoMo 1994 I-587, fig. 9: x 160, fig. 10: detail of the distal part, x 540.

Figs. 2--4: *Spongosilicarmiger gabiolaensis curvatospinus* n. subsp., sample MD 2, rep.-no. KoMo 1994 I-385, fig. 2: detail of the apical spine, x 540, fig. 3: total view, x 160, fig. 4: detail of the apical part of the test below the apical spine.

Fig. 7: *Spongosilicarmiger* cf. *gabiolaensis gabiolaensis* n. sp., x 100, sample MIETTO, red nodular limestones immediately above the pietra verde of the San Ulderico section (MIETTO & PETRONI, 1979), rep.-no. KoMo 1994 I-603.

Fig. 8: *Spongosilicarmiger gabiolaensis gabiolaensis* n. sp., apical part, x 200, sample MD 20, rep.-no. KoMo 1994 I-590

Plate 38

Figs. 1, 3, 5: *Spongolophophaena globocephalis* n. gen. n. sp., sample TT 7; figs. 1, 3: holotype, rep.-no. KoMo 1994 I-233, fig. 1: spicular system, x 660, fig. 3: x 200; fig. 5: x 200, rep.-no. KoMo 1994 I-234.

Figs. 2, 4: *Spongolophophaena longa* n. sp., x 200; fig. 2: holotype, sample TT 18, rep.-no. KoMo 1994 I-509; fig. 4: sample T 12, rep.-no. KoMo 1994 I-510.

Figs. 6, 7, 9: *Conospongocyrtis cephaloconica* n. gen. n. sp.; figs, 6, 9: holotype, sample TT 13, rep.-no. KoMo 1994 I-513, fig. 6: x 200, fig. 9: detail of the wall surface, x 560; fig. 7: x 200, sample TT 18, rep.-no. KoMo 1994 I-514.

Figs. 8, 11: *Triassospongocyrtis cylindrica* n. sp., holotype, sample Köveskál 6 A, rep.-no. KoMo 1994 I-515, fig. 8: lateral view, x 130, fig. 11: oblique lateral-lower view, x 150.

Fig. 10: *Conospongocyrtis conica* n. sp., holotype, x 260, sample TT 7, rep.-no. KoMo 1994 I-511.

Plate 39

Figs. 1-3, 6, 7, 9: *Triassospongocyrtis longispinosa* n. gen. n. sp.; figs. 1, 2: holotype, sample TT 2, rep.-no. KoMo 1994 I-342, fig. 1: lateral view, x 200, fig. 2: lower view, spicular system, x 260; figs. 3, 6: sample MD 12, rep.-no. KoMo 1994 I-306, fig. 3: lower view, spicular system, x 320, fig. 6: detail of the spicular system, x 720; fig. 7. x 200, sample TT 7, rep.-no. KoMo 1994 I-518, fig. 9: lower view, spicular system, x 400, sample FÖ 110, rep.-no. KoMo 1994 I-307.

Figs 4, 8: *Triassospongocyrtis ruesti* n. sp., holotype, sample TT 16, rep.-no. KoMo 1994 I-516, fig. 4: x 130, fig 8: lower view, x 160.

Figs. 5, 10: *Triassospongocyrtis yaoi* n. sp., holotype, sample Köveskál 4 A, fig. 5: x 200, fig. 10: lower view, spicular system, x 220.

Plate 40

Fig. 1: *Tetraspinocyrtis anisica* n. sp., holotype, x 400, sample FÖ 87, rep.-no. KoMo 1994 I-52.

Figs. 2, 3, 8: *Tetraspinocyrtis annuloporata* n. sp., sample FÖ 87; figs. 2, 3: rep.-no. KoMo 1994 I-51 A, fig. 2: upper view, x 780, fig. 3: lateral view, x 500; fig. 8: holotype, x 400, rep.-no. KoMo 1994 I-51.

Figs. 4–6, 10, 12: *Tetraspinocyrtis laevis* n. gen. n. sp., sample FÖ 87; fig. 4: x 420, rep.-no. KoMo 1994 I-403, figs 5, 6, 10: holotype, rep.-no. KoMo 1994 I-402, figs. 5, 6: two different lateral views, x 440, fig. 10: spicular system; fig. 12: x 400, rep.-no. KoMo 1994 I-941.

Figs. 7, 9, 11: *Tetraspinocyrtis fassanica* n. sp., holotype, sample VCB, rep.-no. KoMo 1994 I-401, fig. 7: oblique lateral-lower view, x 400, fig. 9: lower view, x 600, fig. 11: lateral view, x 360.

Plate 41

Figs. 1–4, 7, 13, 15–18: *Annulotriassocampe campanilis longiporata* n. subsp.; figs. 1, 2: sample FÖ 100 D, rep.-no. KoMo 1994 I-66, fig. 1: x 300, fig. 2: detail of the middle part of the test; figs. 3, 4: sample MD 12, rep.-no. KoMo 1994 I-304, fig. 3: x 300, fig. 4: detail of the middle part of the test, x 720; figs. 7, 15: holotype, sample TT 7, rep.-no. KoMo 1994 I-225, fig. 7: x 300, fig. 15. detail of the apical part, x 690; fig. 13: x 200, sample FÖ 110, rep.-no. KoMo 1994 I-841; fig. 16: x 300, sample FÖ 104, rep.-no. KoMo 1994 I-69; fig. 17: x 200, sample TT 16, rep.-no. KoMo 1994 I-355; fig. 18: x 260, sample FÖ 100 D, rep.-no. KoMo 1994 I-950.

Figs. 5, 6, 8, 12: *Annulotriassocampe spinosa* n. sp.; figs. 5, 6: holotype, sample TT 7, rep.-no. KoMo 1994 I-824, fig. 5: detail of the apical part, x 600, 6: x 240; fig. 8: x 360, sample TT 5, rep.-no. KoMo 1994 I-869; fig. 12. x 240, sample FÖ 110, rep.-no. KoMo 1994 I-824

Figs. 9–11: *Annulotriassocampe campanilis campanilis* n. sp.; fig. 9: holotype, x 240, sample FÖ 87, rep.-no. KoMo 1994 I-34; fig. 10: x 240, sample FÖ 87, rep.-no. KoMo 1994 I-34 A, fig. 11: x 260, sample FÖ 100 D, rep.-no. KoMo 1994 I-951.

Fig. 14: *Annulotriassocampe* cf. *campanilis campanilis* n. sp., x 300, sample MD 1, rep.-no. KoMo 1994 I-837.

Plate 42

Fig. 1. *Triassocampe deweveri velata* n. subsp., holotype, x 300, sample TT 5, rep.-no. KoMo 1994 I-774.

Fig. 2: Triassocampe postdeweveri n. sp., holotype, x 240, siliceous Köveskál cemetery section, limestone 0.1 m below sample 4, rep.-no. KoMo 1994 I-743

Fig. 3: *Triassocampe cylindrica* n. sp., holotype, x 200, sample FÖ 87, rep.-no. KoMo 1994 I-406.

Fig. 4: *Triassocampe kahleri* n. sp., holotype, x 260, sample FÖ 100 D, rep.-no. KoMo 1994 I-62.

Figs. 5, 6: *Annulotriassocampe eoladinica* n. sp., sample TT 6, fig. 5: x 200, rep.-no. KoMo 1994 I-830, fig. 6: holotype, x 260, rep.-no. KoMo 1994 I-827.

Figs. 7, 8, 10, 11: *Paratriassocampe gaetanii* n. gen. n. sp.; fig. 7: x 300, sample MD 28, rep.-no. KoMo 1994 I-764; fig. 8: x 300, sample MD 1, rep.-no. KoMo 1994 I-305; fig. 10: holotype, x 240, sample MD 28, rep.-no. KoMo 1994 I-762; fig. 11: x 240, sample MD 22, rep.-no. KoMo 1994 I-765.

Fig. 9: *Paratriassocampe* cf. *gaetanii* n. gen. n. sp., x 300, sample MD 1, rep.-no. KoMo 1994 I-822.

Fig. 12: *Paratriassocampe ornata* n. sp., holotype, 300 x, sample FÖ 87, rep.-no. KoMo 1994 I-35.

Fig. 13: *Striatotriassocampe* ? n. sp., x 260, sample MD 9, rep.-no. KoMo 1994 I-788.

Figs. 14, 15: *Paratriassocampe ? brevis* n. sp., sample FÖ 110; fig. 14: x 400, rep.-no. KoMo 1994 I-769, fig. 15: holotype, x 360, rep.-no. KoMo 1994 I-768.

Fig. 16: *Paratriassocampe postornata* n. sp., holotype, x 300, sample FÖ 100 D, rep.-no. KoMo 1994 I-63.

Plate 43

Figs 1, 5, 6: *Pseudotriassocampe hungarica* n. gen. n. sp., sample FÖ 110; figs. 1, 5: rep.-no. KoMo 1994 I-701, fig 1: x 300, fig. 5: detail from the middle and distal part of the test, x 600; fig. 6: holotype, x 260, rep.-no. KoMo 1994 I-72.

Fig. 2: *Pseudotriassocampe angustiannulata* n. sp., holotype, x 300, sample FÖ 87, rep.-no. KoMo 1994 I-405.

Figs. 4, 10: *Striatotriassocampe nodosoannulata* n. gen. n. sp., fig. 4: x 200, sample TT 5, rep.-no. KoMo 1994 I-785, fig. 10: holotype, x 240, sample TT 13, rep.-no. KoMo 1994 I-784.

Fig. 9: *Pseudotriassocampe longispinosa* n. sp., holotype, x 120, sample TT 6, rep.-no. KoMo 1994 I-702.

Figs. 3, 7, 8: *Striatotriassocampe laeviannulata* n. sp., holotype; sample MD 28, rep.-no. KoMo 1994 I-787, fig. 3: x, fig. 7: detail of the middle part of the test, x 440, fig. 8: detail of the apical part of the test, x 600.

Figs. 11, 12, 15, 16: *Pararuesticyrtium ? illyricum* KOZUR & MOSTLER, 1981, fig. 11: x 240, sample MD 22, rep.-no. KoMo 1994 I-769, fig. 12: x 260, sample TT 3, rep.-no. KoMo 1994 I-770; fig. 15: x 240, sample TT 7, rep.-no. KoMo 1994 I-226; fig. 16: x 240, sample LÖ 110 D, rep.-no. KoMo 1994 I-61.

Fig. 13: *Pararuesticyrtium* cf. *eofassanicum* n. sp., x 260, sample MD 22, rep.-no. KoMo 1994 I-821 A.

Fig. 14: *Pararuesticyrtium trettoense* n. sp., holotype, x 220, sample TT 3, rep.-no. KoMo 1994 I-761.

Plate 44

Figs. 1–6, 10–12: *Triassocampe scalaris scalaris* DUMITRICA, KOZUR & MOSTLER, 1980; fig. 1: x 260, MD 18, rep.-no. KoMo 1994 I-770, fig. 2: x 200, sample MD 18, rep.-no. KoMo 1994 I-712; fig. 3: x 200, sample TT 7, rep.-no. KoMo 1994 I-748 (see also pl. 45, figs 1, 2 for details of the test); fig. 4: x 220, sample MD 12, rep.-no. KoMo 1994 I-706; fig. 5: x 220, sample MD 2, rep.-no. KoMo 1994 I-276, fdig. 6: x 320, sample MD 18, rep.-no. KoMo 1994 I-707; fig. 10: x 240, sample MD 1, rep.-no. KoMo 1994 I-708; fig. 11: x 220, sample MD 18, rep.-no. KoMo 1994 I-711; fig. 12: x 220, sample MD 13, rep.-no. KoMo 1994 I-713.

Fig. 7: *Triassocampe nishimurai* n. sp., x 200, sample FÖ 110, rep.-no. KoMo 1994 I-770.

Figs. 8, 9, 13: *Triassocampe scalaris* DUMITRICA, KOZUR & MOSTLER, 1980, advanced forms; fig. 8: x 300, sample TT 13, rep.-no. KoMo 1994 I-740; fig. 9: x 250, sample TT 7, rep.-no. KoMo 1994 I-745 (for details of the middle part of the test see pl. 45, fig. 3); fig. 13: x 200, sample TT 5, rep.-no. KoMo 1994 I-746 (for details of the middle part of the test see pl. 45, fig. 7).

Fig. 14: *Triassocampe deweveri pauciconstricta* n. subsp., x 240, sample FÖ 110, rep.-no. KoMo 1994 I-773.

Fig. 15: *Triassocampe transita* n. sp., holotype, 300 x, sample MD 18, rep.-no. KoMo 1994 I-755.

Figs. 16, 17: *Triassocampe scalaris baloghi* n. subsp.; fig. 16: holotype, x 320, sample FÖ 100 D, , rep.-no. KoMo 1994 I-716, fig. 17: x 260, sample MD 1, rep.-no. KoMo 1994 I-711.

Plate 45

Figs. 1, 2: *Triassocampe scalaris scalaris* DUMITRICA, KOZUR & MOSTLER, 1980, x 600, sample TT 7, rep.-no. KoMo 1994 I-748 (total view of the specimen see on pl. 44, fig. 3), fig. 1: detail of proximal part of the test, fig. 2: detail of distal part of the test.

Fig. 3: *Triassocampe scalaris* DUMITRICA, KOZUR & MOSTLER, 1980, advanced form, detail of the middle part of the test, x 600, sample TT 7, rep.-no. KoMo 1994 I-745 (for total view of the specimen see pl 44, fig. 9).

Figs. 4, 9–11: *Triassocampe nishimurai* n. sp., sample FÖ 110; fig. 4: x 200, rep.-no. KoMo 1994 I-770; figs. 9–11: holotype, rep.-no. KoMo 1994 I-773, fig. 9: detail of the middle part of the test, x 600, fig. 10: detail of the apical part of the test, x 600, fig. 11: x 260.

Fig. 5: *Triassocampe longicephalis* n. sp., holotype, x 300, sample TT 13, rep.-no. KoMo 1994 I-752.

Fig. 6: *Triassocampe deweveri* (NAKASEKO & NISHIMURA, 1979), advanced form, x 260, sample MD 1, rep.-no. KoMo 1994 I-742.

Fig. 7: *Triassocampe scalaris* DUMITRICA, KOZUR & MOSTLER, 1980, advanced form, detail of the middle part of the test (for total view of the specimen see pl. 44, fig. 13), x 600, sample TT 5, rep.-no. KoMo 1994 I-746.

Fig. 8: *Triassocampe striata* n. sp., holotype, x 320, sample TT 3, rep.-no. KoMo 1994 I-777.

Plate 46

Figs. 1–4, 12: *Yeharaia transita* n. sp., fig. 1: x 260, sample MD 13, rep.-no. KoMo 1994 I-721; fig. 2: x 260, sample TT 7, rep.-no. KoMo 1994 I-489; figs. 3, 12: holotype, sample MD 13, rep.-no. KoMo 1994 I-310, fig. 3: x 260, fig. 12: detail of the middle part of the test, x 780; fig. 4: x 260, sample MD 12, rep.-no. KoMo 1994 I-953.

Fig. 5: *Yeharaia lata* n. sp., holotype, sample TT 14, rep.-no. KoMo 1994 I-700.

Figs. 6–11, 13: *Yeharaia annulata* NAKASEKO & NISHIMURA, 1979; fig. 6: x 260, sample TT 7, rep.-no. KoMo 1994 I-229, figs. 7, 13: sample TT 14, rep.-no. KoMo 1994 I-487, fig. 7: x 200, fig. 13: detail of the apical part, x 730; fig. 8: x 200, sample MD 21, rep.-no. KoMo 1994 I-329; figs. 9, 11: sample TT 7, rep.-no. KoMo 1994 I-229 A, fig. 9: x 330, fig. 11: detail of the middle portion of the test, x 660, fig 10: x 260, sample TT 14, rep.-no. KoMo 1994 I-488

Plate 47

Fig. 1: *Triassocampe striata* n. sp., sample TT 7, x 300, rep.-no. KoMo 1994 I-778.

Fig. 2: *Triassocampe scalaris scalaris* DUMITRICA, KOZUR & MOSTLER, 1980, sample MD 28, x 200, rep.-no. KoMo 1994 I-749.

Fig. 3: *Triassocampe scalaris scalaris* DUMITRICA, KOZUR & MOSTLER, 1980, primitive form, sample FÖ 100 D, x 240, rep.-no. KoMo 1994 I-717.

Figs. 4, 5: *Yeharaia annulata* NAKASEKO & NISHIMURA, 1979, x 400; fig. 4: sample FÖ 100 D, rep.-no. KoMo 1994 I-490, fig. 5: sample FÖ 110, rep.-no. KoMo 1994 I-491.

Fig. 6: *Oertlispongus inaequispinosus inaequispinosus* DUMITRICA, KOZUR & MOSTLER, 1980, sample MIETTO, red nodular limestones immediately above the pietra verde of the San Ulderico section (MIETTO & PETRONI, 1979), x 100, rep.-no. KoMo 1994 I-551 A.

Fig. 7: *Oertlispongus inaequispinosus* DUMITRICA, KOZUR & MOSTLER, 1980, sample FÖ 110, x 220, rep.-no. KoMo 1994 I-537.

Fig. 8: *Oertlispongus aspinosus* n. sp., sample OB 45, equivalents of the early Fassaniàn *reitzi* Zone (about middle part) from a microfauna with *Paragondolella alpina* (KOZUR & MOSTLER), 3.25 m above the Late Anisian crinoidal sparites, x 130, rep.-no. KoMo 1994 I-395.

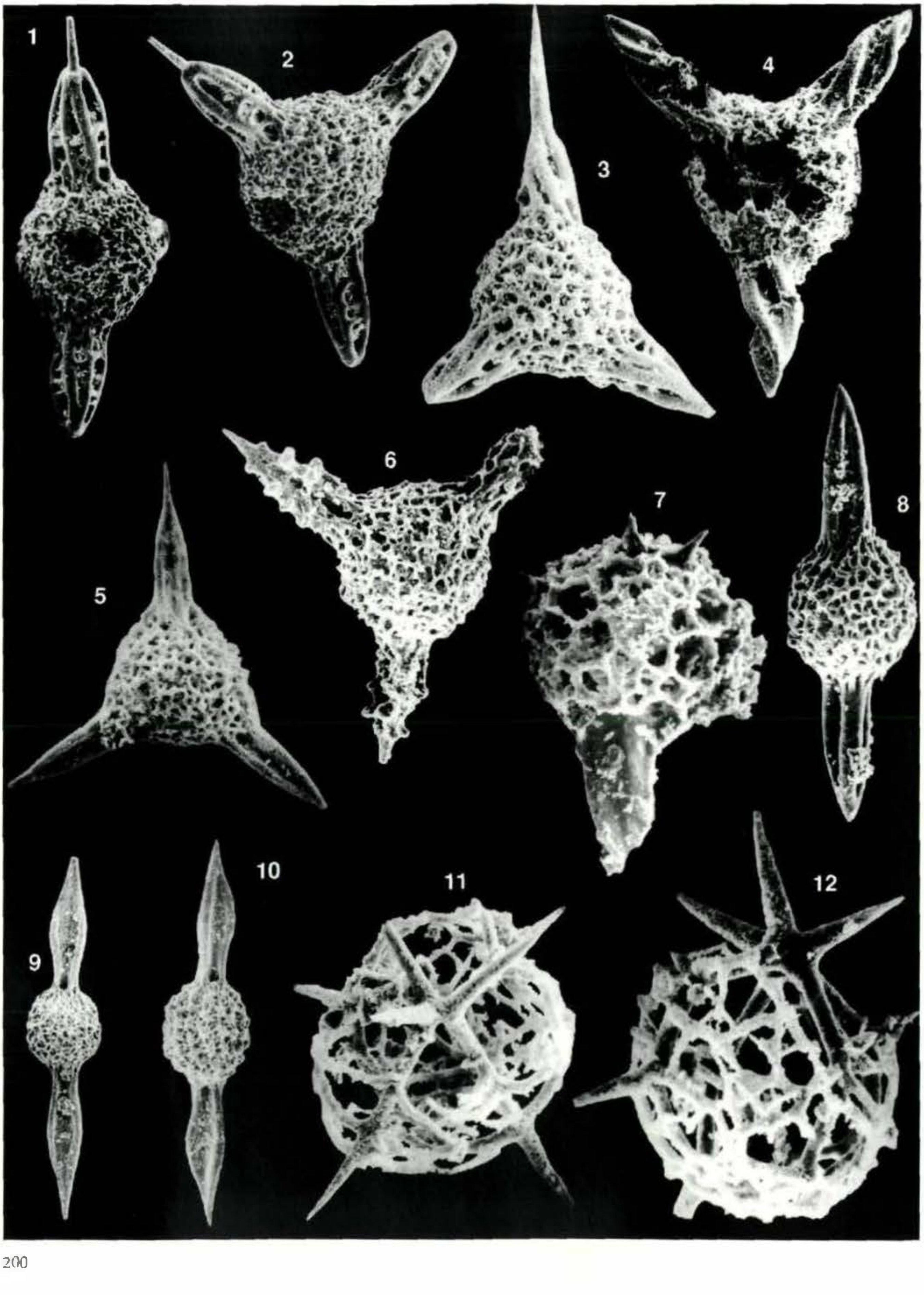
Fig. 9: *Ladinocampe annuloperforata* n. sp., x 200, sample MD 28, rep.-no. KoMo 1994 I-499.

Fig. 10: *Triassocampe cylindrica* n. sp., long morphotype, x 260, sample FÖ 87, rep.-no. KoMo 1994 I-407.

Fig. 11: *Paroertlispongus hermi* (*LAHM*, 1984), x 130, sample FD 17, x 130, rep.-no. KoMo 1994 I-377 A.

Figs. 12, 13: *Anisicyrtis cf.* mocki n. sp., spewcimen with rather distinct outer layer, sample FÖ 87, rep.-no. KoMo 1994 I-55 A, fig. 12: x 360, fig. 13: spicular system, x 1800.

Plate 1



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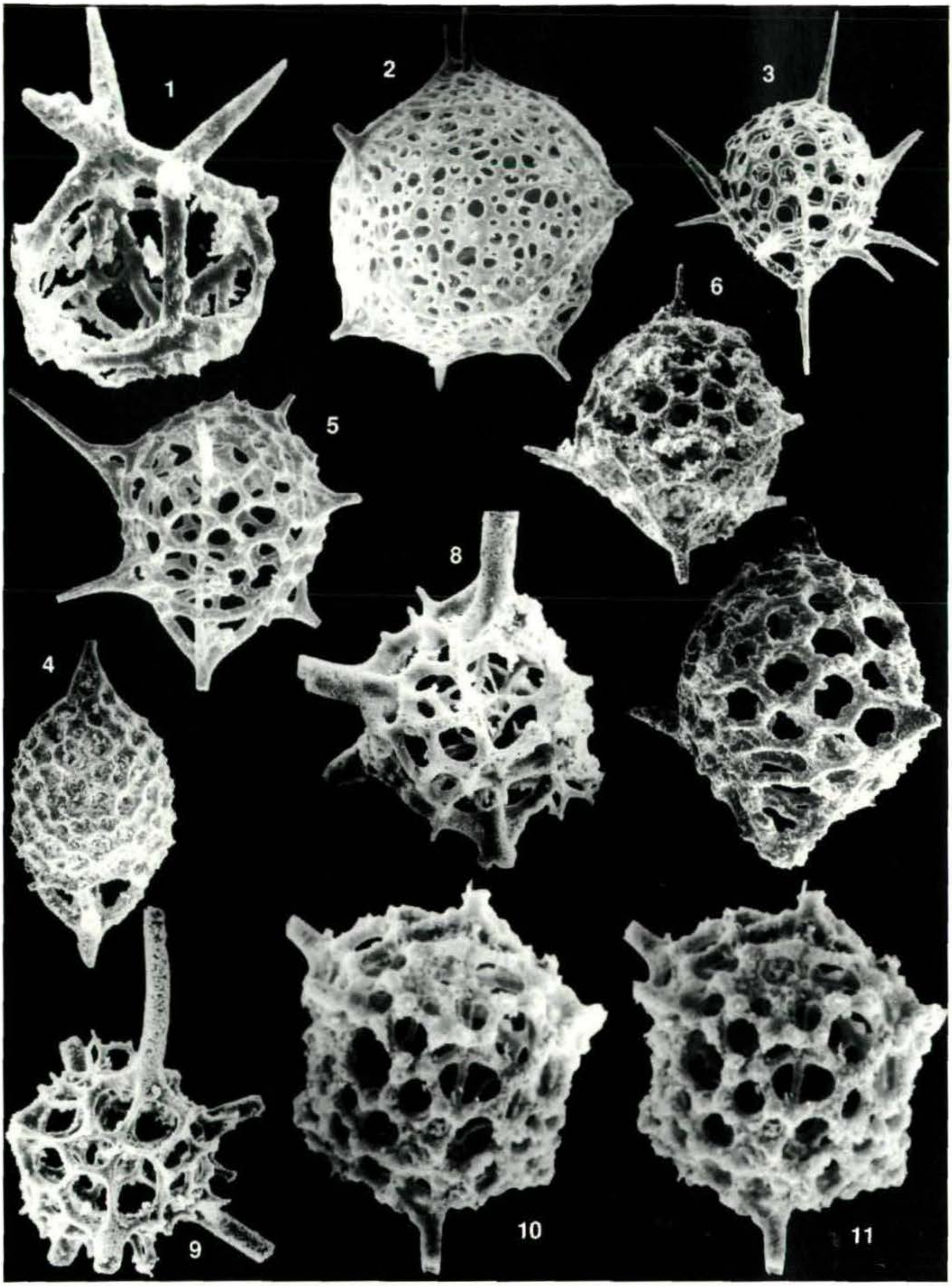

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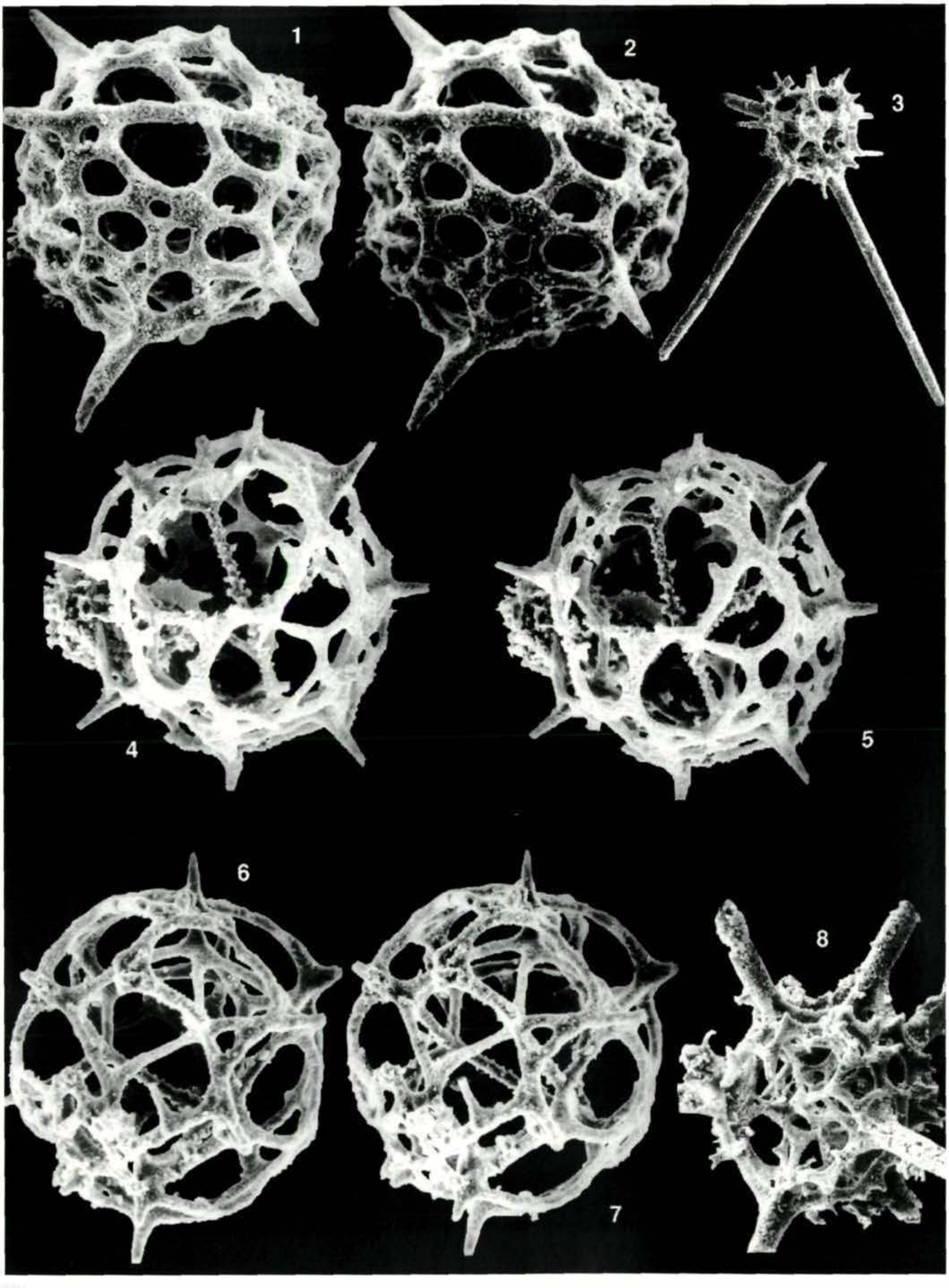

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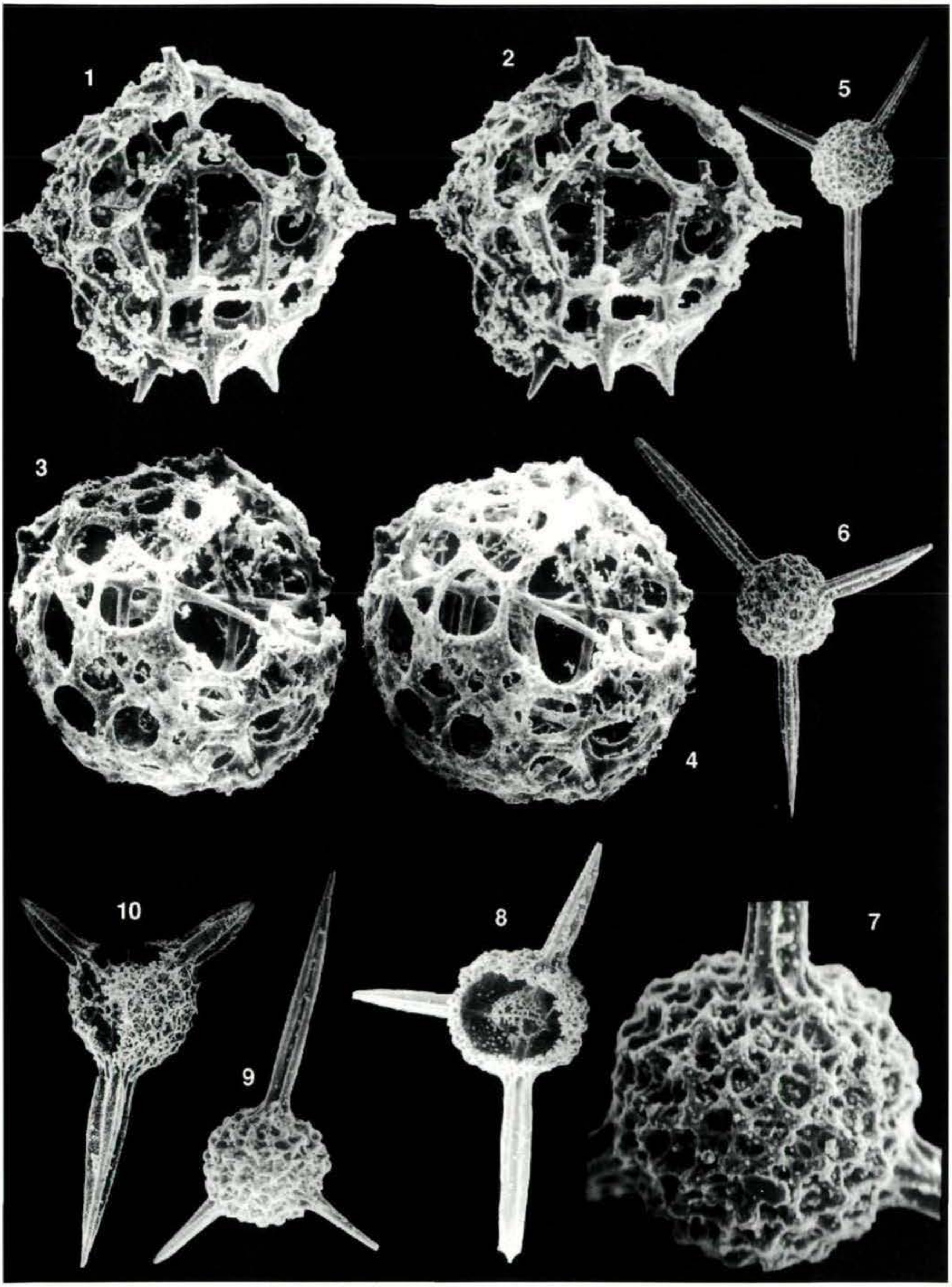

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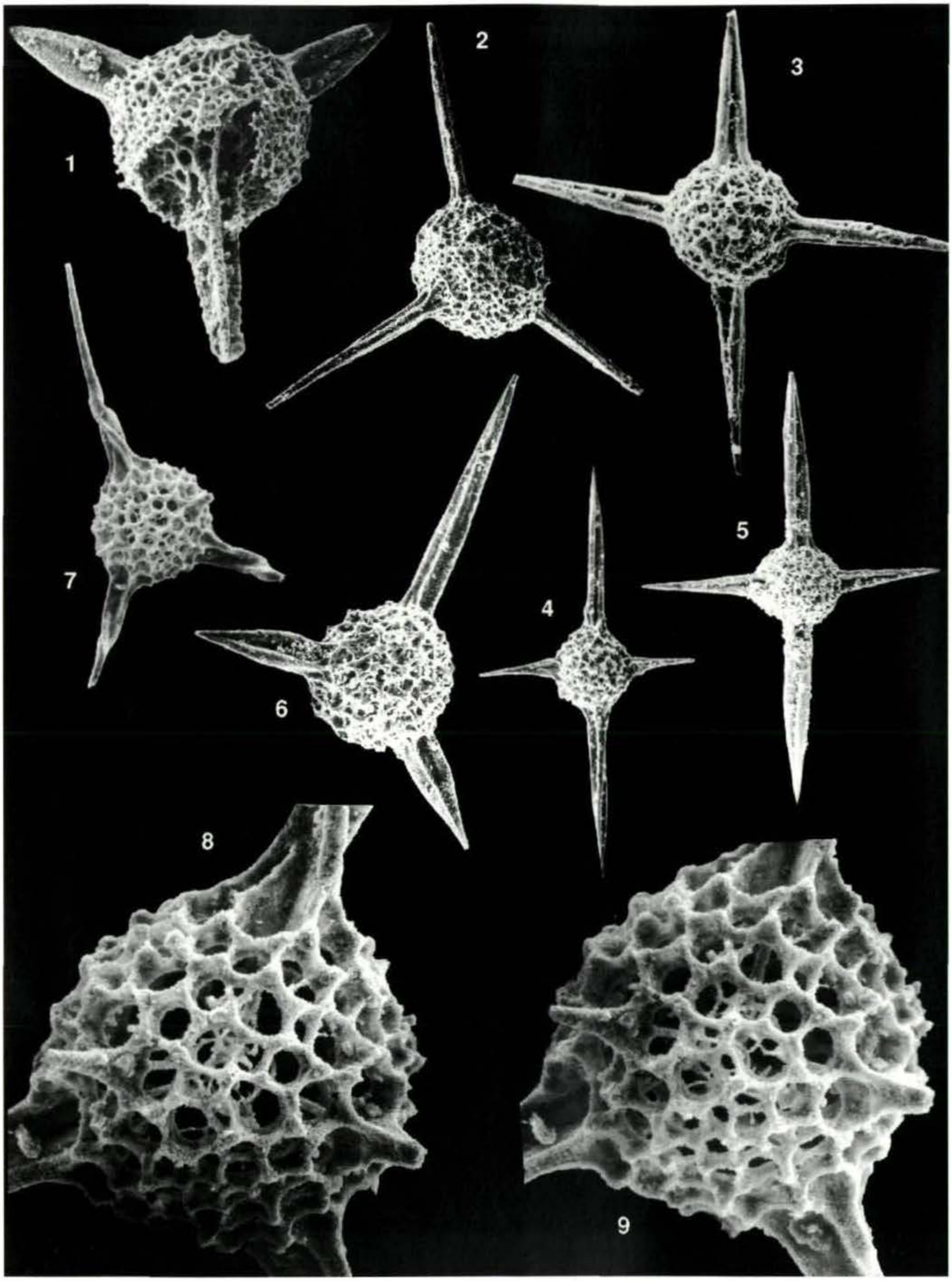

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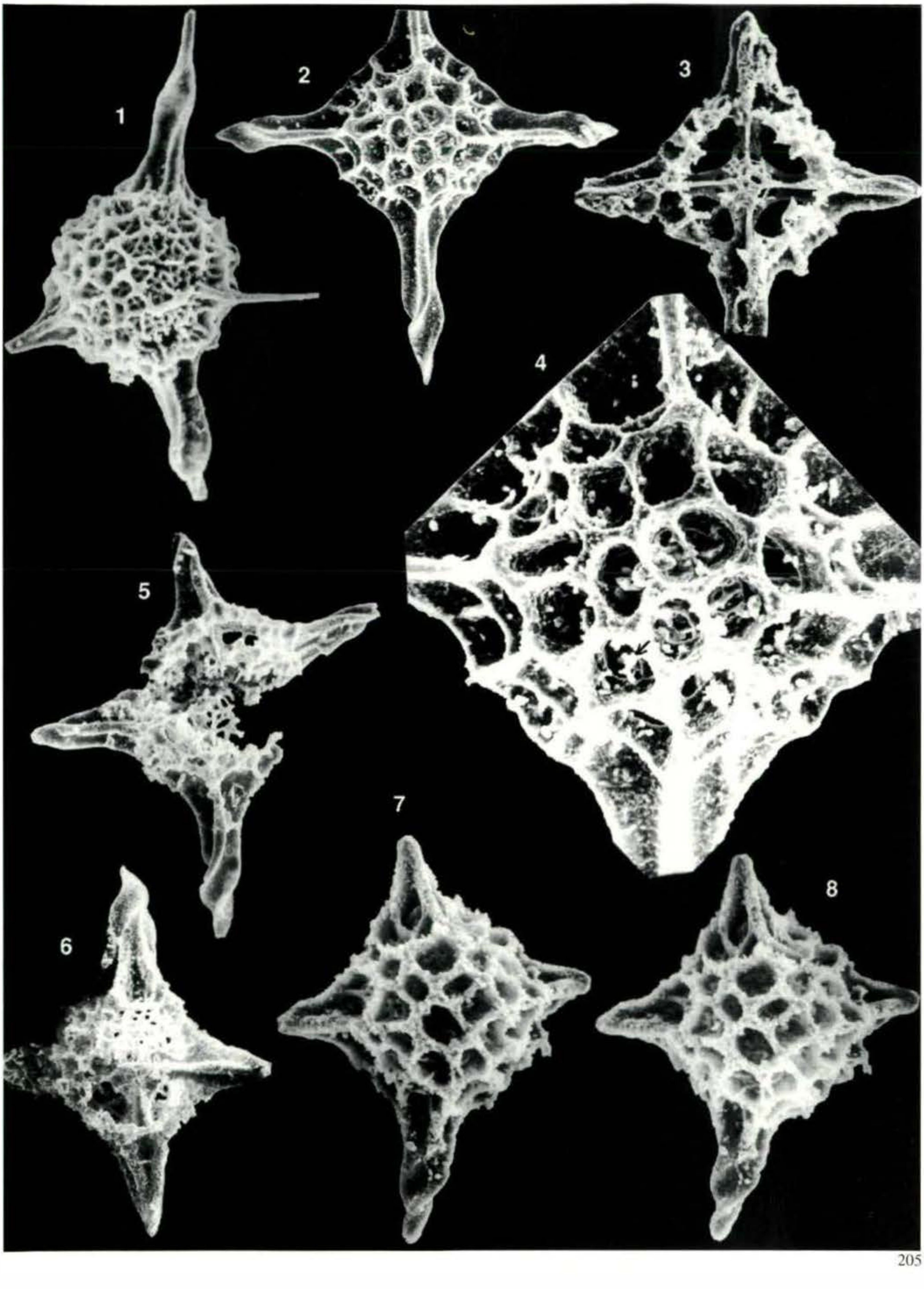

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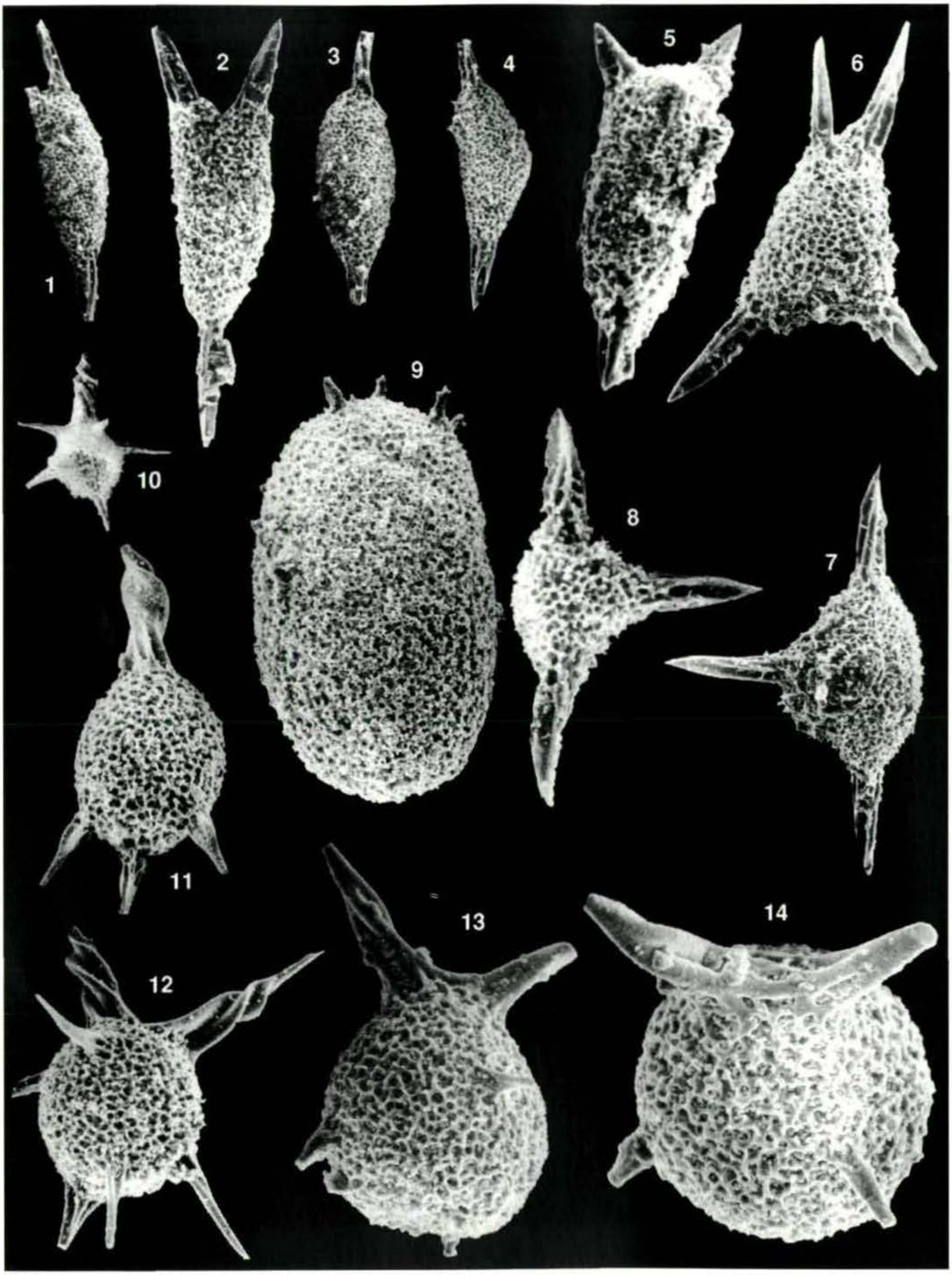

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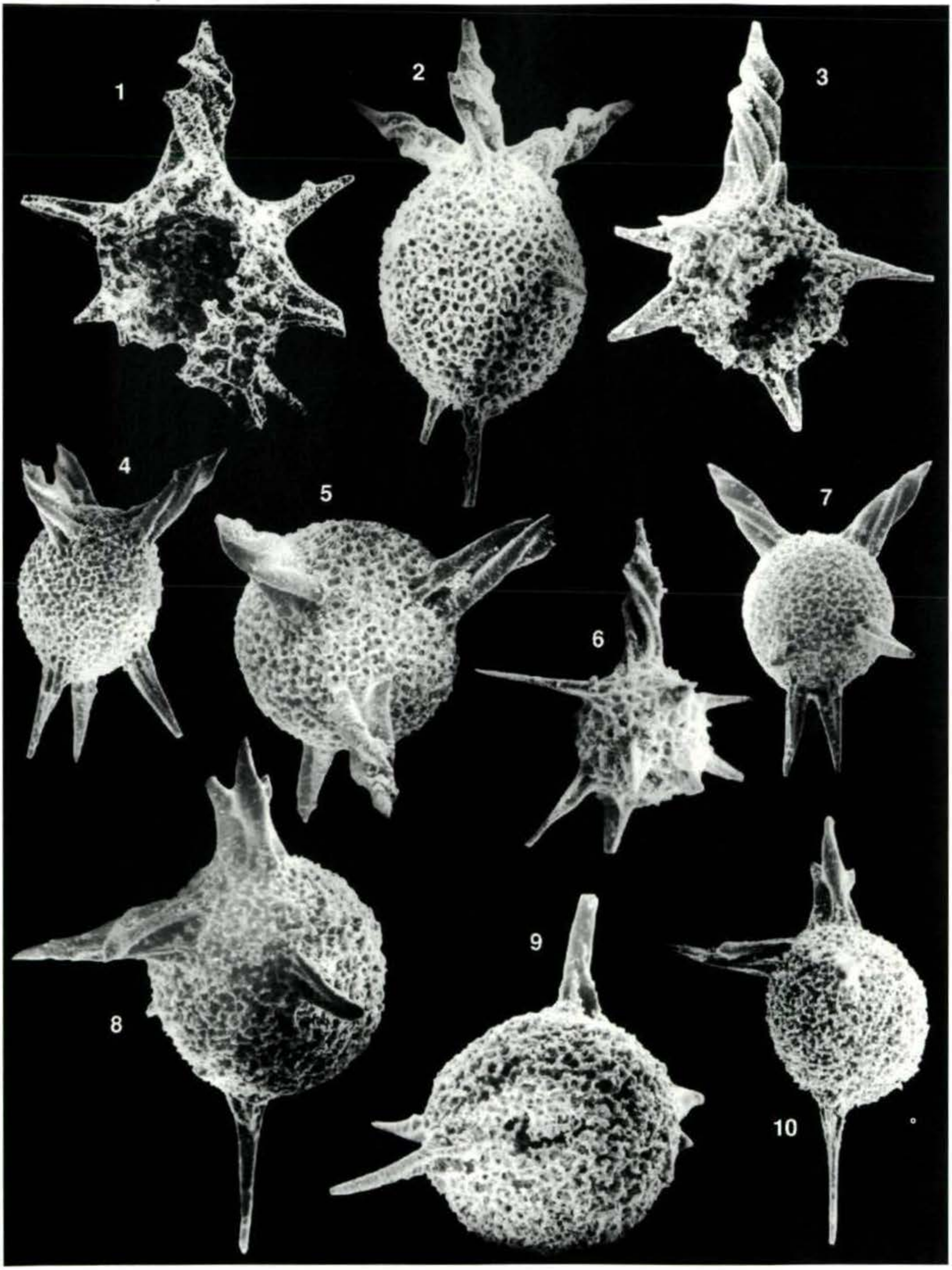

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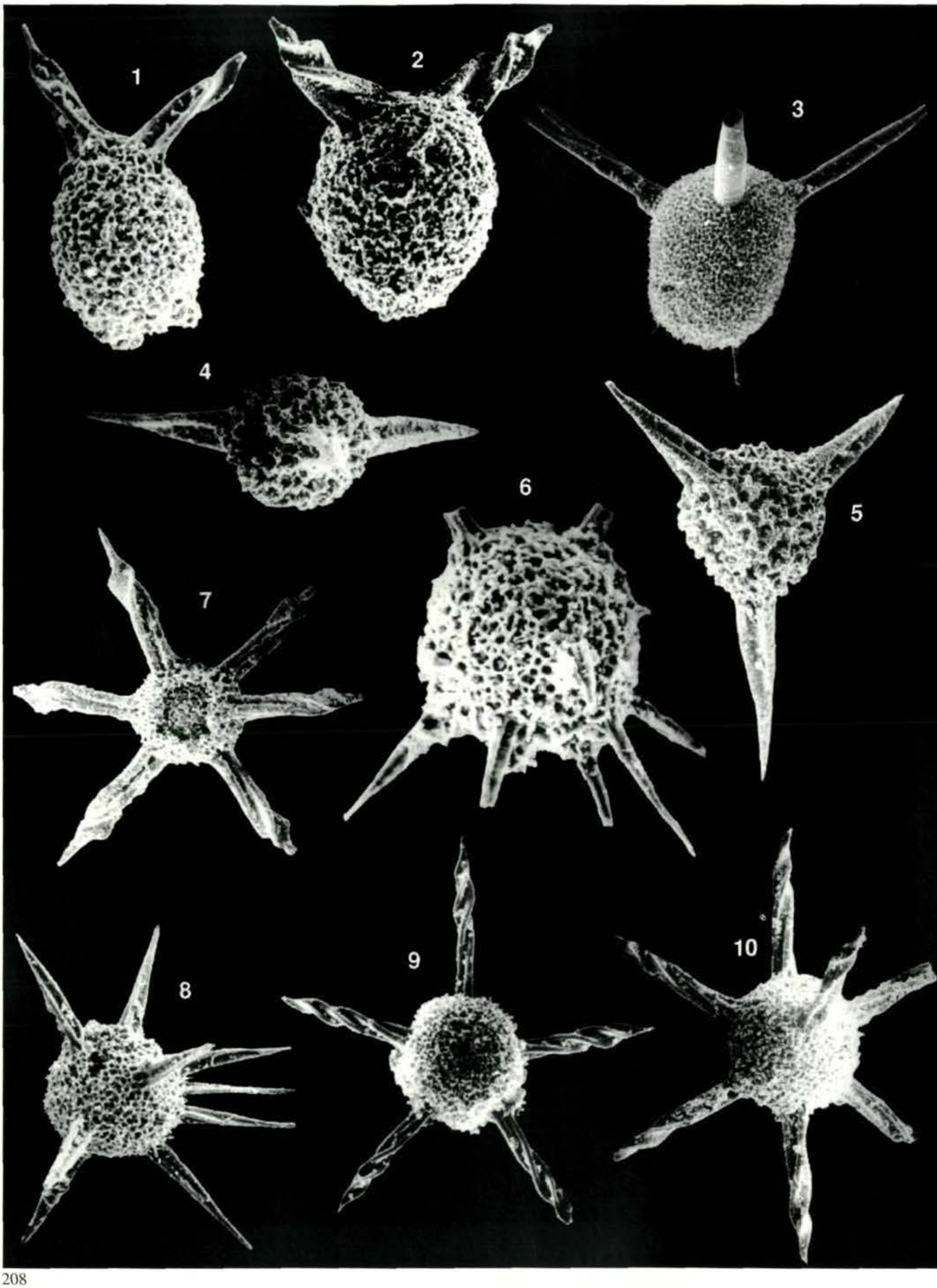

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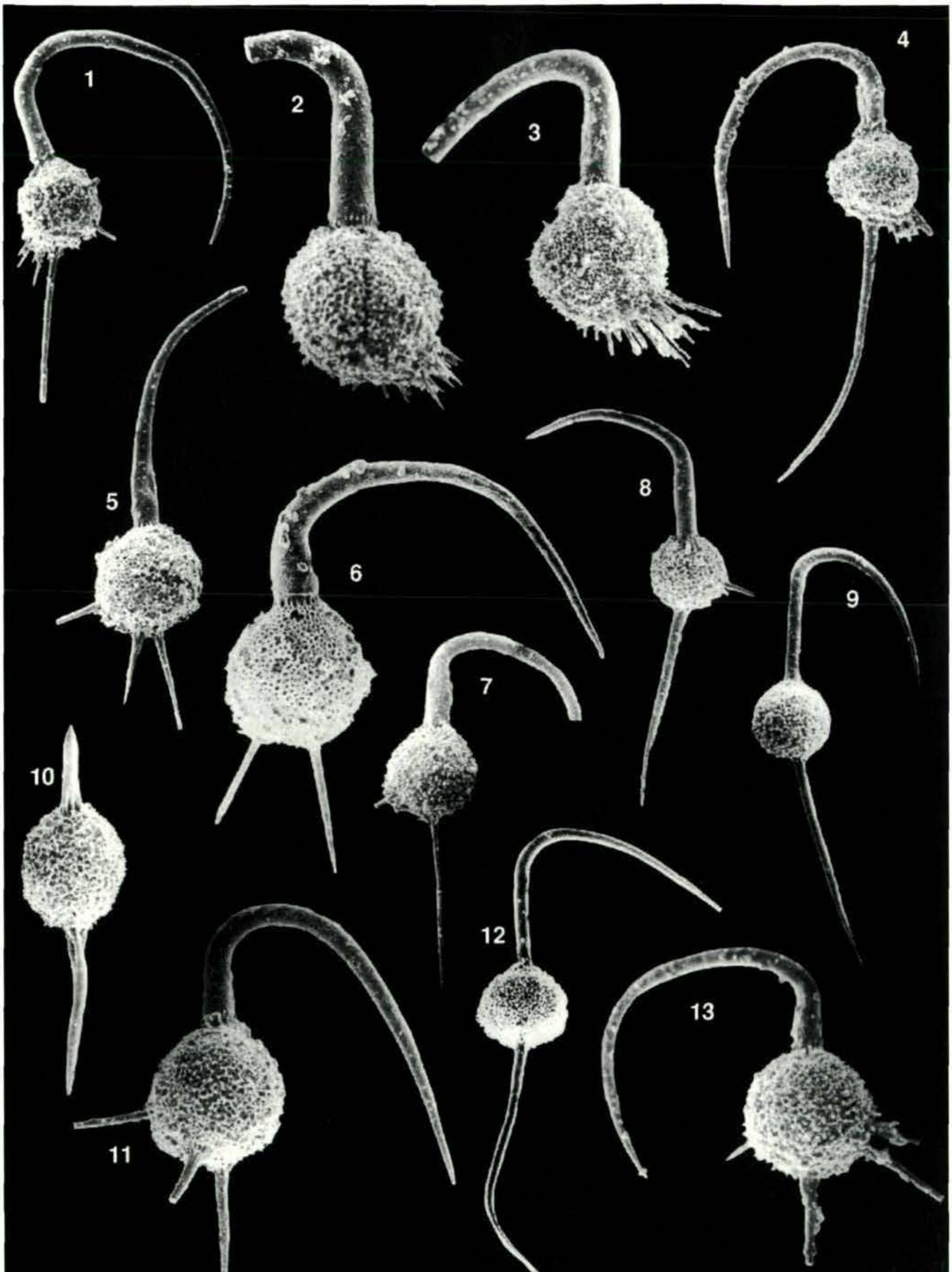

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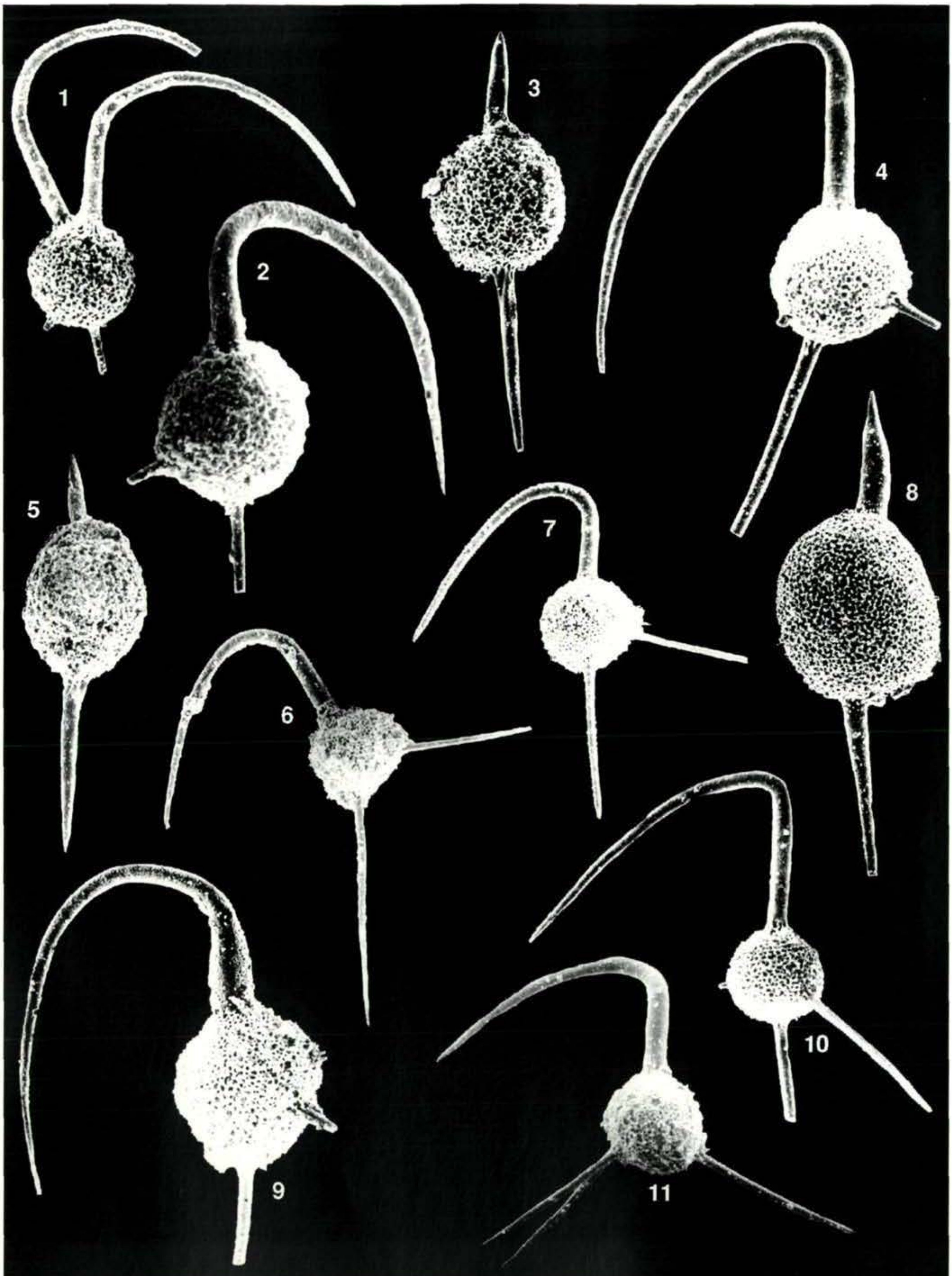

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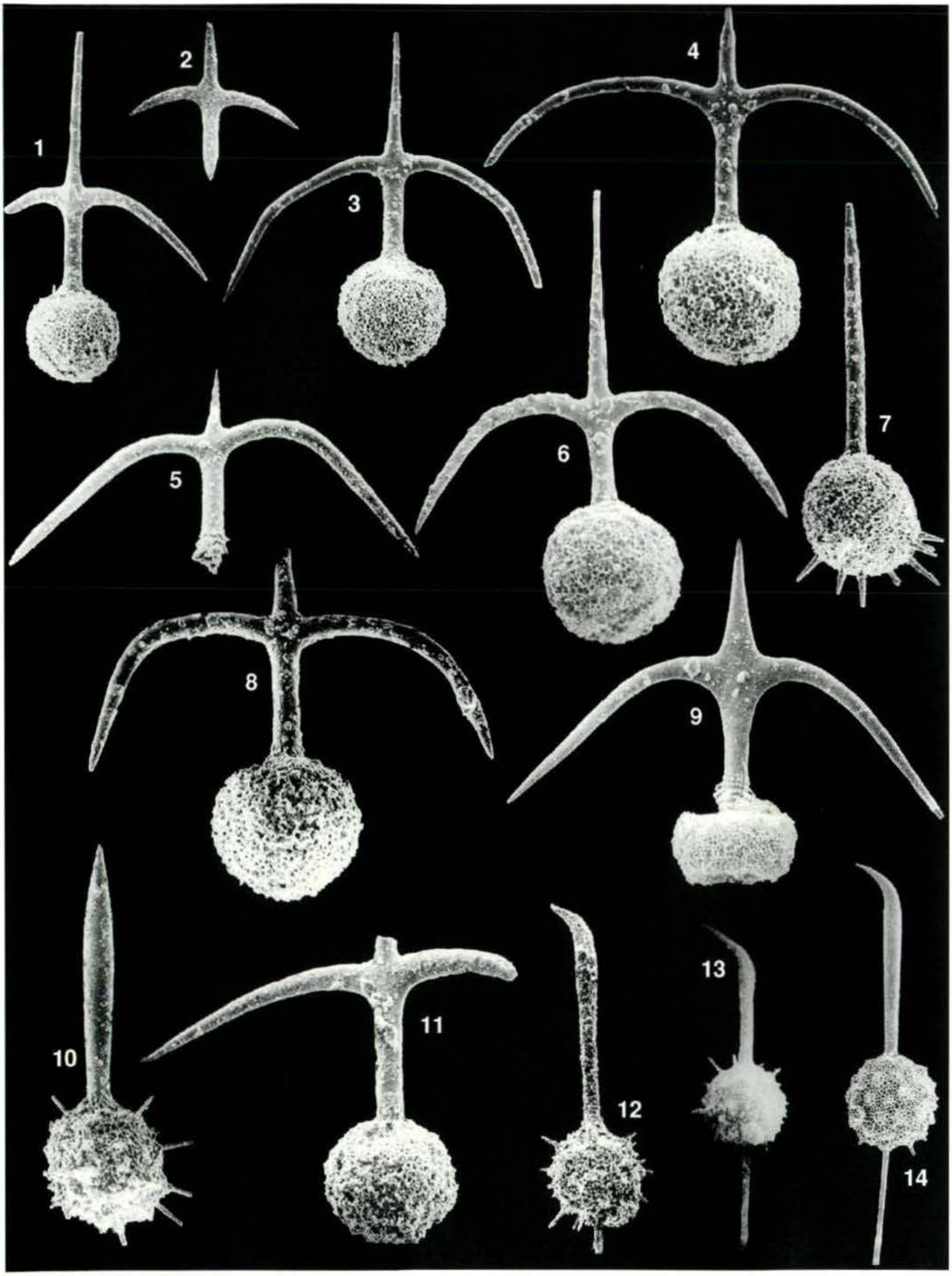

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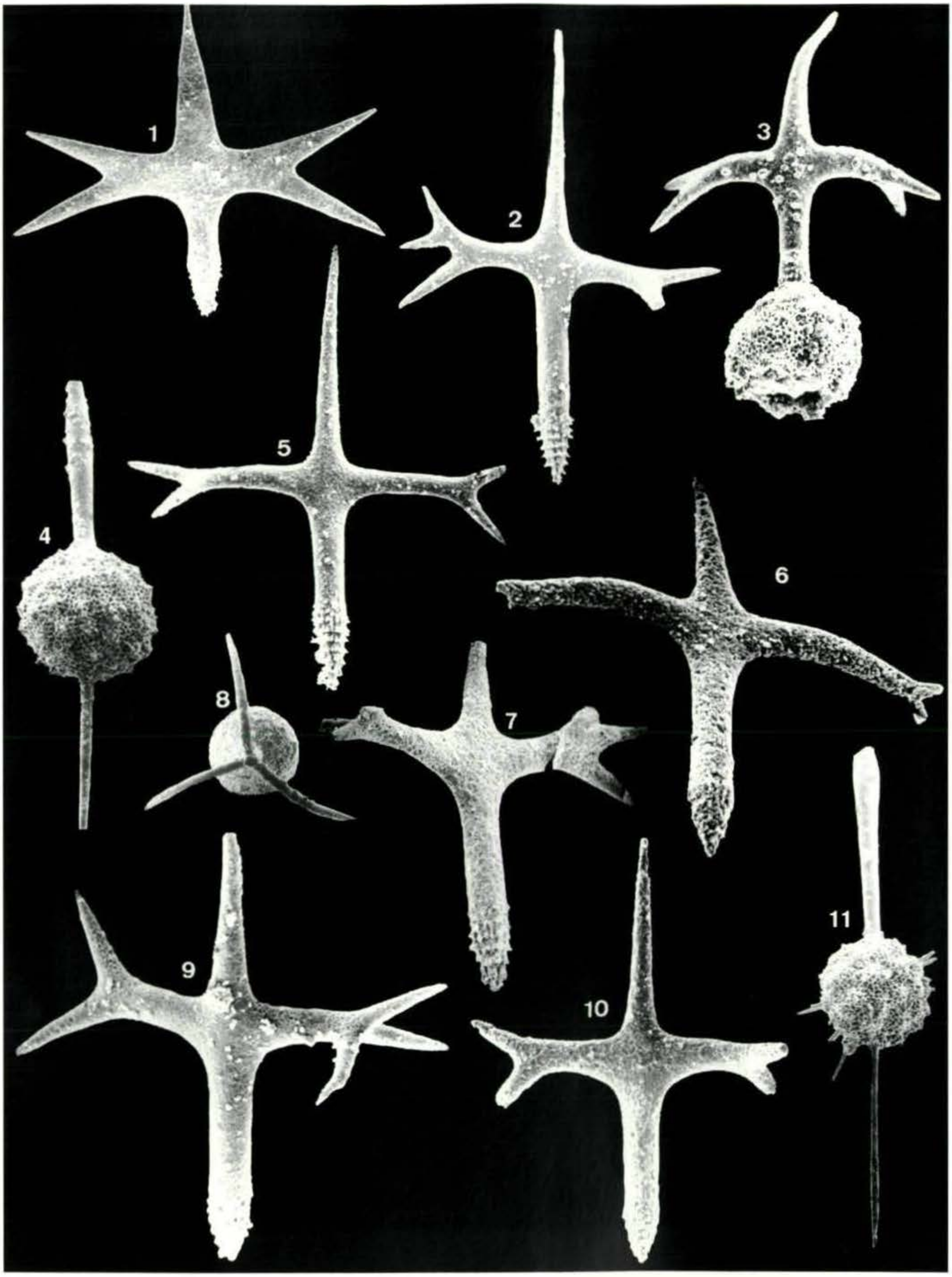

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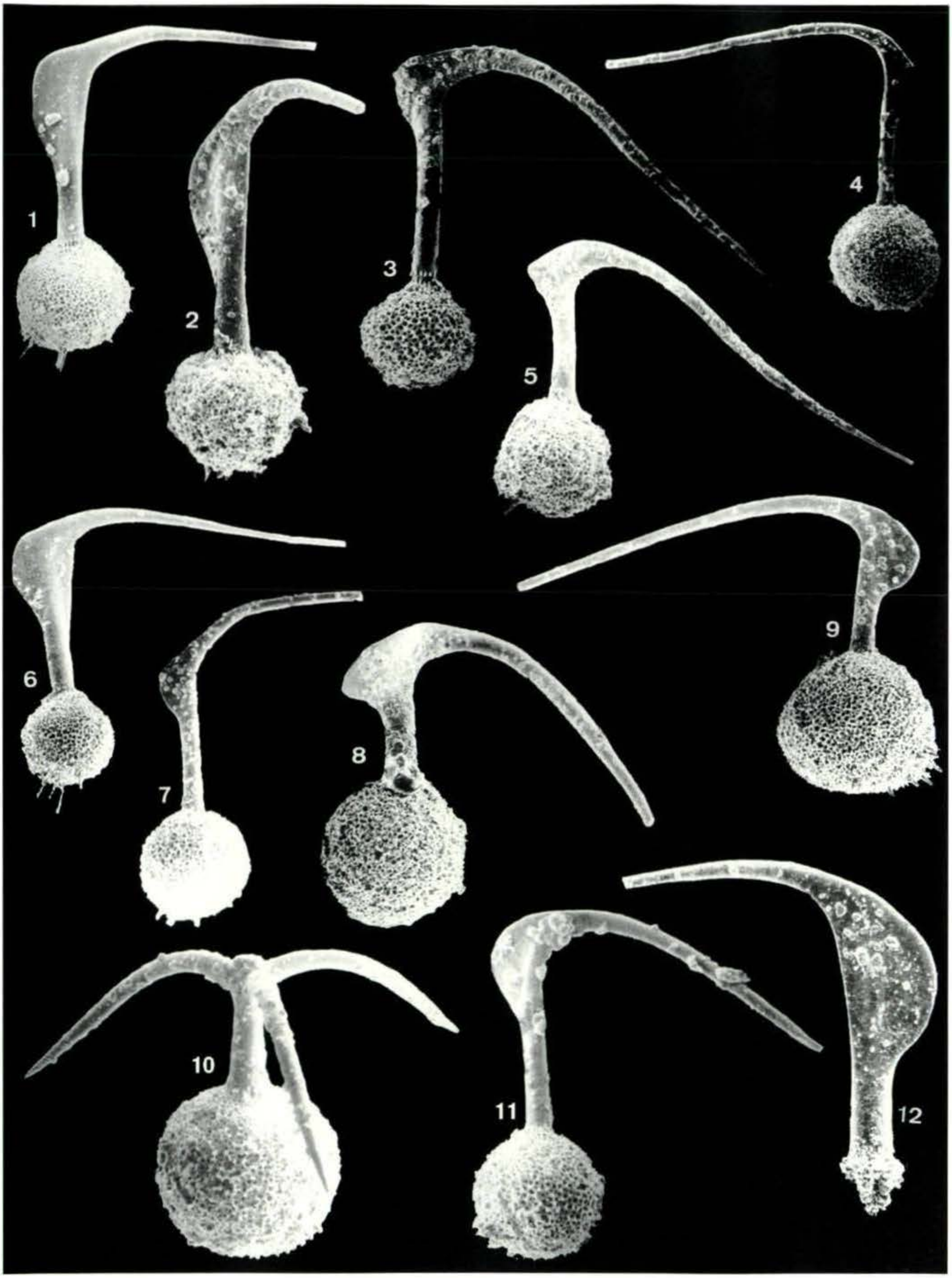

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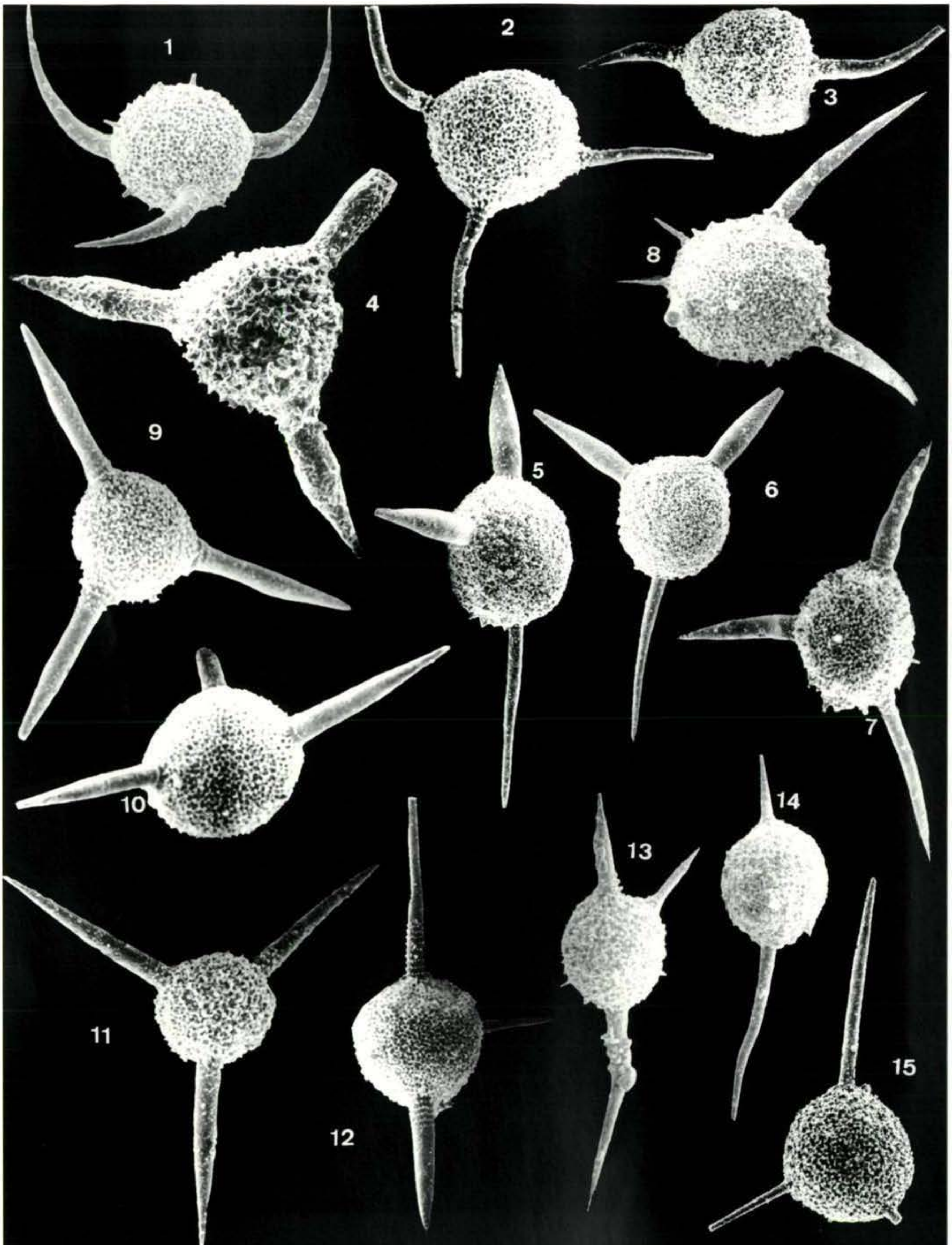

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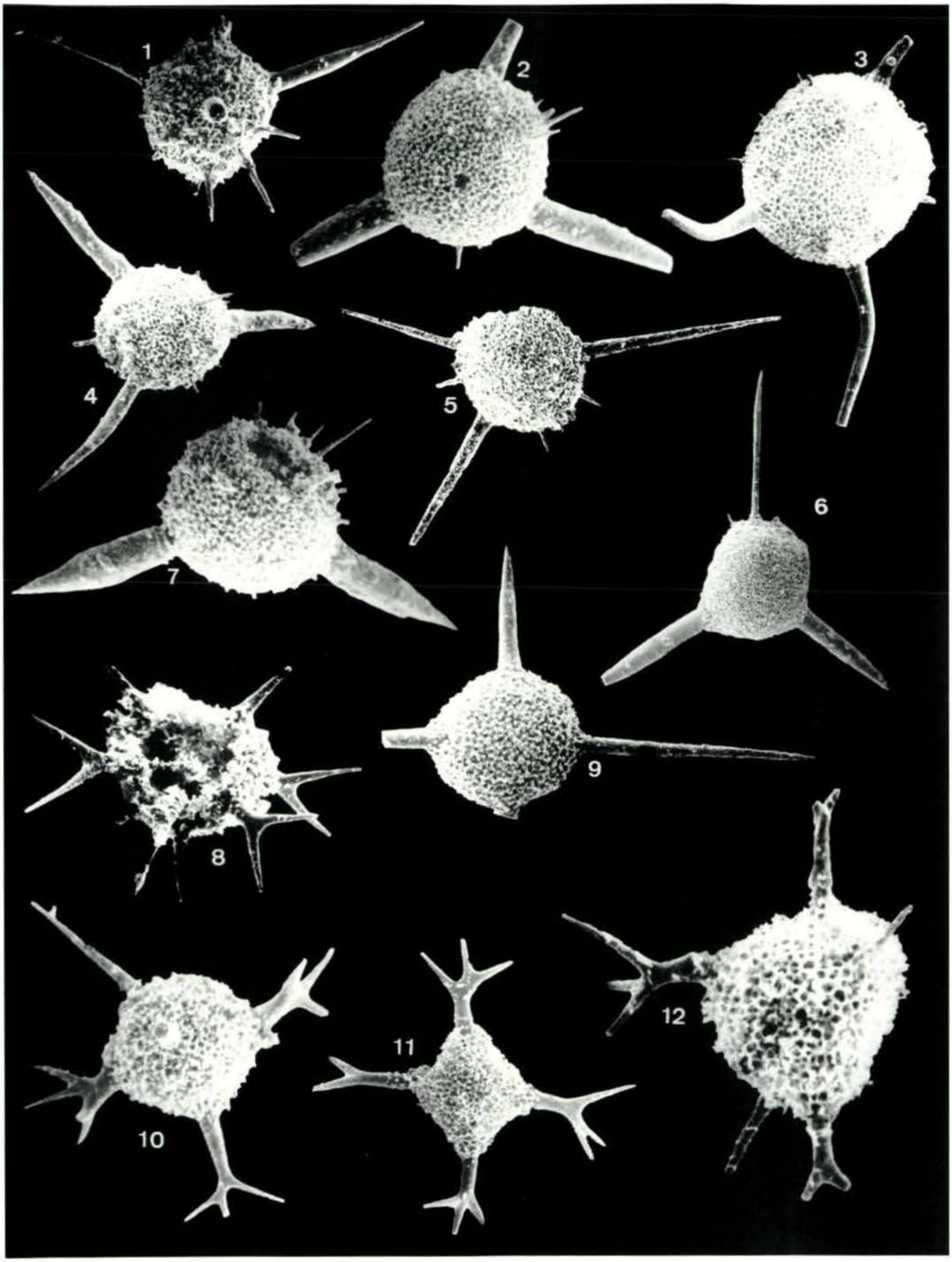

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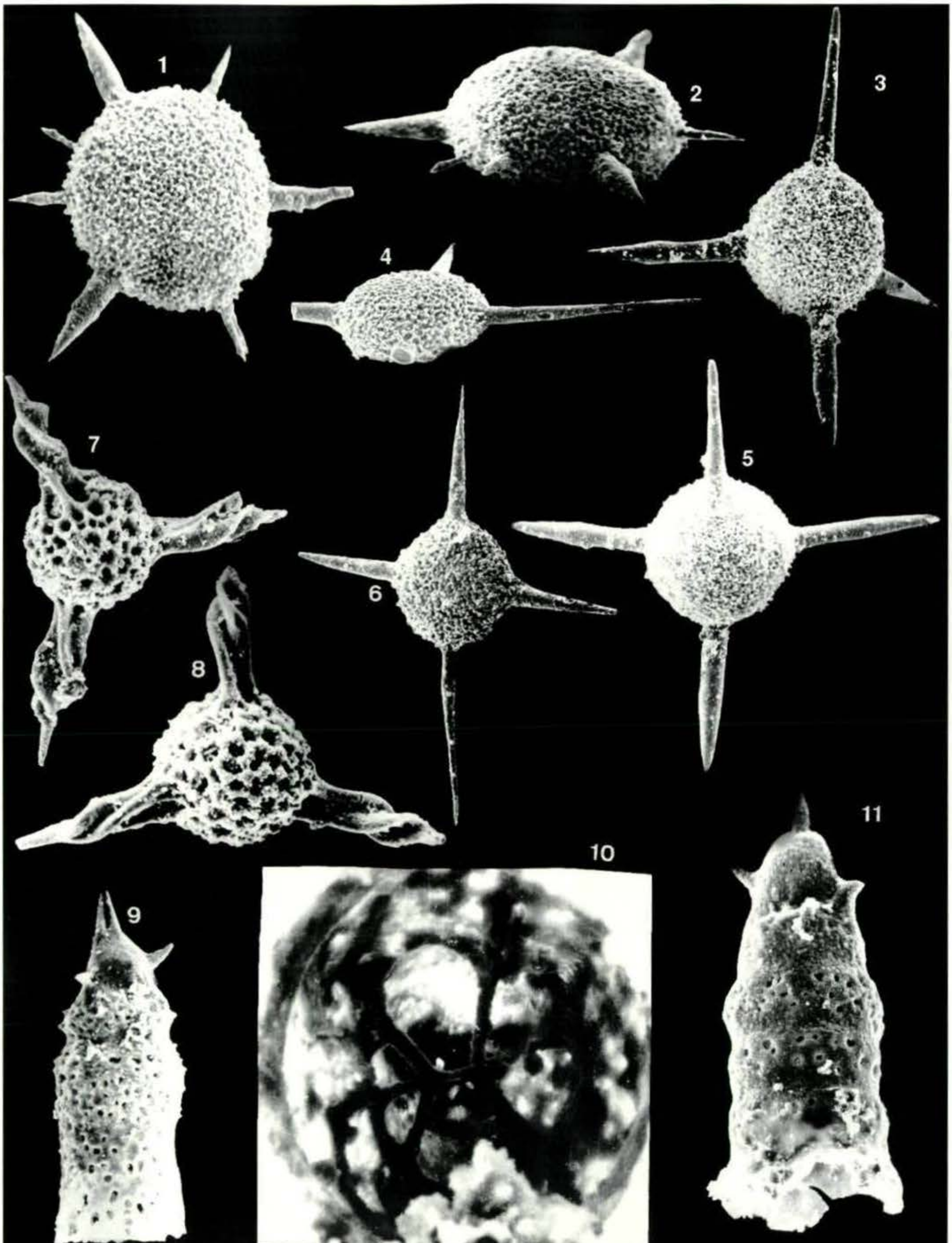

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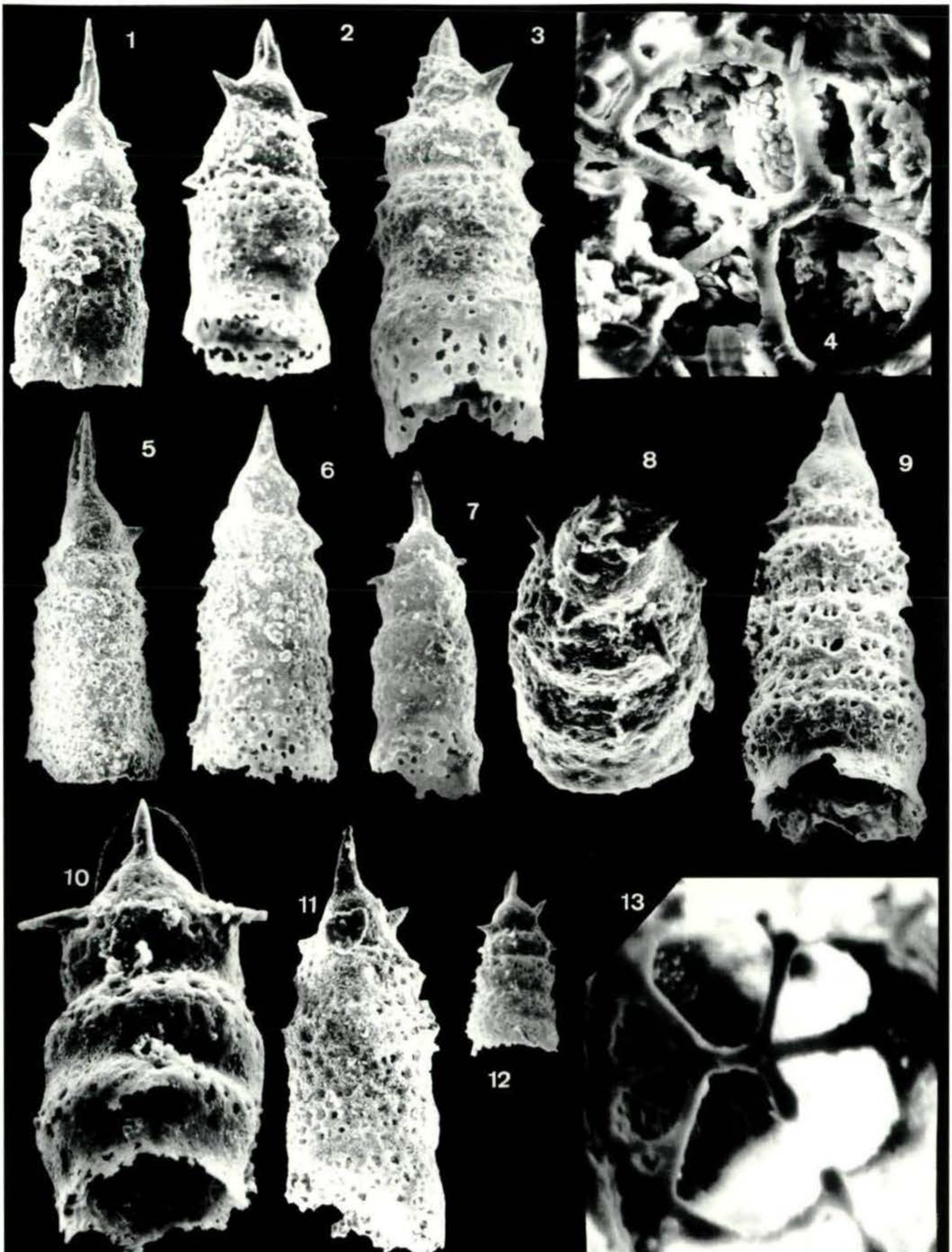

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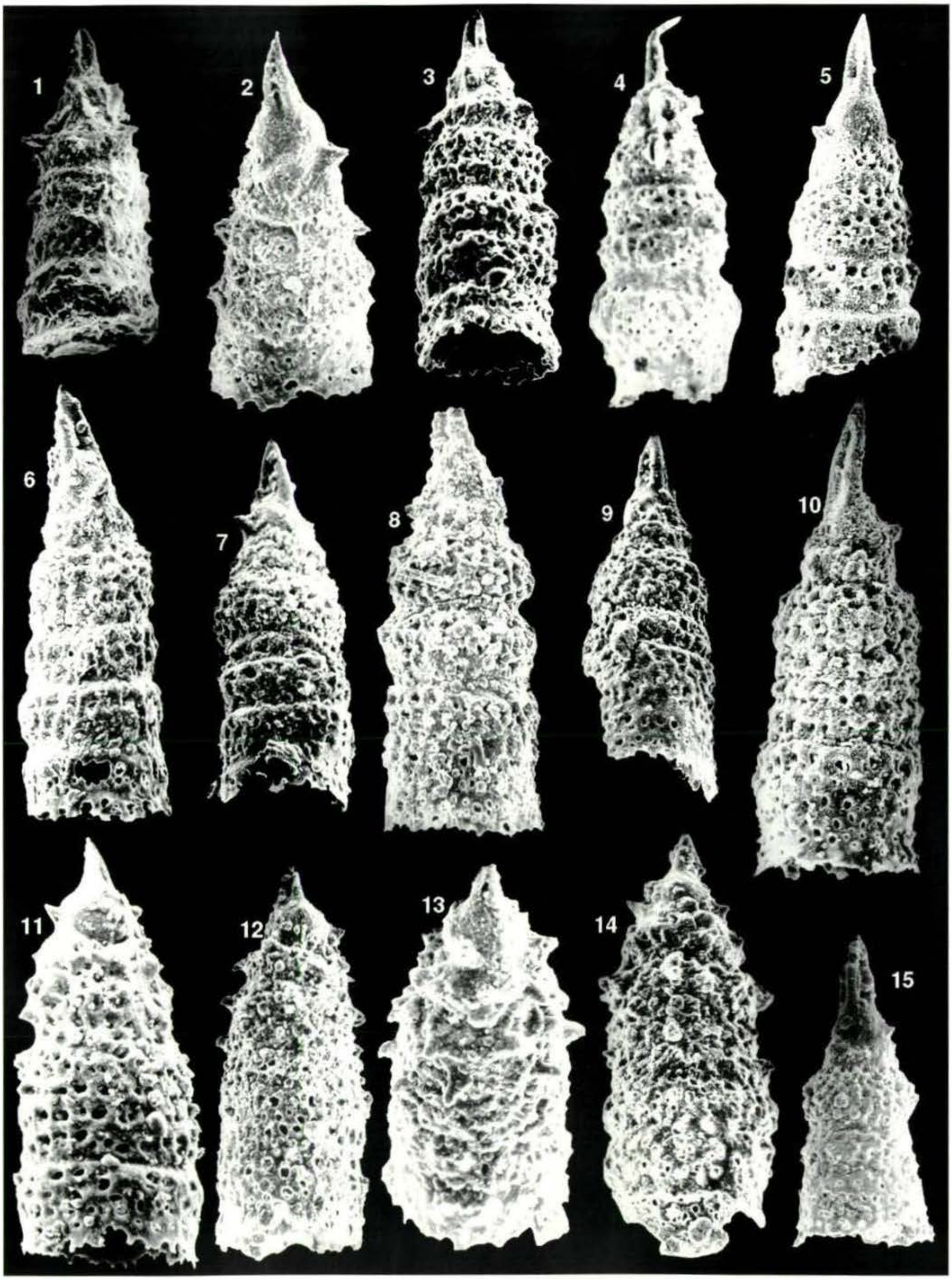

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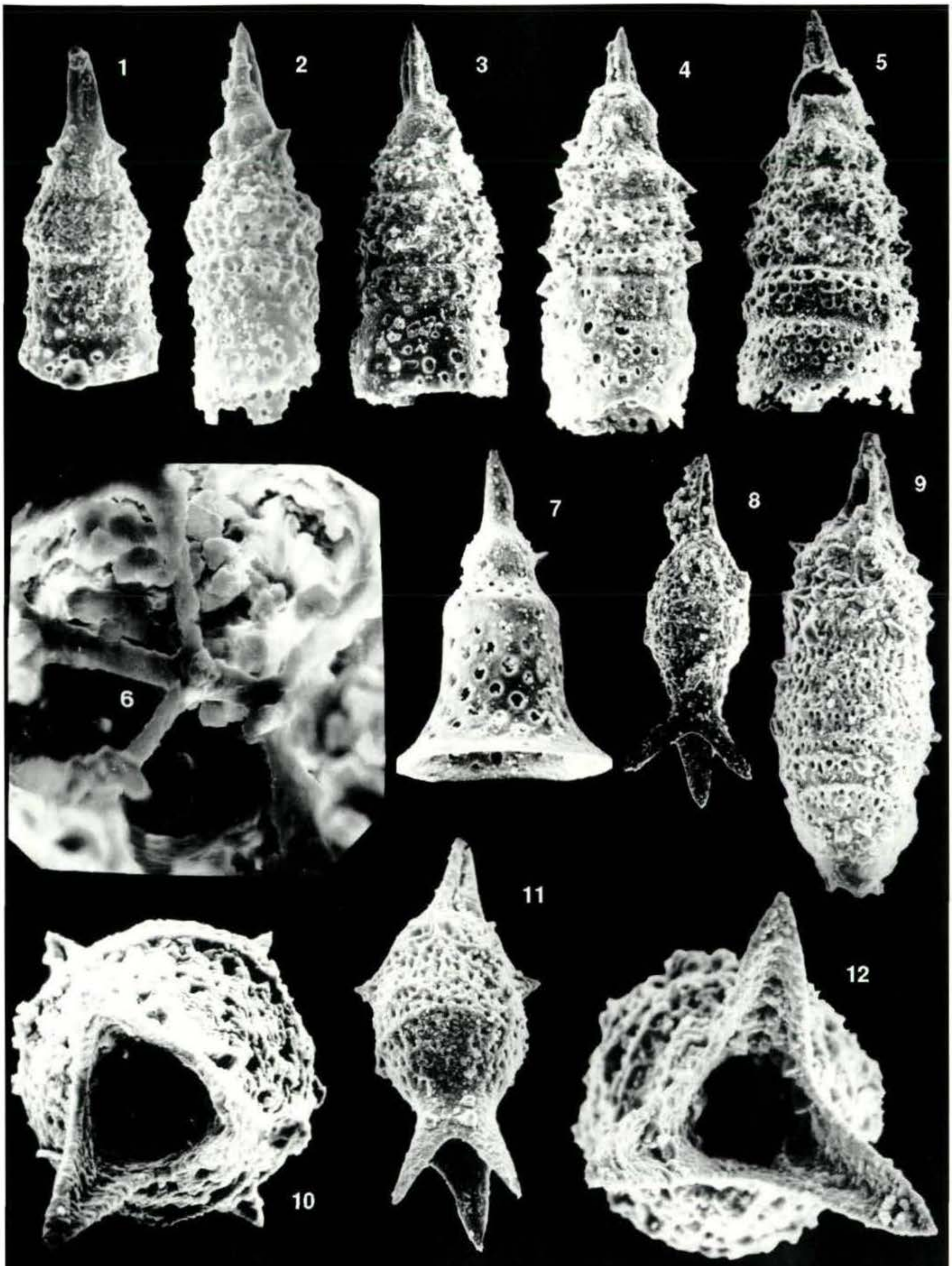

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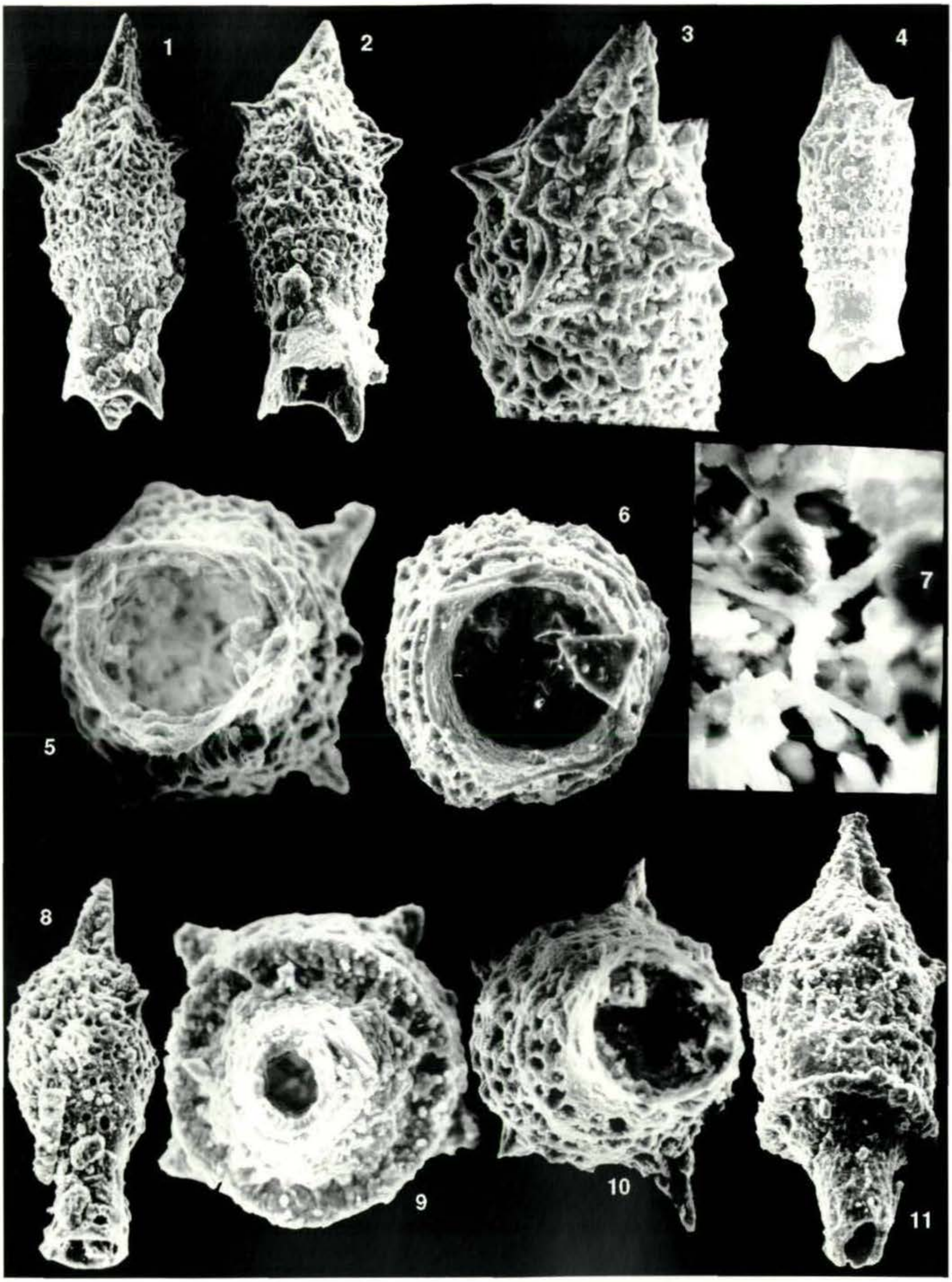

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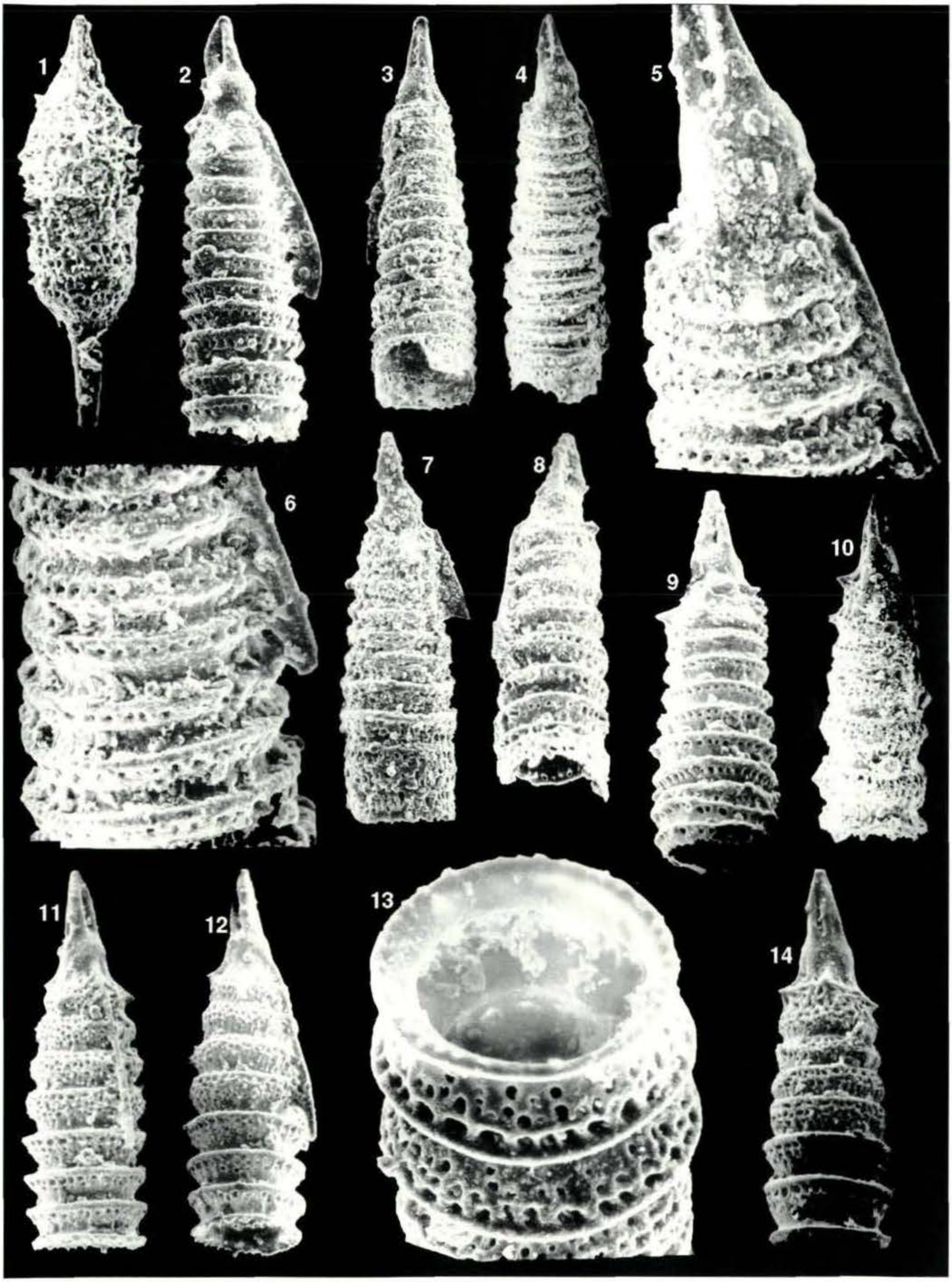

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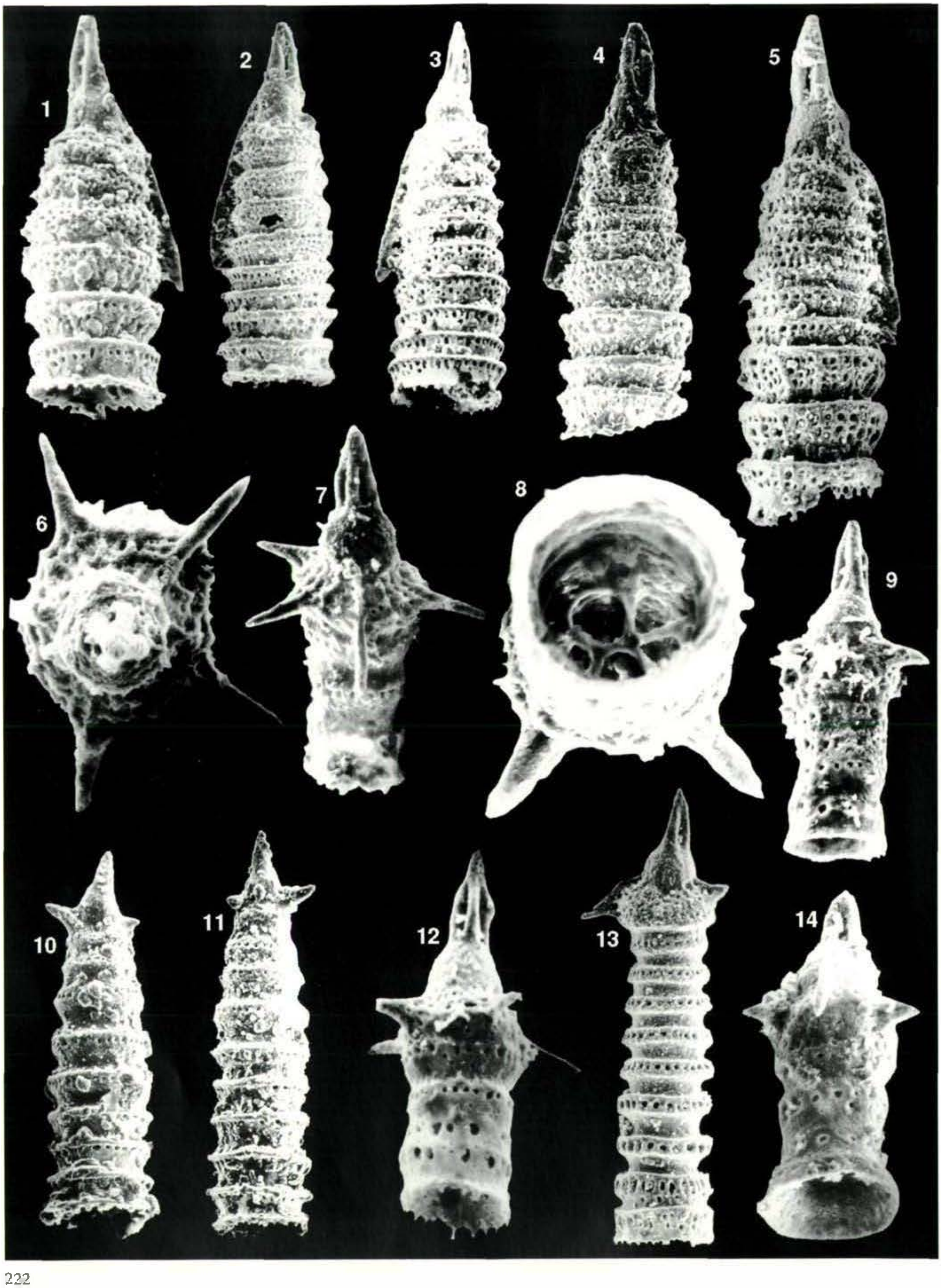
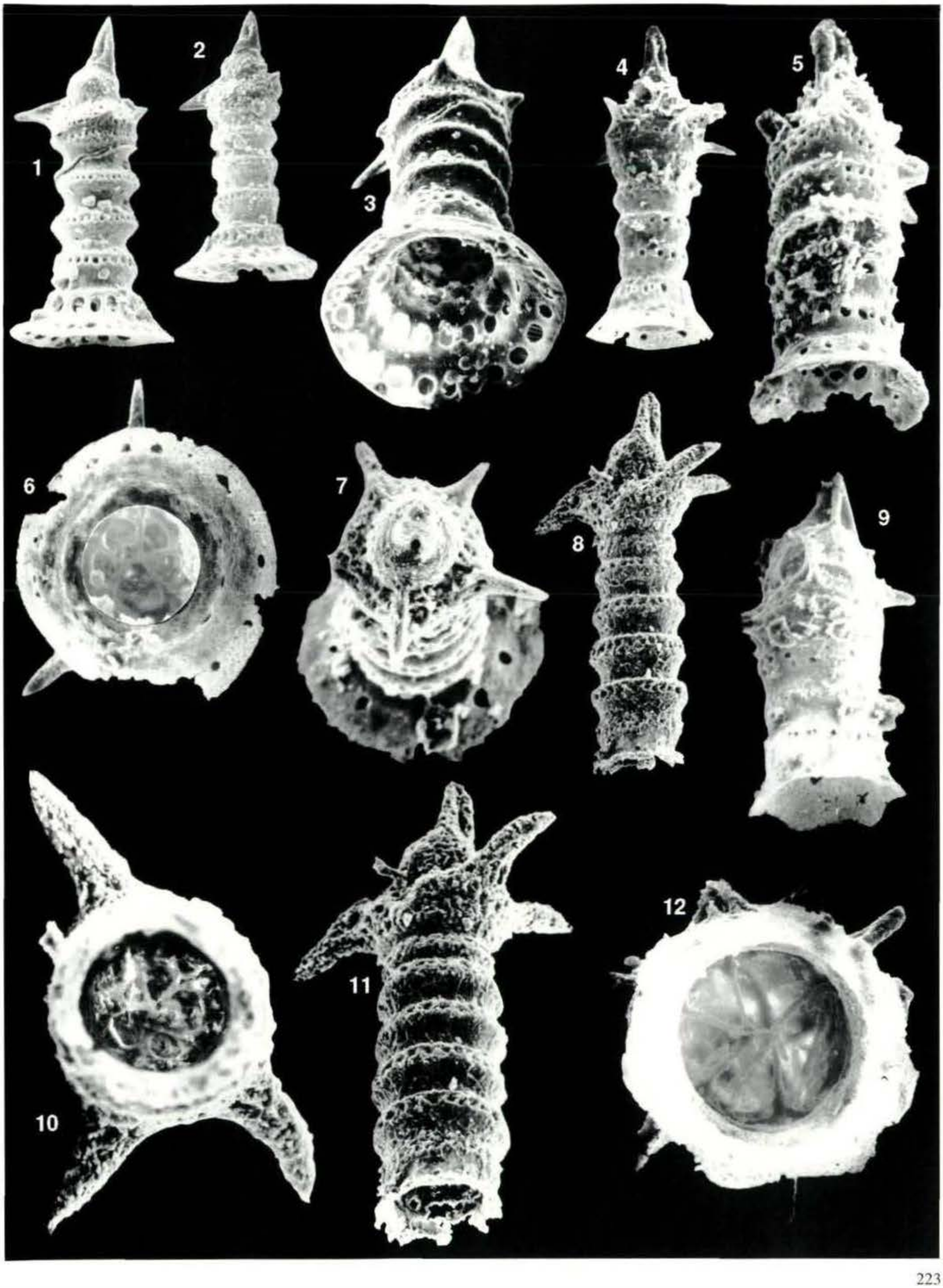


Plate 24



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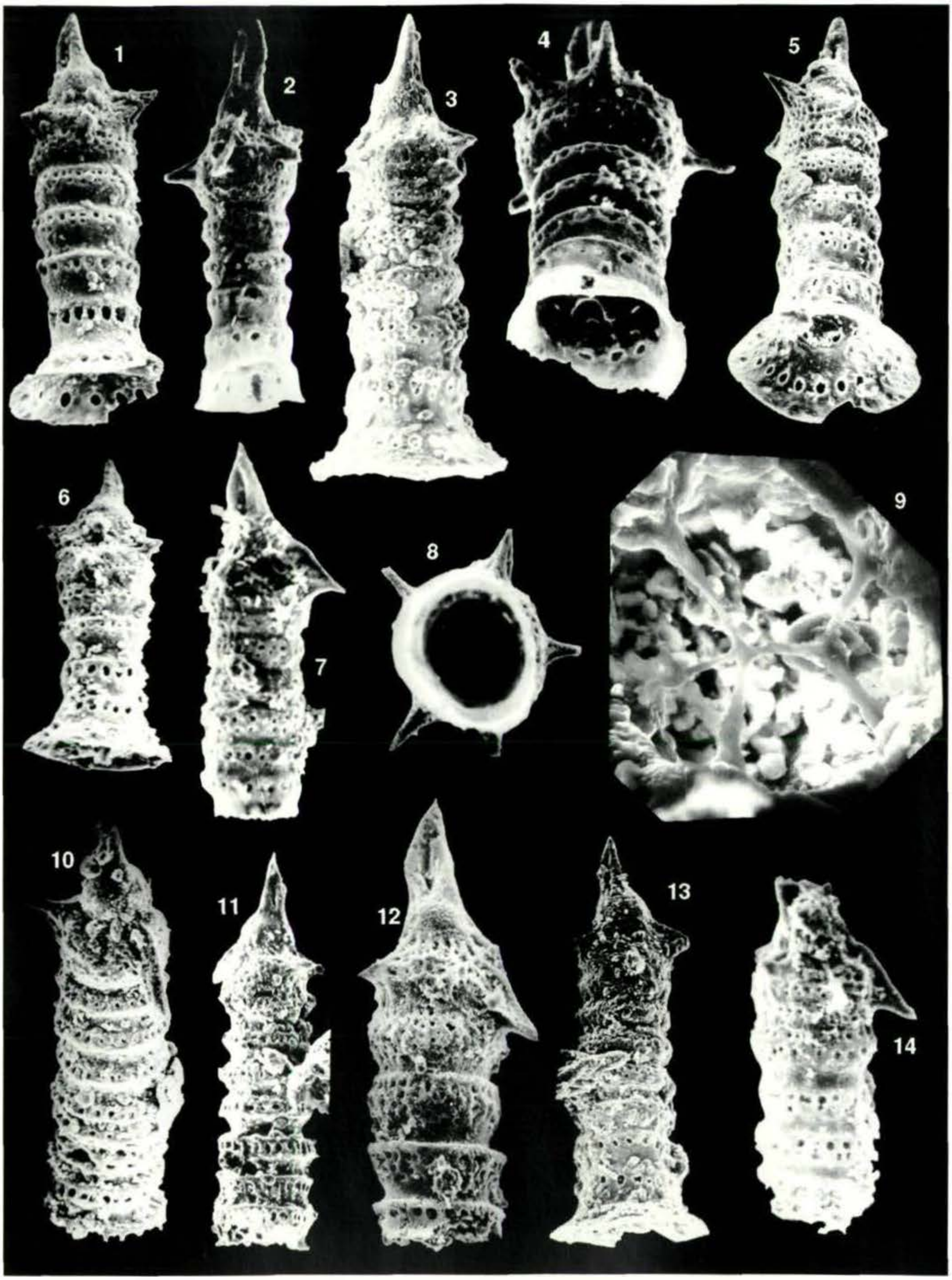

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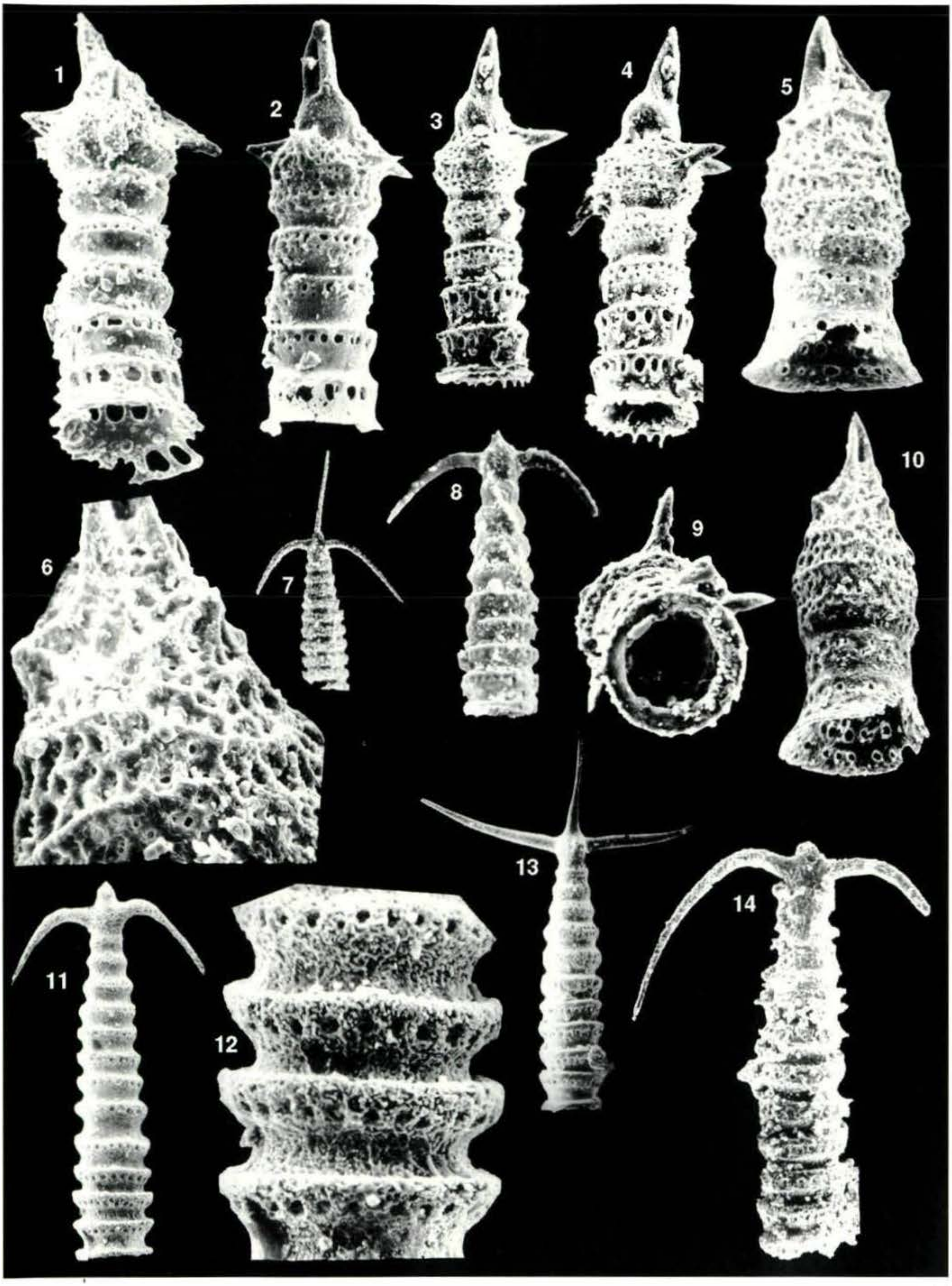

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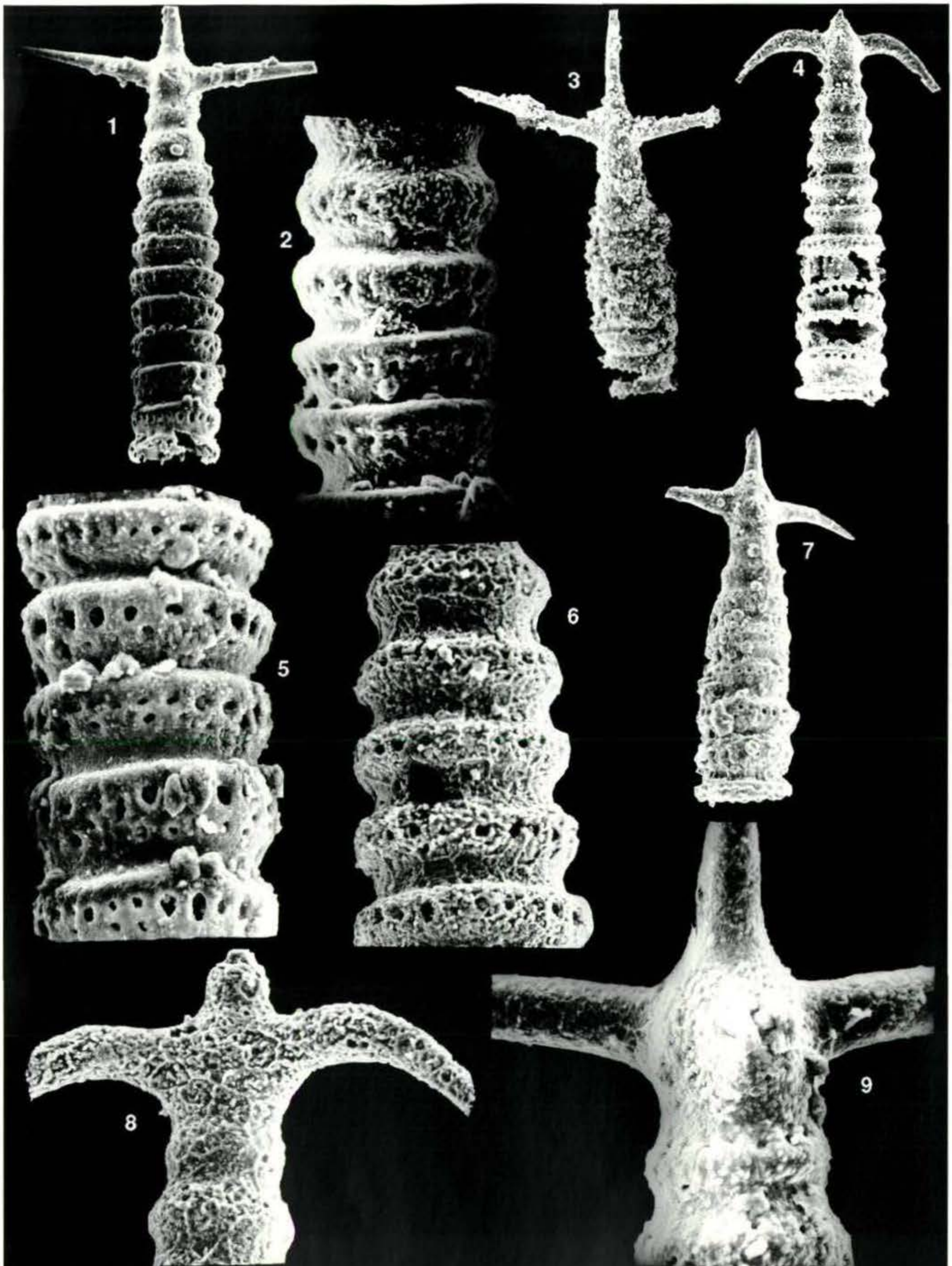

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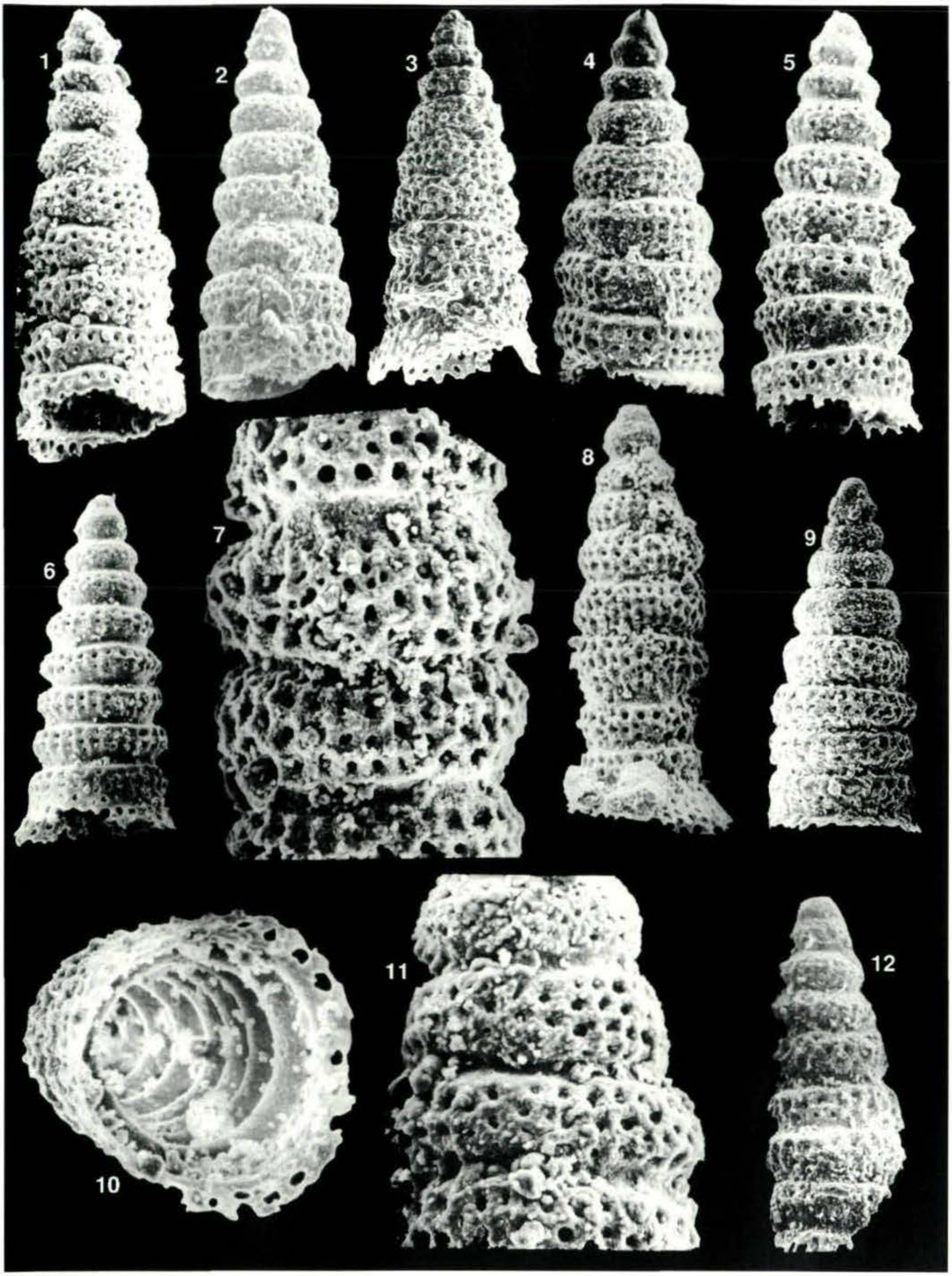

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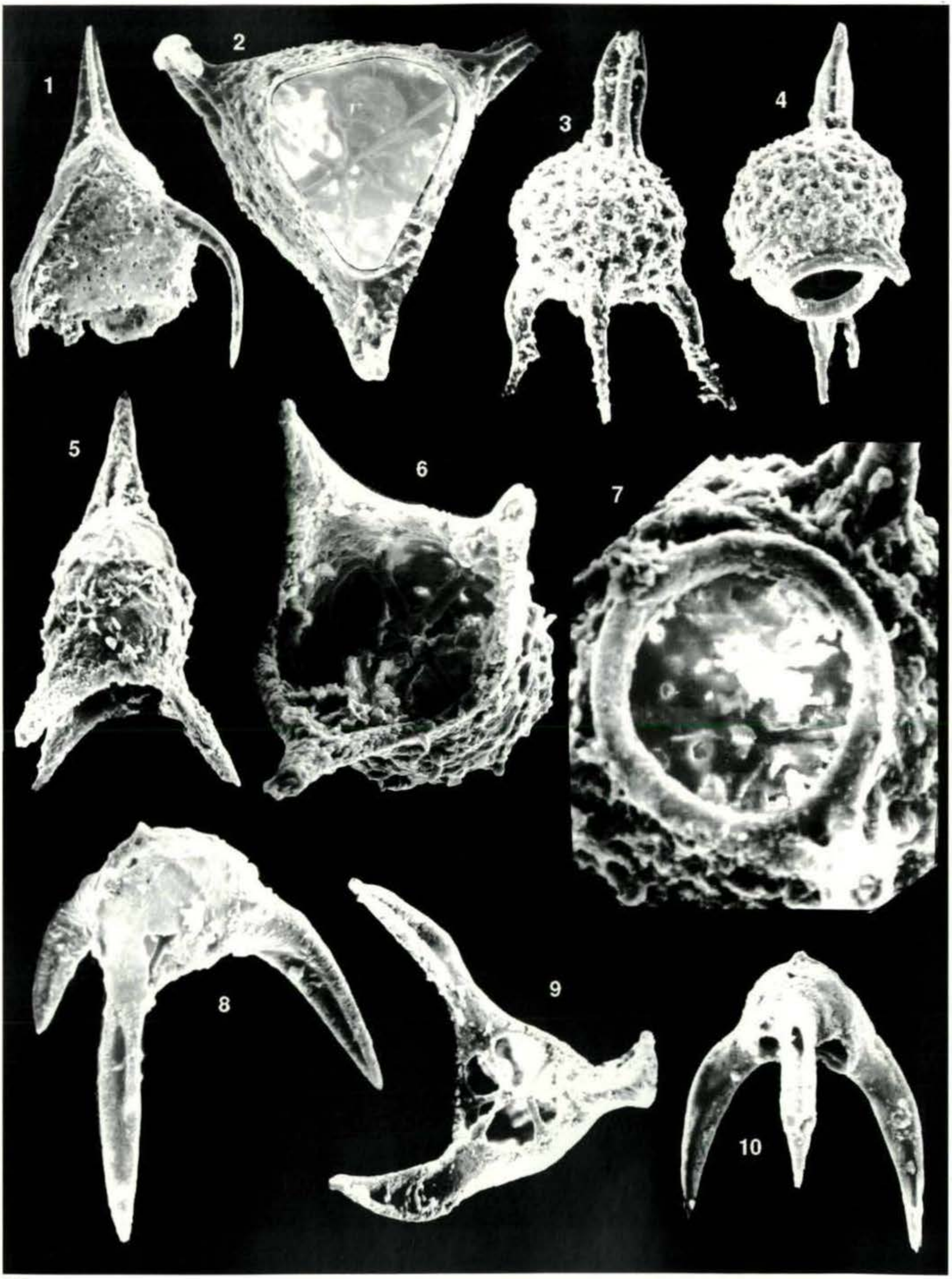

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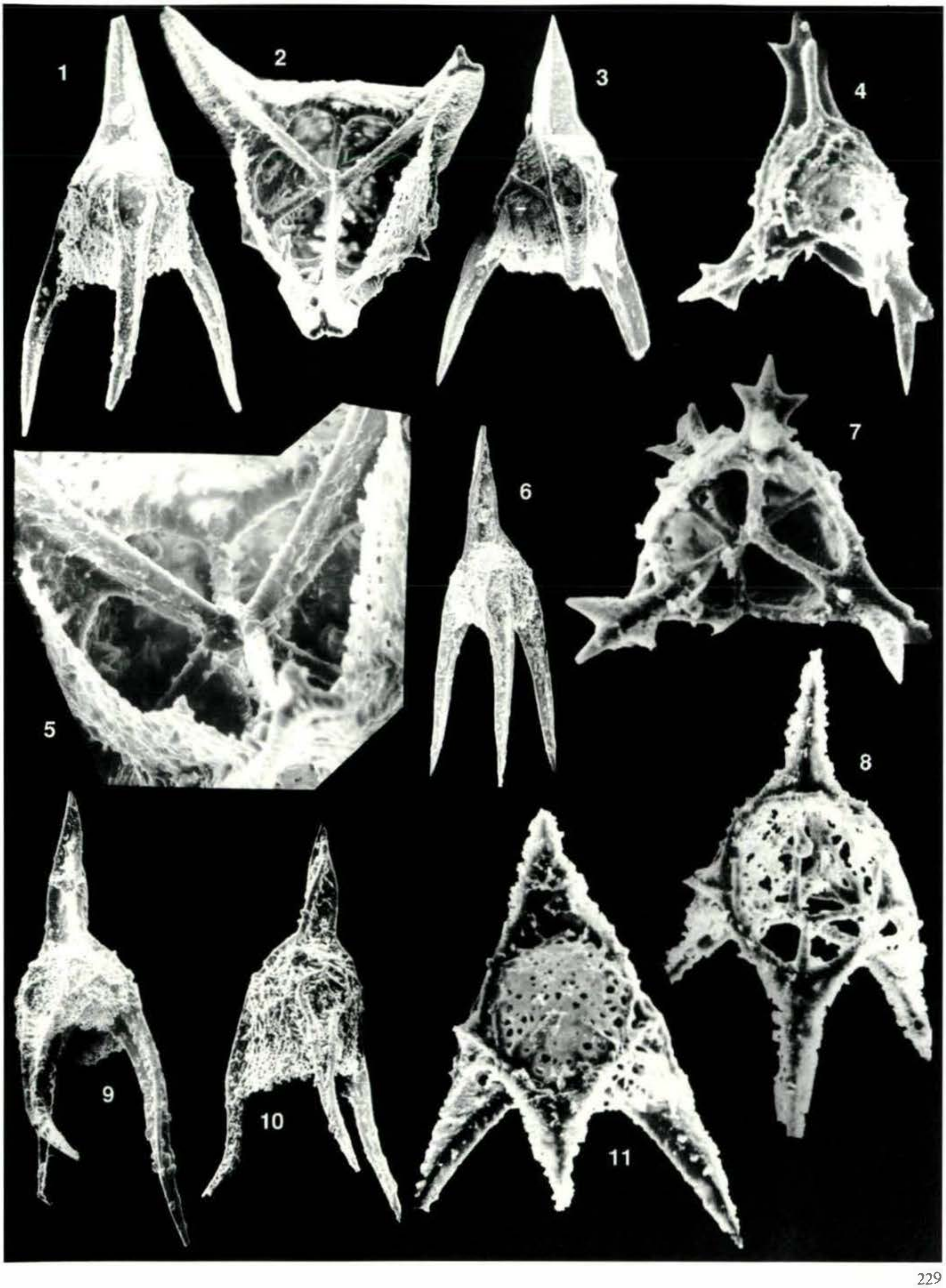

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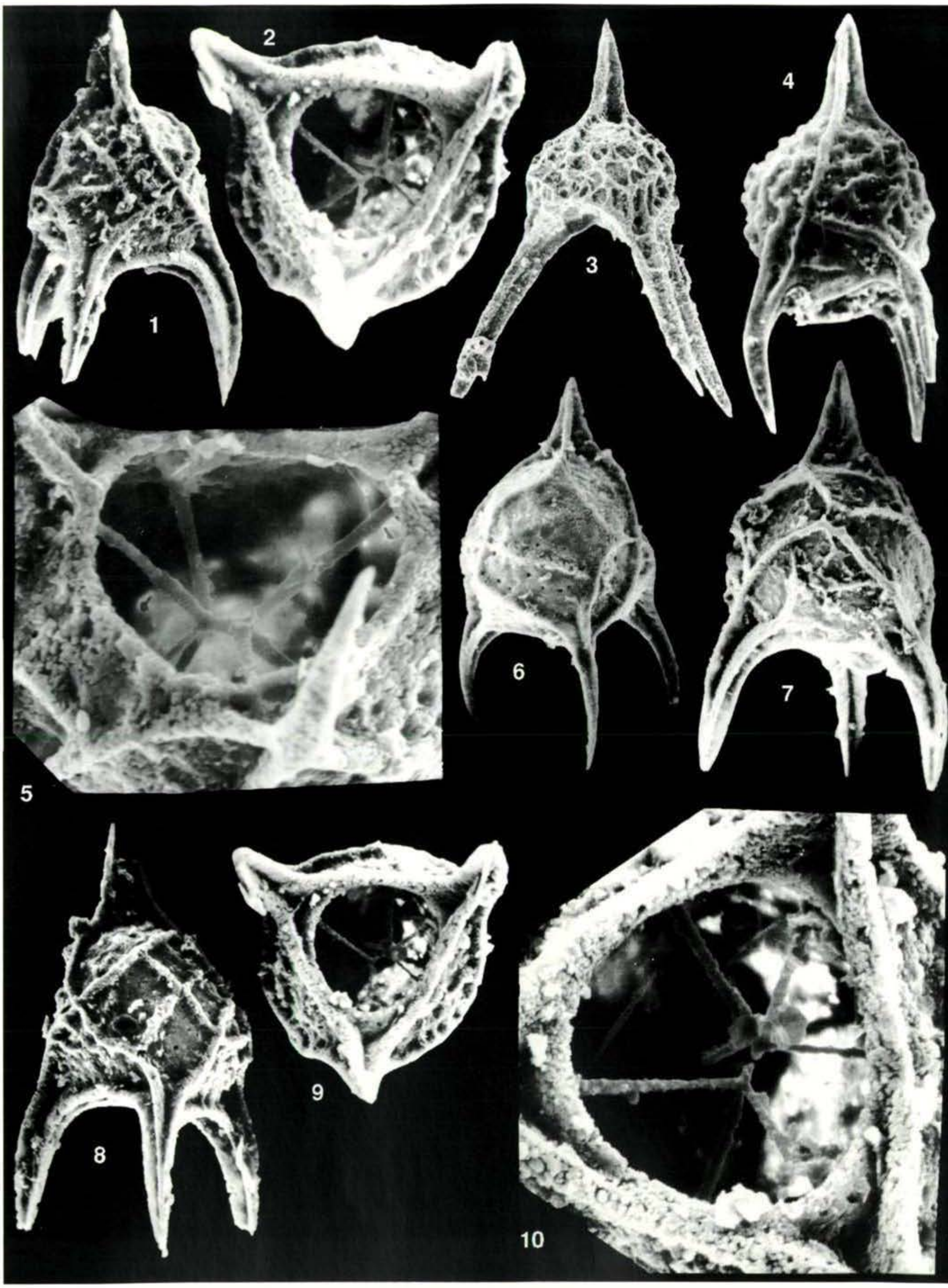

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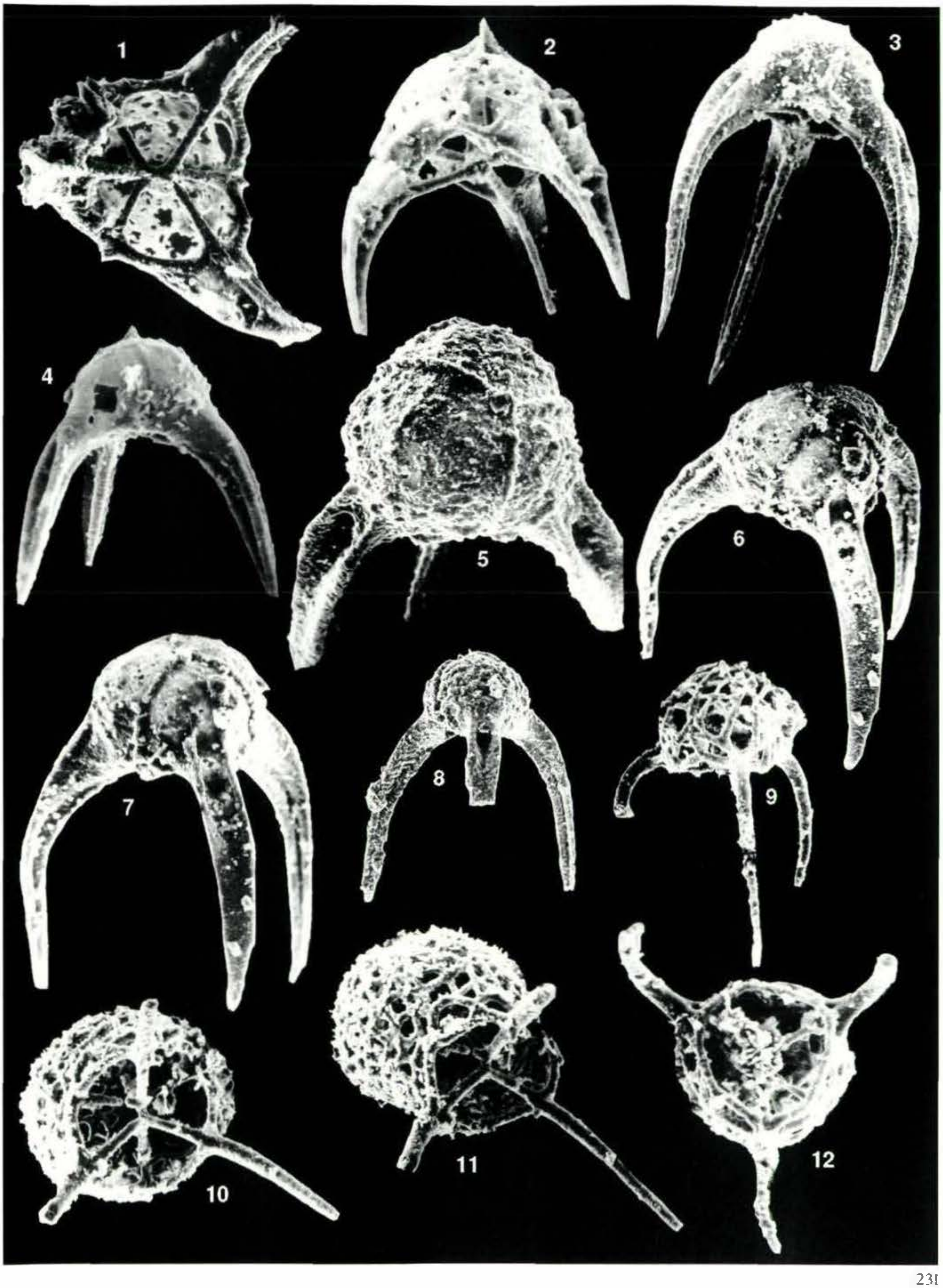

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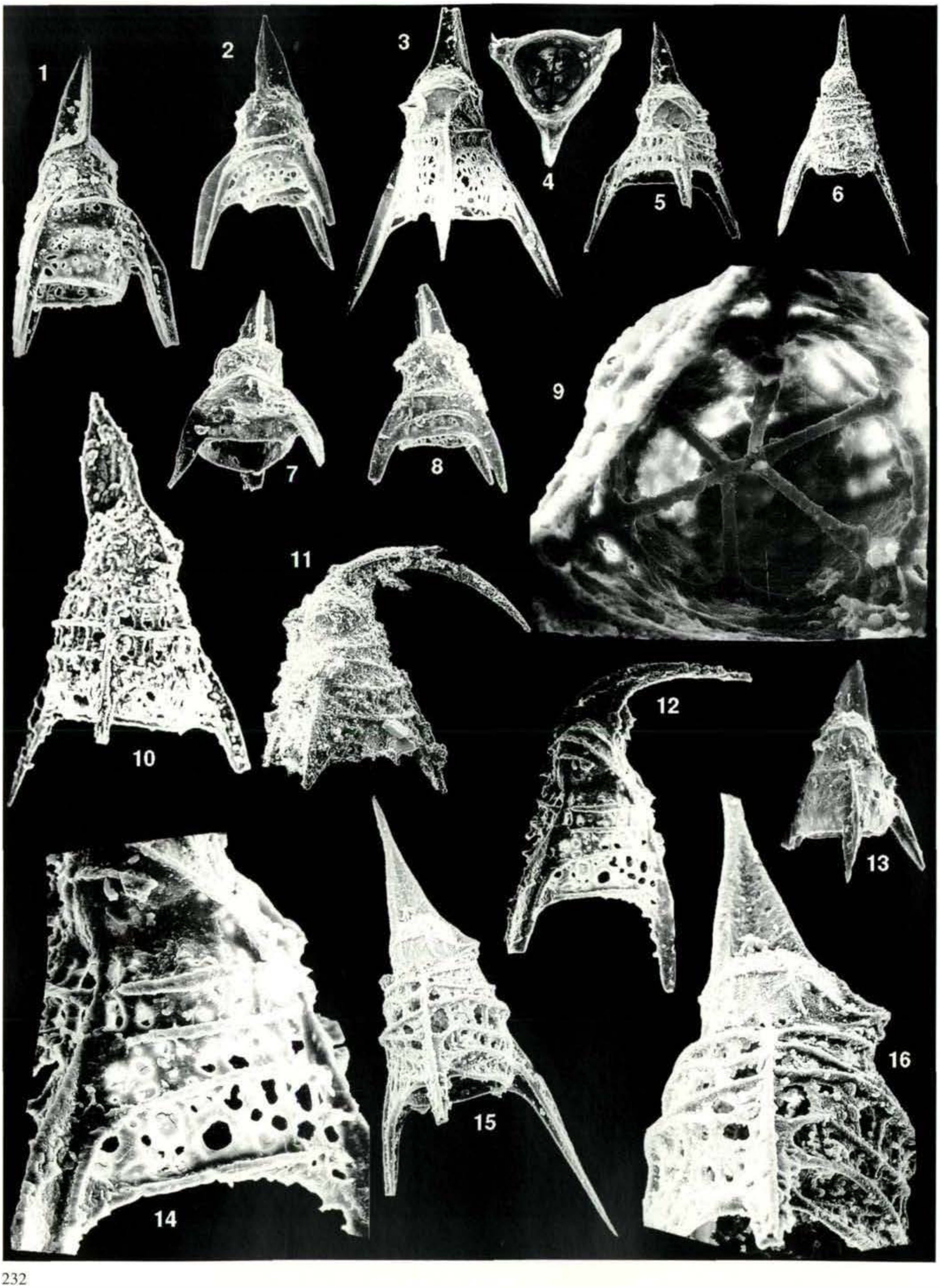

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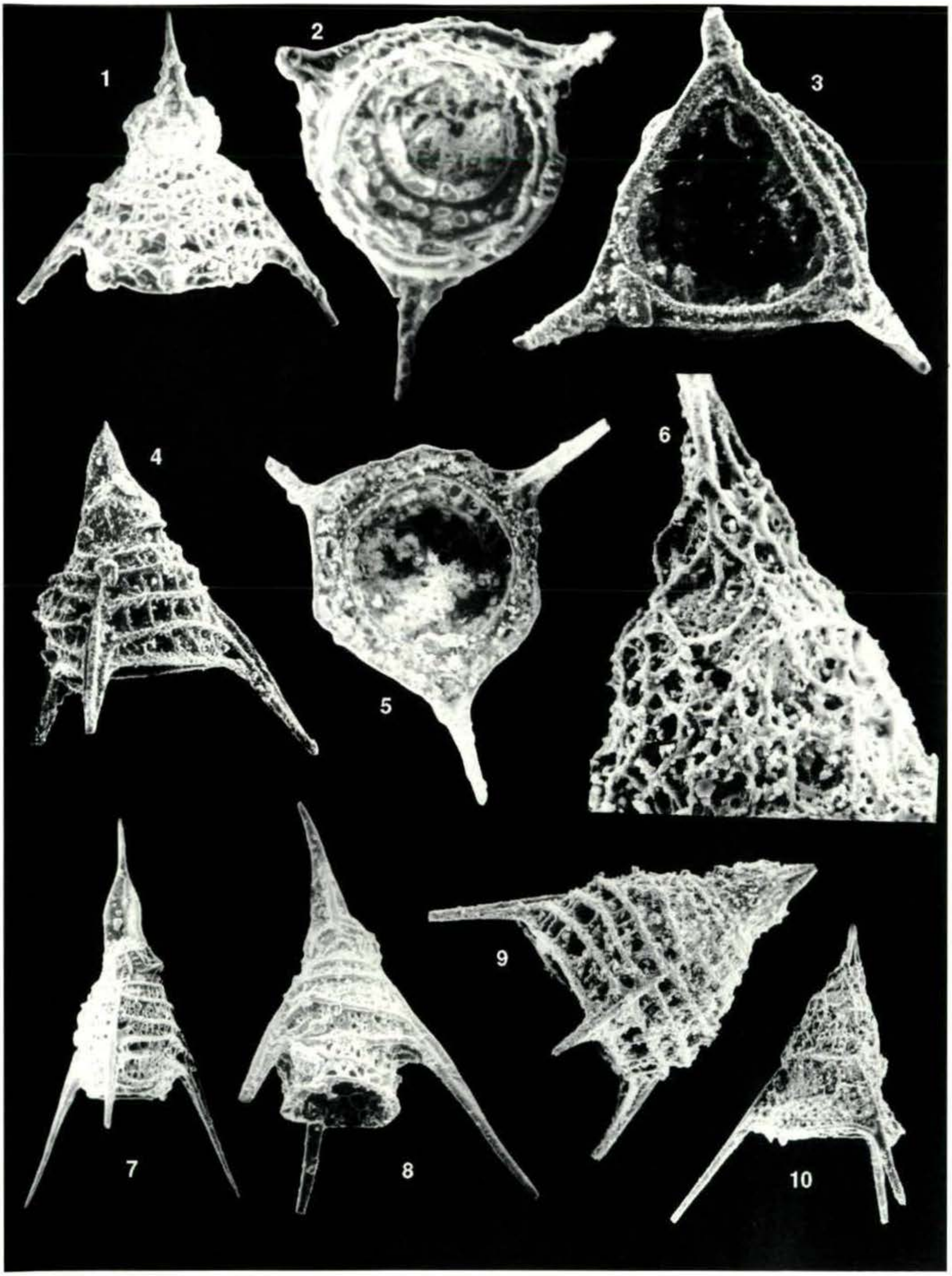

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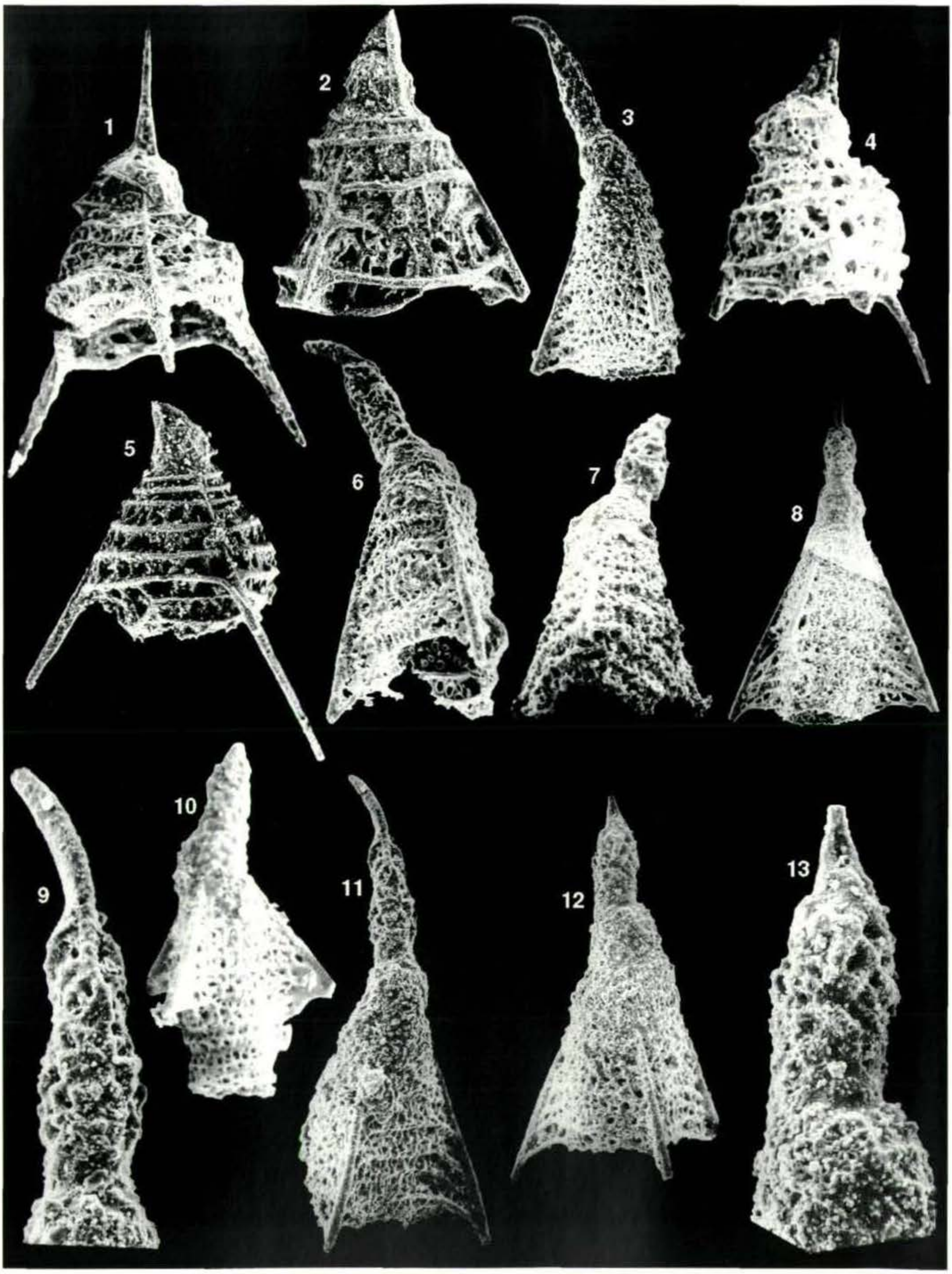

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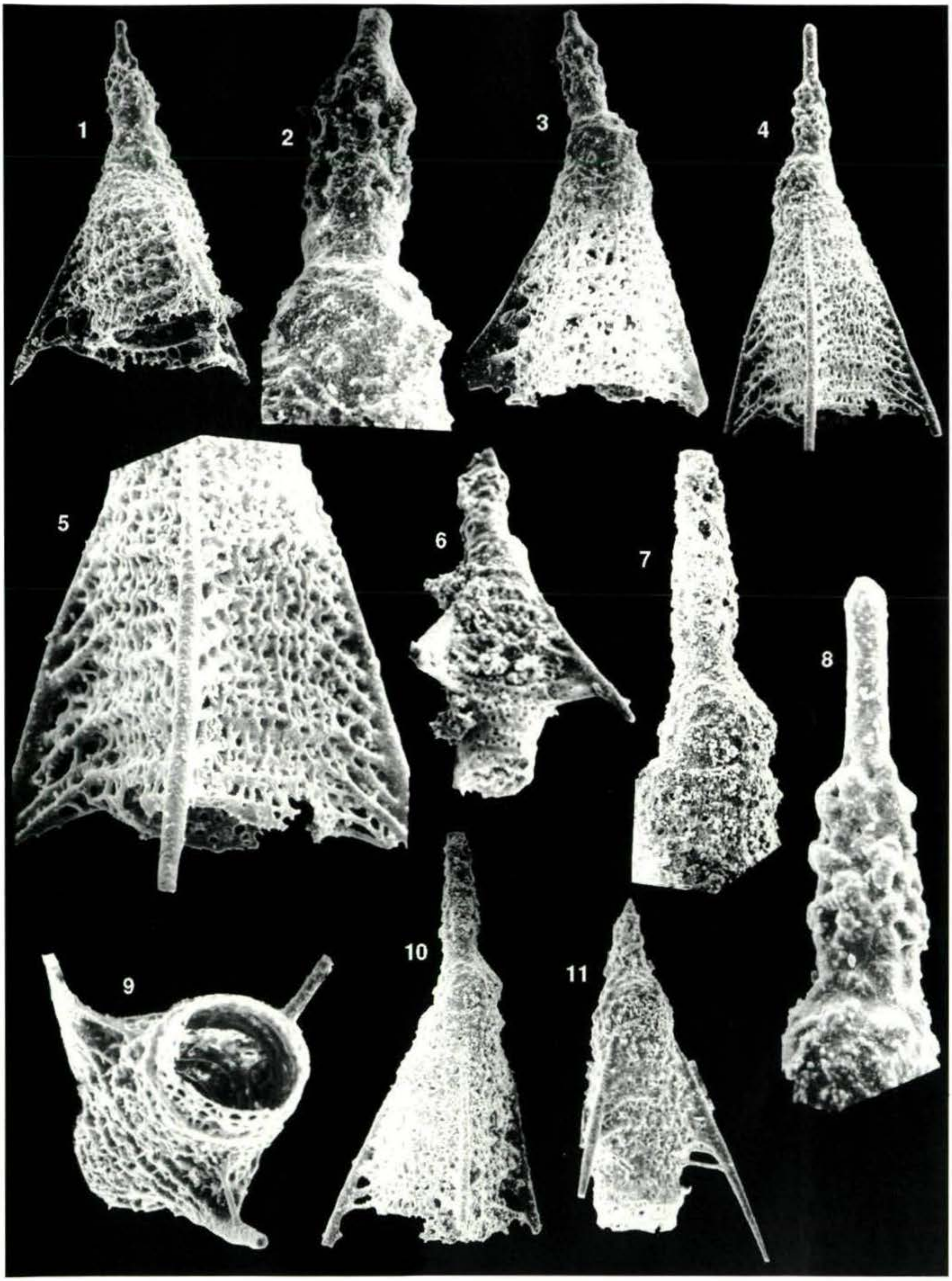

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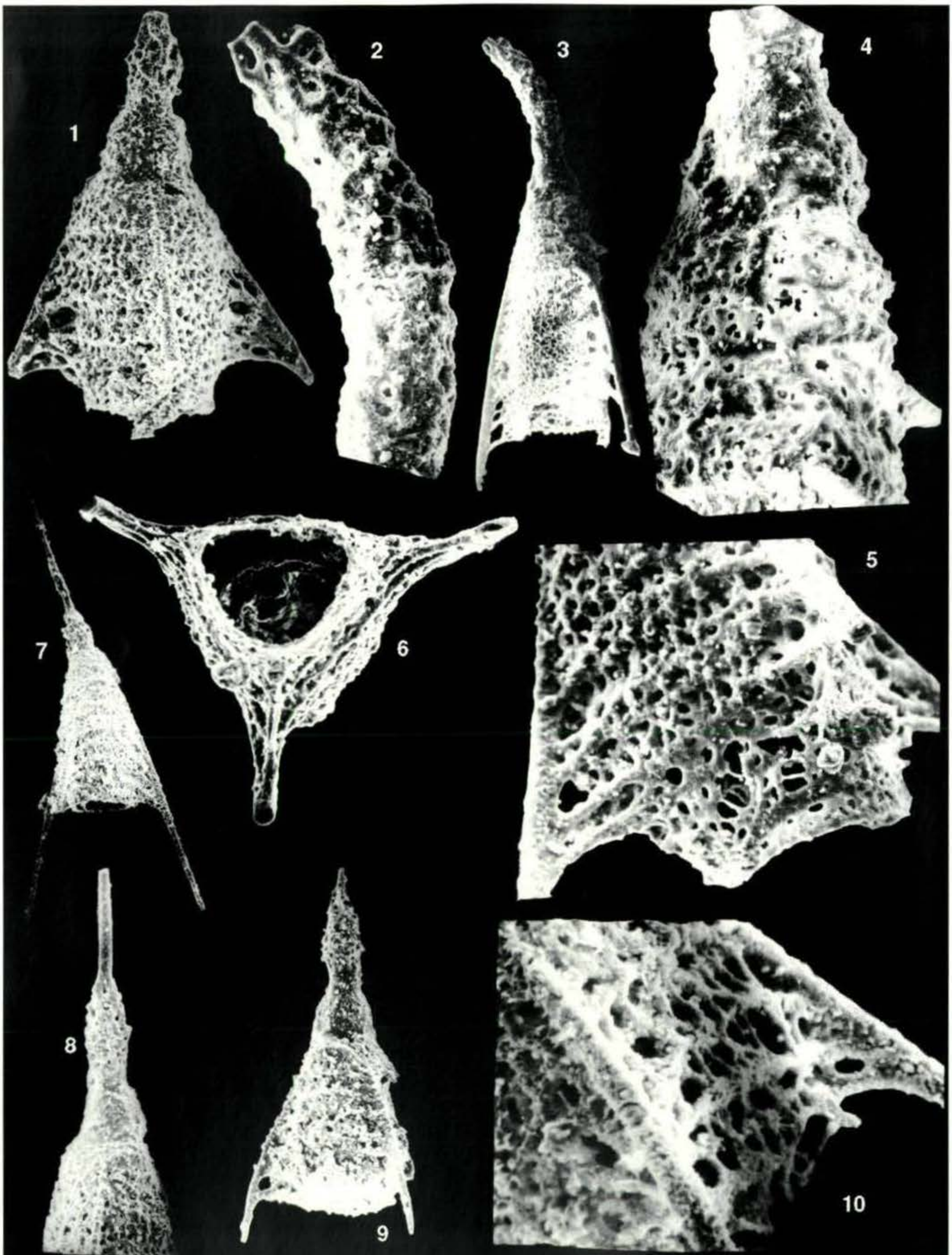

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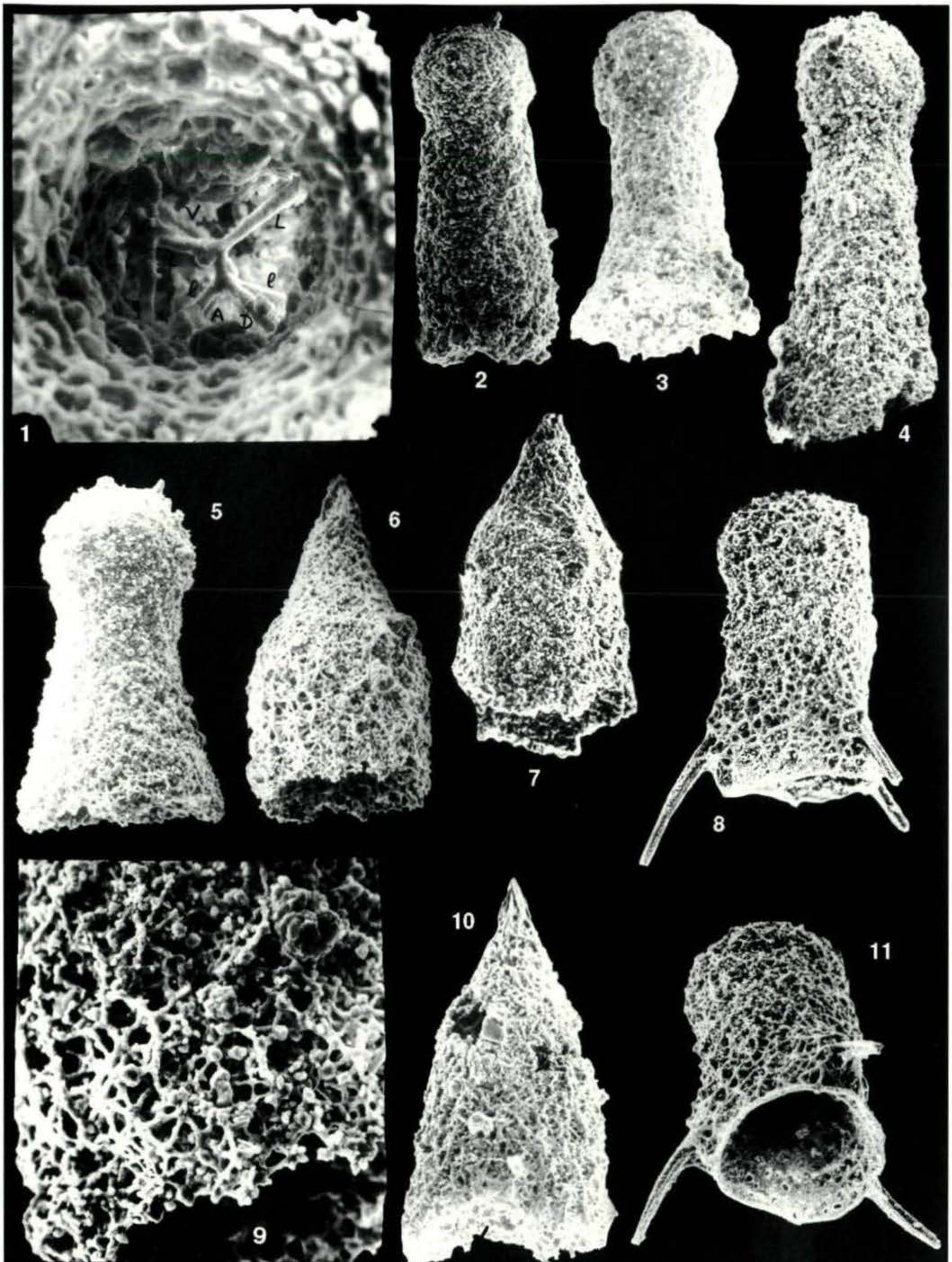

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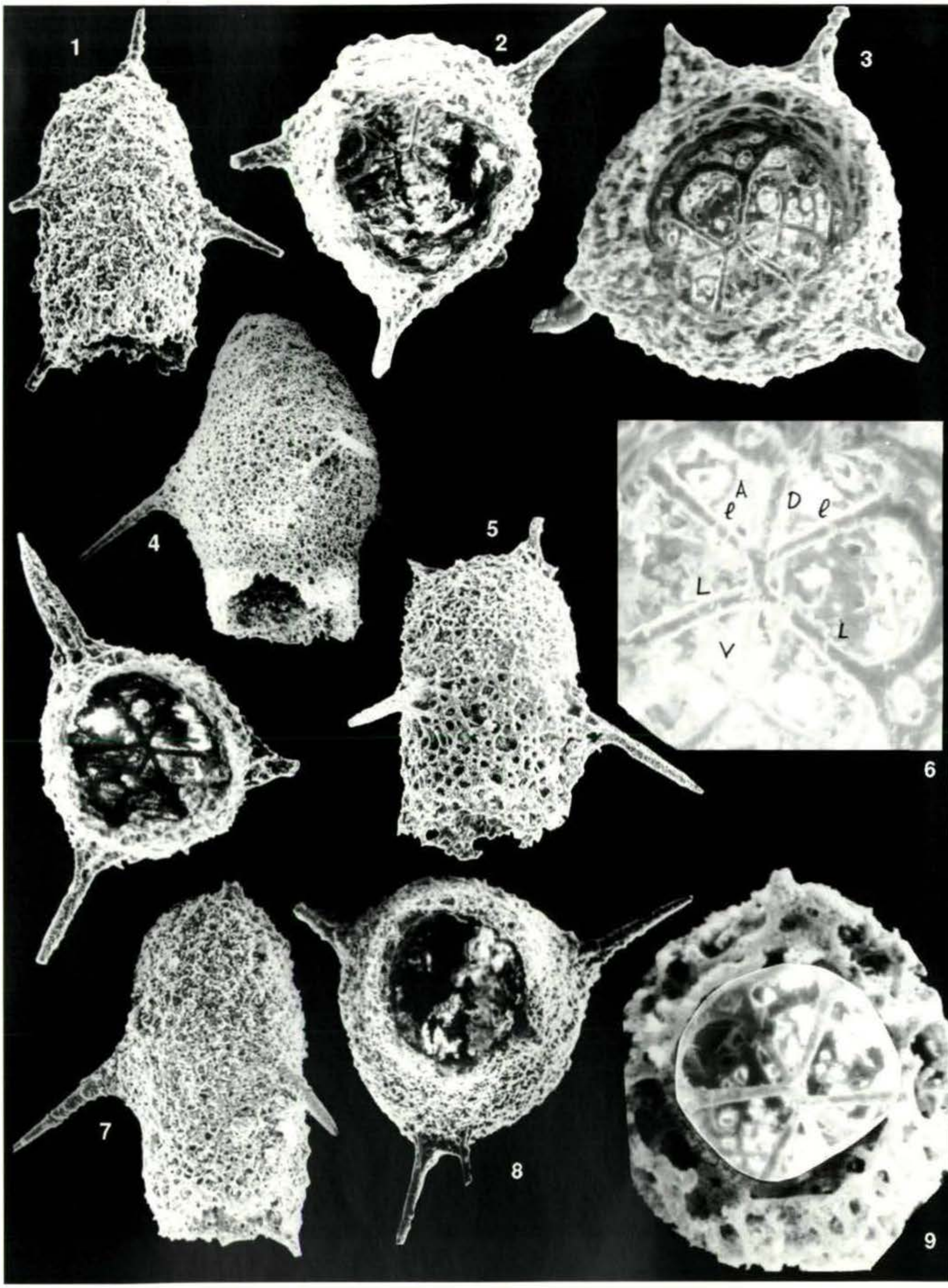

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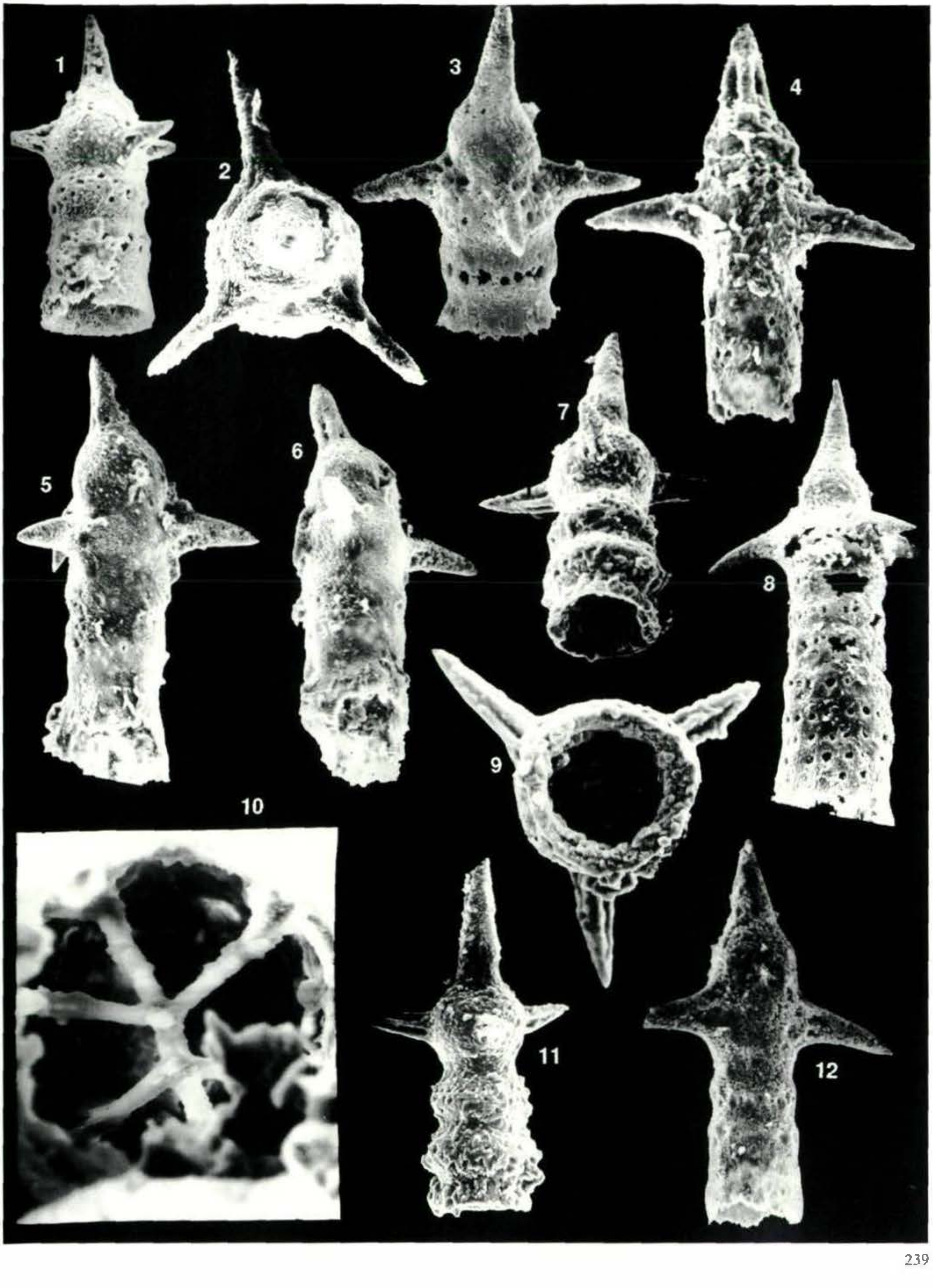

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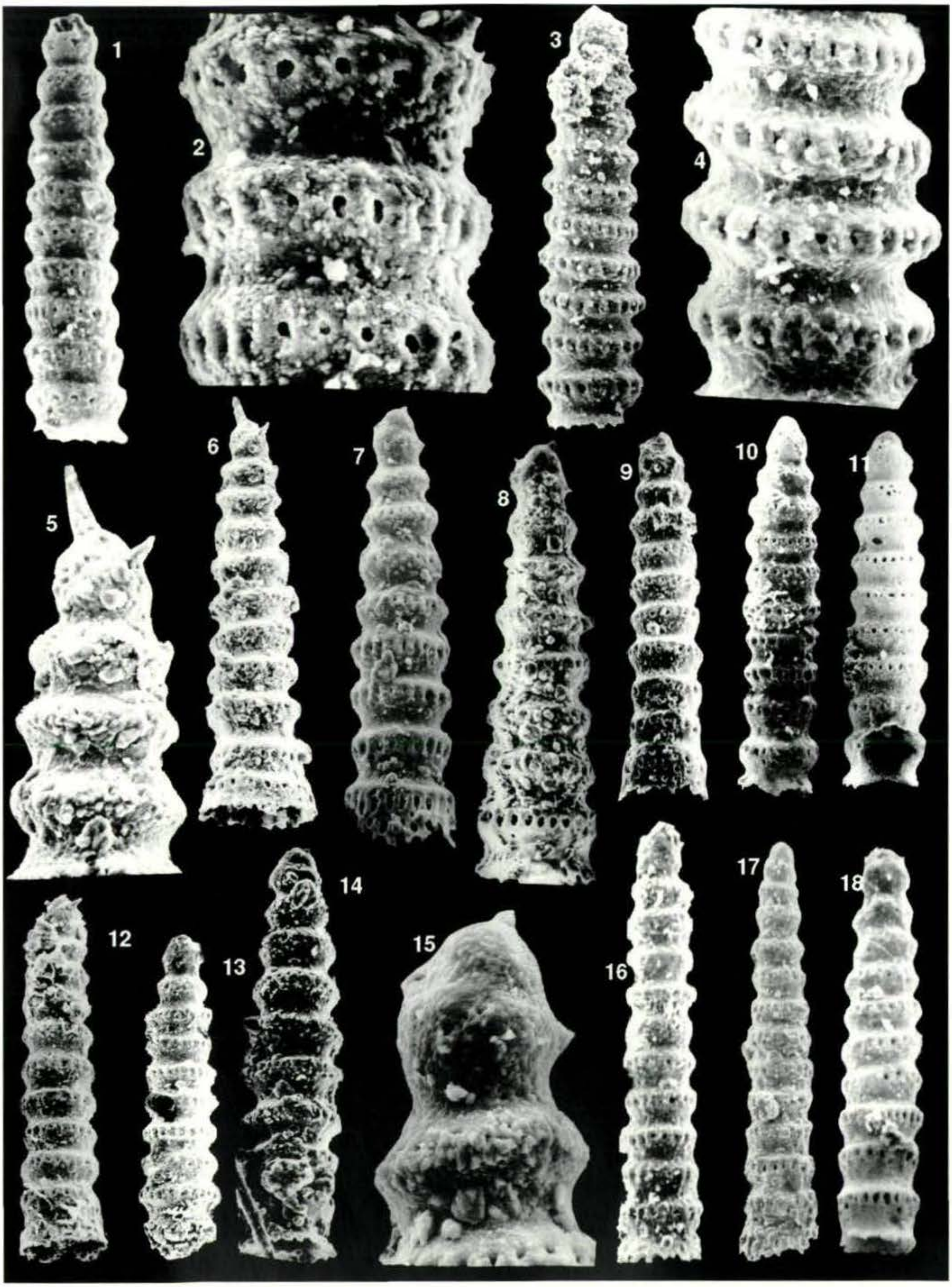

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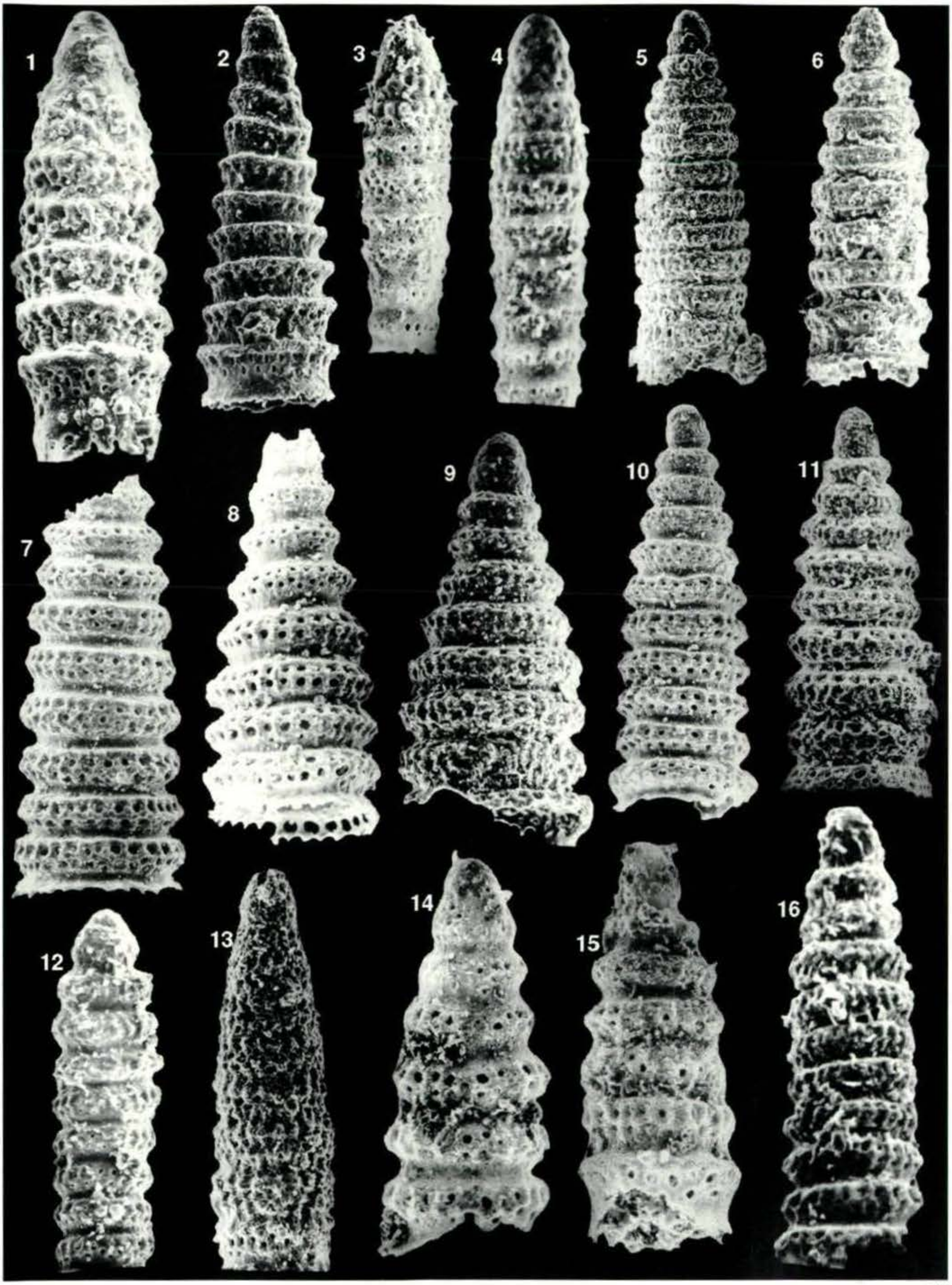

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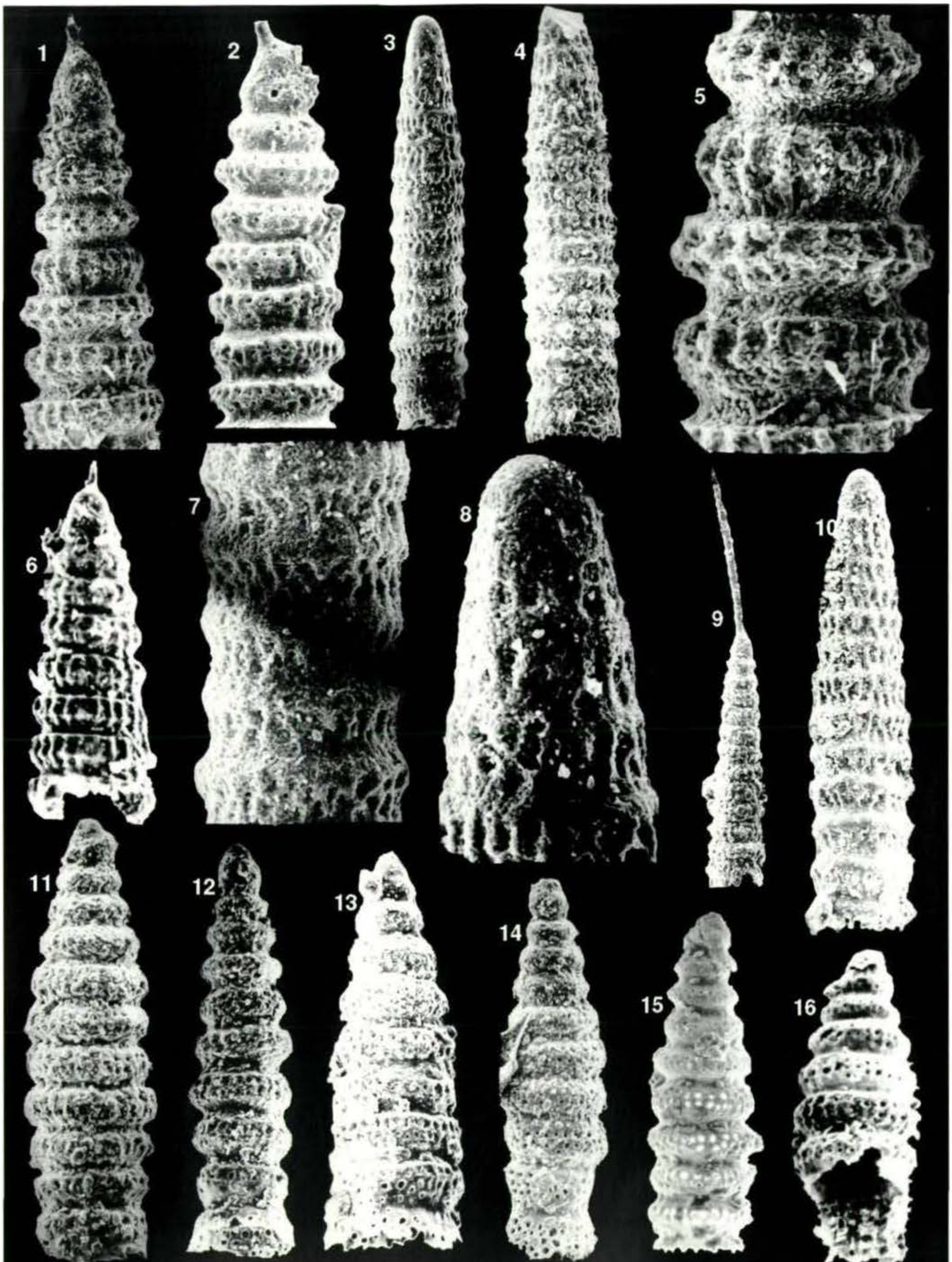

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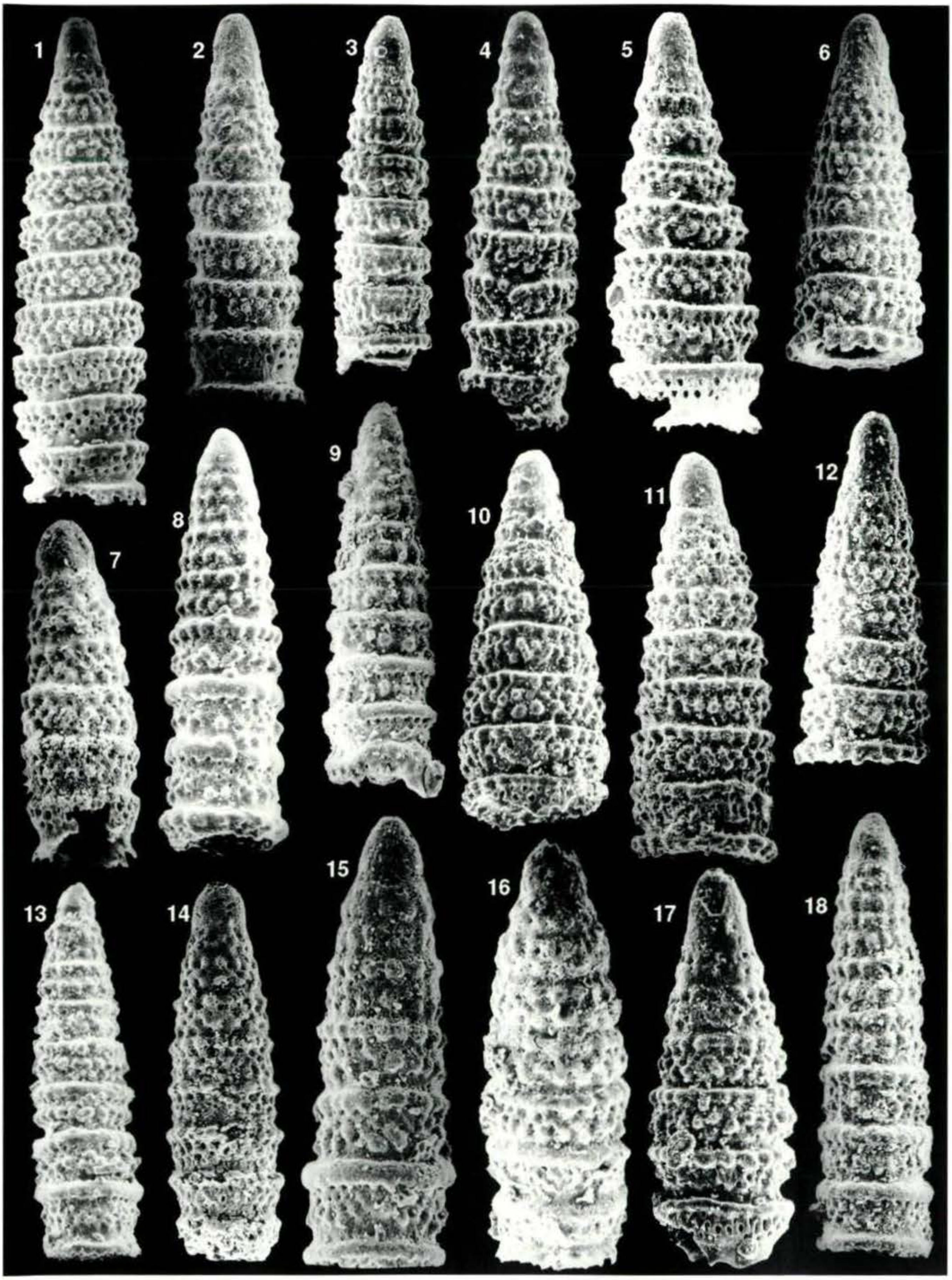
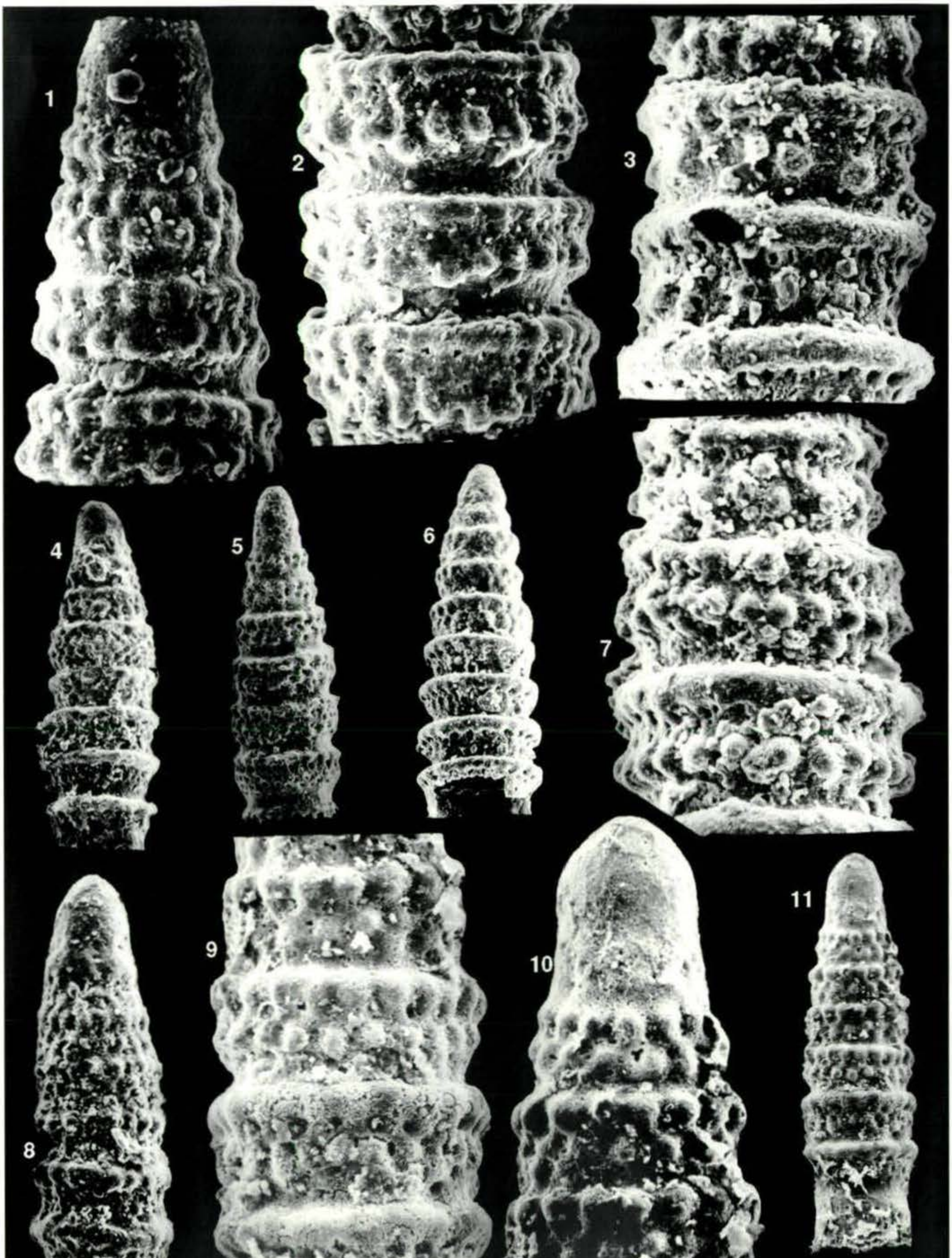


Plate 45



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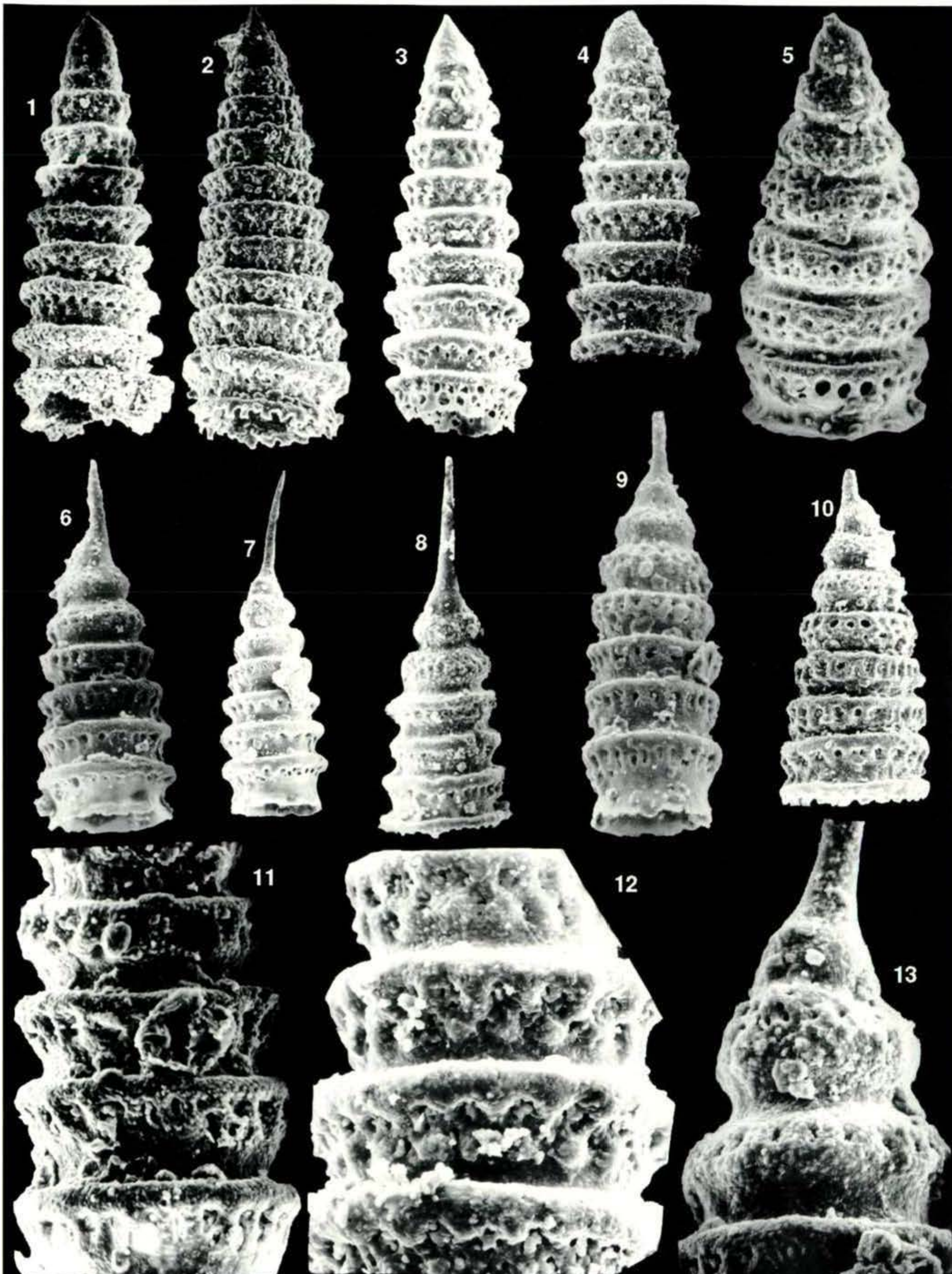
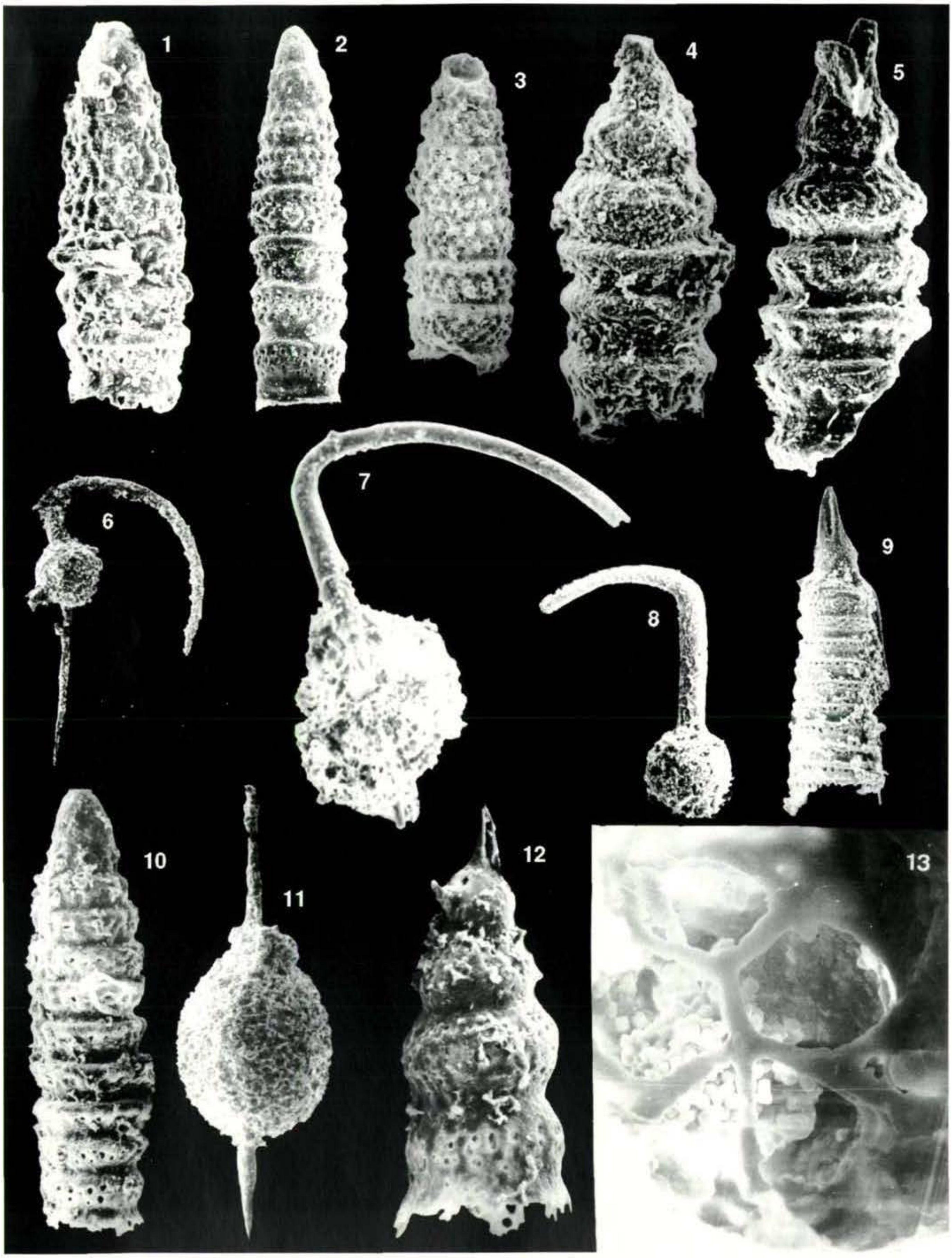


Plate 47



Appendix

Radiolarians from the borehole Inke-1

By H. Kozur

In the borehole Inke-1, south of southwestern Balaton Highland 7 cones of pre-Tertiary, very low grade metamorphic rocks of the interval 4551 - 5000 m were investigated. These rocks consists of a melange of serpentinite, acidic metavolcanoclastics, albite-sericite slates (originally intermediate volcanics), microconglomerates, very pure, strongly deformed limestones and black, siliceous slates with microfauna (pyritized radiolarians, very few conodonts - only ramiform elements, pyritized spongy spicules, pyritized bivalves). The sedimentology and fossil content is described by HAAS, KOZUR & LELKES - FELVARI (in press), the radiolarian fauna under the authorship of KOZUR. Because this paper is already 5 years in press, the radiolarians are described in this appendix likewise under authorship of KOZUR to avoid the use of nomina nuda.

Before the findings of fossils by KOZUR, this very low-grade metamorphic sequence have been placed into the Lower Paleozoic. However, it is a tectonic window below unmetamorphic Dinaric marine Upper Paleozoic and Triassic of the Igal Zone. Similar Triassic rocks of the same metamorphic degree, but without serpentinites, have been investigated by KOZUR; KRAINER & MOSTLER (in prep.) from the South Karawanke Koschuta Unit.

The below described radiolarians are all from black, siliceous shell at 4999–5000 m depth. The age is higher Middle Carnian to lower part of Upper Carnian.

Description of the radiolarian species
Suborder Entactinaria KOZUR & MOSTLER, 1982
Superfamily Palaeoscenidiacea RIEDEL, 1967
Family Hexapylomellidae KOZUR & MOSTLER, 1979
Subfamily Hexapylomellinae KOZUR & MOSTLER, 1979

Genus: *Praenanina* n. gen.

Type species: *Praenanina veghae* Kozur n. gen., n. sp.
Derivatio nominis: According ot the supposed relations to *Nanina* Kozur & Mostler, 1982
Diagnosis: Outer shell spherical, double-walled. Inner layer with small, oval to round pores. Outer layer consists of a coarse lattice with node-like elevated nodal points. Pentactine spicule enclosed in a latticed medullary shell. At least one further medullary shell is present outside the pentactine. No first order spines are present.
Included species: *Praenanina veghae* KOZUR n. gen., n. sp.
Occurrence: Upper Triassic of Tethyan realm.
Remarks: *Hexapylomella* KOZUR & MOSTLER, 1979 has 6 pylomes, but is otherwise quite similar.
Nanina KOZUR & MOSTLER, 1982 has a very thick single-walled outer shell.

Praenanina seems to be a transitional genus between *Hexapylomella* and *Nanina*, but it is by far more closely related to *Hexapylomella* than to *Nanina*. The small pylomes in *Hexapylomella* replace 6 primary spines. Needle shaped remnants of these spines are sometimes still present in the centre of these pylomes. The next pylomorphogenetic step is the closing of the small pylomes. This step is realized in *Praenanina*. The development of a very thick single-walled outer shell as in *Nanina* is, in turn, a large phylomorphogenetic step.

The diagnosis of the Hexapylomellinae KOZUR & MOSTLER, 1979 has to be emended to include all double-walled Triassic Palaeoscenidiacea without first order primary spines on the outer shell. The presence of pylomes is then only a generic character, present in taxa transitional to the family Hindeosphaeridae KOZUR & MOSTLER, 1981.

Praenanina veghae KOZUR n. gen., n. sp.
(Pl. 21, fig. 2; pl. 4A, figs. 1, 3)

Derivatio nominis: In honour of Prof. Dr. Végh, E. Budapest
Holotype: The specimen on pl. 4A, fig. 1
Diagnosis: As for the genus
Measurements: Diameter of outer shell: 250–256 µm
Distribution: Julian(?), Tuvalian of the European Tethys
Remarks: As for the genus. Double-walled sphaerical radiolarians without primary spines and without pylomes are frequent in the Julian and Tuvalian, but their preservation is mostly so bad that a specific and often even a genetic determination is impossible. Most of these radiolarians that are often very dominant components in Lower to Middle Tuvalian radiolarian associations, belong to the genus *Praenanina*. So far as a specific determination is possible,

the Lower to Middle Tuvalian representatives can be assigned to *P. veghae.*

Suborder Spumellaria EHRENBERG, 1875
Superfamily Actinommacea HAECKEL, 1862
emend. KOZUR & MOSTLER, 1979
Family Capuchnosphaeridae De WEVER, 1979
Genus *Capuchnosphaera* De WEVER, 1979

Type species: *Capuchnosphaera triassica* De WEVER, 1979

***Capuchnosphaera* n. sp. sensu**
KOZUR & MOSTLER, 1979
(Pl. 3A, figs. 1–3)

Family Ethmosphaeridae HAECKEL, 1862
Genus *Cenosphaera* EHRENBERG, 1854

Type species: *Cenosphaera plutonis* EHRENBERG, 1854

***Cenosphaera* spp.**
(Pl. 2A, figs. 5, 6)

Suborder Nassellaria EHRENBERG, 1875
Superfamily Eucyrtidiacea EHRENBERG, 1847
Family Canoptidae PESSAGNO, 1979
Genus *Canoptum* PESSAGNO, 1979

Type species: *Canoptum poissoni* PESSAGNO, 1979

***Canoptum* cf. *laxum* BLOME, 1984**
(Pl. 2A, fig. 3)

1984 *Canoptum laxum* new species – BLOME pp. 4748, pl. 11, figs. 9,14

Distribution: Middle Carnian to Middle Norian of European Tethys and western North America.

Canoptum reiflingense
(KOZUR & MOSTLER, 1981)
(Pl. 2A, fig. 4)

1981 *Triassocampe reiflingensis* n. sp. – KOZUR & MOSTLER, p. 99, pl. 26, fig. 1

Remarks: KOZUR & MOSTLER (1981) placed this species still in *Triassocampe* DUMITRICÂ; KOZUR & MOSTLER, 1980, but the small, irregularly distributed pores are already secondary pores in the microgranular layer of silica that covers the wall with the primary pores. Sometimes the number of the secondary pores is very small, like in the fragmentary specimen on pl. 1, fig. 6.

Genus *Japonocampe* KOZUR, 1984 (January)

Type species: *Triassocampe nova* YAO, 1982
Synonym: Latium BLOME, 1984 (April)

***Japonocampe* n. sp. 1 aff. *J. mundum* (Blome, 1984)**
(Pl. 1A, fig. 72)

Remarks: In the present incomplete specimen the segments are higher elevated and the pores in the constrictions are smaller than in *Japonocampe mundum* (BLOME, 1984)

Japonocampe n. sp. 2 (pl. 1A, fig. 3) has shallower segments like in *J. mundum*, but at least the preserved distal part of the test is cylindrical and narrower than in *J. mundum* and the pores in the constriction are larger than in this species.

Genus *Pachus* BLOME, 1984

Type species: *Pachus firmus* BLOME, 1984

***Pachus* sp.**
(Pl. 1A, figs. 5, 6)

Remarks: The very fragmentary specimens fit into the diagnosis of *Pachus* Blome, 1984, but the nodes are not yet so strong as in typical representatives of this genus from the Upper Carnian to Middle Norian.

Family Triassocampidae KOZUR & MOSTLER, 1981

Genus *Annulotriassocampe* KOZUR n. gen.

Type species: *Annulotriassocampe baldii* KOZUR n. gen., n. sp.
Derivatio nominis: According to the smooth rings in the distal segments
Diagnosis: Test multicyrtid, long-conical. Cephalothorax dome-shaped, distally often thickened, with round apical end, smooth, poreless or with a few, widely scattered pores. Often pores, sometimes also tiny spines at the junction of V or other bars of the spicular system with the wall are present. Without, or very rarely with a short apical horn. Abdomen a little broader, but shorter than cephalothorax, with 2-3 rings of pores, often partly or entirely covered by a smooth layer of microgranular silica. Stricture between cephalothorax and abdomen mostly without pores, rarely with a ring of pores that may be partially or entirely closed by a layer of microgranular silica. First postabdominal segment mostly hoop-like, in general with one ring of pores, but additional pores may be present in its distal part.

Following postabdominal segments, very rarely also the first postabdominal segment very high, with a central pore ring, in general bordererd by an upper and lower smooth ring, in primitive forms without these rings. In typical forms the postabdominal segments are narrow subcylindrical and vertically elevated. Only in primitive forms the postabdominal segments are rather hoop-like. All postthoracic segments are separated by deep, smooth strictures.

Included species:
Annulotriassocampe baldii KOZUR n. gen., n. sp.
Triassocampe sulovensis KOZUR & MOCK, 1981 (in KOZUR & MOSTLER, 1981)
? *Triassocampe immaturum* BLOME, 1984
Triassocampe proprium BLOME, 1984
Annulotriassocampe campanilis campanilis n. subsp.
Annulotriassocampe campanilis longiporata n. subsp.
Annulotriassocampe eoladinica n. sp.
Annulotriassocampe spinosa n. sp.
Description of the last 4 taxa see in the main part of this paper (KOZUR & MOSTLER).
Occurrence: Upper Anisian to Julian of the Alps, Western Carpathians and Hungary. Upper Carnian to Middle Nordian of western United States.
Remarks: *Triassocampe* DUMITRICĂ; KOZUR & MOSTLER, 1980 from the Middle Triassic has at least 2 rings of pores in every segment.

Yeharaia NAKASEKO & NISHIMURA, 1979 has smooth rings in the postabdominal segments, like the new genus, but in every segment only one ring is present. Moreover, a long apical horn is present and the thorax is in general large and subglobular.

Annulotriassocampe baldii KOZUR n. gen., n. sp.
(Pl. 1A, fig. 13)

Derivatio nominis: In honour of Prof. Dr. BALDI, T. Budapest
Holotype: The specimen on pl. 1A, fig. 1
Diagnosis: With the character of the genus. Cephalothorax distally not or only very few thickened, with some pores that mark the end of the spicular bars, at least with one pore at the junction of V with the wall. Abdomen separated from the cephalothorax by a narrow stricture with a ring of small pores that are mostly closed by a layer of microgranular silica. Thorax hoop-like to subtrapezoidal. Pores and indistinct nodes quite covered by a layer of microgranular silica. First postabdominal segment hoop-like, with a smooth or slightly nodose ring and a ring of pores above it.

The 2 following short-cylindrical postabdominal segments consist of 2 smooth to slightly nodose rings that border a slightly depressed ring of round pores. In the fourth (inversely trapezoidal) postabdominal segment the nodose lower ring is strongly reduced. In the fourth postabdominal segment the lower ring is nearly entirely reduced. In the same direction the upper ring becomes stronger and stronger.

Measurements of the holotype:
Total length of test: 215 µm
Maximum width of test: 83 µm

	Length	Width
cephalis	35 µm	40 µm
thorax	20 µm	52 µm
abdomen	15 µm	60 µm
postabdominal segments	15–17 µm	70–83 µm

Occurrence: Carnian of the borehole Inke-I.
Remarks: The new species is similar to *Annulotriassocampe sulovensis* (Kozur & Mock, 1981) from the Lower to Middle Carnian of the Western Carpathians. In this species the thorax has open pores, the first postabdominal segment displays some pores below the proximal pore ring and the lower ring of the segments is not or only slightly reduced in the distal part of the test.

Annulotriassocampe proprium (BLOME, 1984) from the Upper Carnian to Middle Norian of western United States is in the distal part of the test identical with *A. baldii* KOZUR n. gen., n. sp., but its proximal part is rather different and a distinct apical horn is present.

Annulotriassocampe n. sp. (pl. 1A, fig. 2) is only known from small fragments of the proximal part of the test. The abdomen displays 2 rings of open pores and the first postabdominal segment is already short-cylindrical with a slightly depressed ring of pores between 2 smooth rings.

Superfamily Theocapsacea HAECKEL, 1882
Family Nakasekoellidae KOZUR, 1984
Genus *Nakasekoellus* KOZUR, 1984 (January)

Type species: *Stichophormis polita* HINDE, 1908 (= *Dictyomitra pessagnoi* NAKASEKO & NISHIMURA, 1979 = *Xipha striata* BLOME, 1984)
Synonym: *Xipha* BLOME, 1984 (April)

***Nakasekoellus inkensis* Kozur n. sp.**
(Pl. 1A, fig. 4)

Derivatio nominis: According to the occurrence in the borehole Inke-I
Holotype: The specimen on pl. 1A, fig. 4
Diagnosis: Tetracyrtid. All segments are separated each other by deep, smooth strictures. Cephalis smooth, poreless. The postcephalic segments increases rapidly in diameter and gradually in their length. Thorax semiglobular, smooth, poreless. Abdomen broadly hoop-like, poreless, with narrow, straight, sharp vertical ribs. These ribs are partly large and a little curved, partly short to moderately long and straight. These latter ribs do not reach the upper margin of the postabdominal segment like the large ones. Aperture large.
Measurements of the holotype (in μm):

	whole test	**thorax**	**abdomen**	**post-abdominal segment**
Length	139	20	25	44
Maximum width	97	37	65	97

Occurrence: Carnian of the borehole Inke-I.

Remarks: Like in all *Nakasekoellus* species the segments have primary pores that are covered by a thick poreless layer. In transmitted light the pores are often visible at least in the thorax and abdomen. For this reason the genus *Canesium* Blome, 1984, is very similar, but in this genus the postabdominal segment has never a cover of microgranular silica.

Dictyomitra pygmaea HINDE, 1908, the only hitherto known species of *Canesium* BLOME, 1984, was included by KOZUR, 1984 into *Nakasekoellus* KOZUR, 1984, because in this time both from *Nakasekoellus* and from the nearly related *Canesium* only one species was known. In this time the creation of 2 monospecific genera was not necessary. The evidence of further species both of *Nakasekoellus* and *Canesium* justified now the separation into 2 genera. *Nakasekoellus* KOZUR, 1984 (January) is therefore used here in the more restricted sense of its younger synonym *Xipha* BLOME, 1984 (April).

It is unclear, whether the costal extensions in „*Xipha*“ *striata* BLOME, 1984 are only intraspecific or preservation-controlled features. In „*Dictyomitra*“ *pessagnoi* NAKASEKO & NISHIMURA, 1979 these costal extensions are present in some specimens (NAKASEKO & NISHIMURA, pl. 9, fig. 3) and missing in other ones (NAKASEKO & NISHIMURA, pl. 9, figs. 2, 4). In the holotype of „*Stichophormis*“ *polita* HINDE, 1908 these costal extensions are well developed. If we regard the presence or absence of costal extensions as specific characteristic, than only *Xipha striata* BLOME, 1984 would be an younger synonym of *Nakasekoellus politus* (HINDE, 1908). But in all *Tricolocampe* species (descendants of *Nakasekoellus*) of Jurassic age, there are likewise species with and without costal extensions (or even velum). This depends on the stage of preservation or partly also on intraspecific variation. The same is assumed for the Triassic *Nakasekoellus* species. For this reason both "*Dictyomitra*" *pessagnoi* NAKASEKO & NISHIMURA, 1979 and *Xipha striata* BLOME, 1984 are here regarded as junior synonyms of *Nakasekoellus politus* (HINDE, 1908).

Nakasekoellus inkensis KOZUR n. sp. is clearly distinguished from *N. politus* (HINDE, 1908) = *Dictyomitra pessagnoi* NAKASEKO & NISHIMURA, 1979 = *Xipha striata* BLOME, 1984 by the smooth thorax and by the considerably higher number of narrower and more irregular ribs on the postabdominal segment.

Explanation of plates

All figures specimens from the plates of the appendix have been solvewd by HF from black siliceous shales and lydites from the borehole Inke-1 at 4999 m - 5000 m, sample 16/II. Rep.-no. Ko 1994 I-1

Plate 1 A

Fig. 1: *Annulotriassocampe baldii* KOZUR n. gen. n. sp., holotype, a) x 300, b) detail, x 720.
Fig. 2: *Annulotriassocampe* n . sp., x 320.
Fig. 3: *Japonocampe* n. sp. 2, x 360
Fig. 4: *Nakasekoellus inkensis* KOZUR, n. sp., holotype, x 480.
Figs. 5, 6: *Pachus* sp., fig. 5: x 400, fig. 6: x 540.
Fig. 7: *Japonocampe* n. sp. 1 aff. *J. mundum* (BLOME, 1984), x 400.
Fig. 8 Fragment of a ramiform conodont, x 300.

Plate 2 A

Fig. 1: Pyritized juvenile bivalve, x 300.
Fig. 2: *Praenanina veghae* KOZUR, n. gen. n. sp., x 260.
Fig. 3: *Canoptum* cf. *laxum* BLOME, 1984, x 540.
Fig. 4: *Canoptum reiflingense* (KOZUR & MOSTLER, 1981), x 440.
Fig. 5: *Cenosphaera* sp. 2, a) x 260, b) detail., x 600.
Fig. 6: *Cenosphaera* sp. 1, x 260.

Plate 3 A

Figs. 1—3: *Capuchnosphaera* n. sp., fig. 1 a: x 400, fig. 1 b: detail of the same specimen, x 860; fig. 2a: x 320, fig. 2 b: detail of the same specimen, x 600; fig. 3: x 460.
Fig. 4: Framboidal pyrite, x 360.
Fig. 5: *Capuchnosphaera*, spec. indet.

Plate 4 A

Fig. 1, 3: *Praenanina veghae* KOZUR, n. gen. n. sp., fig. 1: holotype, a x 220, b) detail, x 480; fig. 3 a: x 260, fig. 3 b: detail of the same specimen, x 600.
Fig. 2: Sponge spicule, x 300.

Plate 1A

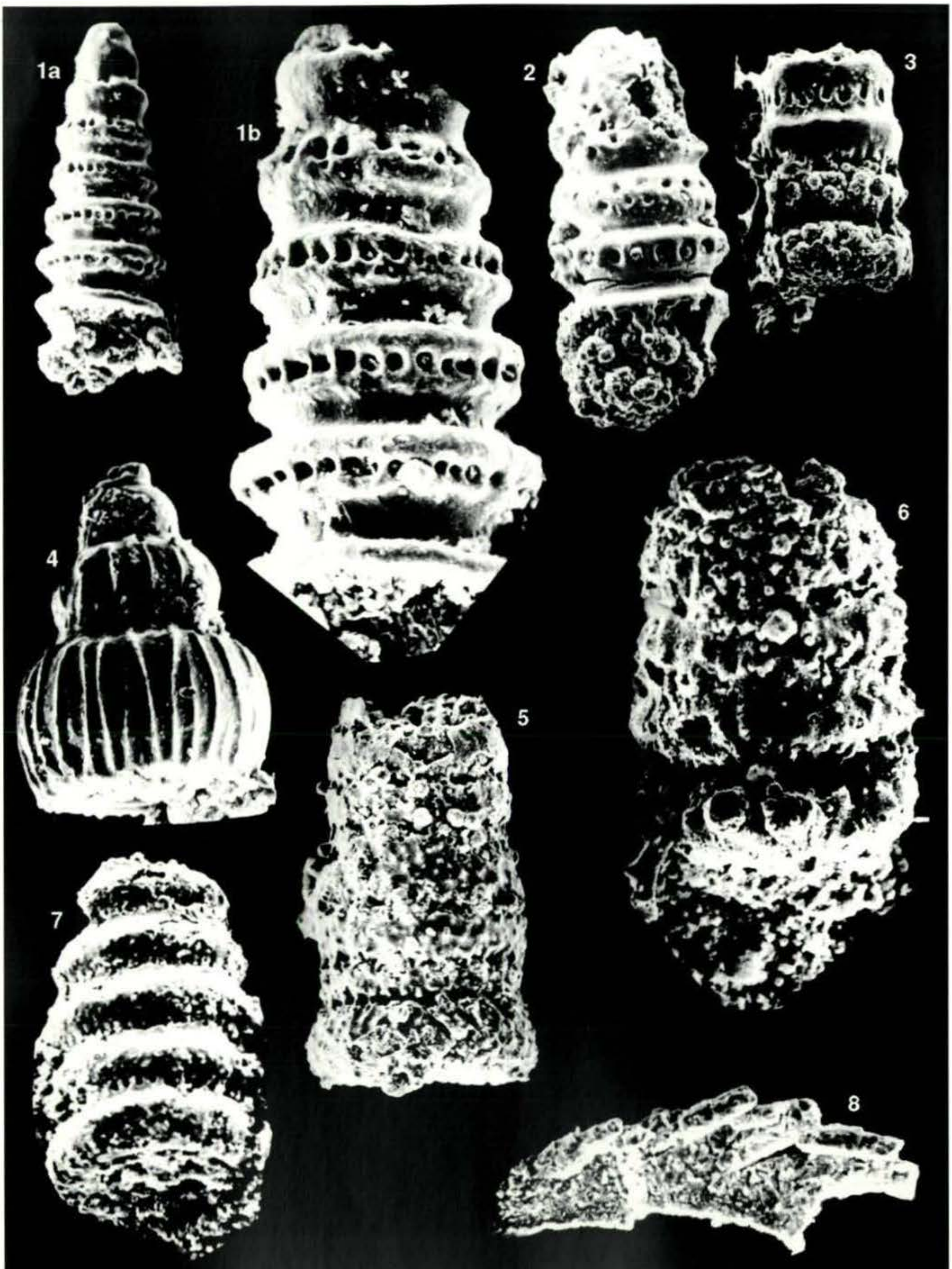


Plate 2A

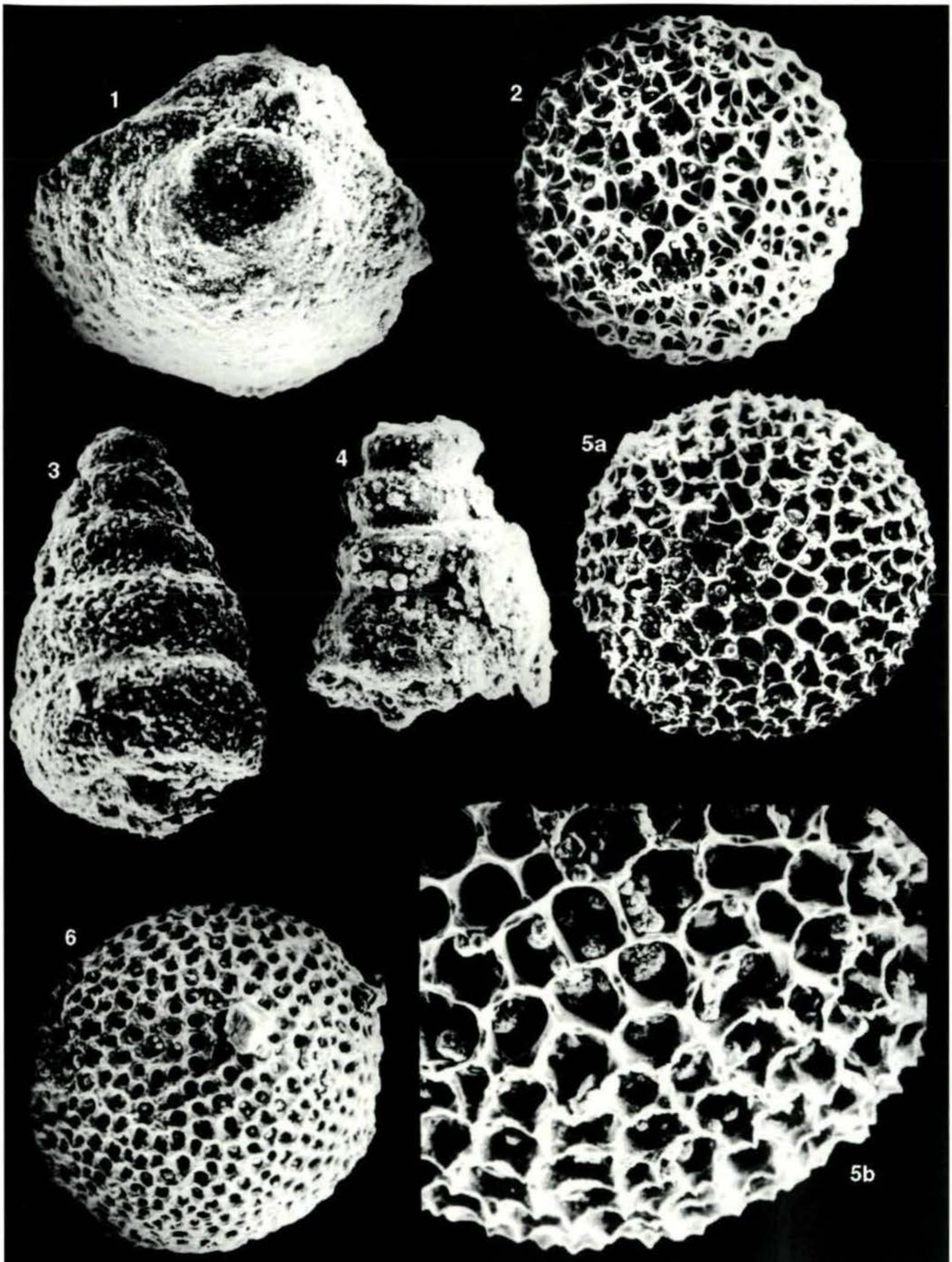


Plate 3A

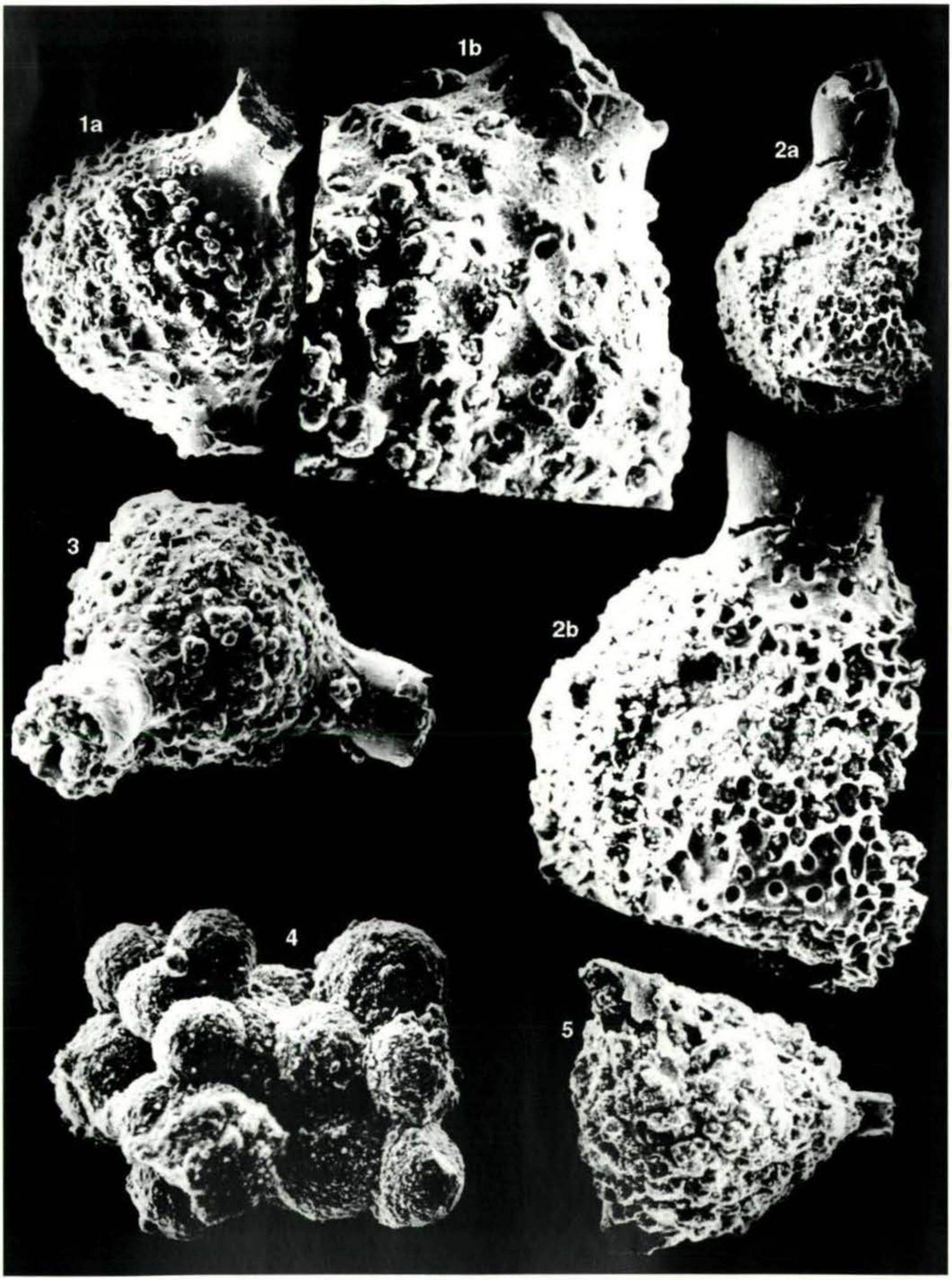


Plate 4A