Geol.Paläont.Mitt.Innsbruck	ISSN 0378-6870	Bd.13	11	S.239-275	Ibk., Jänner 1986

THE FIRST EVIDENCE OF THE UNUMA ECHINATUS RADIOLARIAN ZONE IN THE RUDABÁNYA MTS (NORTHERN HUNGARY)

by J. GRILL & H. KOZUR[1)]

Zusammenfassung

Die Unuma echinatus Radiolarien-Zone wurde nun auch im Rudabanya-Gebirge nachgewiesen. Diese Zone war längere Zeit nur aus Tiefwasserablagerungen in der Umrandung des Pazifik bekannt (die Index-Art war sogar nur in Japan gefunden worden). Später wurde die Unuma echinatus-Zone in Tiefwasserablagerungen des Aalenian bis Mittelbajocian des Bükk-Gebirges nachgewiesen (KOZUR, 1984). Diese Ablagerungen wurden unterhalb des CCD sedimentiert. Sie führen reichlich *Unuma echinatus*. Im Rudabánya-Gebirge wurden die Sedimente mit vereinzelt *Unuma echinatus* ebenfalls in größeren Wassertiefen, jedoch nahe der CCD abgelagert

Die Unuma echinatus-Zone konnte in zwei Subzonen untergliedert werden, die Lupherium officerense-Subzone (Aalenian bis basales Mittelbajocian) und die Yaocapsa mastoidea-Subzone (höheres Mittelbajocian).

Im taxonomischen Teil werden mehrere neue Arten der Gattungen *Foremanina*, *Canoptum*, *Pseudoeucyrtis*, *Hsuum* und der neuen Gattung *Pseudodictyomitrella* beschrieben. In einem Anhang (KOZUR & MOSTLER) werden 5 neue Arten von *Archaeodictyomitra* beschrieben.

Summary

The Unuma echinatus radiolarian zone could now also be found in the Rudabánya Mts. For a longer time this zone was only known from deep water sediments of the Pacific margin (the index species was even unknown outside Japan). The Unuma echinatus zone (with rich occurrences of the index species) was later recognized also in deep water sediments of Aalenian to Middle Bajocian age of the Bükk Mts. (KOZUR, 1984) deposited below the CCD. In the Rudabánya Mts. sediments with only few specimens of *Unuma echinatus* were deposited also in greater water depth, but near the CCD.

---

1) authors' addresses: Dipl. Geol. József Grill and Dr. sc. Heinz Kozur, Hungarian Geological Institute, Népstadion út 14, H-1143 Budapest/ Hungary

Two subzones of the Unuma echinatus zone could be discriminated. The lower Unuma echinatus zone (Lupherium officerense subzone) was correlated with the Aalenian to lowermost Middle Bajocian. The upper Unuma echinatus zone (Yaocapsa mastoidea subzone was placed into the higher part of Middle Bajocian.

In the taxonomic part several new species of the genera *Foremanina*, *Canoptum*, *Pseudoeucyrtis*, *Hsuum* and of the new genus *Pseudodictyomitrella* n. gen. are described. In an appendix by KOZUR & MOSTLER 5 species of *Archaeodictyomitra* are described.

1. Introduction

The Unuma echinatus radiolarian zone is typical for Aalenian to Middle Bajocian deep water sediments, often sedimented below the CCD. Therefore for a long time this radiolarian fauna was only known from eugeosynclinal sequences in Japan with shales, manganese shales, black cherts, that are often connected with basic lavas.

KOZUR (1984) found this fauna also in the South Bükk Shale Unit of Southern and Western Bükk Mts. that consists of the Aalenian and Middle Bajocian of dark shales with some black or grey cherts, manganese nodules and in some places (e. g. Szarvaskő) huge amounts of pillow lavas.

The Unuma echinatus zone should be found in all sequences of the Tethyan Mobile Belt (KOZUR, in press, KOZUR & MOCK, in press). But this Middle Jurassic to Lower Cretaceous suboceanic to oceanic belt was later mostly subducted or metamorphosed (e.g. Penninicum).

The Unuma echinatus fauna can be expected also in those sedimentary areas primarily located between the Tethyan Mobile Belt and the shelf of Apulia or Europe. These sequences were sedimentated partly below, partly above the CCD and have in general no basic volcanics. The presence of the Unuma echinatus fauna could be therefore expected for the Jurassic sequence of the Rudabánya Mts. Well preserved radiolarians of the Unuma echinatus zone could be found now in the Rudabánya Mts. Some of these radiolarians are described here.

2. Stratigraphy

Jurassic sediments cover about 4 km² in the studied area in the middle part of the Rudabánya Mts. SW of Szalonna. The location of the studied area is shown in figs. 1 and 2.

The Jurassic sequence overlies Upper Triassic pelagic limestones, often with tectonic contact. It consists mainly of monotonous black to dark grey shales, marls, siliceous shales and manganeseshales, with some rhyolitic volcanics or subvolcanics, Middle-Upper Triassic limestone olistoliths and sometimes sandstone olistoliths. This Jurassic sequence can be subdivided into threee members.

The Lower Member is about 300 m thick and conists of black, partly siliceous and manganese shales and marls.

The lower part of the Lower Member consists of black to dark grey marls with 9-55 % carbonate, 14-43 % quartz, 3-10 % chlorite, 4-20 % clay minerals, 2-14 % plagioklase. Some interbedded dark limy marls to marly limestones as well as limestone olistoliths are present. The marls are mostly unbedded, sometimes a lamination can be observed. These beds were deposited in a basinal deep water facies, but above the CCD.

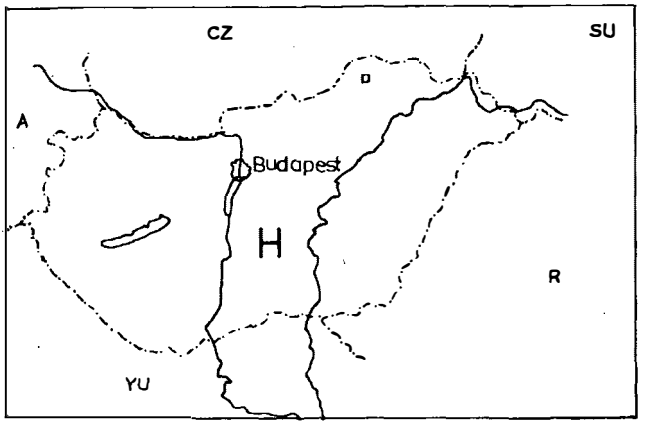

Fig. 1: Location of the Rudabánya Mts. in northern Hungary (open square)

The middle part of the Lower Member consists of black shales, siliceous shales, manganese shales, subordinately also lenses and thin beds of black or dark-grey cherts. The shales consist of 30-60 % quartz, 38-63 % clay minerals + chlorite and 2-7 % plagioklase. Pyrite (about 1 %) is always present. Some samples have a very low primary carbonate content. Therefore the deposition of the sediments in the middle part of the Lower Member seems to be near to the CCD, a little above it for sediments with very low primary carbonate content and somewhat below the CCD for carbonate-free sediments.

All described radiolarians of the Unuma echinatus zone from the Rudabánya Mts. derive from the middle part of the Lower Member. This supports the above given facial data. The Unuma echinatus zone is until now only known from deep water sediments of Japan and the Bükk Mts., deposited well below the CCD. Interesting that this radiolarian fauna was found always in a sequence of black shales, mudstones, siliceous shales, manganese shales and dark cherts. Siliceous limestones and cherty nodules of the same age from the Balaton Highland have never yielded *Unuma echinatus*. In the Rudabánya Mts. this species is very rare inspite of an otherwise very rich radiolarian fauna. In the Bükk Mts. and in Japan *Unuma echinatus* is rather requent. Therefore, *Unuma echinatus* seems to be restricted to sediments deposited below the CCD. In sediments, deposited near or a little above the CCD, *Unuma echinatus* is already very rare.

The upper part of the Lower Member consists of marls, limy marls and some beds of allodapical limestones. Limestone olistoliths (maximum size 1 m^3) and slightly alterated rhyolitic clasts and some bodies of slightly alterated rhyolites are also present.

The marls are well laminated and the allodapical limestones are usually graded. Slumping structures are locally present.

The mineral composition of the marls in the upper part of the Lower Member is similar to that of the marls in the lower part of the Lower Member. The slightly alterated rhyolitic clasts indicate that rhyolites have already been eroded during the deposition of the upper part of the Lower Member. The slightly alterated rhyolitic bodies always have tectoni-

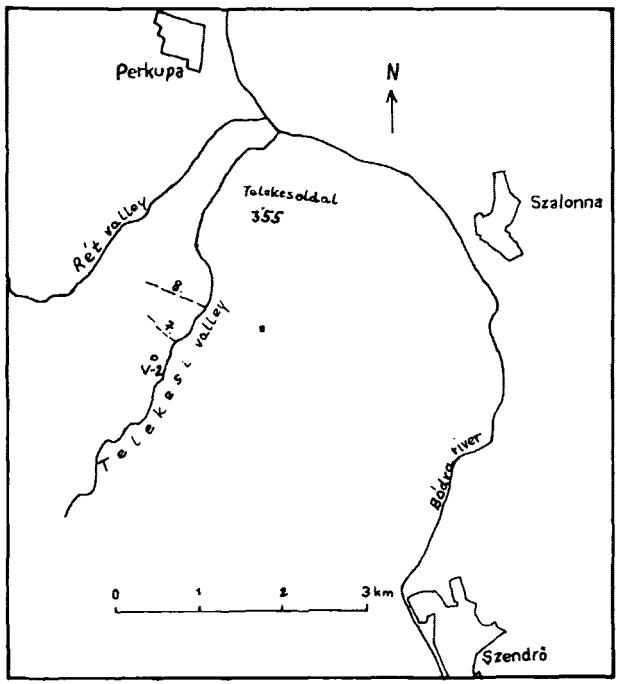

Fig. 2: Studied area in the middle part of the Rudabánya Mts. The filled square indicates the sampling place of the sample GRILL 80 (Csehi-hegy). Circle: borehole Várboc-2. Dashed lines: Telekes side-valleys no. 7 and 8

cal contact with the marls. In spite of this tectonic contact we think that the rhyolitic bodies are probably contemporaneous or almost contemporaneous with the surrounding marls, because the soft marls and the big hard rhyolitic bodies surely reacted with different relative movements to the lateral pressure during the strong tectonization of the whole sequence. Moreover, also the fact that the lower and middle parts of the Lower Member are quite free of rhyolitic bodies and rhyolitic clasts is a further indication for a nearly contemporaneous volcanism during the sedimentation of the upper part of the Lower Member.

The Middle Member is about 100 m thick and consists of dark grey marls with wavy bedding planes. Numerous small sandstone olistoliths (max. size 1 m^3) are present. These sandstones are cross-bedded and consist of 40-70 % quartz, 1-10 % feldspar, 0-5 % mica and small pieces of rock fragments. The intergrain matrix (10-30 %) consists of quartz, chlorite and sericite.

The marls contain 10-30 % carbonate. Therefore this sequence is deposited above the CCD.

The Upper Member is about 300 m thick and consists of black laminated marls with big olistoliths of Triassic limestones and conglomeratic olistoliths with pebbles of limestones and rhyolites.

The marls consist of 10-20 % carbonate, 30-40 % quartz, 5 % plagioclase, 10-25 % clay minerals and 20-30 % chlorite. They contain also

less than 10 % quartz and mica clasts. Rhyolitic tuffs are locally present (Bódva valley).

A Middle and Upper Triassic sequence can be reconstructed from the limestone olistoliths. This Triassic development is quite different from the Triassic sequence that underlies the Jurassic beds (see figs. 4, 5).

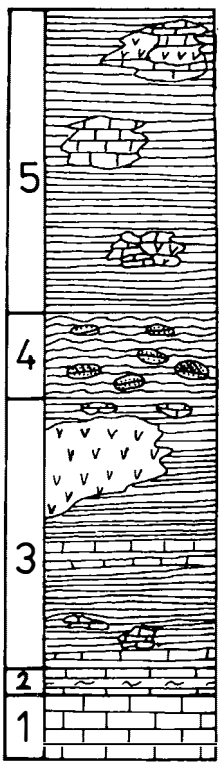

Fig. 3: Stratigraphic column of the investigated area.
1 - Hallstatt Limestone Formation
2 - Zlambach Marl Formation
3 - Lower Member of the Jurassic sequence
4 - Middle Member of the Jurassic sequence
5 - Upper Member of the Jurassic sequence

The Jurassic sequence looks like a schistes lystré type (Caucasian subtype), but we don't know basic magmas yet, unlike the otherwise similar (but carbonate-free) South Bükk Shale Unit of the southern and western Bükk Mts. and the Jurassic sequence of the Meliata Unit. Above all in parts of the South Bükk Shale Unit thick pillow lavas are present (e.g. near Szarvaskő in the western Bükk Mts.). According to KOZUR (in press) and KOZUR & MOCK (in press) both the South Bükk Shale Unit and the Meliata Unit have in the Jurassic a Penninic development (as part of the Tethyan Mobile Belt).

The Middle and Upper Members of the investigated Jurassic sequence show a very low grade metamorphosis (anchimetamorphic) and a slight cleavage oblique to the bedding plane can be observed. The Lower Member is either quite unmetamorphic or its upper part shows the same very low grade metamorphosis like the Middle and Upper Members.

All investigated radiolarian faunas of the Rudabánya Mts. (Csehihegy SW of Szalonna, borehole Várboc-2, Telekes side-valleys number 7 and 8) belong to the Unuma echinatus zone. According to the newest

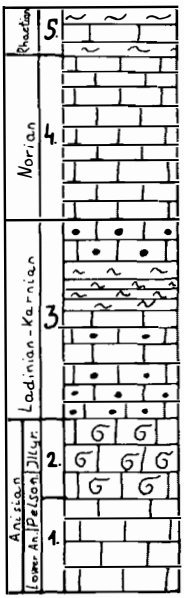

Fig. 4: Middle and Upper Triassic Formation below the Jurassic sequence in the investigated area.
1 - Steinalm Limestone Formation
2 - Dunateto Limestone Formation: red or pink limestones with crinoids, brachiopods
3 - Bódvalenke Limestone Formation: red thin-bedded limestones with cherts, marls
4 - Hallstatt Limestone Formation
5 - Zlambach Marl Formation

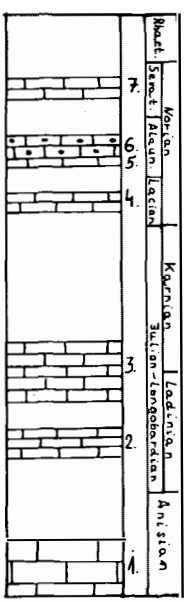

Fig. 5: Triassic sequence reconstructed from olistoliths in the Jurassic sequence of the investigated area.
1 - Steinalm Limestone
2 - Blue-grey limestones (from conglomerate olistoliths)
3 - middle-grey limestone
4 - light grey limestone
5 - light grey limestone
6 - grey limestone with cherts
7 - light grey limestone

data this radiolarian zone covers the time interval from the basal Aalenian to the Middle Bajocian. Typical representatives of *Unuma echinatus* ICHIKAWA & YAO with long spines occur only in the lower Unuma echinatus zone (Aalenian - basal Middle Bajocian) that is well represented in the Rudabánya Mts. A new subspecies with short spines is present in the upper Unuma echinatus zone. This subspecies ranges up to the Bathonian.

Here we give a short description of the two subzones within the Unuma echinatus zone.

Lupherium officerence subzone

Definition: Range of *Lupherium officerence* PESSAGNO & WHALEN, *L. snowshoense* PESSAGNO & WHALEN together with *Unuma echinatus* ICHIKAWA & YAO.
Lower boundary (=lower boundary of the Unuma echinatus zone): First appearance of *L. officerense*, *L. snowshoense* and *U. echinatus*. Most probably also *Archaeodictyomitra prisca* KOZUR & MOSTLER n. sp. and *Striatojaponocapsa plicarum* (YAO) begin at or near the lower boundary of the Unuma echinatus zone.
Upper boundary: Disappearance of *Lupherium officerence*, *L. snowshoense* and first appearance of *Archaeodictyomitra praeprimigena* KOZUR & MOSTLER n. sp., *Eoxitus hungaricus* KOZUR (in press), *Japonocapsa fusiformis* (YAO) and *Yaocapsa mastoidea* (YAO).
Age: *Lupherium officerense* and *L. snowshoense* range from the Aalenian up to the basal part of the Middle Bajocian (lower Otoites sauze zone). *Hsuum rosebudense* PESSAGNO & WHALEN, also a member of the lower Unuma echinatus zone occurs in the Aalenian and Lower Bajocian. According to the definition of the Lupherium officerense subzone its upper boundary lies in the basal part of the Middle Bajocian. Most probbly its lower boundary coincides with the base of the Aalenian.
Distribution: Japan (*L. officerense* is here not yet known, but all other species of the lower Unuma echinatus zone are present), California (*Unuma echinatus* is here unknown, but *L. officerense*, *L. snowshoense* and *H. rosebudense* were first described from there), Bükk Mts. (localities Tarkany orom, Csipés-tető, Csohany-tető, all southern Bükk Mts.) and Rudabánya Mts. (Csehi-hegy SW of Szalonna, borehole Várboc-2, Telekes side-valleys numbers 7, 8). Both in the Bükk Mts. and in the Rudabánya Mts. *Unuma echinatus*, *Lupherium officerense*, *L. snowshoense* and *Hsuum rosebudense* are present.

Yaocapsa mastoidea subzone

Definition: Joint occurrence of *Yaocapsa mastoidea* (YAO), *Japonocapsa fusiformis* (YAO), *Hsuum robustum* PESSAGNO & WHALEN, *H. parasolense* PESSAGNO & WHALEN, *Archaeodictyomitra praeprimigena* KOZUR & MOSTLER n. sp., *Unuma echinatus* n. subsp. (with small spines).
Lower boundary: See upper boundary of the *Lupherium officerense* subzone.
Upper boundary (= upper boundary of the Unuma echinatus zone): Disappearance of *Yaocapsa mastoidea* (YAO) and *Hsuum parasolense* PESSAGNO & WHALEN.
Age: Stephanoceras humphresianum zone of higher Middle Bajocian. *Hsuum parasolense* PESSAGNO & WHALEN is according to PESSAGNO & WHALEN restricted to this ammonoid zone. *Hsuum robustum* PESSAGNO & WHALEN is here also frequent, but still occurs in the Strenoceras subfurcatum zone of the deeper part of Upper Bajocian. *Unuma echinatus* n. subsp. ranges up to the Bathonian. This subspecies is in Japan also present in the next higher radiolarian zone. Therefore the Unuma echinatus zone (assemblage zone) ends within the higher Bajocian.

Distribution: Japan, California (here *Unuma echinatus* is not known yet), Bükk Mts. (localities Varga-tető in the western Bükk Mts. as well as from the northern slope of Kisfennsík in the northern Bükk Mts.), Rudabánya Mts. (uppermost part of the Jurassic sequence in the borehole Várboc-2 = higher part of manganese and siliceous shales in the middle part of the Lower Member).
Remarks: Many species, characteristic of the Yaocapsa mastoidea subzone occur also in the deeper part or even the whole overlying Striatojaponocapsa convexa A.Z. (sensu MATSUOKA, 1983), but a lot of species, frequent in the whole Unuma echinatus zone or only in its upper part disappear at the top of the Unuma echinatus zone. *Unuma echinatus* n. subsp. (perhaps even a new species) ranges up to the Bathonian, where it is already rare. If this taxon is a new species, then the Unuma echinatus zone had to be restricted to the lower and middle subzone of the Unuma echinatus zone as used in this paper. In this case the Yaocapsa mastoidea zone had to be elevated into zonal rank. The taxonomic investigation of the *Unuma echinatus* group is not finished yet.

Maybe that between the Lupherium officerense and Yaocapsa mastoidea subzones there is still a middle subzone of the Unuma echinatus zone. In these faunas, the genus *Lupherium* PESSAGNO & WHALEN seems to be already absent, but the *Archaeodictyomitra* species are still very primitive. Most of the species characteric of the Yaocapsa mastoidea subzone (including the index species) are still absent. If in the future whole sections of the Jurassic in the Bükk Mts. and Rudabánya Mts. will be studied, this third middle subzone of the Unuma echinatus zone can perhaps be exactly separated from the two other subzones.

3. Taxonomic part

Suborder Nassellaria EHRENBERG, 1875
Superfamily Eucyrtidioidea EHRENBERG, 1847 emend.

Remarks: This superfamily includes multicyrtid Nassellaria, in which the segments (with exception of the cephalis and thorax) have about the same height. Horizontal ring structures are often present in the outer sculpture, but never vertical ribs that run over more than one segment. Feet are never present.

An apical horn may be present. Other outer prolongations of the spicular system are only very rarely present (almost exclusively in the most primitive Triassic representatives). Likewise a skirt is only present in some of the most primitive representatives.

Family Stichocapsidae HAECKEL, 1882

Remarks: PETRUŠEVSKAJA (1981) regarded *Parvicingula* PESSAGNO, 1977 as younger synonym of *Stichocapsa* HAECKEL, 1882. *Stichocapsa jaspidea* RÜST, 1885 (type species of *Stichocapsa* HAECKEL, 1882) from the Upper Jurassic is based on a thin section. The outer sculpture is not visible on this specimen for preservation reasons or not present.

We agree with PETRUŠEVSKAJA (1981) that *Stichocapsa jaspidea* RÜST 1885 is near related to *Parvicingula* PESSAGNO, 1977. Like all *Parvicingula* species it is multicyrtid with poreless circumferential rings and three rings of pores between two circumferential rings. The spindle-shaped outline is also frequent in *Parvicingula*. But the type species of *Parvicingula*, *P. santabarbaraensis* PESSAGNO, 1977 has a long apical spine.

Foremanina EMPSON-MORIN, 1981 (= *Ristola* PESSAGNO & WHALEN, 1982) has no apical spine and instead of smooth circumferential rings rather rings of closely spaced nodes. Otherwise it is identical with *Parvicingula*, above all the characteristic three rings of pores between two circumferential rings are present. *Stichocapsa jaspidea* RÜST that has no apical horn, but the characteristic three rings of pores between two circumferential rings, can be compared only with this genus. There are two species groups with *Foremanina* EMPSON-MORIN, 1981: One group, to which also the holotype belongs, is slender-conical, the other group with *Dictyomitra boeseii* PARONA, 1890 ist spindle-shaped, broader and shorter. *Stichocapsa jaspidea* RÜST is surely a thin section of a representative of the *Dictyomitra boeseii* group. The shell and shell morphology is very frequent not visible in thin sections. The genus *Stichocapsa* HAECKEL, 1882 with the type species *Stichocapsa jaspidea* RÜST, 1885 is here restricted to the *Dictyomitra boeseii* group and similar spindle-shaped species.

The near relation of *Stichocapsa* HAECKEL, 1882 with *Foremanina* EMPSON-MORIN, 1981 (= *Ristola* PESSAGNO & WHALEN, 1982) suggests that the Parvicingulidae PESSAGNO, 1977 are a younger synonym of the Stichocapsidae HAECKEL, 1882 as shown by PETRUŠEVSKAJA, 1981.

Until now, spindle-shaped multicyrtid Nassellaria without outer sculpture and outside invisible segmentation were placed into *Stichocapsa*. These species have the same outline as *Stichocapsa jaspidea* RÜST, but the pores are never arranged as in *Stichocapsa jaspidea* RÜST, where three rings of pores are separated by a poreless circumferential ring from the next three rings of pores. These species are similar to *Pseudoeucyrtis* PESSAGNO, 1977, but not so slender and the pore rings are more irregularly. PESSAGNO, 1977 placed these forms into *Pseudoeucyrtis* (*P. paskentaensis* PESSAGNO, 1977) and we follow him in his original scope of the genus *Pseudoeucyrtis* PESSAGNO, 1977. These forms do not belong to the Stichocapsisdae HAECKEL, 1882.

Genus *Foremanina* EMPSON-MORIN, 1981

Type species: *Foremanina schona* EMPSON-MORIN, 1981
Synonym: *Ristola* PESSAGNO & WHALEN, 1982

Foremanina transita n. sp.
(pl. 2, fig. 3)

Derivatio nominis:
According to the transitional position betwwen the genera *Foremanina* EMPSON-MORIN, 1981 and *Eoxitus* KOZUR, in press.
Holotypus:
"*Dictyomitra*" sp. B figured by ICHIKAWA & YAO, 1973, pl. 2, fig. 1, rep.-no. Sc (OCU IN 7-S5)
Locus typicus:
Inuyama area, locality 7 according to YAO, 1972
Stratum typicum:
Cherts of Unuma echinatus zone (Aalenian to Middle Bajocian).
Material: 17 specimens.
Diagnosis: Test conical, width of segments increases moderately fast and quite continuously. Cephalis poreless, subconical to subcylindrical, apically rounded. Collar stricture indistinct, with few pores. Thorax and following chambers trapezoidal in cross section. Thorax with pores that are often closed. Other segments with three rings of round pores and a ring of small spines or spiny nodes at the junction of the segments.

These small spines or spiny nodes are close to each other, but not or only indistinctly joined with a circumferential ring.
Measurements:
l = 188 - 257 µm
Maximum width of segments: 95 - 127 µm
Distribution:
Unuma echinatus zone of Japan. Lower Unuma echinatus zone (Aalenian to basal Middle Bajocian) of Bükk Mts. and Rudabánya Mts.
Remarks: The material from the Bükk Mts. and the Rudabánya Mts. shows all characteristics of the species, but is not well preserved. Therefore the well preserved specimen figured by ICHIKAWA & YAO (1973) has been chosen as holotype.

Foremanina transita n. sp. has not more typical nodose circumferential rings like in the most *Foremanina* species. But on the other hand the nodes or small spines are not so widely separated as in *Eoxitus* KOZUR (in press), where pores are present between the nodes.

Foremanina varbocensis n. sp.
(pl. 2, fig. 4)

Derivatio nominis:
According to the occurrence in the borehole Várboc 2/1
Holotype:
The specimen on pl. 2, fig. 4; rep.-no. J 10415
Locus typicus:
Borehole Várboc 2/1,. Rudabánya Mts., northern Hungary
Stratum typicum:
Black, siliceous manganese shales at 64,1 m. Higher part of lower Unuma echinatus zone. Higher Aalenian or Lower Bajocian.
Material: 4 specimens.
Diagnosis: Test multicyrtid, conical. Width of the segments increases moderately and continuously. Cephalis small, rounded conical, poreless. Thorax with some irregularly scattered pores. Abdomen and first abdominal segment with pores that are proximally more irregularly distributed, and distally arranged in irregular rings. A ring of relatively large, but closely spaced nodes is present in the second postabdominal segment and all following ones. Three rings of pores are present between two nodose rings. These pores are rather small in the proximal segments and moderately large in the distal segments.
Measurements:
l = 191 - 220 µm
Distribution:
Until now only known from the locus typicus.
Remarks: Together with *Foremanina transita* n. sp. this species belongs to the transitional field between the genera *Foremanina* EMPSON-MORIN, 1981 and *Eoxitus* KOZUR, in press. The nodes are still so closely spaced within the rings that also this species should be placed into *Foremanina* EMPSON-MORIN, 1981.

Foremanina veghae n. sp.
(pl. 3, fig. 1)

Derivatio nominis:
In honour of Prof. Dr. E. VÉGH, Budapest.
Holotypus: The specimen on pl. 3, fig. 1 ; rep.-no. J 10333
Locus typicus:
Csehi-hegy (Rudabánya Mts.), SW of Szalonna.

Stratum typicum:
Sample GRILL 80, lower Unuma echinatus zone (Aalenian to Lower Bajocian).
Material: 7 specimens.
Diagnosis: Test conical. Cephalis small, conical, without apical horn, unsculpturated and poreless. Thorax a little longer than cephalis, also unsculpturated and poreless or with very few, irregularly scattered pores. Abdomen considerably larger, with mostly closed pores and strongly nodose circumferential ring. The width of the following segments increases moderately and continuously. All these segments have three rings of pores between slightly nodose circumferential rings.
Measurements:
l = 200 - 219 µm
Maximum width of the segments: 80 - 100 µm
Distribution:
Lower Unuma echinatus zone of the Rudabánya Mts. and Bükk Mts.
Remarks: Similar species are unknown until now.

Family Canoptidae PESSAGNO, 1979

Genus *Canoptum* PESSAGNO, 1979

Type species: *Canoptum poissoni* PESSAGNO, 1979

Canoptum hungaricum n. sp.
(pl. 6, figs. 5,6)

Derivatio nominis:
According to the occurrence in Hungary
Holotypus:
The specimen on pl. 6, fig. 5 ; rep.-no. J 10317
Locus typicus:
Telekes side-valley no. 8, Rudabánya Mts.
Stratum typicum:
Sample TV 8/47 A, lower to Middle Unuma echinatus zone (Aalenian to deeper part of Middle Bajocian). Black, siliceous manganese shales.
Material: 32 specimens.
1982 *Canoptum* (?) sp. A - PESSAGNO & WHALEN, p. 125, pl. 7, figs. 14,16.
Diagnosis: Test slender conical. Cephalis small, rounded conical, smooth, poreless. Thorax with small pores, closed by a layer of microgranular silica. Abdomen with irregularly spaced pores, closed by a layer of microgranular silica. The width of the postabdominal segments increases continuously, but only slowly to very slowly. To the second postabdominal segments the circumferential rings are always distinct, but low. On the lower and upper side of each circumferential ring a ring of open pores is present. Between two circumferential rings there are moreover two irregular rings of pores, most of them closed by a layer of microgranular silica. The pore frame vertices bear small nodes.
Measurements:
l = 195 - 226 µm
Maximum width of the segments: 73 - 96 µm
Distribution:
Higher part of the lower Unuma echinatus zone.
Remarks:
Canoptum kamoensis (MIZUTANI & KIDO, 1983) from the upper Unuma echinatus zone and the next younger zone is distinguished by more prominent circumferential rings. Moreover, the width of the segments increases

in general faster. *Canoptum hungaricum* n. sp., seems to be the forerunner of *C. kamoensis* (MIZUTANI & KIDO). Transitional forms are present in stratigraphic order.

In *Canoptum rudabanyaense* n. sp. only after the third or fourth postabdominal segment very low, rather indistinct circumferential rings are present. In the whole proximal part of the test of *C. rudabanyaense* n. sp., at least to the third postabdominal segment, no strictures are visible on the outer side of the shell.

Canoptum latiannulatum n. sp.
(pl. 7, figs. 4,5)

Derivatio nominis:
According to the broad hoop-like segments.
Holotypus:
The specimen on pl. 7, fig. 4; rep.-no. J 10321.
Locus typicus:
Tárkány orom (southern Bükk Mts.).
Stratum typicum:
Grey cherts within black shales. Lower Unuma echinatus zone (Aalenian to Lower Bajocian).
Material:
More than 100 specimens.
? 1982 *Canoptum* sp. C - WAKITA (pl. 2, fig. 8)
? 1982 *Canoptum* sp. - KIDO et al. (pl. 2, fig. 7)
Diagnosis:
Test conical. Width of segments increases rather fast and then remains constant in the distal parts of the test. Cephalis small, conical, poreless. Thorax a little larger, also poreless. Collar stricture indistinct. Abdomen and postabdominal segments strongly convex, hoop-like. Stricture broad, deep. Whole surface covered with a layer of microgranular silica, in which small, mostly closed pores are present.
Measurements:
l = 169 - 204 µm
Maximum width of segments: 82 - 101 µm
Distribution:
Lower Unuma echinatus zone of the Bükk Mts. and Rudabánya Mts. Aalenian to Lower Bajocian.
Remarks:
Canoptum latiannulatum n. sp. is closely related to *Cinguloturris carpatica* DUMITRICĂ, 1982. The only major difference is the upwelling within the central part of strictures between the distal segments in *Cinguloturris carpatica* DUMITRICĂ. In some specimens of *C. latiannulatus* n. sp. a beginning upwelling in the strictures between the distal segments can be observed. Therefore *Canoptum latiannulatum* n. sp. seems to be the forerunner of *Cinguloturris* DUMITRICĂ, 1982.

Canoptum rudabanyaense n. sp.
(pl. 4, figs. 1,3)

Derivatio nominis:
According to the occurrence in the Rudabánya Mts., Northern Hungary.
Holotypus:
The specimen on pl. 4, fig. 1; rep.-no. J 10318.
Locus typicus:
Csehi-hegy SW of Szalonna.

Stratum typicum:
Black chert within black shales, sample GRILL 80. Lower Unuma echinatus zone (Aalenian to Lower Bajocian).
Material:
23 specimens.
Diagnosis:
Test slender, conical. Cephalis small, rounded conical. Thorax larger, conical. Both segments are smooth, poreless. Collar stricture at the outer side not or very indistinctly visible. Abdomen considerably larger, smooth, poreless or with irregularly sattered indistinct pores, closed by a layer of microgranular silica. The width of the postabdominal segments increases continuously, but very slowly. The low, nodose circumferential rings are visible only after the third or fourth postabdominal segments. Above and below every circumferential ring there is a ring of open pores. These pore rings are sometimes also more proximally present, where no circumferential rings are visible. All other pores of the segments closed by a layer of microgranular silica. In the very shallow strictures there are 1 - 2 irregular rings of closed pores.
Measurements:
l = 203 - 234 µm
Maximum width of the test: 84 - 99 µm
Distribution:
Lower Unuma echinatus zone. Aalenian to Lower Bajocian.
Remarks:
Canoptum rudabanyaense n. sp. is perhaps the forerunner of *C. hungaricum* n. sp. This species is similarly slender, but the circumferential rings begin more proximally.

Superfamily Eucyrtidioidea EHRENBERG, 1847, family inc.

Genus *Pseudoeucyrtis* PESSAGNO, 1977

Type species: *Eucyrtis* (?) *zhamoidai* FOREMAN, 1973

Pseudoeucyrtis buekkensis n. sp.
(pl. 6, fig. 4)

Derivatio nominis:
According to the occurrence in the Bükk Mts.
Holotypus:
The specimen on pl. 6, fig. 4; rep.-no. J 10335
Locus typicus:
Gyöngyvirágbérc (western Bükk Mts.)
Stratum typicum:
Sample K 431/16. Black chert within black shales of middle part of Unuma echinatus zone.
Material:
4 specimens.
Diagnosis:
Multicyrtid, broadly spindle-shaped. Cephalis small, broadly conical, poreless or with some irregularly scattered small pores. Thorax and following segments with large, irregular pentagonal to hexagonal pores that are arranged in indistinct rings. Circumferential rings not visible outside. The width of the segments increases continuously and rather fast to the third postabdominal segment. After this segment the width decreases continuously. All present specimens have a distal aperture, but the last segment seems to be broken away.

Measurements:
l = 158 - 171 µm
Maximum width of the segments: 82 - 88 µm
Distribution:
Until now only known from the stratum typicum at the type locality.
Remarks:
In spite of the fact that this species is only known from the Bükk. Mts. and unknown from the Rudabánya Mts., it is described here for comparison with *Pseudoeucyrtis elongata* n. sp. (from the Rudabánya Mts.) which is similar, but more slender.

Pseudoeucyrtis elongata n. sp.
(pl. 3, fig. 2)

Derivatio nominis:
According to the slender test.
Holotypus:
The specimen on pl. 3, fig. 2; rep.-no. J 10336
Locus typicus:
Csehi-hegy SW Szalonna (Rudabánya Mts.)
Stratum typicum:
Black chert within black shales. Sample GRILL 80. Lower Unuma echinatus zone (Aalenian to Lower Bajocian).
Material:
3 specimens.
Diagnosis:
Multicyrtid, slender. Segments on the outer surface not visible. The width of the segments increases to the mid-length and decreases again after the mid-length. Whole surface with large pentagonal to hexagonal pores. In the last segment the pores are still larger than in the other ones.
Measurements:
l = 155 - 169 µm
Maximum width of the segments: 71 - 78 µm
Distribution:
Until now only known from the stratum typicum of the type locality.
Remarks:
The outline reminds of *Eucyrtis* HAECKEL, 1882, but no strictures are visible between the segments and above all the segments do not have 3 regular rings of pores, like in the type species of *Eucyrtis*.

Genus *Pseudodictyomitrella* n. gen.

Type species: *Pseudodictyomitrella spinosa*

Derivatio nominis:
According to the similarity to *Dictyomitrella* HAECKEL, 1887.
Diagnosis:
Multicyrtid, test conical. Segments not visible outside or only shallow, indistinct strictures between the segments are visible. Cephalis small, smooth, poreless or with mostly closed pores, with or without apical horn. Other segments with large pores. 2 - 4 pore rings are present in every segment.
Distribution:
Unuma echinatus zone of Japan. Lower Unuma echinatus zone of Rudabánya and (?) Bükk Mts.

Assigned species:
Pseudodictyomitrella spinosa n. gen. n. sp.
Cyrtocalpis hexagonata HEITZER, 1930
Pseudodictyomitrella wallacheri n. sp.
? *Dictyomitra* sp. A sensu ISHIDA, 1983
Remarks:
The species,here united in one genus, seems to be very different. There are specimens of *P. wallacheri* n. sp. with well developed strictures. These specimens are almost indistinguishable from *Dictyomitrella* HAECKEL, 1887. But the intraspecific variability in this species is high. Many specimens of *P. wallacheri* n. sp. have almost no strictures. These specimens are clearly different from *Dictyomitrella* HAECKEL, 1887 and they are, in turn, very similar to *P. hexagonata* (HEITZER) without any strictures on the outer test surface. The latter species is again very similar to *P. spinosa* n. sp. and only distinguished from this species by the absence of an apical horn. Therefore all the three species are closely related to each other and should be placed into one genus.

Pseudodictyomitrella spinosa n. gen. n. sp.
(pl. 7, figs. 1 - 3)

Derivatio nominis:
According to the presence of an apical horn.
Holotypus:
The specimen on pl. 7, fig. 1; rep.-no. J 10337
Locus typicus:
Csehi-hegy SW of Szalonna (Rudabánya Mts.).
Stratum typicum:
Black cherts within black shales. Sample GRILL 80. Lower Unuma echinatus zone (Aalenian to Lower Bajocian).
Material:
29 specimens.
1982 Nassellaria ? fam., gen. et spec. indet - TAKEMURA & NAKASEKO, pl. 5, fig. 2
Diagnosis:
Test conical, with apical horn. The width of segments increases rather fast and continuously. The cephalis is pointed conical and bears some vertical ribs that run downwards from the apical horn. All other parts of the test with large pores, that are not arranged in vertical rows or horizontal rings. No strictures between the segments are visible on the outer surface of the test.
Measurements:
l = 175 - 203 µm
Maximum width of the segments: 93 - 103 µm
Distribution:
Lower Unuma echinatus zone (Aalenian to Lower Bajocian) of the Rudabánya Mts. and (?) Bükk Mts. Unuma echinatus zone of Japan.
Remarks:
Pseudodictyomitrella hexagonata (HEITZER, 1930) has no apical horn, the pores are larger, in its distal parts more cylindrical.

Pseudodictyomitrella wallacheri n. sp.
(pl. 4, figs. 5 - 7)

Derivatio nominis: In honour of Dr. L. WALLACHER, Miskolc.
Holotypus:
The specimen on pl. 4, fig. 5; rep.-no. J 10349

Locus typicus:
Csehi-hegy SW of Szalonna (Rudabánya Mts.)
Stratum typicum:
Black cherts within black shales. Sample GRILL 80. Lower Unuma echinatus zone (Aalenian to Lower Bajocian).
Material:
More than 100 specimens.
Diagnosis:
Test broadly conical with shallow distinct to indistinct strictures. Cephalis small, conical, poreless with exception of some scattered pores in its distal part. The width of the segments increases rather fast and continuously. With exception of the cephalis all segments have large pores arranged in distinct to indistinct rings. The pores in the strictures are mostly a little larger than the other ones.
Measurements:
l = 140 - 155 µm
Maximum width of the test: 78 - 95 µm
Distribution:
Frequent in the Lower Unuma echinatus zone (Aalenian to Lower Bajocian) of the Rudabánya Mts.
Remarks:
Pseudodictyomitrella hexagonata (HEITZER, 1930) has no strictures.

Superfamily Archaeodictyomitracea PESSAGNO, 1976

Remarks:
The Archaeodictyomitracea PESSAGNO, 1976 developed from primitive Eucyrtidioidea EHRENBERG, 1847. Vertical ribs are always present in this superfamily. The most primitive Archaeodictyomitracea PESSAGNO, 1976 are the Hsuidae PESSAGNO & WHALEN, 1982. In some Hsuidae the vertical ribs are sometimes still short (not longer than one segment) but in the most Hsuidae, like in all other families of the Archaeodictyomitracea the vertical ribs are longer than one segment.

Whether we regard the Archaeodictyomitracea PESSAGNO, 1976 as independent superfamily or only as an independent stock within the Eucyrtidioidea EHRENBERG, 1847 is a matter of choice. We prefer the first variant.

Family Hsuidae PESSAGNO & WHALEN, 1982

Genus *Hsuum* PESSAGNO, 1977

Type species: *Hsuum cuestaense* PESSAGNO, 1977

Hsuum baloghi n. sp.
(pl. 3, figs. 3 - 6)

Derivatio nominis:
In honour of Prof. Dr. K. BALOGH, Budapest.
Holotypus:
The specimen on pl. 3, fig. 3; rep.-no. J 10438.
Locus typicus:
Borehole Várboc - 2/1 (Rudabánya Mts.).
Stratum typicum:
Lower part of the siliceous manganese shales at 64,1 m. Lower Unuma echinatus zone (Aalenian - Lower Bajocian).

Material:
More than 100 specimens.
1982 *Hsuum* sp. B - SHASHIDA et al. (pl. 2, fig. 4)
1982 *Hsuum* sp. - TAKEMURA & NAKASEKO (pl. 2, fig. 2)
Diagnosis:
Test conical. Cephalis poreless, smooth or with very weak ribs. Remaining test with long ribs that run over several segments, some even over all postabdominal segments. 1 - 2 vertical rows of small pores are present between the ribs.
Measurements:
l = 160 - 283 µm
Maximum width of the test: 95 - 138 µm
Distribution:
Lower Unuma echinatus zone of the Rudabánya Mts. and Bükk Mts. (Aalenian to Lower Bajocian). Unuma echinatus zone of Japan.
Remarks:
Hsuum rosebudense PESSAGNO & WHALEN, 1982 has a short apical horn and larger pores. The sculpture is identical.

Hsuum fuchsi n. sp.
(pl. 6, figs. 1 - 3)

Derivatio nominis:
In honour of Dr. P. FUCHS, Miskolc.
Holotypus:
The specimen on pl. 6, fig. 1; rep.-no. J 10420
Locus typicus:
Borehole Várboc-2/1 (Rudabánya Mts.).
Stratum typicum:
Deeper part of the siliceous manganese shales at 64,1 m. Lower Unuma echinatus zone (Aalenian - Lower Bajocian).
Material:
More than 100 specimens.
? 1982 *Hsuum* sp. B - HATTORI & YOSHIMURA (pl. 3, fig. 7)
1982 *Hsuum* sp. G, pars - KISHIDA & SUGANO (pl. 8, fig. 15)
Diagnosis:
Test conical, multicyrtid. Cephalothorax conical, with few strong ribs that continue to the abdomen that has already pores. 1 - 2 postabdominal segments bear weak to moderately strong ribs of different length. The following segments have short, regular, sharp and high ribs that are always restricted to one segment. Pores between the ribs small, mostly arranged in two vertical rows. Constriction between the segments with one indistinct ring of pores or here the pores are irregularly scattered.
Measurements:
l = 262 - 373 µm
Maximum width of the test: 120 - 150 µm
Distribution:
Unuma echinatus zone of Japan. Lower Unuma echinatus zone of Rudabánya Mts. and Bükk Mts.
Remarks:
Hsuum parasolense PESSAGNO & WHALEN, 1982 has a short apical horn and the regular short ribs begin immediately after the apical part with few strong and long ribs.

Hsuum bipartitum n. sp.
(pl. 5, figs. 1 - 6; pl. 7, fig. 6)

Derivatio nominis:
According to the quite different sculpture on the proximal and apical parts.
Holotypus:
The specimen on pl. 5, fig. 1; rep.-no. J 10425
Locus typicus:
Telekes side-valley number 7 (Rudabánya Mts.).
Stratum typicum:
Black siliceous manganese shales, sample Tv 7 Mn G, lower Unuma echinatus zone (Aalenian to Lower Bajocian).
Material:
More than 100 specimens
1982 *Hsuum* spp., pars - KIDO et al. (pl. 2, fig. 3)
1982 *Hsuum* sp. G, pars - KISHIDA & SUGANO (pl. 8, figs. 13, 14).
Diagnosis:
Test long, slender, subconical, distal subcylindrical. Cephalothorax poreless, with few ribs to nearly smooth. Proximal half (or a bit less) of the test with long, low vertical ribs, separated by a row of large pores. Distal half of the test with high short ribs, restricted to one segment or sometimes connected by very low ribs with the high short ribs of the adjacent segment. Mostly two vertical rows of small pores are present between two adjacent ribs in the distal part of the test. One or two rings of pores can be observed in the constrictions.
Measurements:
l = 189 - 363 µm
Maximum width of the test: 81 - 132 µm
Distribution:
Unuma echinatus zone of Japan. Lower Unuma echinatus zone (Aalenian to Lower Bajocian) of the Bükk Mts. and Rudabánya Mts. Very frequent and characteristic.
Remarks:
The distal part of *Hsuum fuchsi* n. sp., is almost identical, but the proximal part of the test has quite a different sculpture.

Sculpture and above all pore arrangement in the distal half of the test are characteristic of the genus *Hsuum*, but the sculpture and pore arrangement of the proximal part of the test rather remind of *Parahsuum* YAO, 1982.

Appendix

EARLIEST ARCHAEODICTYOMITRA SPECIES FROM THE UNUMA ECHINATUS ZONE OF NORTHERN HUNGARY

H. KOZUR & H. MOSTLER[1)]

Family Archaeodictyomitridae PESSAGNO, 1976

Genus *Archaeodictyomitra* PESSAGNO, 1976

Type species: *Archaeodictyomitra squinaboli* PESSAGNO, 1976

Archaeodictyomitra annulata KOZUR & MOSTLER, n. sp.
(pl. 10, fig. 2)

Derivatio nominis:
According to the hoop-like distal segments.
Holotypus:
The specimen on pl. 10, fig. 2; rep.-no. J 10395
Locus typicus:
Varga-tető (western Bükk Mts.).
Stratum typicum:
Black cherts within black shales. Upper Unuma echinatus zone (higher part of Middle Bajocian).
Material:
2 specimens.
Diagnosis:
Test multicyrtid, conical. Segments get wider continuously and moderately fast,but the next one to the last segment is elevated hoop-like. The last segment is separated by a stricture and smaller than the penultimate one. Vertical ribs numerous (up to 14 on one side). The small round pores are widely separated in the space between the ribs.
Measurements:
l = 164 - 170 µm
Distribution:
Until now only known from the stratum typicum of the type locality.
Remarks:
This species can be clearly distinguished from all other *Archaeodictyomitra* species by the hoop-like elevation of the penultimate segment.

Archaeodictyomitra praeprimigena KOZUR & MOSTLER n. sp.
(pl. 8, figs. 1,2)

Derivatio nominis:
Forerunner of the Upper Bathonian *Archaeodictyomitra primigena* PESSAGNO & WHALEN, 1982

---

1) addresses: Dr. sc. Heinz Kozur, Hungarian Geological Institute, Népstadion út 14, H-1143 Budapest/Hungary; Prof. Dr. Helfried Mostler, Institut für Geologie und Paläontologie der Universität, A-6020 Innsbruck/Österreich, Innrain 52.

Holotypus:
The specimen on pl. 8, fig. 2; rep.-no. J 10396
Locus typicus:
Varga-tető (western Bükk Mts.).
Stratum typicum:
Black cherts within black shales. Upper Unuma echinatus zone (higher part of Middle Bajocian).
Material:
More than 100 specimens.
1982 *Archaeodictyomitra* sp. - WAKITA (pl. 1, fig. 1)
1982 *Archaeodictyomitra* sp. A - AITA (pl. 3, fig. 14)
1982 *Archaeodictyomitra* sp. G - KISHIDA & SUGANO (pl. 11, fig. 9)
Diagnosis:
Test multicyrtid, conical. The width of the segments increases moderately and continuously until the penultimate segment. The last segment is separated by a stricture and again smaller. In the remaining test no strictures are visible. Pores small, widely spaced. The pore ring of the above mentioned stricture mostly has a little larger pores.
Measurements:
l = 160 - 190 µm
Maximum width of the test: 75 - 90 µm
Distribution:
Upper Unuma echinatus zone and next younger radiolarian zone of Japan and of the Bükk Mts. Upper part of Middle Bajocian to Upper Bajocian, (?) Lower Bathonian.
Remarks:
In *Archaeodictyomitra whalenae* n. sp. there is no stricture that separates the last segment.

In *Archaeodictyomitra primigena* PESSAGNO & WHALEN, 1982 from the Upper Bathonian there is also a stricture that separates the last segment. But this large segment is by far larger than the other ones.

Archaeodictyomitra prisca KOZUR & MOSTLER n. sp.
(pl. 8, figs. 3 - 6; pl. 9, fig. 1)

Derivatio nominis:
Oldest known typical *Archaeodictyomitra* species.
Holotypus:
The specimen on pl. 8, fig. 4; rep.-no. J 10388.
Locus typicus:
Tárkány orom (southern Bükk Mts.).
Stratum typicum:
Black cherts within black shales of Lower Unuma echinatus zone (Aalenian to Lower Bajocian).
Material:
More than 100 specimens.
Diagnosis:
1982 *Archaeodictyomitra* sp. A - SASHIDA; IGO et al. (pl. 2, fig. 9)
? 1982 *Archaeodictyomitra* sp., pars - OWADA & SAKA (pl. 1, fig. 9)
1982 *Archaeodictyomitra* sp. - IMOTO; TAMAKI et al. (pl. 3, fig. 8)
Diagnosis:
Test multicyrtid, long, proximally slender-subconical, distally cylindrical. Strictures in general indistinctly visible or at least indicated by a ring of pores. Vertical ribs closely spaced. Pores relatively large, arranged in rings, mostly only visible in the strictures in other places closed by a layer of microgranular silica. Often almost all pores are closed with the exception of one or two rings in the last two strictures.

Measurements:
l = 170 - 227 µm
Maximum width of the test: 58 - 83 µm
Distribution:
Unuma echinatus zone of Japan. Lower and middle Unuma echinatus zone of Bükk Mts. and Rudabánya Mts. (Aalenian to deeper part of Middle Bajocian).
Remarks:
This species is the oldest representative of the genus *Archaeodictyomitra* PESSAGNO, 1976. In spite of the fact that the pores are still relatively large, there are not more connecting elevated bars between the vertical ribs separating the pores.

Other slender representatives of *Archaeodictyomitra* have smaller pores.

Archaeodictyomitra transita KOZUR & MOSTLER n. sp.
(pl. 10,. fig. 1)

Derivatio nominis:
According to the transitional position between the genera *Lupherium* PESSAGNO & WHALEN, 1982 and *Archaeodictyomitra* PESSAGNO, 1976.
Holotypus:
The specimen on pl. 10, fig. 1; rep.-no. J 10387.
Locus typicus:
Csehi-hegy (Rudabánya Mts.)
Stratum typicum:
Black cherts within black shales. Sample GRILL 80. Lower Unuma echinatus zone (Aalenian to Lower Bajocian).
Material:
2 specimens.
? 1982 *Archaeodictyomitra* sp. C - HATTORI & YOSHIMURA (pl. 3, fig. 1)
Diagnosis:
Multicyrtid, slender- subconical. The width of the segments increases only very slowly. Strictures between the segments almost invisible. Proximal half of the test with *Lupherium* structures. Connecting transversal bars between the vertical ribs here well developed. Pores in this part of the test small, round, situated in the centre of a rectangular to quadratic field built up by two adjacent transversal bars and two vertical ribs. Distal half of the test with *Archaeodictyomitra* structure. No connecting bars are present here between the vertical ribs (14 - 15 on one side). Pores between the vertical ribs here partly closed by micro-granular silica.
Measurements:
l = 217 - 234 µm
Maximum width of the test: 97 - 100 µm
Distribution:
Until now only know from the stratum typicum at the type locality.
Remarks:
In spite of the fact that only two slightly damaged specimens are present, this species is described here, because it is a perfect transitional form between the generea *Lupherium* PESSAGNO & WHALEN, 1982 and *Archaeodictyomitra* PESSAGNO, 1976.

Archaeodictyomitra whalenae KOZUR & MOSTLER n. sp.
(pl. 9, figs. 2 - 5)

Derivatio nominis:
In honour of Prof. Dr. P.A. WHALEN, Texas
Holotypus:
The specimen on pl. 9, fig. 3; rep.-no. J 10401.
Locus typicus:
Gyöngyvirágbérc (western Bükk Mts.).
Stratum typicum:
Dark cherts within black shales of the Unuma echinatus zone. Sample K 431/16.
Material:
More than 100 specimens.
1973 *"Lithomitra"* sp. A - ICHIKAWA & YAO (pl. 6, fig. 3)
1982 *Archaeodictyomitra* cfr. *rigida* PESSAGNO - SASHIDA; IGO et al. (pl. 2, fig. 5)
1982 *Archaeodictyomitra* sp., pars - OWADA & SAKA (pl. 1, fig. 8)
1982 *Archaeodictyomitra rigida* PESSAGNO group, pars - KIDO; KAWAGUCHI et al. (pl. 1, figs. 7, 9)
1982 *Archaeodictyomitra* sp. B - KISHIDA & SUGANO (pl. 9, fig. 8)
1982 *Archaeodictyomitra* sp. C - KISHIDA & SUGANO (pl. 9, figs. 9, 10)
1982 *Archaeodictyomitra* sp. J - KISHIDA & SUGANO (pl. 12, fig. 11)
1982 *Archaeodictyomitra* sp. L - KISHIDA & SUGANO (pl. 12, fig. 15)
1982 *Archaeodictyomitra* sp. A - PESSAGNO & WHALEN (p. 117, pl. 8, fig. 10)
Diagnosis:
Test multicyrtid, conical. The width of the segments increases rather fast and continuously. Only the last segment is not larger than the penultimate one or even a little smaller. Strictures shallow, but always visible. Pores small, mostly closed. Only in the strictures a ring of pores is always open.
Measurements:
l = 137 - 150 µm
Maximum width of the test: 70 - 80µm
Distribution:
Frequent in the Unuma echinatus zone of Japan, the Bükk Mts. and the Rudabánya Mts. Upper part of Middle Bajocian of eastern Central Oregon, U.S.A.
Remarks:
Very similar to *Archaeodictyomitra rigida* PESSAGNO, 1977. In this species the strictures are not visible on the outer surface.

In *Archaeodictyomitra praeprimigena* KOZUR & MOSTLER n. sp. the last segment is separated by a distinct stricture and considerably smaller than the penultimate segment.

Acknowledgements

We thank Prof. Dr. K. BALOGH and Dipl. Geol. P. PELIKÁN for important data about the geology of the Bükk Mts. and for samples and support in sampling of the Jurassic in the Bükk Mts. We also thank Dr. S. KOVÁCS for giving us samples and data from the Rudabánya Mts.

References

DUMITRICĂ, P. & MELLO, J. (1982): On the age of the Meliata Group and the Silica nappe radiolarites (localities Držkovce and Bohúňovo, Slovak Karst, ČSSR).-Geol. práce, Správy, 77, 17-28, 4 pls., 3 figs., Bratislava.

EHRENBERG C.G. (1848): Über die mikroskopischen kieselschaligen Polycystinen als mächtige Gebirgsmasse von Barbados und über das Verhältnis der aus mehr als 300 neuen Arten bestehenden ganz eigenthümlichen Formengruppe jener Felsmasse zu den jetzt lebenden Thieren und zur Kreidebildung. Eine neue Anregung zur Erforschung des Erdlebens. Monatsber. preuß. Akad. Wiss. Berlin, Jg. 1847, 40-61, 1 pl., Berlin.

EHRENBERG, C.G. (1875): Fortsetzung der mikrogeologischen Studien als Gesammt-Übersicht der mikroskopischen Paläontologie gleichartig analisirter Gebirgsarten der Erde, mit specieller Rücksicht auf den Polycystinen-Mergel von Barbados.-Abh. preuß. Akad. Wiss. Berlin, Jg. 1875, 1-126, Berlin.

EMPSON-MORIN, K. (1981): Campanian Radiolaria from DSDP Site 313, Mid-Pacific Mountains.-Micropaleontology, 27/3, 249-292, 13 pls., 6 figs., New York.

GRILL, J., LESS, GY. et al. (1984): Magyarázó az Aggtelek-Rudabányai hegység földtani térképéhez 25 000-es sorozat.-Perkupa. Manuscript, MÁFI, Budapest.

HAECKEL, E. (1882): Entwurf eines Radiolarien-Systems auf Grund von Studien der Challenger-Radiolarien.-Jena. Zeitschr. Naturwiss., 15 (n.F. 8), 418-472, Jena.

HAECKEL, E. (1887): Report on the Radiolaria collected by H.M.S. Challenger during the years 1873-1876.-Rep. Sci. Res. Voyage H.M.S. Challenger, Zool., 18, 1-1893, 140 pls., London.

HEITZER, I. (1930): Die Radiolarienfauna der mitteljurassischen Kieselmergel im Sonnwendgebirge.-Jahrb. geol. L.A. Wien, 80, 381-406, 3 pls., Wien.

ICHIKAWA, K. & YAO, A. (1973): Scanning electron microscope studies of pores of some cyrtoid radiolarians.-Journ. Geosci., Osaka City Univ., 16(7), 125-144, 7 pls., 1 tab., Osaka.

ICHIKAWA, K. & YAO, A. (1976): Two new genera of Mesozoic cyrtoid radiolarians from Japan. In: TAKAYANAGI, Y. & SAITO, T. (eds.): Progress in Micropaleontology, 110-117, 2 pls., New York.

ISHIDA, K. (1983): Stratigraphy and radiolarian assemblages of the Triassic and Jurassic siliceous sedimentary rocks in Konose Valley, Tokushima Prefecture, Southwest Japan.-J. Sci., Univ. Tokushima, 16, 111-141, 12 pls., 2 figs., 1 tab., Tokushima.

KOZUR, H. (1984): New radiolarian taxa from the Triassic and Jurassic.-Geol. Paläont. Mitt. Innsbruck, 13/2, 49-88, 7 pls., Innsbruck.

KOZUR, H. (in press): New biostratigraphical data from the Bükk Mts., Uppony Mts. and Mecsek Mts. and their tectonical implications.-Acta Geol. Hung.

KOZUR, H. (in press): The radiolarian genus *Eoxitus* n. gen. from the Unuma echinatus zone/Bajocian/of northern Hungary.-Proc. Acad. Wetensch.

KOZUR, H. & MOCK (in press): Deckenstrukturen im südlichen Randbereich der Westkarpaten.-Geol. Paläont. Mitt. Innsbruck.

MATSUCKA, A. (1983): Middle and Late Jurassic radiolarian biostratigraphy in the Sakawa and adjacent areas, Shikoku, Southwest Japan.-J. Geosci., Osaka City Univ., 26/1, 1-48, 9 pl., 10 figs., Osaka.

MIZUTANI, S. & KIDO, S. (1983): Radiolarians in Middle Jurassic siliceous shale from Kaniaso, Gifu Prefecture, Central Japan.-Trans. Proc. Palaeont. Soc. Japan, N.S., 132, 253-262, 3 pls., Tokyo.

NAKASEKO, K. (ed.): Proceedings of the First Japanese Radiolarian Symposium, JRS 81 Osaka.-News of Osaka Micropaleontologists, Spec. Vol., 5, 485 pp., Osaka. This volume contains numerous Japanese radiolarian papers, quoted mostly in the synonymy lists.
PARONA, C.F. (1890): Radiolarie nei noduli selciosi del Calcare Giurese di Cittiglio presso Laveno.-Boll. Soc. Geol. Italiana, 9, 132-175, 6 pls., Roma.
PESSAGNO, E.A. (1976): Radiolarian zonation and stratigraphy of the Upper Cretaceous portion of the Great Valley sequence, California Coast Ranges.-Micropaleont. Press, Spec. Publ., 2, 1-95, 14 pls.
PESSAGNO, E.A. (1977a): Upper Jurassic Radiolaria and radiolarian biostratigraphy of the California Coast Ranges.- Micropaleontology, 23/1, 56-113, 12 pls., 4 figs., New York.
PESSAGNO, E.A. (1977b): Lower Cretaceous radiolarian biostratigraphy of the Great Valley sequence and Franciscan complex, California Coast Ranges.-Cushman Found. Foram. Res., Spec. Publ., 15, 87 pp., 12 pls., 7 tabs., Menlo Park.
PESSAGNO, E.A.; FINCH, W. & ABBOTT, P.L. (1979): Upper Triassic Radiolaria from the San Hipólto Formation, Baja California.-Micropaleontology, 25/2, 160-197, 9 pls., 6 figs., New York.
PESSAGNO, E.A. & WHALEN, P.A. (1982): Lower and Middle Jurassic Radiolaria (multicyrtid Nassellariina) from California, east-central Oregon and the Queen Charlotte Islands, B.C.-Micropaleontology, 28/2, 111-169, 13 pls., 5 figs., New York.
PETRUŠEVSKAJA, M.G. (1981); Radioljarii otrjada Nassellaria mirogo okeana. In: Opredeliteli po faune SSSR, 128, 406 pp., Leningrad (izd. ZIN AN SSSR).
RÜST, D. (1885): Beiträge zur Kenntnis der fossilen Radiolarien aus Gesteinen des Jura.-Palaeontographica, 31, 273-321, 20 pls., Stuttgart.
YAO, A. (1979): Radiolarian fauna from the Mino Belt in the northern part of the Inuyama area, Central Japan. Part II: Nassellaria 1.- J. Geosci., Osaka City Univ., 22/2, 21-72, 12 pls., 1 fig., 21 tabs., Osaka.

Explanation of plates

Plate 1

Radiolarians of the lower Unuma echinatus zone (Lupherium officerense subzone) of Rudabánya and Bükk Mts. Aalenian to basal Middle Bajocian.

Fig. 1: *Unuma echinatus* ICHIKAWA & YAO, 1976, typical form with long spines, characteristical for the lower Unuma echinatus zone, Csehi-hegy SW of Szalonna (Rudabánya Mts.), sample GRILL 80, V = 400 x, rep.-no. J 10447, film-no. 5138.

Fig. 2: *Protunuma fusiformis* ICHIKAWA & YAO, 1976, V = 480 x, rep.-no. J 10448, film-no. 5173 (other data as for fig. 1).

Fig. 3: *Praewilliriedellum cephalospinosum* KOZUR, 1984, Csipkés-tető (southern Bükk Mts.), V = 400 x, rep.-no. J 10302, film-no. 0556.

Figs. 4, 5: *Lupherium officerense* PESSAGNO & WHALEN, 1982; fig. 4: Tárkány orom (southern Bükk Mts.), V = 300 x, rep.-no. J 10410, film-no. 7524; fig. 5: Csehi-hegy SW of Szalonna (Rudabánya Mts.), sample GRILL 80, V = 360 x, rep.-no. J 10409, film-no. 5202.

Plate 2

Fig. 1: *Hsuum robustum* PESSAGNO & WHALEN, 1982, Varga-tető (western Bükk Mts.), upper Unuma echinatus zone (Yaocapsa mastoidea subzone), higher Middle Bajocian, V = 400 x, rep.-no. J 10449, film-no. 9063.

Fig. 2: *Japonocapsa fusiformis* (YAO, 1979), borehole Várboc-2/1 (Rudabánya Mts.) at 3,1 m, upper Unuma echinatus zone (Yaocapsa mastoidea subzone), higher Middle Bajocian, V = 720 x, rep.-no. J 10452, film-no. 6454.

Fig. 3: *Foremanina transita* n. sp., Csipkés-tető (southern Bükk Mts.), higher part of lower Unuma echinatus zone (higher Aalenian to basal Middle Bajocian), V = 400 x, rep.-no. J 10382, film-no. 0542.

Fig. 4: *Foremanina varbocensis* n. sp., holotype, borehole Várboc-2/1 (Rudabánya Mts.) at 64,1 m, higher part of lower Unuma echinatus zone (higher Aalenian to basal Middle Bajocian), V = 340 x, rep.-no. J 10415, film-no. 6614.

Fig. 5: *Hexasaturnalis hexagonus* (YAO, 1972), broken specimen, Csehi-hegy SW Szalonna (Rudabánya Mts.), sample GRILL 80, lower Unuma echinatus zone (Lupherium officerense subzone), Aalenian to Lower Bajocian, V = 240 x, rep.-no. J 10453, film-no. 5143.

Fig. 6: *Yaocapsa macroporata* KOZUR, Varga-tető (western Bükk Mts.), upper Unuma echinatus zone (Yaocapsa mastoidea subzone), higher Middle Bajocian, V = 400 x, rep.-no. J 10306, film-no. 9060.

Plate 3

All figured specimens are from the sample GRILL 80, Csehi-hegy SW of Szallona (Rudabánya Mts.), lower Unuma echinatus zone (Lupherium officerense subzone), Aalenian to Lower Bajocian.

Fig. 1: *Foremanina veghae* n. sp., holotype, V = 400 x, rep.-no. J 10333, film-no. 5231.

Fig. 2: *Pseudoeucyrtis elongata* n. sp., holotype, V = 400 x, rep.-no. J 10336, film-no. 5112.

Figs. 3-6: *Hsuum baloghi* n. sp., fig. 3: holotype, V = 400 x, rep.-no. J 10438, film-no. 5209; fig. 4: V = 400 x, rep.-no. 10439, film-no. 5184; fig. 5: V = 260 x, rep.-no. J 10442, film-no. 6620; fig. 6: V = 480 x, rep.-no. J 10441, film-no. 5132.

Plate 4

All figured specimens are from the sample GRILL 80, Csehi-hegy SW of Szalonna (Rudabánya Mts.), lower Unuma echinaus zone (Lupherium officerense subzone), Aalenian to Lower Bajocian.

Figs. 1, 3: *Canoptum rudabanyaense* n. sp., V = 320 x; fig. 1: holotype, rep.-no. J 10318, film-no. 5169; fig. 3: rep.-no. J 10319, film-no. 5196.

Figs. 2, 4: *Pseudodictyomitrella hexagonata* (HEITZER, 1930); fig. 2: V = 540 x, rep.-no. J 10341, film-no. 5537; fig. 4: V = 440 x, rep.-no. J 10343, film-no. 5200.

Figs. 5-7: *Pseudodictyomitrella wallacheri* n. sp.; fig. 5: holotype, V = 480 x, rep.-no. J 10349, film-no. 5164; fig. 6: V = 320 x, rep.-no. J 10348, film-no. 5227; fig. 7: V = 400 x, rep.-no. J 10347, film-no. 5232.

Plate 5

All figured specimens are from the lower Unuma echinatus zone (Lupherium officerense subzone) of Aalenian to basal Middle Bajocian age.

Figs. 1-6; *Hsuum bipartitum* n. sp., fig. 1: holotype, Telekes side-valley no. 7 (Rudabánya Mts.), sample Mn G, V = 320 x, rep.-no. J 10425, film-no. 6482; fig. 2, Tárkány orom (southern Bükk Mts.), rep.-no. J 10428, a) V = 240 x, film-no. 7519, b) detail, V = 400 x, film-no. 7520; fig. 3: borehole Várboc-2/1 (Rudabánya Mts.) at 64,1 m, V = 320 x, rep.-no. J 10427, film-no. 6525; fig. 4: V = 240 x, rep.-no. J 10429, film-no. 6598 (other data as for fig. 1); fig. 5: V = 220 x, rep.-no. J 10426, film-no. 6615 (other data as for fig. 3); fig. 6: V = 200 x, rep.-no. J 10430, film-no. 7550 (other data as for fig. 2).

Plate 6

Figs. 1-3: *Hsuum fuchsi* n. sp., lower Unuma echinatus zone (Lupherium officerense subzone), Aalenian to basal Middle Bajocian; fig. 1; holotype, borehole Várboc-2/1 (Rudabánya Mts.) at 64,1 m, V = 220 x, rep.-no. J 10420, film-no. 6613; fig. 2: Telekes side-valley no. 7 (Rudabánya Mts.), sample Mn G, V = 300 x, rep.-no. J 10422, film-no. 6469; fig. 3: Telekes side-valley no. 8 (Rudabánya Mts.), sample Tv 8-47 A, V = 260 x, rep.-no. J 10421, film-no. 9944.

Fig. 4: *Pseudoeucyrtis buekkensis* n. sp., holotype, Gyöngyvirágbérc (western Bükk Mts.), sample K 431=16, (?) middle part of Unuma echinatus zone (Middle Bajocian), V = 440 x, rep.-no. J 10335, film-no. 5122.

Figs. 5, 6: *Canoptum hungaricum* n. sp., lower Unuma echinatus zone (Lupherium officerense subzone), Aalenian to basal Middle Bajocian; fig. 5: holotype, Telekes side-valley no. 8 (Rudabánya Mts.), sample Tv 8 - 47A, V = 320 x, rep.-no. J 10317, film-no. 9956; fig. 6: transitional form to *Canoptum kamoensis* (MIZUTANI & KIDO, 1983), Telekes side-valley no. 7 (Rudabánya Mts.), sample Mn G, V = 320 x, rep.-no. J 10414, film-no. 6593.

Plate 7

All figured specimens are from the lower Unuma echinatus zone (Lupherium officerense zone) of Aalenian to basal Middle Bajocian age.

Figs. 1-3: *Pseudodictyomitrella spinosa* n. sp.; figs. 1, 2: Csehi-hegy SW of Szalonna (Rudabánya Mts.), sample GRILL 80; fig. 1: holotype, V = 320 x, rep.-no. J 10337, film-no. 5158; fig. 2: V = 400 x, rep.-no. J 10338, film-no. 5194; fig. 3: Csipkés-tető (southern Bükk Mts.), V = 400 x, rep.-no. J 10339, film-no. 0550.

Figs. 4, 5: *Canoptum latiannulatum* n. sp., Tárkány orom (southern Bükk Mts.), fig. 4: holotype, V = 440 x, rep.-no. J 10321, film-no. 7501; fig. 5: V = 400 x, rep.-no. J 10323, film-no. 7500.

Fig. 6: *Hsuum bipartitum* n. sp., Tárkány orom (southern Bükk Mts.), V = 260 x, rep.-no. 10435, film-no. 5150.

Plate 8

Figs. 1, 2: *Archaeodictyomitra praeprimigena* KOZUR & MOSTLER n. sp., Varga-tető (western Bükk Mts.), upper Unuma echinatus zone (Yaocapsa masoidea subzone), higher Middle Bajocian, V = 400 x; fig. 1: transitional form to *Archaeodictyomitra* sp. F sensu KISHIDA & SUGANO, 1982 and to *A. whalenae* KOZUR & MOSTLER, n. sp., rep.-no. J 10398, film-no. 9062; fig. 2: holotype, rep.-no. J 10398, film-no. 9062.

Figs. 3-6: *Archaeodictyomitra prisca* KOZUR & MOSTLER, n. sp., lower Unuma echinatus zone (Lupherium officerense subzone), Aalenian to basal Middle Bajocian; figs. 3, 6: Csehi-hegy SW Szalonna (Rudabánya Mts.), sample GRILL 80, V = 400 x; fig. 3: rep.-no. J 10413, film-no. 5224; fig. 6: rep.-no. J 10389, film-no. 5162; fig. 4: holotype, Tárkány orom (southern Bükk Mts.), V = 360 x, rep.-no. J 10388, film.-no. 7531; fig. 5: borehole Várboc-2/1 (Rudabánya Mts.), V = 480 x, rep.-no. J 10418, film-no. 6453.

Plate 9

Fig. 1: *Archaedictyomitra prisca* KOZUR & MOSTLER, n. sp., Tárkány orom (southern Bükk Mts.), lower Unuma echinatus zone (Lupherium officerense subzone), Aalenian to Lower Bajocian, V = 400 x, rep.-no. J 10391, film-no. 7528.

Figs. 2-5: *Archaedictyomitra whalenae* KOZUR & MOSTLER, n. sp.; fig. 2: Varga-tető (western Bükk Mts.), upper Unuma echinatus zone (Yaocapsa mastoidea subzone), higher Middle Bajocian, V = 540 x, rep.-no. J 10403, film-no. 9642; fig. 3: holotype, Gyöngyvirábérc (western Bükk Mts.) sample K 431/16, (?) middle part of the Unuma echinatus zone, V = 600 x, rep.-no. J 10401, film-no. 5147; fig. 4: borehole Várboc-2/1 (Rudabánya Mts.) at 3,1 m, upper Unuma echinatus zone (Yaocapsa mastoidea subzone), higher Middle Bajocian, V = 480 x, rep.-no. J 10419, film-no. 6449; fig. 5: Tárkány orom (southern Bükk Mts.), lower Unuma echinatus zone (Lupherium officerense subzone), Aalenian to Lower Bajocian, V = 400 x, rep.-no. J 10402, film-no. 5209.

Fig. 6: *Archaeodictyomitra* sp. aff. *rigida* PESSAGNO, 1977, Varga-tető (western Bükk Mts.), upper Unuma echinatus zone (Yaocapsa mastoidea subzone), higher Middle Bajocian, V = 480 x, rep.-no. J 10407, film-no. 8996.

Plate 10

Fig. 1: *Archaeodictyomitra transita* KOZUR & MOSTLER, n. sp., holotype, Csehi-hegy SW of Szalonna (Rudabánya Mts.), sample GRILL 80, lower Unuma echinatus zone (Lupherium officerense subzone), Aalenian to Lower Bajocian, rep.-no. J 10387, a) V = 320 x, film-no. 5144, b) detail of the proximal part of the test, V = 860 x, film-no. 5145, c) detail of the distal part of the test, V = 720 x, film-no. 5146.

Fig. 2: *Archaeodictyomitra annulata* KOZUR & MOSTLER, n. sp., holotype, Varga-tető (western Bükk Mts.) upper Unuma echinatus zone (Yaocapsa mastoidea subzone), higher Middle Bajocian, V = 480 x, rep.-no. J 10395, film-no. 5272.

Plate 1

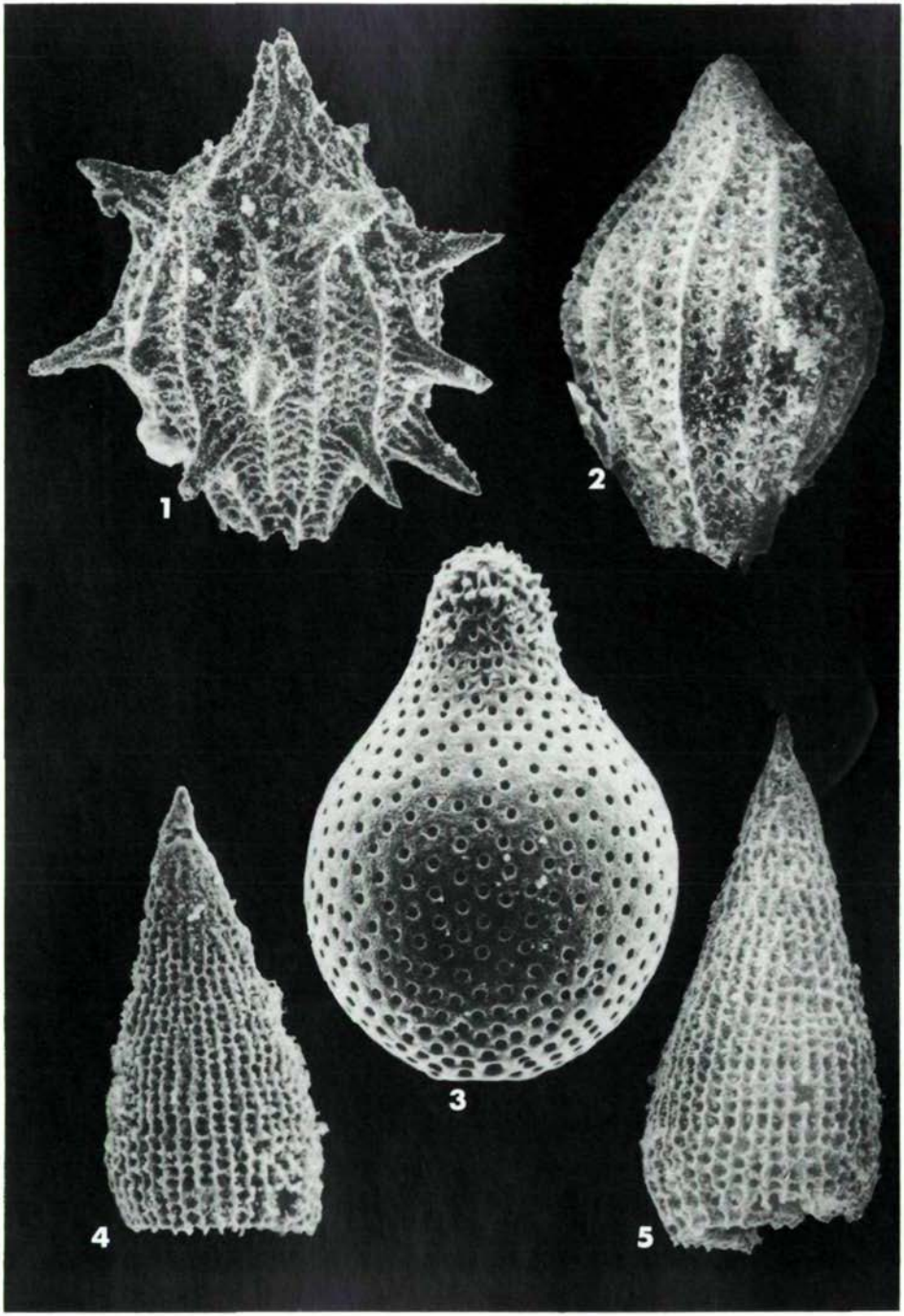

Plate 2

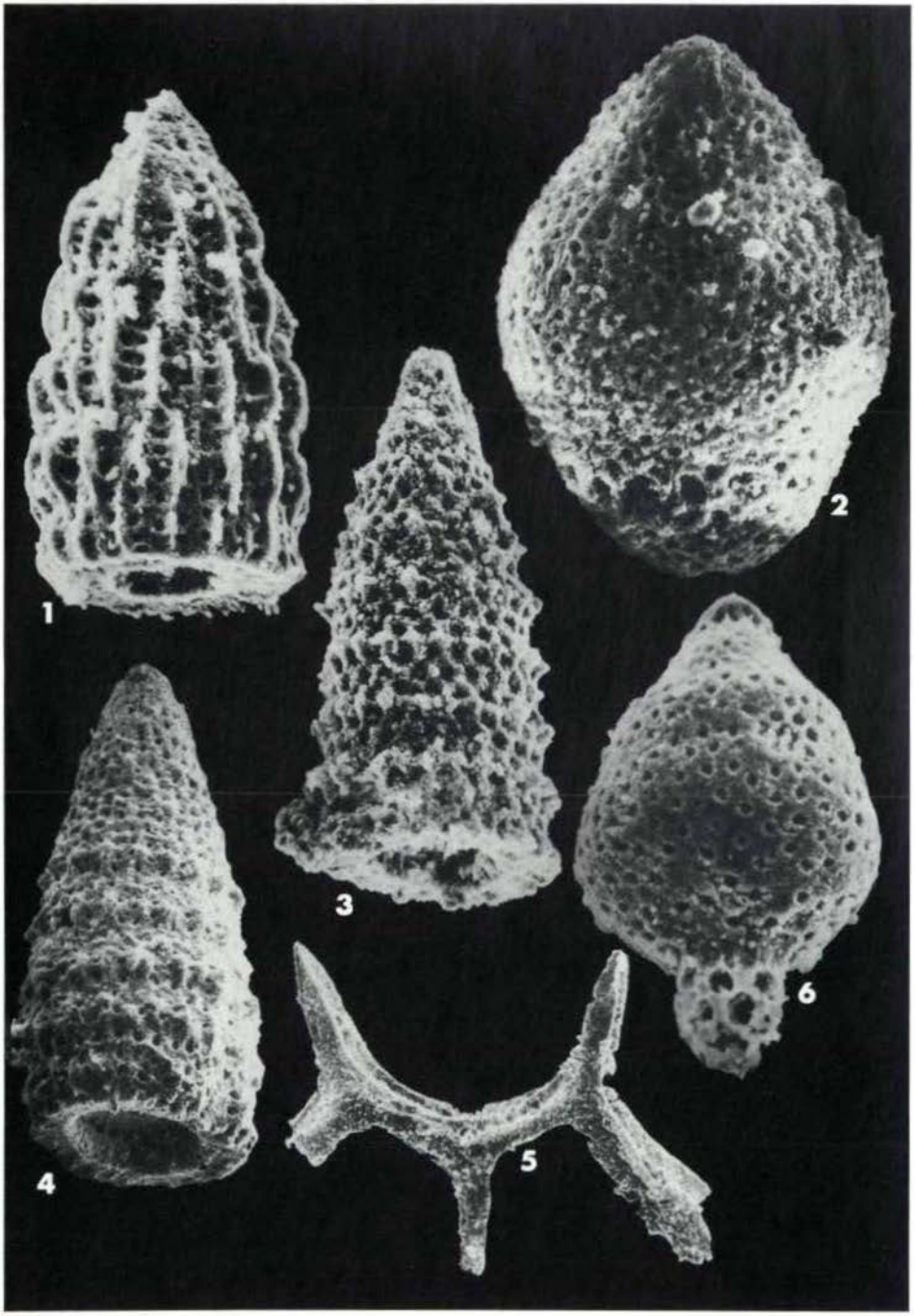

Plate 3

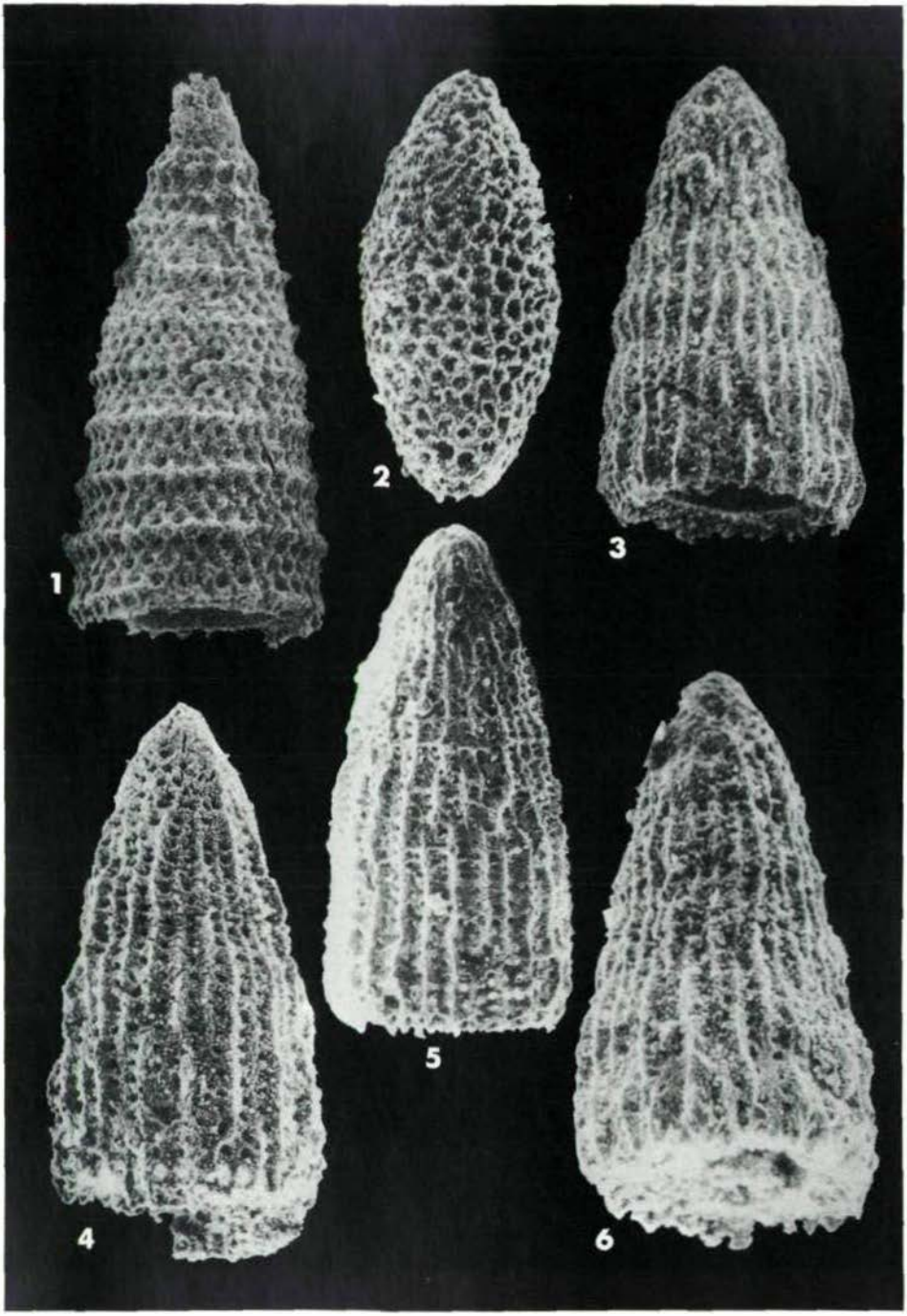

Plate 4

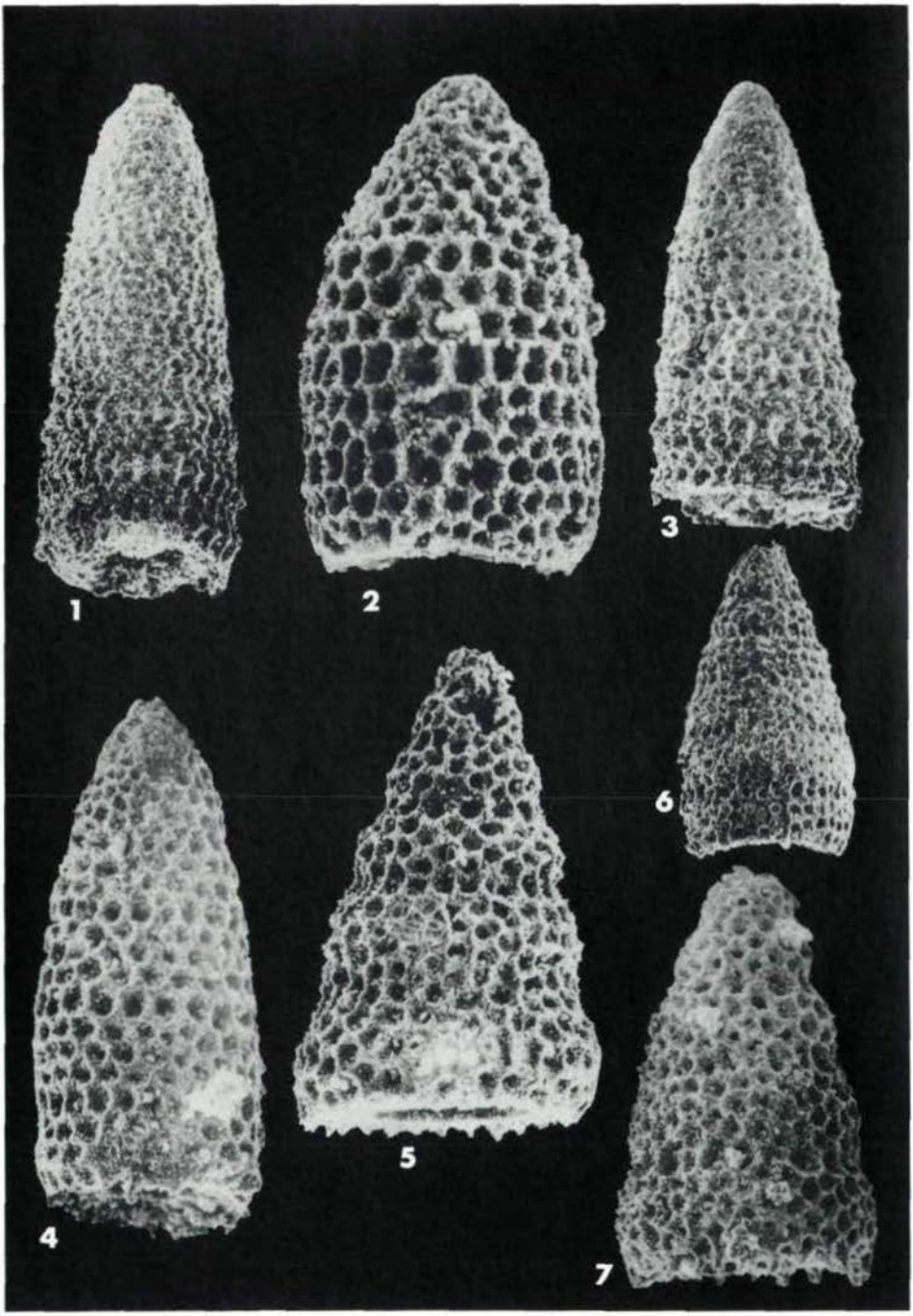

Plate 5

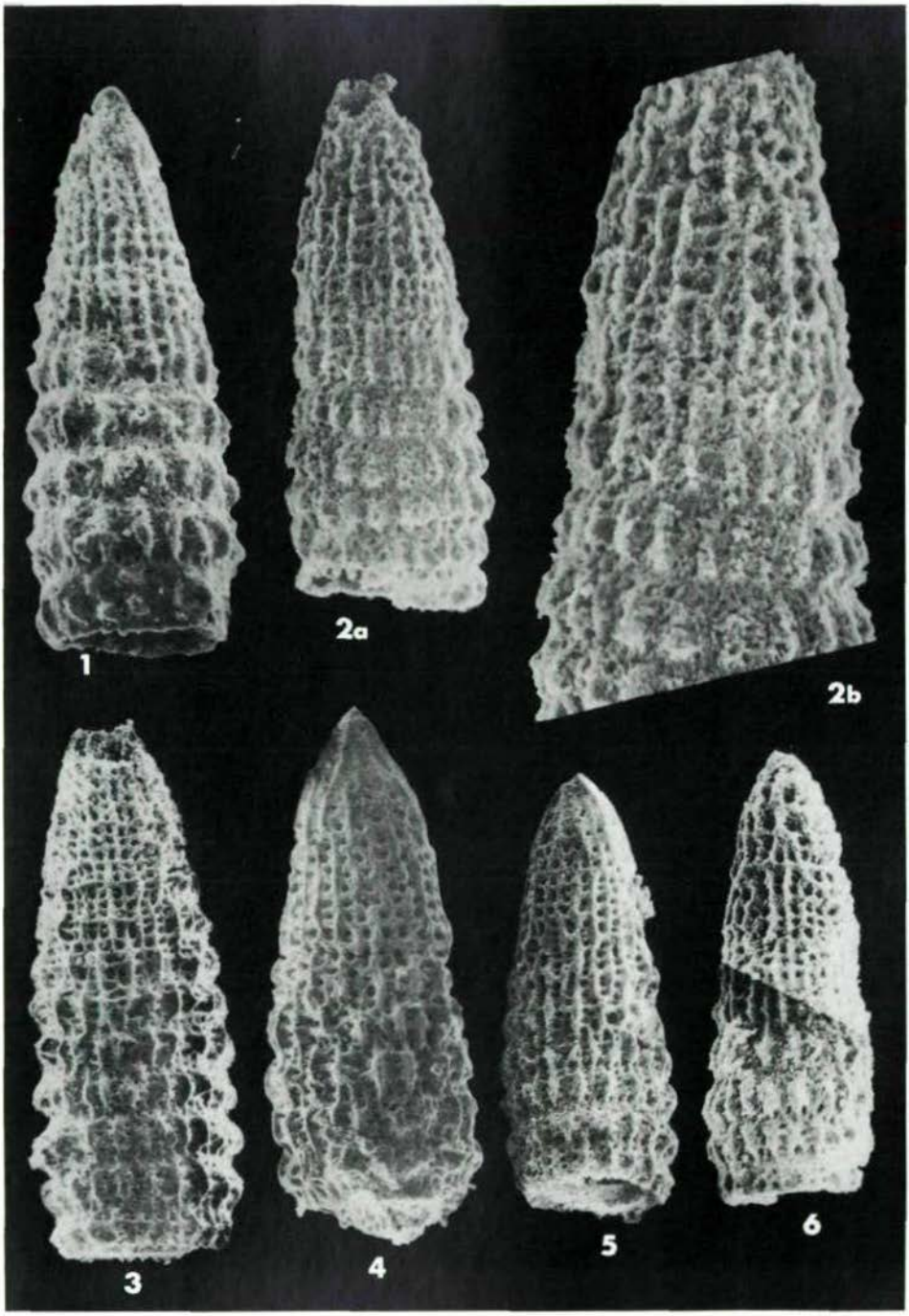

Plate 6

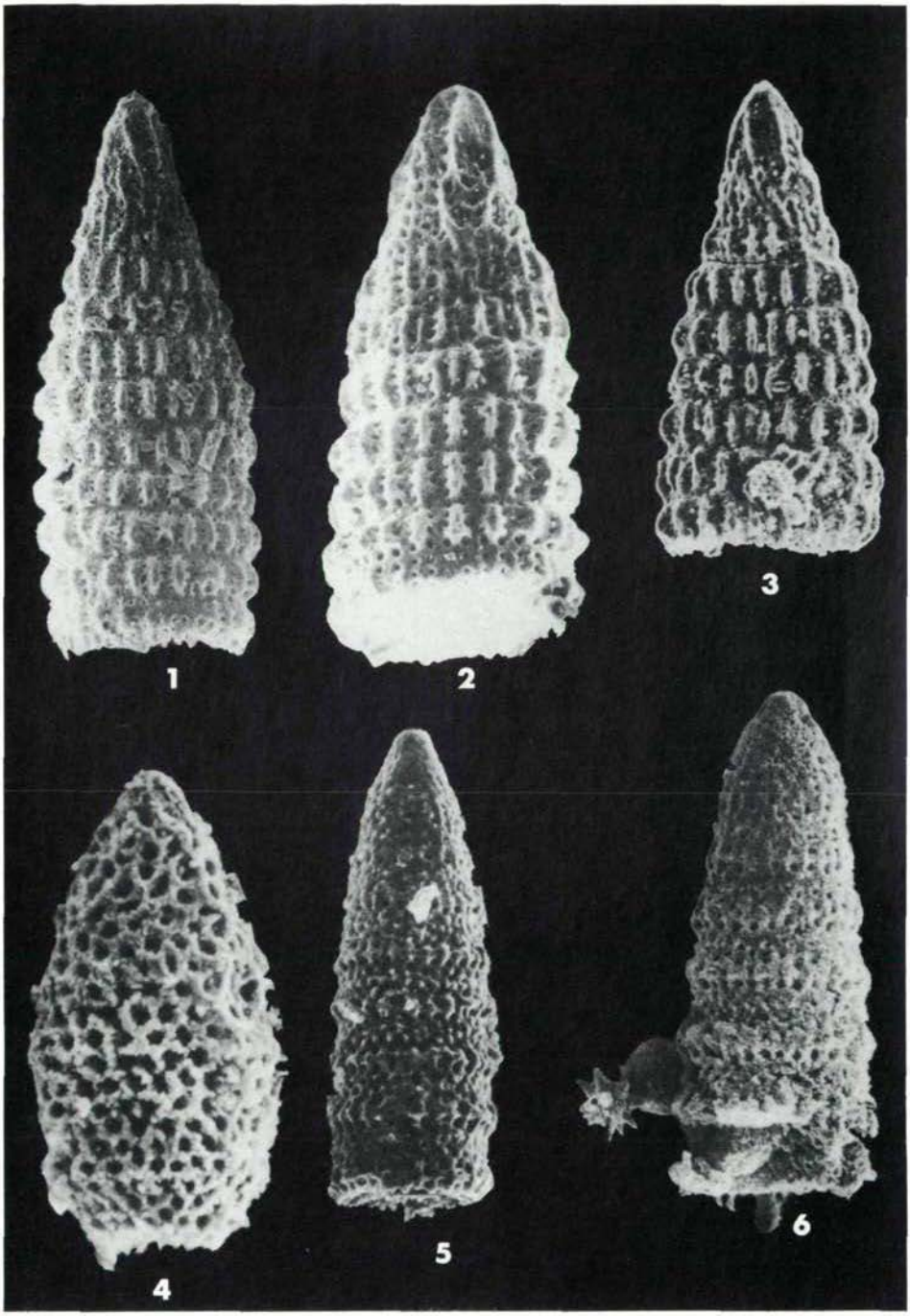

Plate 7

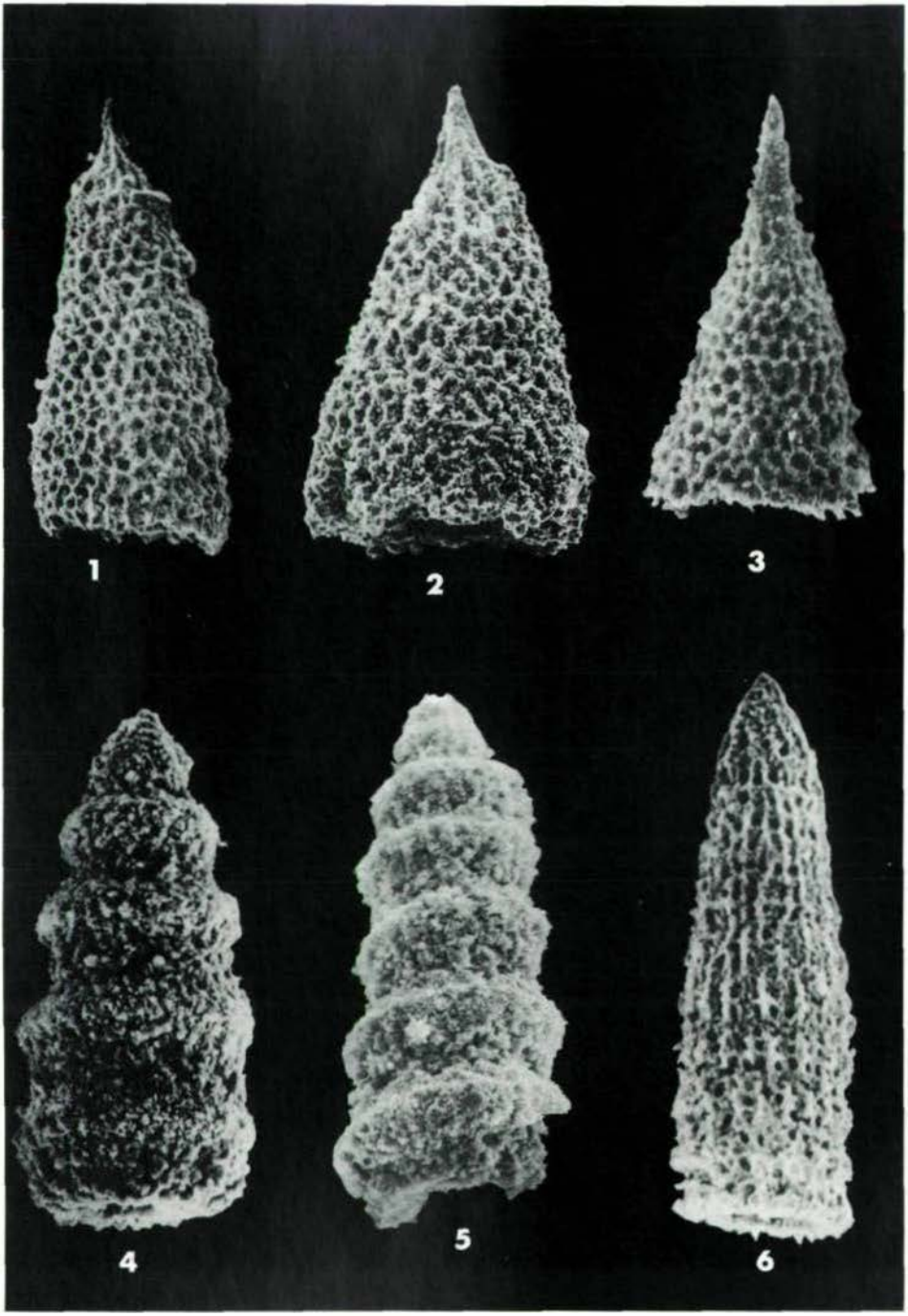

Plate 8

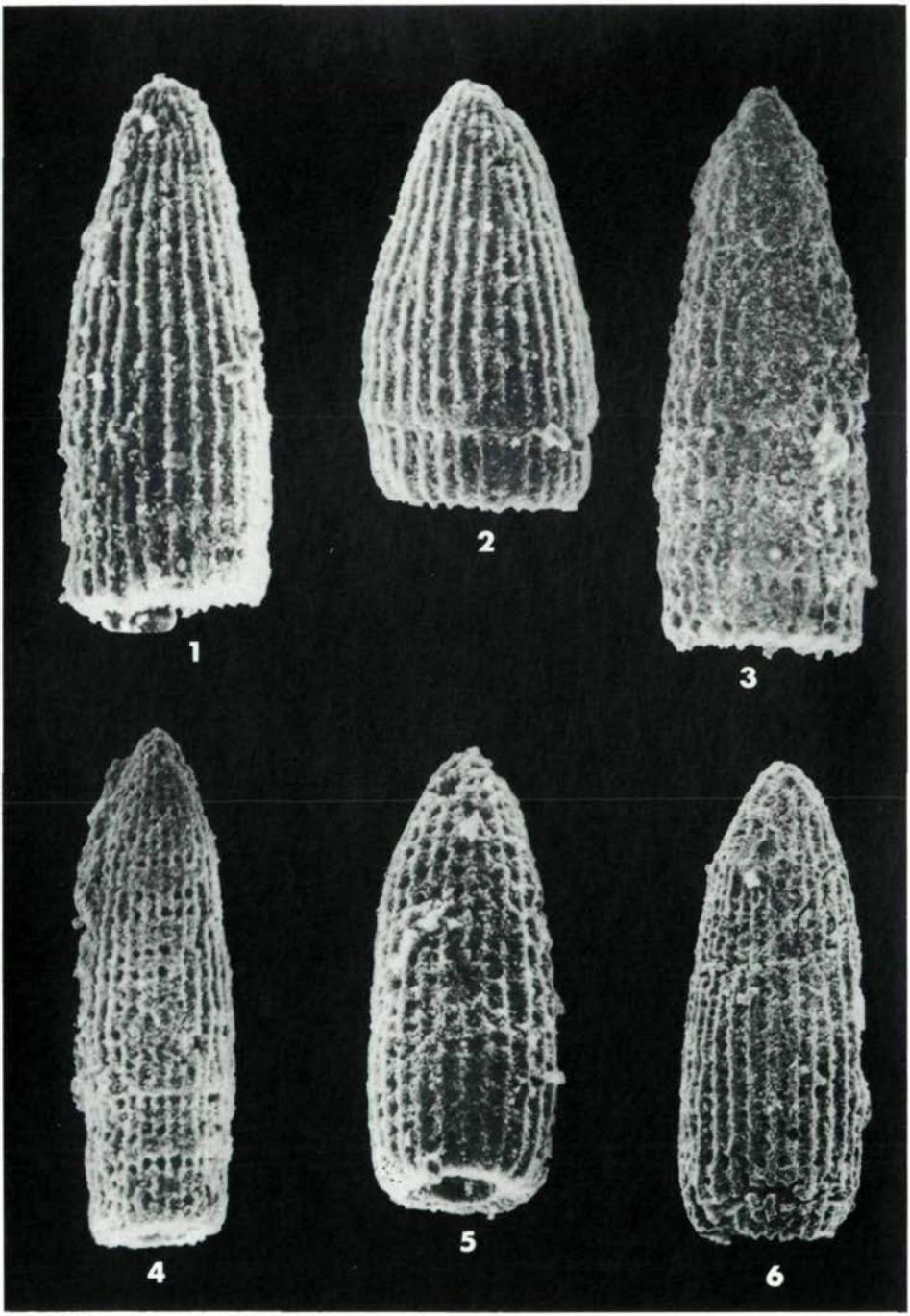

Plate 9

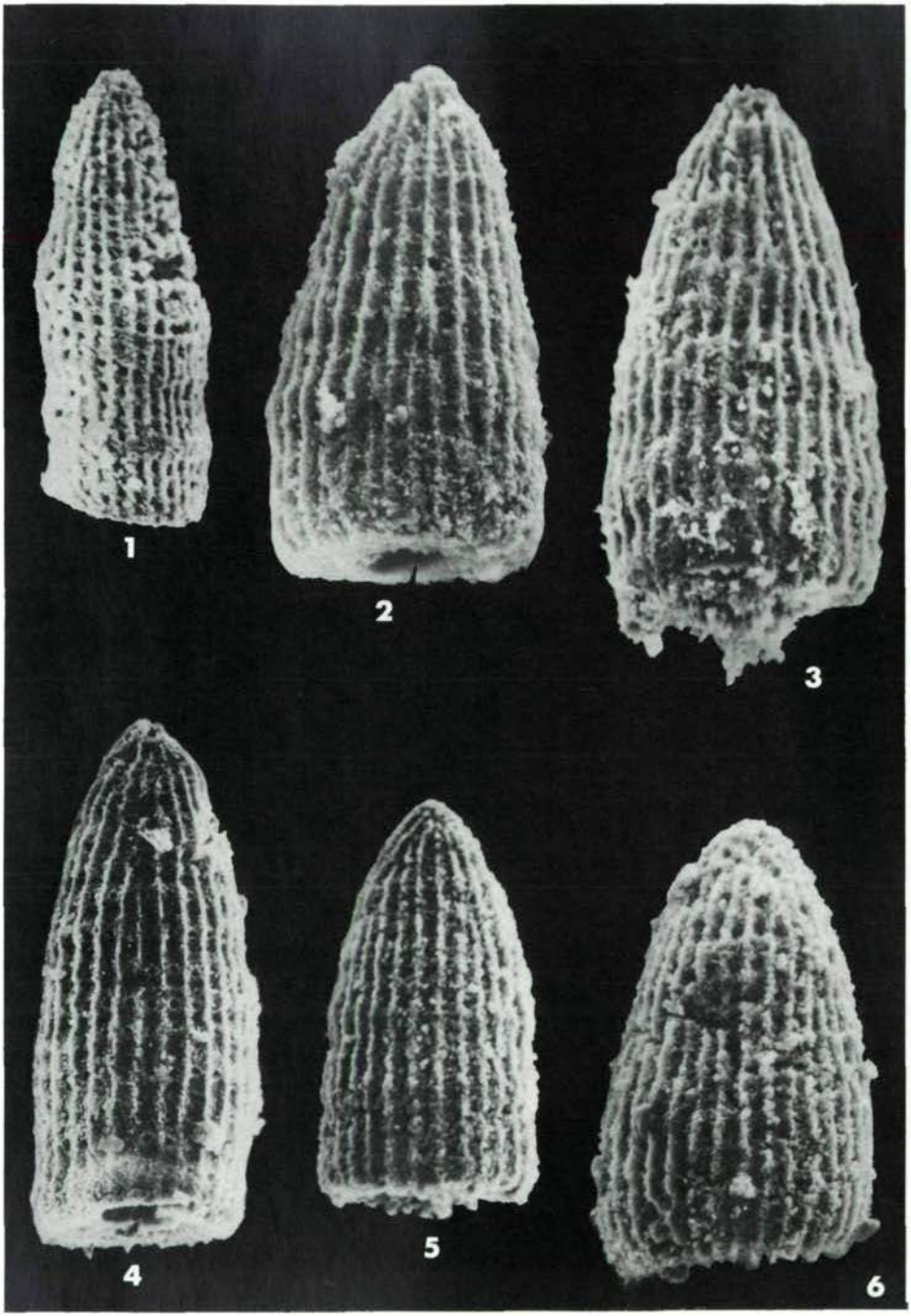

Plate 10