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# NEW RADIOLARIAN TAXA FROM THE TRIASSIC AND JURASSIC

by H. Kozur[1)]

Zusammenfassung

Aus dem Jura und der Trias werden 2 Familien, 4 Unterfamilien, 15 Gattungen und 1o Arten von Radiolarien neu beschrieben. Die Gattung *Tricolocampe* HAECKEL, 1882 wird emendiert.

Der stratigraphische Wert der neu beschriebenen Radiolarien-Taxa wird diskutiert. Mit Hilfe von Radiolarien konnte erstmalig Jura in Nordungarn (Bükk-Gebirge, Rudábanya-Gebirge) fossilmäßig belegt werden.

Summary

2 families, 4 subfamilies, 15 genera and 1o species of Triassic and Jurassic radiolarians are established. The genus *Tricolocampe* HAECKEL, 1882 was emended.

The stratigraphic value of the new radiolarian taxa is discussed. By the aid of radiolarians for the first time Jurassic age of sediments could be paleontologically proven in northern Hungary (Bükk Mts. and Rudábanya Mts.)

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Subclass Radiolaria MÜLLER, 1858

Order Polycystina EHRENBERG, 1838

Suborder Spumellaria EHRENBERG, 1875

Superfamily Trematodiscaea HAECKEL, 1982 emend. KOZUR & MOSTLER, 1978

Family Patulibracchiidae PESSAGNO, 1971 emend. BAUMGARTNER, 198o

Subfamily Natragliinae N. subfam.

Diagnosis: Large, multi-layered spongy disc with 6 spongy bracchia arranged in 3 pairs of opposed bracchia, each one of each pair situated along the same axis. Distal end of bracchia with central spine, with or without lateral spines.
Pores irregularly distributed, only in the inner part of the disc concentrically arranged.

Distribution: Upper Triassic.

Included genera: *Natraglia* PESSAGNO, 1979: Norian
*Trimiduca* KOZUR & MOSTLER, 1979: Cordevolian

Remarks: No other representatives of the Patulibracchiidae PESSAGNO, 1971 have 6 bracchia and so large central disc. On the other hand, the inner structure is similar to that of the Patulibracchidae.
Most similar is *Paronaella* PESSAGNO, 1971 emend. BAUMGARTNER, 198o with quite the same inner structure, but only with 3 bracchia.

Suborder Nassellaria EHRENBERG, 1875

Superfamily Eucyrtidiacea EHRENBERG, 1875

Family Williriedellidae DUMITRICĂ, 197o

Genus *Praewilliriedellum* n. gen.

Derivatio nominis: Forerunner of *Williriedellum* DUMITRICĂ, 197o

Type species: *Praewilliriedellum cephalospinosum* n. gen. n. sp.

Diagnosis: Tricyrtid, cryptocephalic. Thorax not or only very slightly depressed into the abdominal segment. Sutural pore highly differentiated. Aperture round, moderately large. Cephalothorax or whole test with spines. Cephalis mostly imperforate. Thorax and abdomen with small round pores.

Distribution: Bajocian of Bükk Mts. and Rudábanya Mts.

Included species: *Praewilliriedellum cephalospinosum* n. gen. n. sp.
*Praewilliriedellum spinosum* n. sp.

Remarks: The cephalothorax of *Williriedellum* DUMITRICA, 197o is deeply depressed into the abdomen. For this reason, the outside visible free part of the cephalothorax of *Williriedellum* is in relation to the abdomen smaller than in *Praewilliriedellum* n. gen. Moreover, the test is never spinose in *Williriedellum* DUMITRICA, 197o.

*Praewilliriedellum cephalospinosum* n. gen. n. sp.

(Pl. 2, fig. 1)

Derivato nominis: According to the spinose cephalis

Holotype: The specimen on pl. 2, fig. 1; rep.-no J 1o3o2

Locus typicus: Road cut W of Csipkés-tető, southern Bükk Mts., coordinates: x = 557.67o, y = - 6o7.38o

Stratum typicum: Dark cherts in the South Bükk Shales, Middle Bajocian.

Material: 16 specimens.

Diagnosis: Cephalis imperforate or with few small pores, with numerous spines. Collar stricture outside not visible. Thorax elongated, distally slightly widened, with numerous small round pores. Its surface proximally with spines, distally rough, but without spines. Abdomen strongly expanded, globular to slightly ellipsoidal. Surface smooth with numerous small round pores. Aperture round, moderately large, situated in the centre of a depressed, sligthly ribbed area. Sutural pore large, closed by a lattice with numerous, closely spaced pores.

Measurements: length of the unit: 18o-22o µm, length of cephalothorax: 6o-65 µm, width of abdomen: 14o-15o µm, diameter of aperture: 12-14 µm

Distribution: Until now known from the locus typicus only.

Remarks: *Praewilliriedellum spinosum* n. sp. has a spinose abdomen.

*Praewilliriedellum spinosum* n. sp.

(Pl. 1, figs. 1-3)

Derivato nominis: According to the spinose surface of the whole test.

Holotypus: The specimen on pl. 1, fig. 1; rep. - no. J 1o3o3

Locus typicus: Road cut W of Csipkés-tető, southern Bükk Mts., coordinates: x = - 557.67o, y = - 6o7.38o

Stratum typicum: Dark cherts in the Soth Bükk Shales, Middle Bajocian.

Material: 34 specimens.

Diagnosis: Cephalis small, with rough or slightly spinose surface, poreless. Collar stricture outside not visible or only indistinct. Thorax slightly larger than cephalis, short cyclindrical, slightly spinose, with few small pores. Abdomen strongly expanded, globular, with numerous small, round pores and many pointed spines. Aperture round, small. Sutural pore moderately large, closed by a sligthly convex or flat latticed plate with 6-9 closely spaced pores.

Distribution: Csipkés-tető (southern Bükk Mts.): Middle Bajocian and lowermost Telekesvölgy Formation of Telekes valley (Rudábanya Mts.): Bajocian silicous manganese shales.

Remarks: *Praewilliriedellum cephalospinosum* n. gen. s. sp. has a smooth abdomen.

Genus *Praezhamoidellum* n. gen.

Derivato nominis: Supposed forerunner of *Zhamoidellum* DUMITRICA 197o

Type species: *Praezhamoidellum yaoi* n. gen. n. sp.

Diagnosis: Tricyrtid or tetracyrtid, very rarely even with 5 or 6 segments. Cephalis poreless, but sometimes with closed hexagonal pore frame. Cryptocephalic; cephalis always partly depressed into the considerably larger thorax that is not depressed into the abdomen. Thoracic wall with small pores. Abdomen very large, with small pores and round aperture. In tetracyrtid species the size of the segments increase continuously from the cephalis to the abdomen. The postabdominal segment is very large in these species. It has also small round pores. Very rarely after the large first postabdominal segment, there is still a similarly large second postabdominal segment or even two further large segments (second and third postabdominal segments). No differentiated sutural pore.

Distribution: Middle Jurassic of Bükk Mts. and Japan.

Included species: *Praezhamoidellum yaoi* n. gen. n. sp.
*Stichocapsa convexa* YAO, 1979
*Stichocapsa japonica* YAO, 1979
*Tricolocapsa* sp. cf. *T. parvipora* TAN SIN HOK sensu YAO, 1979
*Praezhamoidellum buekkense* n. sp.

Remarks: The tetracyrtid to multicyrtid species belong perhaps to an independent genus. But they are only distinguished by additional segments and have the same stratigraphic distribution like the tricyrtid species.
*Zhamoidellum* DUMITRICĂ, 197o from the higher Callovian and Oxfordian is cryptocephalic and cryptothoracic. It has no aperture.
*Williriedellum* DUMITRICĂ, 197o has a differentiated sutural pore. Moreover, its thorax is deeply depressed into the abdomen.
*Praewilliriedellum* n. gen. has also a highly differentiated sutural pore.

*Praezhamoidellum yaoi* n. gen. n. sp.

(Pl. 3, fig. 3)

Derivatio nominis: In honour of Prof. Dr. A. YAO, Japan

Holotype: The specimen on pl. 3, fig. 3; rep. - no. J 1o3o4

Locus typicus: Road cut W of Csipkes-tető, southern Bükk Mts., coordinates: x = - 557.67o, y = 6o7.38o

Stratum typicum: Dark cherts in the South Bükk Shales, Middle Bajocian.

Material: 23 specimens.

1973 "*Hemicryptocapsa*" sp. - ICHIKAWA & YAO, pl. 4, fig.7
1979 *Tricolocapsa cf. T.* ruesti TAN SIN HOK - YAO, p. 3o-31, pl. 3, figs. 8-2o

Diagnosis: Tricyrtid, cryptocephalic. Strictures between the chambers outside indistinct. Small cephalis considerably depressed into the thorax. Thorax larger than cephalis, not depressed into the strongly expanded, more or less globular abdomen.
The whole test, also the cephalis, has a large hexagonal frame with narrow ridges and depressed inner part, in the centre of which is always (with exception of the cephalis) a small pore. Aperture small, round.

Measurements: length of the unit: 82-95 µm, length of cephalothorax: 21-27 µm, width of abdomen: 79-88 µm, diameter of aperture: 5,5-6,1 µm.

Distribution: Middle Bajocian of the Bükk Mts. and Japan. Silicous manganese shales of Telekesvölgy Formation of the Rudábanya Mts.

Remarks: Distinguished from all other species of *Praezhamoidellum* n. gen. by its hexagonal pore frame.

*Praezhamoidellum buekkenses* n. sp.

(Pl. 3, fig. 1)

Derivato nominis: According the occurrence in Bajocian of the Bükk Mts.

Holotype: The specimen on pl. 3, fig. 1; rep. - no. J 1o3o5

Locus typicus: Road cut W of Csipkes-tető, southern Bükk Mts., coordinates: x = - 557.67o, y = 6o7.38o

Stratum typicum: Dark cherts in the South Bükk Shales, Middle Bajocian.

Material: 15 specimens.

Diagnosis: Tri- or tetracyrtid, strictures between the chambers outside almost invisible. Cephalis small, without pores, depressed into the larger thorax. Last segment (abdomen or postabdominal segment) strongly expanded, globular considerably higher than the other segments all together. Aperture small, round.
Surface smooth, pores of the thorax and abdomen widely scattered, small, round.

Measurements: length of the unit: 7o-8o μm, length of cephalothorax 23-28 μm, width of abdomen: 65-71 μm, diameter of aperture: 5-6 μm

Distribution: Until now only known from the locus typicus.

Remarks: *Praezhamoidellum japonicum* (YAO, 1979) has a similar shape, pore size and distribution, but the first 3 segments are all together so long or even longer than the last one.
Only pyritized specimens are present. Because the strictures between the segments are nearly invisible, it is not clear, whether this species is tricyrtid or tetracyrtid.

Family Syringocapsidae FOREMAN, 1973

Subfamily Japonocapsinae n. subfam.

Diagnosis: Tricyrtid to multicyrtid. Stricture between the segments outside often not visible. Cephalis small, poreless or with very few pores, sometimes partly depressed into the thoracic cavity. Other segments with widely scattered round pores. Continuous longitudinal ribs may be sometimes present.

In the distal part there is always a short appendix that is often separated from the distal segment by a ring of very large pores. If these large pores are absent, than the whole appendix bears large pores. More rarely, a very short distal tubus with large pores is present.
A sutural pore is situated at the thorax-abdomen boundary.

Occurrence: Middle Jurassic of the Bükk Mts. and Japan. De WEVER in De WEVER et. al., 1979, figured Japonocapsinae from the Norian sample XPF 3o (Greece). But in this sample are present a lot of radiolarians that have not evolved earlier than in the higher Liassic or even in the Middle Jurassic. Beside of these radiolarian typical Norian radiolarian occur. Therefore it is most probably that the sample XPF 3o is a Middle Jurassic sample with reworked Norian radiolarians.

Included genera: *Japonocapsa* n. gen.
*Striatojaponocapsa* n. gen
*Yaocapsa* n. gen.

Remarks: The Syringocapsinae FOREMAN, 1973 have always a strong, often very long narrow distal tubus. They are also proximally elongated, often with apical horn. No sutural pore is present in the Syringocapsinae FOREMAN.

## Genus *Japonocapsa* n. gen.

Derivatio nominis: According to the frequent occurrence in the Middle Jurassic of Japan

Type species: *Tricolocapsa fusiformis* Yao, 1979

Diagnosis: Tricyrtid to tetracyrtid, ovoidal to shortly spindle-shaped. Small cephalis poreless or with very small pores. Segments outside not separated each other. Sutural pore distinct. The short appendix has the form of an inversely conical small additional segment at the distal end. It has the same wall structure and pore size as the post-cephalic segments, but it is always separated from the distal segment by a ring of very large pores.

Occurrence: Bajocian.

Included species: *Tricolocapsa fusiformis* YAO, 1979
*Stichocapsa tegiminis* YAO, 1979
*Japonocapsa* n. sp. A (= *Tricolocapsa* sp. C. sensu De WEVER, 1979)
*Japonocapsa* spp.

Remarks: Several species from the Bajocian of the Bükk Mts. will be described in an other paper.
*Striatojaponocapsa* n. gen. is distinguished by the presence of uninterrupted longitudinal ribs on the whole wall.

*Yaocapsa* n. gen. has a short, tubus-like distal prolongation with big pores that is not separated by a row of very big pores from the distal segment.
De WEVER (in De WEVER et al., 1979) figured typical *Japonocapsa* species as *Tricolocapsa* A, B, C from the sample XPF 3o that he placed in the Norian. As already mentioned above, this sample seems to represent a Bajocian sample with reworked Triassic radiolarians, because it contains typical Jurassic or even Bajocian species and genera together with Upper Triassic ones.
Typical representatives of the trisegmented *Tricolocampe* HAECKEL 1882 emend. are quite unknown from the Triassic. Such typical representatives of this genus were figured as *Eucyrtidium* (?) sp. aff. (resp. cf.) *E. ptyctum* RIEDEL & SANFILIPPO by De WEVER, 1979 (pl. 6, figs. 1, 2). The genus *Hsuum* PESSAGNO, 1977, not present before the Lower Pliensbachian, is also present in this sample. The documentation of *Hsuum* sp. cf. *obispoensis* PESSAGNO, 1977 by De WEVER 1979 is very poor, but it seems to be a *Hsuum*.
Williriedellidae DUMITRICĂ, 197o were also reported by De WEVER, 1979 from the sample XPF 3o. He determined these species as *Cryptamphorella conora* (FOREMAN), *Dicolocapsa* sp. aff. *D. verbeeki* TIN SAN HOK and *Dicolocapsa* sp. Neither the species nor the genus determinations are correct, but at least "*Cryptamphorella conara*" (FOREMAN) is a typical representative of the Williriedellidae DUMITRICĂ that are unknown before the Toarcian.

## Genus *Striatojaponocapsa* n. gen.

Derivatio nominis: According the presence of longitudinal ribs.

Type species: *Tricolocapsa plicarum* YAO, 1979

Diagnosis: Tricyrtid with large, short ellipsoidal to globular abdomen. Segments also outside separated each other. Cephalis poreless. Postcephalis segments with partly dibranching, continuous longitudinal ribs and one line of widely separated round pores between ribs. Some ribs reach into the cephalis, other ones are shorter. Appendix very short, separated from the distal segment by a ring of very large pores. Sutural pore not yet observed.

Occurrence: Bajocian of the Bükk Mts. and Japan.

Included species: *Tricolocapsa plicarum* YAO, 1979
*Striatojaponocapsa* n. sp.

Remarks: *Japonocapsa* n. gen. has no longitudinal ribs. *Unuma* ICHIKAWA & YAO, 1976 has also longitudinal ribs, but the distal appendix has the form of a short tubus with big pores and it is not separated by a ring of very large pores from the distal segment. Moreover, *Unuma* is multicyrtid.

## Genus *Yaocapsa* n. gen.

Derivatio nominis: In honour of Prof. Dr. A YAO, Osaka, Japan, the author of the type species.

Type species: *Cyrtocapsa mastoidea* YAO, 1979

Diagnosis: Tetracyrtid, pear-shaped; segments outside not or only indistinctly separated each other. Cephalis poreless or with very few small pores. Postcephalic segments with very few small pores. Postcephalic segments with widely scattered small pores. Sutural pore very distinct. Distal appendix with large pores, but not separated from the distal segment by a ring of very large pores. Very tiny apical horn may be present. The appendix may have also a distal spine.

Distribution: Bajocian of Bükk Mts. and Japan.

Included species: *Cyrtocapsa mastoidea* YAO, 1979
*Yaocapsa macroporata* n. op.

Remarks: The appendix in *Japonocapsa* is separated from the distal segment by a ring of very big pores and has otherwise small pores like the postcephalic segments. *Unuma* ICHIKAWA & YAO, 1976 has the same type of appendix, but this genus is multicyrtid and has strong longitudinal ribs.
*Yaocapsa* n. gen. is a little transitional to the Syringocapsinae, FOREMAN 1973, above all to *"Syringocapsa"* (n. gen.) *agolarium* FOREMAN, 1973 that is otherwise not a typical representative of the Syringocapsinae. The wall structure and the presence of a sutural pore indicate that *Yaocapsa* n. gen. should be assigned to the Japonocapsinae n. subfam.

## *Yaocapsa macroporata* n. sp.

(Pl. 7, fig. 4)

Derivatio nominis: According to the large pores for the genus

Holotype: The same specimen on pl. 7, fig. 4; rep. - no. J 1o3o6

Locus typicus: Varga-teto (Bükk Mts.), coordinates: x = - 556.o8o, y = - 594.2oo

Stratum typicum: Black radiolarites in dark shales of Bajocian age.

Material: More than 1oo specimens.

Diagnosis: Tetracyrtid, strictures between the chambers very shallow, but often well visible. Cephalis small, proximally poreless, distally with some pores. Thorax some-

what larger than cephalis, with small pores. Abdomen considerably wider, but not much higher than thorax. Postabdominal segment very large, very much higher than abdomen. Both abdomen and postabdominal chambers with large pores. Distal appendix large, with very large pores. Sutural pore very distinct consisting of closely spaced large pores.

Measurements: length of the unit: 125-135 µm, width of postabdominal segment: 81-85 µm, length of appendix: 21-23 µm, pore diameter of postabdominal segment 2,8-3,7 µm, pore diameter of appendix: 7,4-9,2 µm.

Distribution: Bajocian of Bükk Mts.

Remarks: *Yaocapsa mastoidea* (YAO, 1979) has considerably smaller and wider spaced pores on the abdomen and postabdominal segments. The strictures between the chambers are outside very indistinct.

## Family Nakasekoellidae n. fam.

Diagnosis: Tricyrtid or tetracyrtid. Cephalis small to very small, rarely with small apical horn. Other segments considerably larger, either well separated by deep strictures or only collar stricture outside visible. Aperture wide to moderately wide.
Cephalis poreless, rarely with few pores. Other segments with round pores that are often covered by a thick poreless layer. The last or two last segments are often costate. These longitudinal ribs set off at the constrictions between the segments, but they may continue in form of short spines at the distal margin of the last segment.

Occurrence: Norian - uppermost Jurassic, ? Lower Cretaceous.

Included genera: *Nakasekoellus* n. gen.
*Tricolocampe* HAECKEL, 1882 emend.
*Nishimuraella* n. gen.

Remarks: The taxa assigned to this family were until now often placed in *Eucyrtidium* EHRENBERG, 1847. But the type species of *Eucyrtidium, Lithocampe acuminata* EHRENBERG, 1844 is a multicyrtid Nassellaria with latticed shell and apical horn. In this species the segments at first gradually increase in their diameter and distally the diameter of segments decreases again. *Eucyrtidium* EHRENBERG, 1847 is therefore sure not related to the Triassic and Jurassic Nakasekoellidae n. fam.
The Theocapsidae HAECKEL, 1882 emend. KOZUR (in press) are similar, but their aperture is always closed.
Also the Spongocapsulidae PESSAGNO, 1977 have often a similar shape, but their wall is porous and spongy.

Genus *Tricolocampe* HAECKEL, 1882 emend.

Type species: *Tricolocampe clepsydra* RÜST, 1855,
(=*Eucyritidium ptyctum* RIEDEL & SANFILIPPO, 1974)

Emended diagnosis: Tricyrtid with fragile velum of different length. Cephalis small to very small, poreless, with or without apical horn. Thorax considerably larger, with round pores, often covered by a layer of microgranular silica. Abdomen, in turn, considerably larger than thorax, thick-walled. Pores mostly closed by a thick layer of microgranular silica. Abdomen often with prominent longitudinal ribs. Aperture large, round, open. Velum mostly present, but in many species only rarely preserved, because it is in general very fragile. This coarsely latticed velum is separated from the distal chamber mostly by a ring of very large pores. In general, the velum is short (with 1-2 rings of pores), but sometimes it is cylindrical and rather long.

Occurrence: ? Norian, Jurassic, ? Lower Cretaceous.

Included species: *Tricolocampe clepsydra* RÜST, 1885
Synonym : *Eucyrtidium ptyctum* RIEDEL & SANFILIPPO, 1974
*Eucyrtidium* (?) *unumaensis* YAO, 1979
*? Tricolocampe* ? n. sp.A (= *Theocorys* sp. A sensu NAKASEKO & NISHIMURA, 1979)
*Tricolocampe* sp. (numerous undescribed Jurassic species)

Remarks: *Tricolocampe clepsydra* RÜST, 1885 from the Late Jurassic was introduced for specimens in thin sections that have exactly the same form as thin sections of *Eucyrtidium ptyctum* RIEDEL & SANFILIPPO, 1974. Of course, the ribs on the abdomen are only rarely visible in such thin sections. No other radiolarians of this form and size are known from the Late Jurassic. Therefore *Eucyrtidium ptyctum* RIEDEL & SANFILIPPO, 1974 is here regarded as younger synonym of *Tricolocampe clepsydra* RÜST, 1885.
*Tricolocampe* ? n. sp. A. (= *Theocorys* sp. A sensu NAKASEKO & NISHIMURA, 1979), from the Norian of Japan has no velum. This species is also distinguished from all other true *Tricolocampe* species by its long abdomen. Most probably this species belongs to a new genus of Nakasekoellidae n. fam. and it seems to be not directly related to *Tricolocampe* HAECKEL, 1882 emend. that has evolved from *Nakasekoellus* n. gen. True *Tricolocampe* species are therefore unknown from the Triassic, but very common in the Middle and Upper Jurassic. As pointed out in the remarks to *Japonocapsa* n. gen., the only "Norian" sample with true *Tricolocampe species* (XPF 3o by De WEVER et al., 1979) seems to be a Jurassic sample with

predominantly Jurassic species and reworked Upper Triassic ones.

*Nakasekoellus* n. gen. has always 4 segments.

*Nishimuraella* n. gen. is distinguished by the absence of a stricture between thorax and abdomen, by the distally strongly decreasing diameter of the test and by the presence of a poreless ring at the blunt distal end.

## Genus *Nakasekoellus* n. gen.

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

Type species: *Stichophormis polita* HINDE, 1908
(= *Dictyomitra pessagnoi* NAKASEKO & NISHIMURA, 1979)

Diagnosis: Tetracyrtid. Cephalis very small, poreless. The postcephalic segments increase rather fast in diameter and gradually in their length. All segments abruptly separated each other by deep strictures. Aperture wide. Pores of the postcephalic segments mostly covered by a microgranular imperforate layer. Only in the postabdominal segment the large round pores may be uncovered. Cephalis smooth. Thorax faintly ribbed or smooth. Abdomen and postabdominal segments may be coarsely longitudinally ribbed. Costae interrupted at the stricture between the abdomen and the postabdominal segment. At the distal end of the postabdominal segment the costae are strongest and may overreach a little the distal margin to form very short spines.

Occurrence: Norian.

Included species: *Stichophormis polita* HINDE, 1908
Synonym: *Dictyomitra pessagnoi* NAKASEKO & NISHIMURA, 1979
*Dictyomitra pygmaea* HINDE, 1908
? Synonym: *Eucyrtidium* ? sp. A NAKASEKO & NISHIMURA, 1979

Remarks: *Tricolocampe* HAECKEL, 1882 emend. is tricyrtid and if costae are present, only one segment (the last one) is strongly ribbed. Because all Triassic Nakasekoellidae with deep strictures between the segments and abruptly set off distal segment are four-segmented and all Jurassic ones have only 3 segments, this difference seems to be important to separate *Tricolocampe* HAECKEL, 1882 emend. from *Nakasekoellus* n. gen. In well preserved material of *Tricolocampe clepsydra* RÜST, 1885 still a very short latticed velum is present that may be considered as the most proximal part of a rudimentary postabdominal chamber. So, *Tricolocampe* HAECKEL, 1882 emend. is sure the descendant of *Nakasekoellus* n. gen.

## Genus Nishimuraella n. gen.

Derivatio nominis: In honour of Prof. Dr. A. NISHIMURA, Osaka

Type species: *Stichocapsa nana* SHENG, 1976,
(=*Siphocampium*? sp. A sensu YAO, 1982)

Diagnosis: Tricyrtid, mostly very small Nassellaria. Cephalis small, poreless, rarely with some pores. Collar stricture mostly distinct, other strictures mostly not visible. The diameter of the test increases at first continuously until somewhat below the midlength and it decreases than toward the blunt distal end, where always a low poreless zone is present. Postcephalic segments with relatively large pores. Aperture somewhat constricted, moderately wide.

Occurrence: Upper Triassic.

Included Species: *Stichocapsa nana* SHENG, 1976
Synonym: *Siphocampium* (?) sp. A sensu YAO, 1982
? *Tricolocapsa arrecta* HINDE, 19o8
? *Dictyomitra parva* SHENG, 1976
? *Dictyocephalis deformis* SHENG, 1976
? Synonym:*Squinabolella* (?) sp. A sensu YAO, 1982

Remarks: The best preserved material from this genus was figured by YAO, 1982 (pl. 2, fig. 15-17) as *Siphonocampium* (?) sp. A. Most of the other species assigned here to *Nishimuraella* n. gen. are either inadequately documented or their taxonomic position is unclear.
Both in *Tricolocampe* HAECKEL, 1882 emend. and in *Nakasekoellus* n. gen. all segments are abruptly separated by deep strictures and the aperture is larger.

## Family Unumidae n. fam.

Diagnosis: Spindle-shaped, multisegmented Nassellaria with inversely subconical last segment that has a very small aperture or ends in a conical appendix with large pores. Junction of segments not visible at the surface. Few, but strong plicae of different length are always present. They run continuously over the segments. Wall with small round pores arranged in longitudinal lines.

Occurrence: Norian-Bajocian

Included genera: *Unuma* ICHIKAWA & YAO, 1976
*Protunuma* ICHIKAWA & YAO, 1976

Remarks: The first Triassic Unumidae n. fam. were published by HINDE, 1908. *Sethamphora pyriformis* HINDE, 1908 is a *Protunuma* ICHIKAWA & YAO, 1976. *Sethamphora squinaboli* HINDE, 1908 may also belong to this genus, but perhaps it represents a new genus of the Unumidae n. fam. Also PESSAGNO et al., 1979 (pl. 4, fig. 8) figured a Norian *Protunuma* as unnamed Nassellaria.
The Syringocapsinae FOREMAN, 1973 have never longitudinal ribs and only 3-4 segments. Moreover, they have always a more or less long narrow distal tubus.
The Japonocapsinae n. subfam. above all the longitudinally striated genus *Striatojaponocapsa* n. gen. are similar, but have only 3-4 segments and a suture pore.

## Superfamily Lychnocaniacea HAECKEL, 1882

## Family Silicarmigeridae KOZUR & MOSTLER, 1980

Diagnosis: Dicyrtid, but postcephalic portion of the shell subdivided by transversal ridges in numerous "pseudo-segments". Cephalis moderately large, poreless, with stout apical horn. The large thorax has irregular pores between the transversal ridges. The thorax widens distally, but its distalmost part forms a short to moderately long velum with or without transversal ridges. This velum tapers distally and narrows or even closes the primary large aperture. Apical horn, cephalis and upper part of the thorax may be covered by a microgranular to finely spongy layer.
Cephalic spicular system with A, V, L, D, l, Mb and arches AV, Al, Dl, Ll and LV. A short vertical horn is present. In prolongation of D and 2 L there are 3 long, mostly at least distally rounded, proximally three-bladed feet.

Occurrence: Anisian-Liassic.

Included genera: *Silicarmiger* DUMITRICĂ; KOZUR & MOSTLER, 1980
*Jacus* De WEVER, 1982
*Spongosilicarmiger* n. gen.

Remarks: Like in *Jacus* De WEVER, 1982 also in *Silicarmiger* DUMITRICĂ; KOZUR & MOSTLER, 1980 and *Spongosilicarmiger* n. gen. a velum is present that is separated from the feet, but this velum has the same structure as the thorax (with transversal rings) whereas in *Jacus* De WEVER, 1982 the transversal rings are indistinct or quite missing at the velum.

*Jacus anatiformis* De WEVER, 1982 has also on the thorax no ring structures and belongs to *Sanfilippoella* KOZUR & MOSTLER, 1979.
The Muellericyrtiidae KOZUR & MOSTLER, 1981 are near related, but have a thick solid wall with only 1-2 transversal ring structures. Moreover they are tricyrtid.

Genus *Silicarmiger* DUMITRICĂ; KOZUR & MOSTLER, 1980

Type species: *Silicarmiger costatus* DUMITRICĂ; KOZUR & MOSTLER, 1980

Diagnosis: Silicarmigeridae without microgranular to finely spongy cover on the apical horn, cephalis and proximal parts of the thorax. Velum small with transversal rings. Aperture large. Feet distally with round cross section.

Occurrence: Anisian - Cordevolian.

Included species: *Silicarmiger costatus costatus* DUMITRICĂ; KOZUR & MOSTLER, 1980
*Silicarmiger costatus anisicus* KOZUR & MOSTLER, 1981
*Eonapora curvata* KOZUR & MOSTLER, 1979
*Silicarmiger* sp. A sensu YAO; MATSUOKA & NAKATANI, 1982

Remarks: *Jacus* De WEVER, 1982 is very similar, but the velum has no or only very indistinct transversal rings. Aperture sometimes closed by the velum.
*Spongosilicarmiger* n. gen. has a microgranular to spongy cover on the apical horn, cephalis, and at least proximal parts of the thorax.
*Eonapora curvata* KOZUR & MOSTLER, 1979 has the typical ring structure of *Silicarmiger* DUMITRICĂ; KOZUR & MOSTLER, 1980. Also the cephalis has some rings. But this is, like the strongly curved apical horn, a specific feature.

Genus *Spongosilicarmiger* n. gen.

Type species: *Spongosilicarmiger italicus* n. gen. n. sp.

Diagnosis: Silicarmigeridae with microgranular to finely spongy cover on the apical horn, cephalis and at least proximal parts of the thorax. Velum moderately large, aperture medium-sized. Feet at least distally with round cross section.

Occurrence: Upper Anisian and above all Lower Ladinian.

Included species: *Spongosilicarmiger italicus* n. gen. n. sp.
*Spongosilicarmiger* n. sp. A (= *Stichopterium*) ? sp. A sensu NAKASEKO & NISHIMURA, 1979)
*Spongosilicarmiger* n. sp. B (= *Stichopterium* ? sp. B sensu NAKASEKO & NISHIMURA, 1979)

Remarks: Both *Silicarmiger* DUMITRICĂ, KOZUR & MOSTLER, 1980 and *Jacus* De WEVER, 1982 have no microgranular to spongy cover on the proximal parts of the test.
*Nofrema* DUMITRICĂ, KOZUR & MOSTLER, 1980 has this cover, but this genus has only one or two transversal rings in a thick-walled thorax with irregularly scattered pores.

*Spongosilicarmiger italicus* n. gen. n. sp.

(Pl. 6, fig. 2; pl. 7, fig. 1)

Derivatio nominis: According to the occurrence in the Southern Alps, Italy

Holotype: The specimen on pl. 6, fig. 2, pl. 7, fig. 1; rep. - no. T 5822

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

Stratum typicum: Buchenstein Beds, Lower Ladinian

Material: More than 100 specimens.

Diagnosis: *Spongosilicarmiger* with moderately long, almost straight, in the middle part expanded apical horn that is covered by a porous spongy layer. Cephalis with rough nodose surface. Thorax including the rings covered by spongy to microgranular layer.

Description: Dicyrtid. Cephalis moderately large, poreless, with rough nodose surface. Apical horn moderately long, almost straight, only distal sometimes curved. Middle part of apical horn expanded, covered by spongy porous layer that quite obscure the primary three blades. Only in the upper part of apical horn the three blades may be still free. The topmost part of the apical horn is prolongated in a slender, round, straight or slightly curved spine that is mostly broken away. Proximal not expanded part of the apical horn rounded and mostly quite smooth. Only in the stratigraphically oldest subspecies covered by spongy layer.
Thorax large, subpyramidal, but its diameter decreases distally again in an open velum. The inner layer consists of numerous transversal rings and a coarse lattice between these rings. Both the rings and the inner lattice are covered by a spongy to microgranular layer. The rings are still visible, but sometimes only indistinctly recognizable.
Three feet in prolongation of D and 2 L slender, roundish,

proximally connected with the thorax by prolongations of the rings, distally free.
Cephalic spicular system with A, D, 2 l, V, 2 L, Mb.

Measurements: length of the unit: 35o-37o μ m.

Occurrence: Lower Fassanian of Balaton Highland and Southern Alps.

Remarks: *Spongosilicarmiger* n. sp. (description by KOZUR & MOSTLER, in press) has a longer, curved apical horn that is not expanded in its middle part.

## Superfamily Theopiliacea HAECKEL, 1882

## Family Neoscidiocapsidae PESSAGNO, 1969

Diagnosis: Test large, dicyrtid, umbrella-shaped, helmet-shaped or biconvex-discoidal in longitudinal view, circular or somewhat elliptical transversally. Cephalis small, hemisphaerical to conical, imperforate or perforate. Apical horn often present. In prolongation of V with vertical horn or cephalopyle (tube or pore). Poorly developed to pronounced collar stricture. Thorax conical, rarely cylindrical in shape proximally; flaring to form a moderately to very broad skirt distally.
Thorax pore frame variable in size, polygonal, elliptical to circular, often arranged in concentric rows. In primitive taxa thorax wall double-layered. Outer layer with large pores and inner layer imperforate or with small pores. Radial bars, rarely also concentric rings may be present in the thorax. Thoracic mouth usually covered by a convex to planiform perforate to imperforate velum with or without accessory aperture. In primitive taxa the velum covers not only the thoracic mouth or its distal part, buth the whole distal side of the skirt reaching until its outer margin. In these forms connecting bars between the distal parts of the skirt and velum are present inside the radial thoracic bars and larges radial hollow tubes may be present origination from the thorax-velum junction in prolongation of the thoracic bars. Cephalis and proximal portion of the thorax frequently covered by secondary layer of epithecal deposits which tend to obscure primary meshwork.
Cephalic spicular system with A, V, L, D, 1, Mb, Ax.

Occurrence: Rhaetian-Cretaceous.

Remarks: In spite of its specialized test shape this family represents a rather conservative stock. From the Rhaetian to Upper Cretaceous the general test shape has not much changed and the spicular system is still primitive in Upper Cretaceous representatives in having well developed l.

## Subfamily Citriduminae n. subfam.

Diagnosis: Neosciadiocapsidae with very large convex velum reaching until the margin of the huge thoracic skirt. By this the shell seems to be biconvex. Radial bars in the thorax always present. Distally there are connecting bars between the radial thoracic bars and the velum. Vertical spine always present. No cephalopyle. Outer layer of wall with large pore frame. Inner layer imperforate to finely porous

Occurrence: Rhaetian-Lower Pliensbachian.

Included genera: *Citriduma* De WEVER, 1982
*Praecitriduma* n. gen.

Remarks: In all genera of the Neosciadiocapsinae PESSAGNO, 1969 the velum closes or narrows only the thoracic mouth but never reaches to the margin of the thoracic skirt. The radial thoracic bars, very rarely present in the Neosciadiocapsinae, are not connected distally by crossing bars with the velum. The shell in the Neosciadiocapsinae has never an outer coarsely latticed layer closed by an inner imperforate to finely porous layer. Instead of the vertical horn mostly a cephalopyle is present in the Neoscidiocapsinae.

## Genus *Praecitriduma* n. gen.

Derivatio nominis: Forerunner of *Citriduma* De WEVER, 1982

Type species: *Praecitriduma mostleri* n. gen. n. sp.

Diagnosis: Test biconvex-discoidal. Cephalis small, poreless, with tiny apical horn and vertical spine. Thorax low, broadly conical with very large thoracic skirt. Pores of the conical part of thorax irregularly arranged, radial bars here not or only indistinctly visible. Pores at the skirt clearly concentrically arranged. The 15-19 (mostly 17) radial ridges are well pronounced on the skirt. The velum reaches until the margin of the skirt. It is convex with a rounded elevation in its centre. By this the test is biconvex in lateral view. Thoracic wall double-layered. Outer layer with large pore frame. Inner layer mostly imperforate.

Occurrence: Rhaetian.

Included species: *Praecitriduma mostleri* n. gen. n. sp.

Remarks: *Citriduma* De WEVER, 1982 is distinguished by the presence of large tubes in prolongation of the radial thoracic bars.

*Praecitriduma mostleri* n. gen. n. sp.

(Pl. 4, fig. 6; pl. 6, fig. 3)

Derivatio nominis: In honour of Prof. Dr. H. MOSTLER, Innsbruck.

Holotype: The specimen at pl. 4, fig. 6; pl. 6, fig. 3; rep. - no. T 5823

Locus typicus: Zlambachgraben, Austria

Stratum typicum: Sample Zl 6/1, Rhaetian Zlambach Beds

Material: 3 specimens

Diagnosis, occurrence and remarks: As for the genus.

Measurements: Maximum diameter of test: 195-216 µm.

Family Deflandrecyrtiidae KOZUR & MOSTLER, 1979

Subfamily Deflandrecyrtiinae KOZUR & MOSTLER, 1979

Genus *Goestlingella* KOZUR & MOSTLER, 1979

Type species: *Goestlingella cordevolica* KOZUR & MOSTLER, 1979

*Goestlingella illyrica* n. sp.

(Pl. 4, fig. 1)

Derivatio nominis: According to the occurrence in the Illyrian.

Holotype: The specimen on pl. 4, fig. 1; rep.-no. T 5824

Locus typicus: Felsőörs, Balaton Highland, Hungary

Stratum typicum: Sample FÖ 87, *Paraceratites trinodosus* zone, Illyrian.

Material: More than 1oo specimens.

Diagnosis: Beginning tricyrtid. Cephalis moderately large with stout apical horn and big ventral spine. Cross section of apical horn round. Cephalis almost poreless, only near the collar stricture 2 small pores may be present in prolongation of both L. Collar stricture broad. Thorax large, globular. Abdomen short, flaring to a moderately large skirt with smooth distal margin. Thorax and abdomen with large pores.

Cephalic spicular system with A, 2 l, V 2 L, Mb. Dorsal spine reduced to a node or quite missing.

Measurements: Length of the unit: 17o-183 µm, diameter of aperture: 1o8-115 µm.

Occurrence: Illyrian of Balaton Highland.

Remarks: Most primitive species of *Goestlingella* KOZUR & MOSTLER, 1979. But like the Ladinian and Cordevolian species D is reduced to a node or quite missing.

Superfamily Triospyridacea HAECKEL, 1882

Family Dipospyrididae HAECKEL, 1882

Subfamily Triassobipedidinae n. subfam.

Diagnosis: Monocyrtid small Nassellaria with three big spines in prolongation of A and 2 L. Cephalis large, subellipsoidal to subcylindrical, poreless or with some large pores near the basis of the two feet.
Spicular system with massive A, V, L, D, l, Mb and arches AV, ? AL, Al, Ll, ? AD, VL, Dl.

Occurrence: Middle Triassic.

Included genus: *Triassobipedis* n. gen.

Remarks: See at the family.

Genus Triassobipedis n. gen.

Derivatio nominis: According to the 2 feet and the occurrence in the Triassic

Type species: *Triassobipedis balatonica* n. gen. n. sp.

Diagnosis and occurrence: See at the subfamily.

Included species: *Triassobipedis balatonica* n. gen. n. sp.

Remarks: *Dipodospyris* HAECKEL, 1882 is very similar, but it has a latticed shell and a distinct sagittal ring. *Bipedis* De WEVER, 1982 is according to De WEVER, 1982 dicyrtid and in the spicular system D is absent. But it seems to be rather monocyrtid. Than it could belong to the Triassobipedidinae n. subfam. It is distinguished from *Triassobipedis* n. gen. by the presence of a cephalopyle and by the absence of D in the spicular system.

Triassobipedis *balatonica* n. gen. n. sp.

(Pl. 4, fig. 4)

Derivatio nominis: According to the occurrence in the Balaton Highland (locality Felsőörs)

Holotype: The specimen on pl. 4, fig. 4; rep.-no. T 5825

Locus typicus: Felsőörs, Balaton Highland

Stratum typicum: Bed 87, *Paraceratites trinodosus* zone (Illyrian)

Material: 7 specimens

Diagnosis, occurrence and remarks: As for the genus and subfamily.

Measurements: Length of the unit: 136-145 µm, largest diameter of aperture: 33,8-34 µm, smallest diameter of aperture: 23,0-23,6 µm.

Family Pylentonemidae DEFLANDRE, 1963

Diagnosis: Monocyrtid, sometimes also with velum-like pseudothorax (dicyrtid). Cephalis large, globular, hemispherical, rarely subpyramidal. It may be perforate or imperforate. Sometimes strongly costate. Aperture moderately large to large.
Spicular system massive and large, with A, V, L, D, l, Mb and the arches AV, Al, LV, Ll, Dl. The arches are sometimes well visible at the surface in form of ribs or more rarely sagittal strictures. In thick-walled taxa the arches are neither at the outer nor at the inner surfaces well visible. In prolongation of A and 2 L are always three stout feet present. Vertical horn often occurs. Also in prolongation of 2 l stout to small spines may be present.

Occurrence: Silurian - Cretaceous.

Remarks: This family has continuously derived from Ordovician pylomate Entactinaria KOZUR & MOSTLER, 1982. In the transition field all genera with a moderately large to large aperture and with beginning bipolarity in the arrangement of the spines (with three strong ones around the aperture) are placed to the Pylentonemidae DEFLANDRE, 1963.

## Subfamily Pylentoneminae DEFLANDRE, 1963

Diagnosis: Cephalis large, spherical to subspherical, imperforate or with pores. Aperture moderately large to large. Three large spines in prolongation of D and 2 L and often some smaller spines are situated around the aperture. On the opposite side a strong spine in prolongation of A is present. Spines in prolongation of V and 2 l always stout, sometimes as long as spines in prolongation of A, D and 2 L. Arches AV and AL missing or indistinct. At least arch Dl present.

Occurrence: Silurian - Middle Triassic.

Included genera: *Pylentonema* DEFLANDRE, 1963: Silurian-Lower Carboniferous
*Cyrtisphaeractenium* DEFLANDRE, 1972: Viséan
*Cyrtisphaeronemium* DEFLANDRE, 1972: Viséan
*Pararchocyrtium* DEFLANDRE, 1972: Viséan
*Neopylentonema* n. gen.: Pelsonian - Fassanian

Remarks: De WEVER, 1981 did not discuss the differences between the subfamilies Pylentoneminae DEFLANDRE, 1963 and Poulpinae De WEVER, 1981. The only phylomorphogenetical trend in the Paleozoic to Triassic Pylentonemidae DEFLANDRE, 1963 that can be used for the separation of these two subfamilies is the reduction of the spines in prolongation of V and 2 1. Spines in prolongation of V and 2 1 are absent or rudimentary in the Poulpinae De WEVER 1981, but always strong in the Pylentoneminae DEFLANDRE, 1963.

The last representatives of true Pylentoneminae DEFLANDRE, 1963, were found in the Middle Triassic of Hungary and the Southern Alps (*Neopylentonema* n. gen. In this genus all spines with exception of V have the same length and sculpture. But also the spine in prolongation of V is very large.
*Eonapora* KOZUR & MOSTLER, 1979 is a transitional genus between the Pylentoneminae DEFLANDRE, 1963 and the Poulpinae De WEVER, 1981. Spines in prolongation of V and 2 1 are still present in this genus, but they are always considerably smaller than those in prolongation of A, D and 2 L.

### Genus *Neopylentonema* n. gen.

Derivatio nominis: Because of the stratigraphic position

Type species: *Neopylentonema mesotriassica* n. gen. n. sp.

Diagnosis: Cephalis very large, with only a few pores near the basis of the spines or along the arches that are on the surface visible as strong ribs.
Spicular system with A, V, L, D, 1, Mb and arches AV, AD,

Al, Vl, LL, Ll, DL, Dl. All spines continue on the surface in very big four-bladed spines. With exception of V they have all about the same length and subterminal verticles with spines that originate in the ends of the four blades. Spine in prolongation of V without verticil, but only a little smaller than the other ones.

Occurrence: Middle Triassic.

Included species: *Neopylentonema mesotriassica* n. gen. n. sp.

Remarks: Distinguished from all other Pylentoneminae DEFLANDRE, 1963 by the presence of verticils in all spines with exception of V and by the strong arches, visible at the surface in form of ridges.
Some of the Poulpinae De WEVER, 1981 have also strong arches, visible on the surface of the cephalis in form of ribs. But no genus of the Poulpinae De WEVER, 1979 has so strong spines in prolongation of V and 2 1.
Most similar is *Eonapora* KOZUR & MOSTLER, 1979 that is the only genus of Poulpinae De WEVER with spines in prolongation of V and 2 1. But these spines are by far smaller than in *Neopylentonema* and have no verticils.

*Neopylentonema mesotriassica* n. gen. n. sp.

(Pl. 4, fig. 5; pl. 5, fig. 1; pl. 6, fig 1)

Derivatio nominis: According to the occurrence in the Middle Triassic.

Holotype: The specimen on pl. 5, fig. 1; pl. 6, fig. 1; rep.-no. T 5826

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

Stratum typicum: Sample MD 1, Fassanian

Material: 9 specimens

Diagnosis, occurrence and remarks: As for the genus.

Measurements: Length of cephalis (without spines): 95-1o7 µm, width of cephalis: 96-1o7 µm; diameter of aperture: 64-68 µm, length of spines: 55-62,5 µm.

Superfamily Parvicingulacea PESSAGNO, 1977

Family Canoptidae PESSAGNO, 1979

Genus *Whalenella* n. gen.

Derivatio nominis: In honour of Prof. Dr. P. A. WHALEN, Dallas

Type species: *Dictyomitra arrecta* HINDE, 19O8 (= *Triassocampe* ? sp. E by YAO, 1982)

Diagnosis: Multicyrtid, elongated conical. Cephalis small, poreless. Thorax also poreless or with very few pores. Other segments with an inner layer with large pore frames that is partly covered by a layer of microgranular silica. Only one ring of pores in the constrictions is uncovered. Until the first postabdominal segment even this pore ring may be covered. The microgranular layer of the abdomen and postabdominal segments is costate. Costae discontinuous, not crossing strictures between the chambers. Aperture large.

Occurrence: ? Ladinian, Norian.

Included species: *Dictyomitra arrecta* HINDE, 19o8

Synonym: *Triassocampe* ? sp. E by YAO, 1982
*Whalenella* n. sp. A ( = *Pseudodictyomitra* - like Nassellaria sensu PESSAGNO et al., 1979)
*Whalenella* ? n. sp. B

Remarks: *Canoptum* PESSAGNO, 1979 and *Japonocampe* KOZUR, 1983 have no costae on the microgranular layer.
*Pseudodictyomitra* PESSAGNO, 1977 is superficially very similar, but has always two rows of pores in the strictures between the costate chambers. There is no direct link between *Whalenella* KOZUR, 1983 and *Pseudodictyomitra* PESSAGNO, 1977.

## Genus *Japonocampe* n. gen.

Derivatio nominis: According to the occurrence in Japan.

Type species: *Triassocampe nova* YAO, 1982

Diagnosis: Multicyrtid, conical. Cephalis small, poreless. Thorax a little larger, also poreless. Abdomen and postabdominal segments partially covered by a layer of microgranular silica. Only one ring of moderately large pores is uncovered situated just below the interferential rings in the constriction.

Occurrence: Upper Carnian-Norian.

Included species: *Triassocampe nova* YAO, 1982

Remarks: In *Canoptum* PESSAGNO, 1979 the whole surface is covered by microgranular silica, in which very small secondary pores may be present.
*Triassocampe* DUMITRICA; KOZUR & MOSTLER, 198o has no cover of microgranular silica. The constrictions are poreless. less.
*Japonocampe* n. gen. seems to be a transitional genus between the Triassocampidae KOZUR & MOSTLER, 1981 (without microgranular cover, constrictions poreless) and the Canoptidae PESSAGNO, 1979 (with microgranular cover troughout the whole test, constrictions of the primary layer with pores).

## Family Triassocampidae KOZUR & MOSTLER, 1981

### Genus *Ladinocampe* n.gen.

Derivatio nominis: According to the occurrence in the Ladinian

Type species: *Ladinocampe multiperforata* n. gen. n. sp.

Diagnosis: Multicyrtid, elongated conical to subcylindrical. Cephalis small, poreless, with stout bladed apical horn. Thorax with numerous small irregularly scattered pores. Following 7-11 segments always separated by deep poreless strictures. Abdomen and first two postabdominal segments either hoop-like with numerous small pores or ring and one or more pore rings below the solid ring. segments inversely conical, with strong proximal solid ring and one more pore rings below the solid ring. In the collar stricture begins a long spine that runs along the outer side of the test until the second or third postabdominal segment. 3-4 short pyramidal thorns originate on the thorax or in the collar stricture. Spicular system with Mb, A, D, l, V, L.

Occurrence: Lower Ladinian.

Included species: *Ladinocampe multiperforata* n. gen. n. sp.
*Ladinocampe* n. sp. (KOZUR & MOSTLER, in press)

Remarks: Most similar to *Yeharaia* NAKASEKO & NISHIMURA, 1979. But this genus has in general an expended thorax with large pores. With exception of the apical horn no thorns or even such long spine like in *Ladinocampe* are present in *Yeharaia* and the solid rings begin always with the abdomen in this genus.

### *Ladinocampe multiperforata* n. gen. n. sp.

(Pl. 5, fig. 2)

Derivatio nominis: According to the numerous pores in each segment.

Holotype: The specimen on pl. 5, fig. 2; rep.-no. T 5828

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

Stratum typicum: Lower Ladinian Buchenstein Beds, sample TT 7

Material: More than 100 specimens.

Diagnosis: Elongated subconical to subcylindrical *Ladinocampe* with hoop-like abdomen, first and second postabdominal segments. These segments bear like the thorax numerous small pores. Only in the second postabdominal segment there is proximal an indistinct solid ring and immedia-

tely below a pore ring. All other pores irregularly scattered. The third and further postabdominal segments are inversely conical with strong proximal solid ring and a ring of moderately large pores below it. Below this pore ring further, but small and irregularly scattered pores are present.

Measurements: Length of the unit: 325-340 µm, maximum width of the unit: 115-119 µm.

Occurrence: Buchenstein Beds of Southern Alps. Middle part of Lower Ladinian.

Remarks: *Ladinocampe* n. sp. KOZUR & MOSTLER (in press) have ring-like abdomen and postabdominal segments with one central pore ring in the abdomen, first and second postabdominal ring.

## Genus *Spinotriassocampe* n. gen.

Derivatio nominis: According to the large apical and lateral spines at the cephalis and the similarity to *Triassocampe* DUMITRICA, KOZUR & MOSTLER, 1980

Type species: *Spinotriassocampe hungarica* n. gen. n. sp.

Diagnosis: Multicyrtid, very elongated subconical to subcylindrical. Cephalis with small to stout apical horn and two very long, wing-like lateral spines in prolongation of 2 L. Thorax, abdomen and postabdominal segments mostly hoop-like to subspherical with 1-2 pore rings or irregularly distributed pores. Sometimes the post-thoracic test consists of circumferential ridges with one pore ring. Constrictions always deep and poreless. Spicular system with Mb, A, D, l, V, L.

Occurrence: World-wide in the Middle Triassic.

Included species: *Spinotriassocampe hungarica* n. gen. n. sp.
*Spinotriassocampe* spp. (still undescribed)

Remarks: By the large wing-like lateral spines of the cephalic easily to distinguish from all other Triassocampidae KOZUR & MOSTLER, 1981

## *Spinotriassocampe hungarica* n. gen. n. sp.

(Pl. 4, fig. 2)

Derivatio nominis: According to the frequent occurrence in Hungary

Holotype: The specimen on pl. 4, fig. 2; rep.-no. T 5827

Locus typicus: Felsőörs, Balaton Highland

Stratum typicum: Bed 87, *Paraceratites trinodosus* zone (Illyrian)

Material: 53 specimens.

Diagnosis: Multicyrtid, elongated subconical. Cephalis small to moderately large, poreless, with strong round apical horn and two similarly large, round straight lateral spines. Thorax subglobular, with few very small pores. Abdomen and postabdominal segments subglobular to hoop-like, with scattered pores that are not arranged in rings. Constrictions deep and broad, poreless.

Measurements: Length of the unit: 236-240 µm, maximum width of the unit: 83-87 µm, length of lateral spines: 61-64 µm

Remarks: There are still several undescribed *Spinotriassocampe* species, mostly of Ladinian age. *Spinotriassocampe* n. sp. A (= *Stichopilium* sp. A sensu NAKASEKO & NISHIMURA, 1979) has similar spines, but is more slender and the smaller segments have one or two pore rings.
Also *Spinotriassocampe* n. sp. B (= *Triassocampe*? sp. F sensu YAO, 1982) is more slender and the smaller segments have only one pore ring. Moreover, the apical spine is small in this species and the large lateral spines are downward-curved.

Remarks to the stratigraphic value of the new radiolarian taxa

The *Praewilliriedellum*, *Praezhamoidellum*, *Japonocapsa*, *Striatojaponocapsa* and *Yaocapsa* species of Csipkés-tető are accompanied by species of *Unuma*, *Parvicingula*, *Hsuum* and *Lupherium*, e. g. *Hsuum mirabundum* PESSAGNO & WHALEN, 1982, *Lupherium ophicerense* PESSAGNO & WHALEN, 1982. The two latter species are guide forms for the lower *Otoites sauzei* zone (lower part of Middle Bajocian) of Oregon. Rich assemblages of the above mentioned genera are also known from the Bajocian of Japan. The same radiolarian fauna is present in the manganese shales of the Tolekesvölgy Formation of Rudabánya Mts.

The paleontological evidence for Jurassic strata - the first in the Bükk Mts. and Rudabánya Mts. and in whole northern Hungary - is very important for the stratigraphical and tectonical interpretations of these areas. In the Bükk Mts. the whole South Bükk Shales as well as similar shales in the western Bükk Mts. with pillow lavas belong to the Jurassic. In many localities Bajocian radiolarians were found. Middle Jurassic radiolarians are also present in a tectonic window in the NE Bükk (Kisfennsík) surrounded and tectonically overlain by Triassic and Paleozoic beds. Therefore the whole Paleozoic - Triassic sequence of the northern, central, southeast and isolated parts of the southern Bükk Mts. are part of a nappe structure (see also KOZUR, in press, BALOGH, KOZUR & PELIKÁN, in preparation).

The many new radiolarian species of the Bükk Jurassic will be described in a separate paper (this journal, in press).

*Tricolocampe* HAECKEL, 1882 emend., well recognizable even in thin sections, is a frequent and good indicator for Jurassic age. The Triassic occurrence reported by DE WEVER, 1979, from the sample XPF 30 seems to be a stratigraphic misinterpretation of a Jurassic sample with reworked Norian radiolarians.

Very important guide forms belong to the Lower Ladinian genus *Spongosilicarmiger*. Most of these species will be described by KOZUR & MOSTLER (this journal, in preparation).

*Nakasekoellus* n. gen. includes world-wide distributed Norian guide forms. Also this genus, like *Tricolocampe* HAECKEL, 1882 emend. is well recognizable in thin sections, often even in specific level.

*Goestlingella illyrica* n. sp. is the oldest so far known species of *Goestlingella* KOZUR & MOSTLER, 1979. This genus includes several important and easily recognizable guide forms for the Illyrian to Cordevolian times. The Cordevolian species were described by KOZUR & MOSTLER, 1979, 1981. The Ladinian species will be described by KOZUR & MOSTLER (this journal, in preperation).

*Spinotriassocampe* n. gen. yields important guide forms for the Anisian and Ladinian, whereas *Japonocampe* n. gen. is a stratigraphically important Upper Triassic genus.

All other described genera and species are rather rare taxa, but partly highly interesting regarding their phylomorphogenetic relationships.

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EXPLANATION OF PLATES

Plate 1

Figs. 1-3: *Praewilliriedellum spinosum* n. sp., road cut W of Csipkés-tető (southern Bükk Mts.), coordinates: x = - 557.67o, y = 6o7.38o. Dark cherts of Middle Bajocian age, Fig. 1: holotype, rep. no. J 1o3o3. a) lateral view, x 48o; b) upper view, x 6oo. Fig. 2: lateral view, x 6oo, rep. no. J 1o3o7 Fig. 3: sutural pore of an other specimen, x 16oo, rep. - no. J 1o3o8

Fig. 4: *Japonocampe nova* (YAO, 1982), holotype, locality 16 according to YAO, 1982, Inuyama area (Japan), Upper Norian *bidentata* conodont zone, rep. - no. OCU MR 2466, x 142. From YAO, 1982.

Fig. 5: *Whalenella* n. sp. A (= *Pseudodictyomitra* - like Nassellaria sensu PESSAGNO et al., 1979), locality V 5A3 sensu PESSAGNO et al., 1979, Vizcaino Peninsula, Baja California Sur (México), Chert Member of San Hipólto Formation, Norian, x 125. From Pessagno et al., 1979.

Plate 2

Fig. 1: *Praewilliriedellum cephalospinosum* n. gen. n. sp., holotype, road cut of Csipkés-tető (southern Bükk Mts.), coordinates: x = - 557-67o, y = - 6o7.38o. Dark Cherts of Middle Bajocian age, rep.-no. J. 1o3o2 a) oblique upper view, x 54o, b) lateral view, x 4oo, c) oblique lower view, x 54o.

Fig. 2: *Natraglia unica* PESSAGNO, 1979, holotype, locality V 4FB according PESSAGNO et al., 1979, Vizcaino Peninsula, Baja California Sur (México), Chert Member of San Hipólto Formation, Norian, x 36o. From PESSAGNO et al., 1979.

Fig. 3: *Whalenella arrecta* (HINDE, 19o8), locality 16 according to YAO, 1982, Inuyama area (Japan), Upper Norian *M. bidentatus* conodont zone, rep. - no. S 16-1-19/4, 161-8b. x 142 (from YAO, 1982 = *Triassocampe* ? sp. E YAO, 1982.

Fig. 4, 5: *Nishimuraella nana* (SHENG, 1976), locality 16 according to YAO, 1982, Inuyama area (Japan), Upper Norian *M. bidentatus* conodont zone, rep. - nos. fig. 4: S 16-1-7/9, 159-1oa, fig. 5: S 16-1-9/1. x 142 (from YAO, 1982 = *Siphonocampium* ? sp. A. YAO, 1982).

Fig. 6: *Nakasekoellus pygmaeus* (HINDE, 19o8), locality MN 23o1 according to NAKASEKO & NISHIMURA, 1979, Mino belt (central Japan), Upper Carnian, rep. - no. MT MN 23o1-5. x 34o (from NAKASEKO & NISHIMURA, 1979 = *Eucyrtidium* ? sp. A).

Plate 3

Fig. 1: *Praezhamoidellum buekkense* n. sp., holotype, road cut W of Csipkés-tető (southern Bükk Mts.), Coordinates: x = - 557.67o, y = - 6o7.38o. Dark cherts of Middle Bajocian age, rep. - no. J 1o3o5. a) lateral view, x 94o, b) upper view, x 1ooo

Fig. 2: *Whalenella* ? n. sp. B, Felsőörs (Balaton Highland, Hungary), uppermost part of Buchenstein Beds, sample FÖ 11o. x 26o, rep. - no. T 5829.

Fig. 3: *Praezhamoidellum yaoi* n. gen. n. sp., holotype, road cut W of Csipkés-tető, coordinates: x = - 557.67o, y = - 6o7.38o. Dark cherts of Middle Bajocian age; rep.- no. J 1o3o4. x 86o. a) lateral view, b) oblique lateral view, small aperture visible.

Fig. 4: *Nakasekoellus polita* (HINDE, 19o8), locality MN 23o1 after NAKASEKO & NISHIMURA, 1979, Mino belt (central Japan), Upper Carnian, rep. - no. MT MN 23o1-3. x 34o (from NAKASEKO & NISHIMURA, 1979 = *Dictyomitra pessagnoi* NAKASEKO & NISHIMURA, 1979).

Plate 4

Fig. 1: *Goestlingella illyrica* n. sp., holotype, Felsőörs (Balaton Highland, Hungary), grey limestones of *Paraceratites trinodosus* zone, sample FÖ 87, Illyrian, rep. - no. T 5824. x 4oo.

Fig. 2: *Spinotriassocampe hungarica* n. sp., holotype, Felsőörs (Balaton Highland, Hungary), grey limestones of *Paraceratites trinodosus* zone, sample FÖ 87, Illyrian, re. - no. T 5827. x 32o.

Fig. 3: *Silicarmiger curvatus* (KOZUR & MOSTLER, 1979), emend., oberes Cordevol, sample FS 8 (see MOSTLER & SCHEURING, 1974), Großreifling (Austria), rep. - no. T 583o. x 26o.

Fig. 4: *Triassobipedis balatonica* n. sp., holotype, Felsőörs (Balaton Highland, Hungary), grey limestones of *Paraceratites trinodosus* zone, sample FO 87, Illyrian, rep. - no. T 5825. a) lower view, x 6oo, b) lateral view, x 54o.

Fig.: *Neoplylentohema mesotriassica* n. gen. n. sp., oblique lower view, Passo della Gabiola, Recoaro (Vicentinian Alps, Italy), sample MD 22, Buchenstein Beds, Lower Ladinian, rep. - no. T 5831. x 32o.

Fig. 6: *Praecitriduma mostleri* n. gen. n. sp., holotype, upper view, Zlambachgraben (Austria), Rhaetian part of Zlambach marls, sample Zl 6/1, rep.-no. T 5823. x 2oo.

Plate 5

Fig. 1: *Neopylentonema mesotriassica* n. gen. n. sp., holotype, Passo della Gabiola, Recoaro (Vicentinian Alps), Buchenstein Beds, sample MD 1, Lower Ladinian, rep.-no. T 5826. a) lower view, x 36o, b) lateral view, x 4oo, c) spicular system, x 1ooo.

Fig. 2: *Ladinocampe multiperforata* n. sp., holotype, road cut San Ulderico-Pallé, Tretto (Vicentinian Alps, Italy), Buchenstein Beds, Lower Ladinian, sample TT 7, rep. - no. T 5828. x 22o.

Plate 6

Fig. 1: *Neopylentonema mesotriassica* n. gen. n. sp., holotype, oblique lateral view (other views see pl. 5, figs. 1a-c), Passo della Gabiola, Recoaro (Vicentinian Alps, Italy), Buchenstein Beds, sample MD 1, Lower Ladinian, rep. - no. T 5826. x 4oo.

Fig. 2: *Spongosilicarmiger italicus* n. gen. n. sp., holotype, Passo della Gabiola, Recoaro (Vicentinian Alps, Italy), Buchenstein Beds, sample MD 1, Lower Ladinian, rep. - no. T 5822. x 2oo.

Fig. 3: *Praecitriduma mostleri* n. gen. n. sp., holotype (see also pl. 4, fig. 6), Zlambachgraben (Austria) Rhaetian part of Zlambach Marls, sample Zl 6/1, rep. - no. T 5823, a) oblique upper view, x 3oo, b) oblique lateral view, x 6oo.

Plate 7

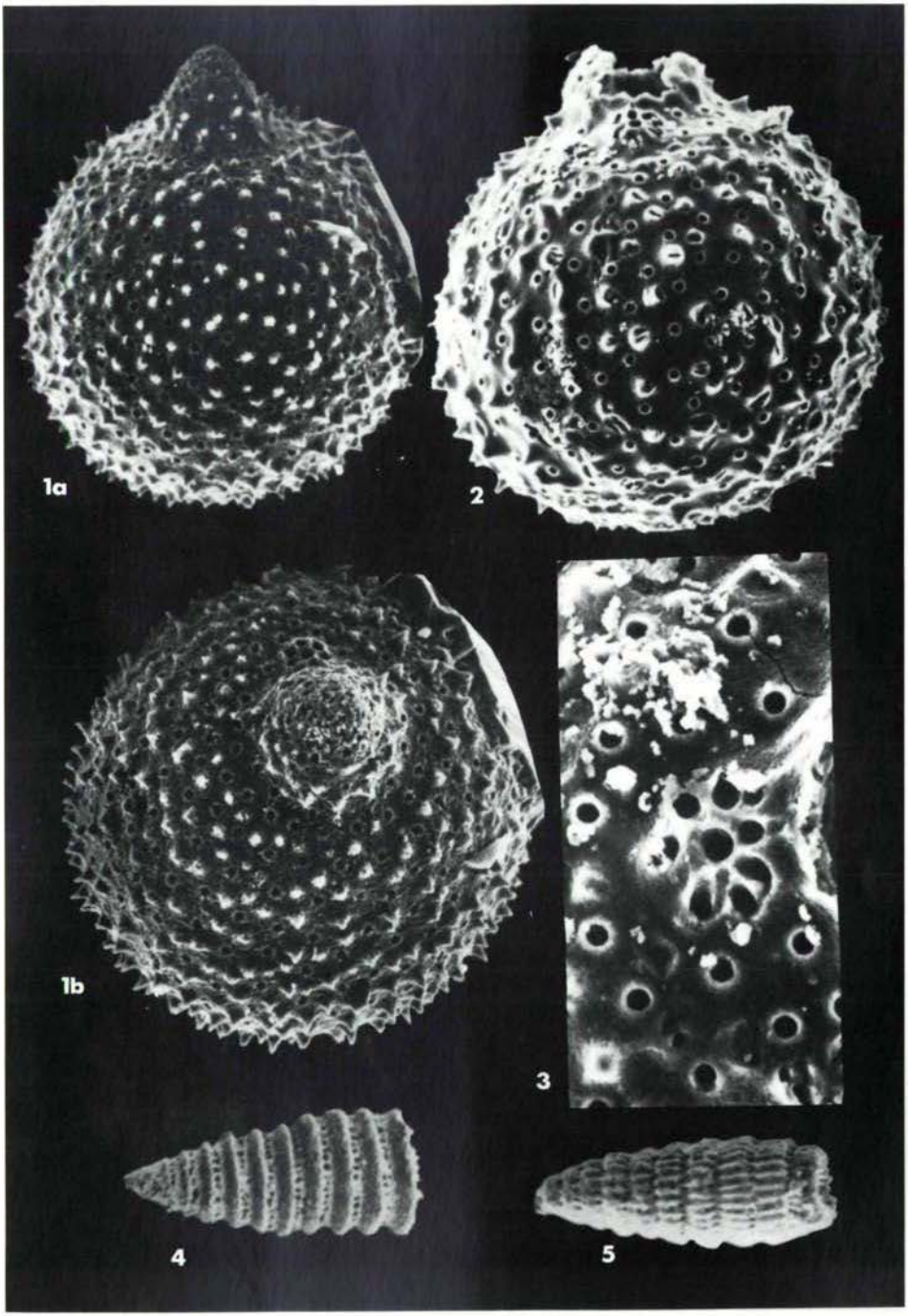
Fig. 1: *Spongosilicarmiger italicus* n. gen. n. sp., holotype (see also pl. 6, fig. 2), Passo della Gabiola, Recoaro (Vicentinian Alps, Italy), Buchenstein Beds, sample MD 1, Lower Ladinian, rep. - no. T 5822. x 4oo. a) distal part, b) proximal part, apical spine (covered by spongy to microgranular layer) expanded in its middle part, apical part still bladed.

Fig. 2: *Japonocapsa fusiformis* (YAO, 1979), Varga-tető (western Bükk Mts.) coordinates: x = - 556.o8o, y = - 594.2oo, dark cherts within black shales of Bajocian age, rep. - no. J 1o3o9. x 4oo.

Fig. 3: *Striatojaponocapsa plicarium* (YAO, 1979), Varga-tető (western Bükk Mts.), coordinates: x = - 556.o8o, y = - 594.2oo; dark cherts within black shales of Bajocian age, rep. - no. J. 1o31o. x 48o.

Fig. 4: *Yaocapsa macroporata* n. sp., holotype, Varga-tető (western Bükk Mts.), coordinates: x = - 556.o8o, y = - 594.2oo; dark cherts within black shales of Bajocian age, rep. - no. J 1o3o6. x 54o.

## Plate 1



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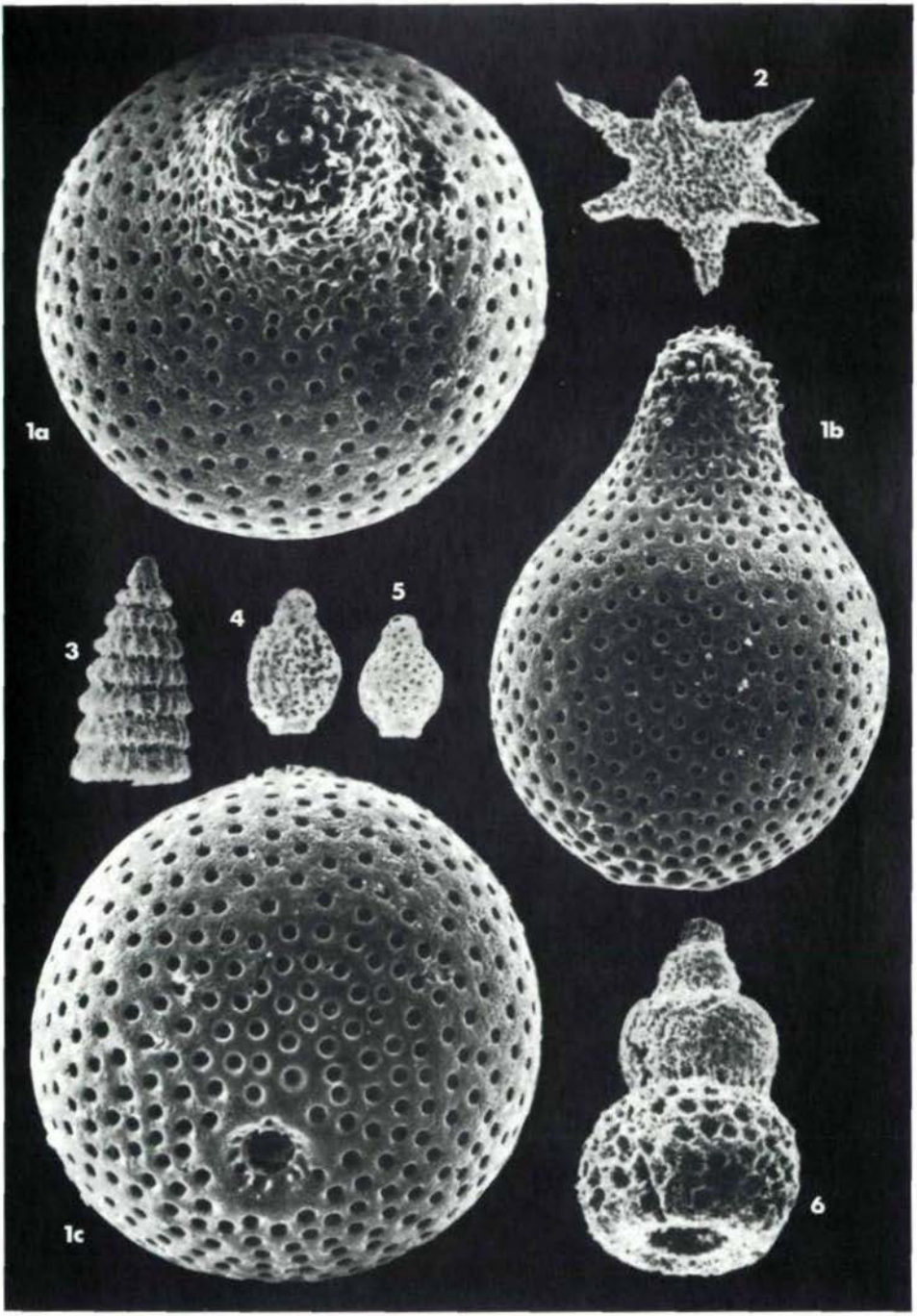

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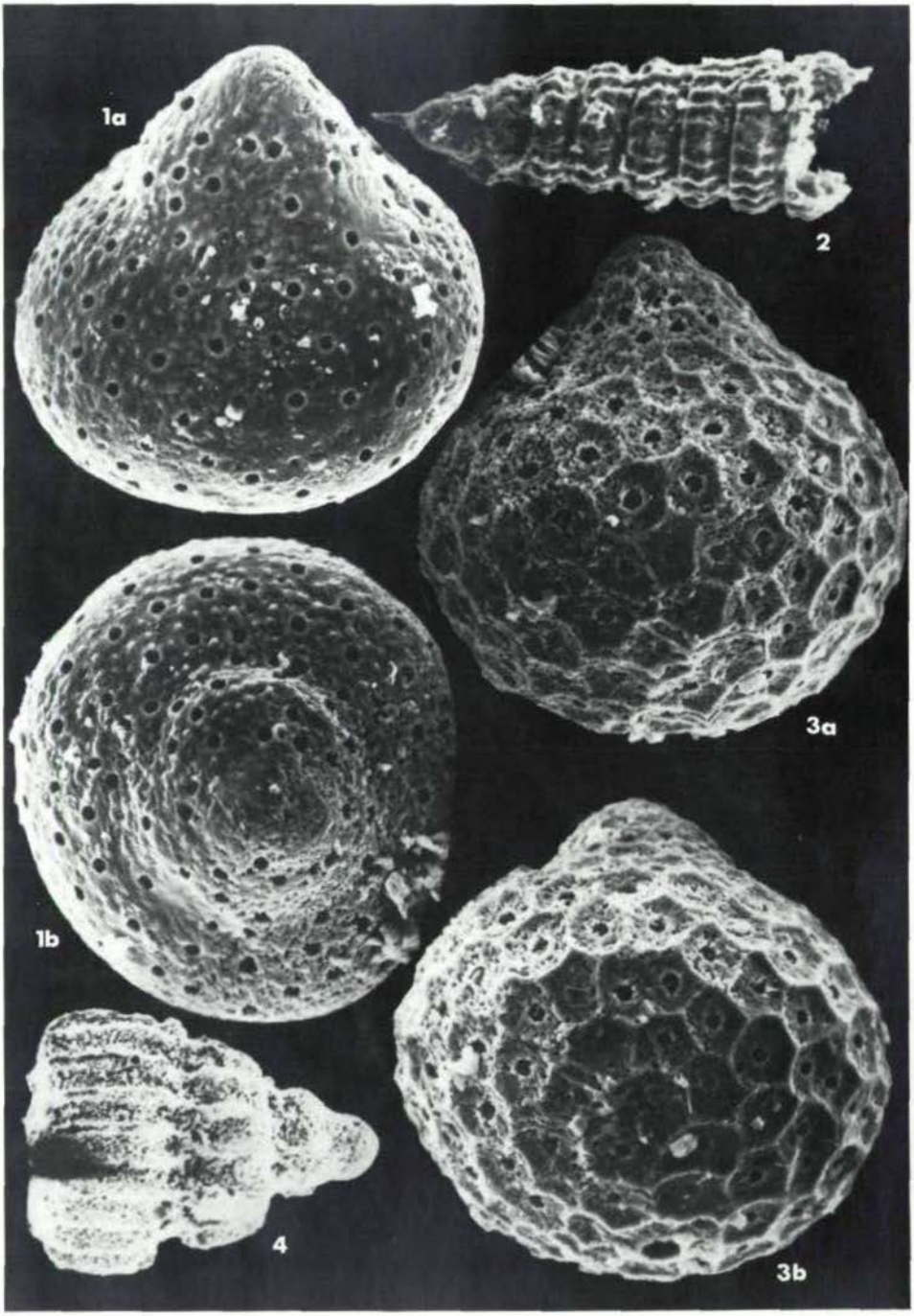

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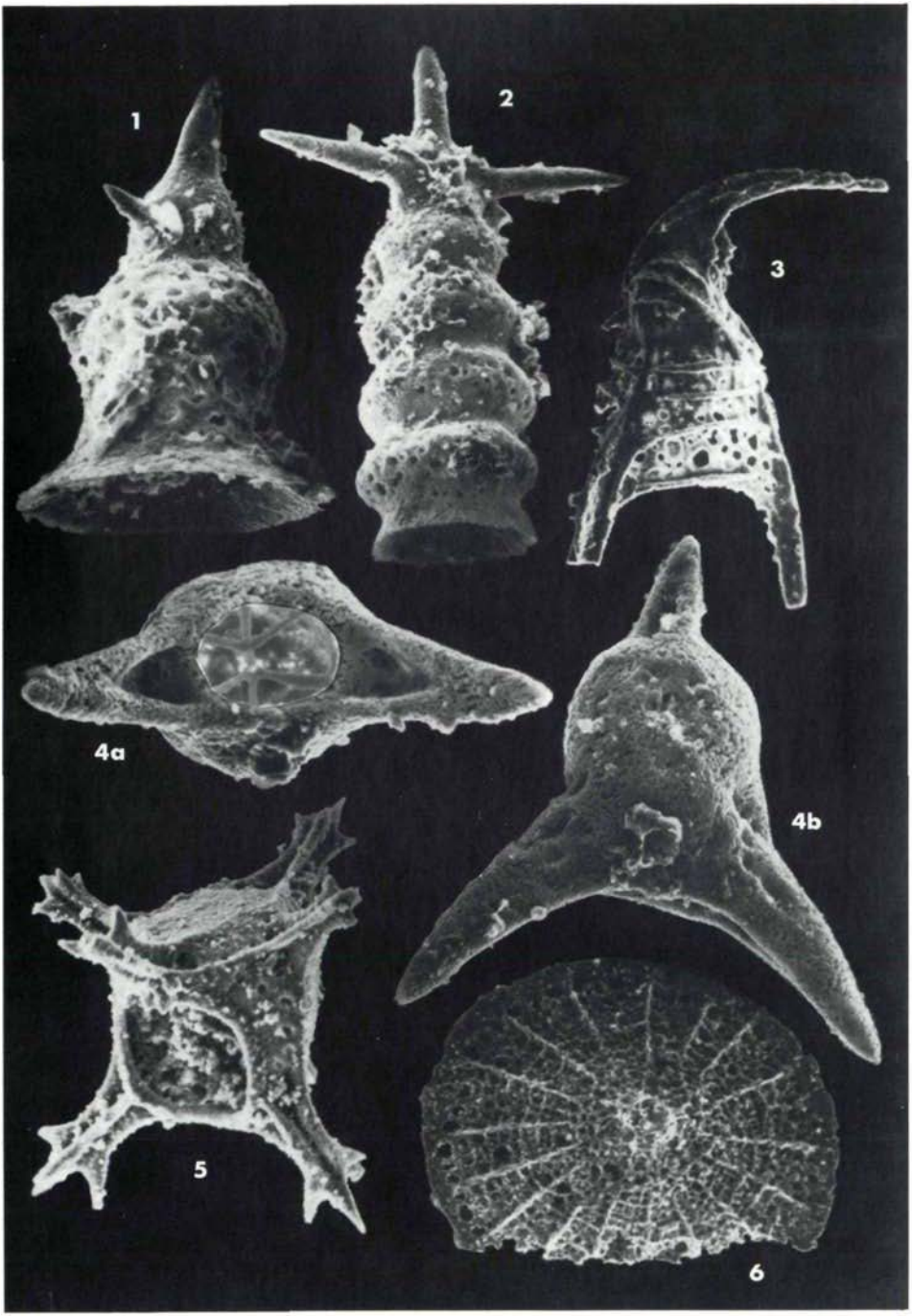

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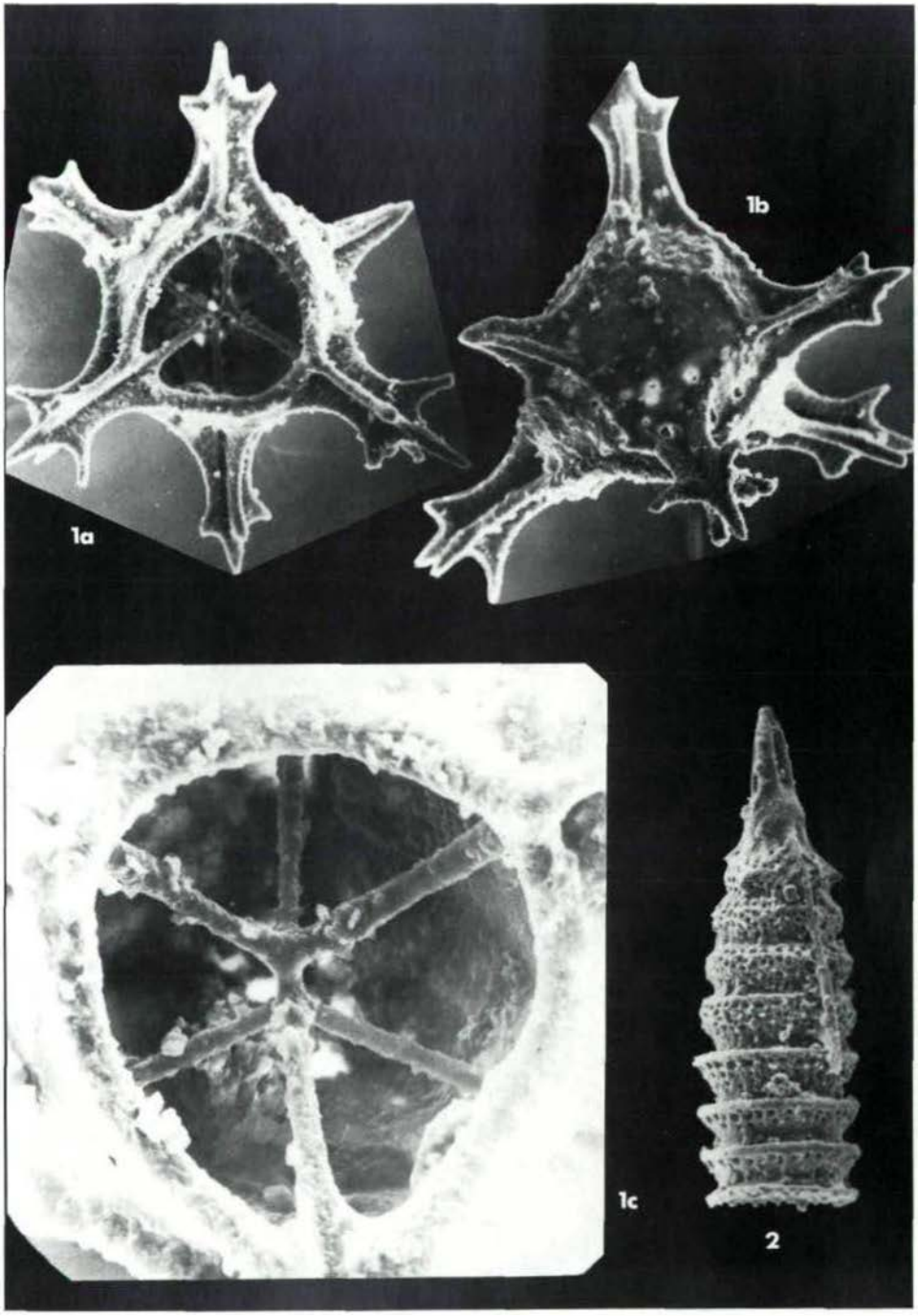

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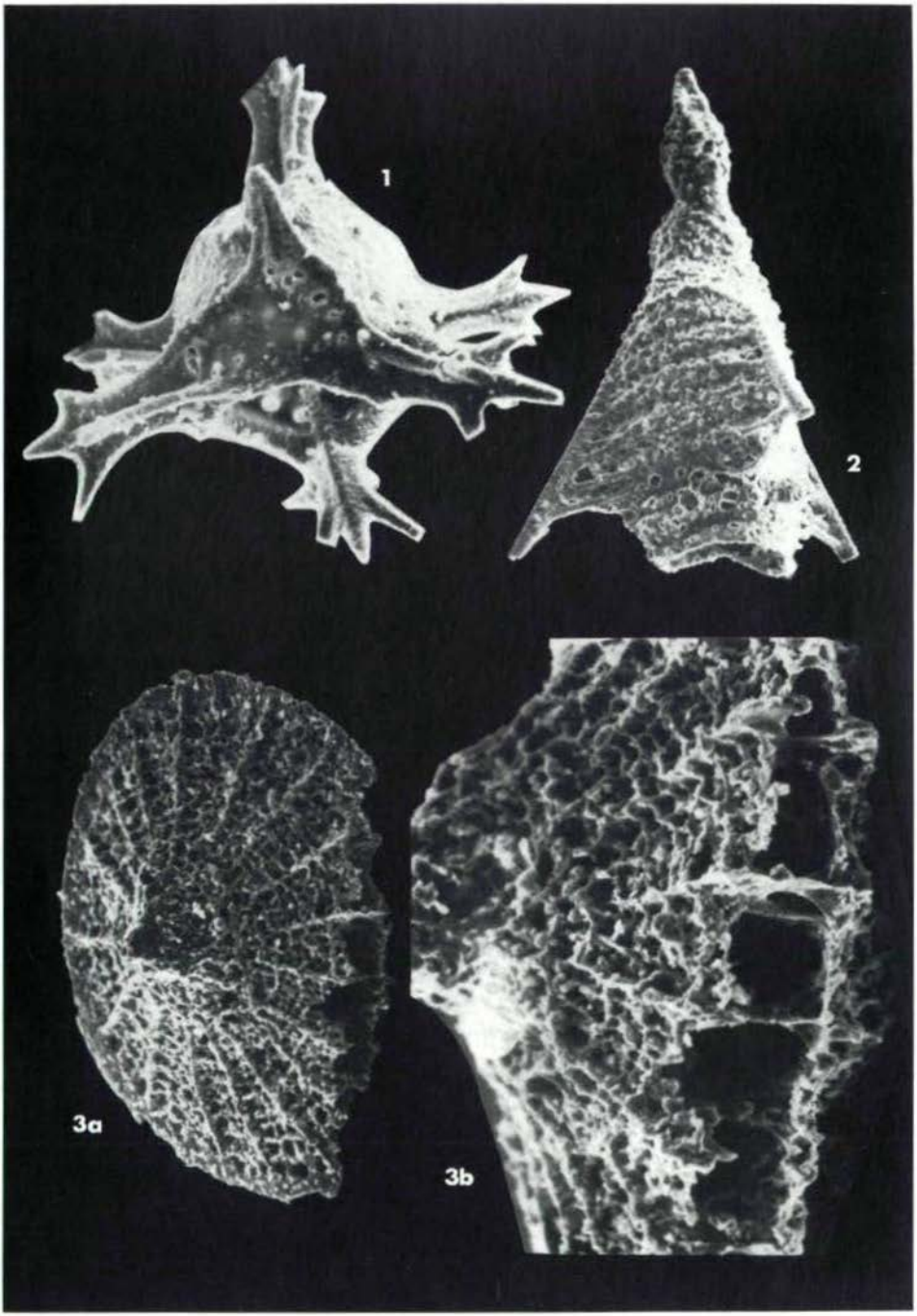

## Plate 7