

RADIOLARIANS FROM A LOWER CRETACEOUS SECTION AT LIPNIK NEAR BIELSKO-BIAŁA (CARPATHIANS, POLAND)

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Abstract: Radiolarians (Polycystina) from the Lower Cretaceous (Hauterivian to Albian) of Lipnik near Bielsko-Biała are redescribed. The previous determinations are revised on the basis of observations in SEM. The radiolarians belong to the order Spumellaria (7 species) and to Nassellaria (11 species).

Key words: Radiolarians, Lower Cretaceous, Outer Carpathians, Poland.

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INTRODUCTION

The presence of radiolarians (Polycystina) in the Lower Cretaceous deposits from Lipnik near Bielsko-Biała (Fig. 1) was first reported by Geroch & Nowak (1963). Recently, the specimens from this locality have been studied in SEM and the previous determinations have been revised. The occurrence of some species, which have not been recorded before, has been ascertained. The species determined belong to Spumellaria (7 species) and to Nassellaria (11 species). Among these taxons, there are index species of the Lower Cretaceous, such as *Hemicryptocapsa tuberosa* Dumitriča and *Holocryptocanium japonicum* Nakaseko, Nishimura & Sugano (*vide* Aoki, 1982), and also *Thanarla conica* (Aliev) (*vide* Pessagno, 1977; Dr Schaaf, personal communication, 1986).

There are many records of the occurrence of radiolarians in the Cretaceous deposits in the outer Carpathians (e.g. Sujkowski, 1932; Burtanówna *et al.*, 1933; Książkiewicz, 1951; Bieda *et al.*, 1963; Geroch *et al.*, 1967). They concern mostly the so-called Radiolarite beds included in the Cenomanian. But, in the same time, the taxonomy and morphology of these fossils from this region in Poland is poorly known.

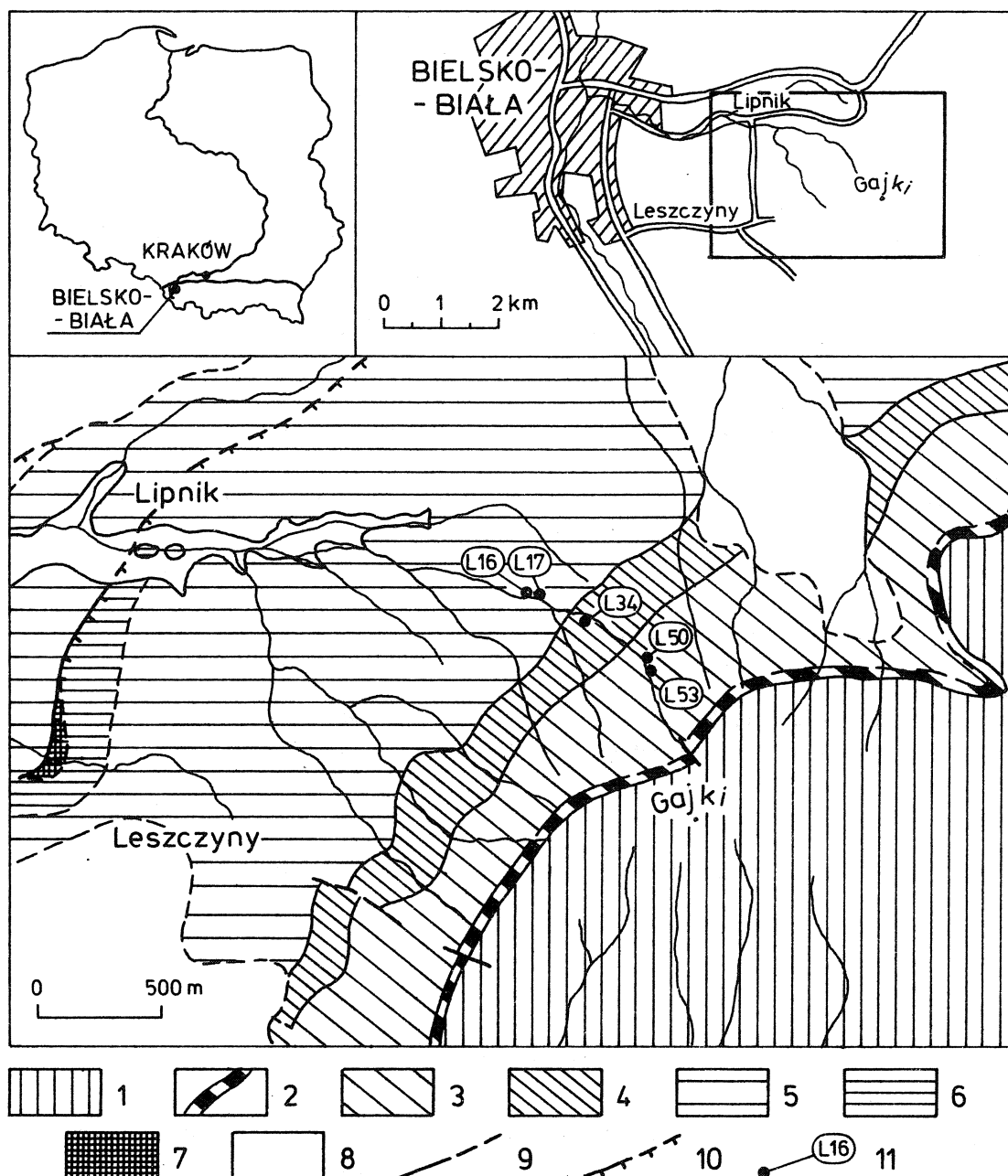


Fig. 1. Geological sketch map of vicinity of Lipnik (after Geroch & Nowak, 1963) showing the location of the section studied. 1 – Lower Godula beds; 2 – Upper Lgota Beds (Mikuszowice silex); 3 – Lower and Middle Lgota beds; 4 – Verovice beds; 5 – Upper Cieszyn Shales and Grodziszcze Shales; 6 – Cieszyn Limestones; 7 – Lower Cieszyn Shales; 8 – Quaternary; 9 – faults; 10 – overthrusts; 11 – position of samples

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The collection of figured specimens is housed in the Institute of Geology, Warsaw University under the numbers RI/1–RI/18.

Geological situation

The rocks exposed at Lipnik near Bielsko-Biala are flysch deposits of the Silesian nappe of the Outer Carpathians. The lithostratigraphic profile of these deposits after Geroch and Nowak (1963, fig. 1–3) is shown in Figure 2. The discussion on the biostratigraphy and age of these deposits is to be found in Bieda *et al.* (1963) and in Geroch *et al.* (1967).

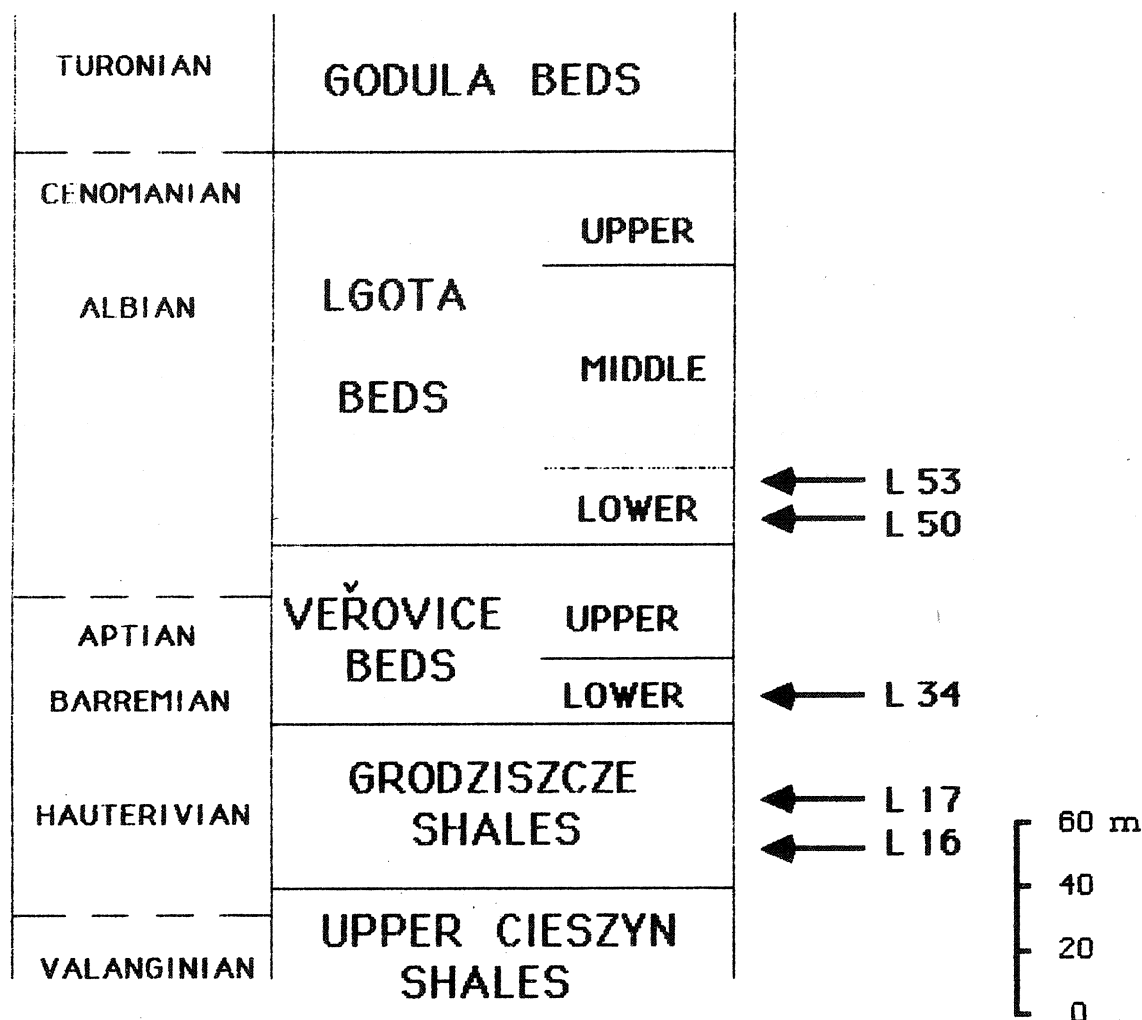


Fig. 2. Position of micropalaeontological samples in the stratigraphical column of Lower Cretaceous of Lipnik

The contacts between the lithostratigraphic units mentioned reveal no apparent breaks in sedimentation, except for that between the Lgota beds and Godula beds. It is supposed that there is a hiatus at the boundary between those units related to intraformational erosion.

The rocks of the two oldest units (the Cieszyn Shales and Grodziszczce Shales) contain calcium carbonate, which is present in both pelitic deposits (marly shales, marls) and in the coarse-grained ones (sandstones). In the younger units, from the Verovice Beds up, the pelitic deposits (shales) are devoid of calcium carbonate while the coarse-grained ones (sandstones,

conglomerates, cherts) are calcareous. The distribution of microfauna in these deposits is related to the calcium carbonate content. The marly shales and marls of the Upper Cieszyn Shales and Grodziszczce Shales contain calcareous and agglutinated foraminifers and radiolarians. In the shales of the Verovice Beds and Lgota Bedes there occur, almost exclusively, agglutinated foraminifers and radiolarians. The sandstones and cherts include calcareous foraminifers and sponge spicules.

Thirty-five taxons of agglutinated and calcareous foraminifers, ten taxons of radiolarians, and two taxons of *Cadosina* have been recorded from the Lower Cretaceous section at Lipnik by Geroch and Nowak (1963).

MATERIAL

The present collection of radiolarians has been derived from the samples L. 16, L. 17, L. 34, L. 50 and L. 53. The position of the samples is indicated in Figure 2. Their lithology is as follows: samples L. 16 and L. 17 are alternating dark and light gray, marly shales; sample L. 34 is black shale (flaky when weathered); samples L. 50 and L. 53 are greenish-gray, spotted shale. The most abundant radiolarians have been recovered from samples L. 17 and L. 34.

The present specimens are pyritised or calcified. Pyritisation and calcification of radiolarian skeletons found in Mesozoic deposits is a common phenomenon (Sanfilippo & Riedel, 1985). The skeletons are, in most cases, thick and massive, which is probably due to diagenetic processes.

SYSTEMATIC DESCRIPTIONS

Subclass RADIOLARIA Müller, 1858

Superorder POLYCYSTINA Ehrenberg, 1838, emend. Riedel, 1967

Order SPUMELLARIA Ehrenberg, 1875

Family ELLIPSIDIIDAE Haeckel, 1887

Genus *Cenellipsis* Rüst, 1885

Cenellipsis sp.

Pl. I: 2

1963 *Cenellipsis* sp.; Geroch & Nowak, p. 253, fig. 6: 10.

Material. Few well preserved specimens.

Dimensions (in μm). Longer axis 230–250, shorter axis 175–190.

Description of specimens. Skeletons ellipsoidal, meshwork very fine with elliptical pore frames.

Occurrence. Lower Lgota Beds at Lipnik, Albian (sample L. 50).

Family ACTINOMMIDAE Haeckel, 1862, emend. Riedel, 1971

Genus *Conosphaera* Haeckel, 1887*Conosphaera* sp.

PL. I: 5

1963 *Conosphaera* cf. *sphaeroconus* Rüst; Geroch & Nowak, p. 253, fig. 6; 7.

Material. A few well preserved specimens.

Dimensions (in μm). Diameter about 200–212.

Description of specimens. Skeletons spherical, hollow, thin walled, surface bumpy, covered with meshwork.

Occurrence. Grodziszczce Shales at Lipnik, Hauterivian (sample L. 16).

Family PORODISCIDAE Haeckel, 1881, emend. Kozlova in: Petrushevskaja & Kozlova, 1972

Genus *Histiastrum* Ehrenberg, 1847*Histiastrum aster* Lipman, 1952

PL. III: 5

1952 *Histiastrum aster* n. sp.; Lipman, p. 35, pl. 11, figs. 6–7.1962 *Histiastrum aster* Lipman; Lipman, p. 300, pl. 2, fig. 5.1966 *Histiastrum aster* Lipman; Kozlova & Gorbovets, p. 84, pl. 3, fig. 9.1981 *Crucella aster* (Lipman); Nakaseko & Nishimura, p. 148, pl. 2, figs. 9, 101981 *Histiastrum aster* Lipman; Schaaf, p. 435, pl. 8, fig. 1, pl. 11, fig. 5.1984 *Histiastrum aster* Lipman; Schaaf, p. 160, fig. 2.

Material. More than ten well preserved specimens.

Dimensions (in μm). Distance between shoulder terminations (along diameter) about 280–320; length of shoulders 70–80, width of shoulders 100–120.

Description of specimens. Skeleton thick, flattened, cross shaped. Central part discoidal with four massive shoulders projecting from it. Shoulders have wide bases and rounded or truncated terminations. Sides of the cross slightly concave. Meshwork irregular, pores finer over central area and coarser over shoulders.

Remarks. In specimens studied, the concavity of sides and the shape of shoulder terminations vary.

Occurrence. Grodziszczce Shales at Lipnik, Hauterivian (sample L. 17).

Family PHACODISCIDAE Haeckel, 1882

Genus *Phacotriactis* Sutton, 1896*Phacotriactis* sp.

Pl. II: 6

Material. A few well preserved specimens.

Dimensions (in μm). 233–288.

Description of specimens. Skeletons triangular, apices slightly truncated and rounded, sides straight or slightly concave. Central part raised, ornamented by concentric rings. Meshwork irregular.

Remarks. In these specimens, the elongation of apices and the degree of concavity of sides vary.

The concentric rings can not be interpreted as corresponding to the corner in *Pyramispongia* Pessagno (see Pessagno, 1973, p. 78).

Occurrence. Grodziszczce Shales at Lipnik, Hauterivian (sample L. 17).

Family PSEUDOAULOPHACIDAE, 1967

Genus *Pseudoaulophacus* Pessagno, 1963*Pseudoaulophacus* sp.

Pl. I: 6

Material. More than ten well preserved specimens.

Dimensions (in μm). Diameter of disc 250–500.

Description of specimens. Skeletons rounded, discoidal. Over central part of both surfaces there occur circular raised areas covering 1/3 of disc surface.

Remarks. Variability of described specimens concerns the size of disc. They differ from *P. floresensis* Pessagno (1963, p. 200, pl. 2: 2, 3, pl. 4: 6, pl. 7: 1, 5) in lacking 3 spines.

Occurrence. Grodziszczce Shales at Lipnik, Hauterivian (sample L. 17).

Family SPONGODISCIDAE Haeckel, 1882

Genus *Spongodiscus* Ehrenberg, 1854a*Spongodiscus multus* Kozlova, 1966

Pl. III: 6

1966 *Spongodiscus* (?) *multus* Kozlova & Gorbovets, p. 87-88, pl. 4: 10.

Material. One well preserved specimen.

Dimensions (in μm). Diameter 270, height 160.

Description of specimen. Skeleton drum-shaped, with almost flat surfaces and concave lateral side. Meshwork irregular.

Occurrence. Grodziszczce Shales at Lipnik, Hauterivian (sample L. 17).

Family CAVASPONGIDAE Pessagno, 1973

Genus *Pyramispongia* Pessagno, 1973? *Pyramispongia* sp.

Pl. II: 5

Material. A few well preserved specimens.

Dimensions (in μm). About 230.

Description of specimens. Skeleton subtriangular, apices rounded, sides more or less convex. Meshwork irregular.

Remarks. The described specimens lack fine structures due to pyritisation, which makes the generic assignment uncertain. If the presence of lateral "gates" between triangle corners could be ascertained, the specimens would be included in *Cavaspongia* Pessagno (1975, p. 76). However, the present specimens more resemble *Pyramispongia* Pessagno (1973, p. 78–79). The raised areas at corners of the skeletons have not been observed with certainty due to poor preservation. The skeleton surface is irregular.

Occurrence. Grodziszczce Shales at Lipnik, Hauterivian (sample L. 17).

Order NASSELLARIA Ehrenberg, 1875

Family STICHOCYRTIDAE Haeckel, 1882

Genus *Cyrtocapsa* Rüst, 1885*Cyrtocapsa grutterinki* Tan Sin Hok, 1927

Pl. I: 4

1927 *Cyrtocapsa grutterinki* n. sp., Tan Sin Hok, p. 64, pl. 13, fig. 110.1981 *Cyrtocapsa grutterinki* Tan Sin Hok; Nakaseko & Nishimura, p. 149, pl. 13, figs. 9, 10.1981 *Cyrtocapsa grutterinki* Tan Sin Hok; Schaaf, p. 433, pl. 6, figs. 6ab.

1984 *Cyrtocapsa grutterinki* Tan Sin Hok; Schaaf, p. 156, figs 3ab.

Material. A few well preserved specimens.

Dimensions (in μm). Height about 210–237, maximum width 150–175.

Description of specimens. Skeletons pear-shaped, apical spine present. Meshwork irregular.

Remarks. In thin sections the presence of 3 to 4 segments has been noted.

Occurrence. Lower part of Verovice Beds, Barremian (sample L. 34).

Genus *Stichocapsa* Haeckel, 1881

Stichocapsa sp.

Pl. III: 2

1963 *Stichocapsa an beckmanni* Rüst; Geroch & Nowak, p. 253, fig. 6: 1, 2.

Material. Numerous, poorly preserved specimens.

Dimensions (in μm). Height about 400–500, maximum width 210–230.

Description of specimens. Skeletons elongated; cephalis rounded, devoid of abdominal spine, thorax and abdomen. Postabdominal chambers, six in number, trapesoidal, increase indistinctly in height towards the cephalis. Limits between segments marked by slight constrictions and rows of oval apertures. Base closed. Surface of skeleton finely granulate.

Remarks. *Stichocapsa* sp. is similar, in general shape and the microstructure of the external skeleton layer, to *Canoptum poissoni* Pessagno from Lower Triassic and Lias of California (Pessagno, Finch & Abbott, 1979, p. 184, pl. 4: 10, 16), but differs from the latter in being larger, less elongated and in lacking the oral orifice. Moreover, in *C. poissoni*, the segments are separated by an aperture.

Occurrence. Lower part of Lgota Beds, Albian (sample L. 53).

Genus *Stichomitra* Cayeux, 1897

Stichomitra sp.

Pl. III: 3

Material. More than ten well preserved specimens.

Dimensions (in μm): Height 350–380, maximum width 150–165.

Description of specimens. Skeletons conical, elongated. Capitulum and thorax indistinct. Abdomen consisting of 8 segments, separated by slight constrictions. Oral orifice indistinct. Perforation irregular, present over the whole surface, pores increasing in diameter towards the skeleton base.

Occurrence. Grodziszczce Shales at Lipnik, Hauterivian (sample L. 17).

Family WILLIRIEDELLIDAE Dumitriča, 1970

Genus *Hemicryptocapsa* Tan Sin Hok, 1927 emend. Dumitriča, 1970

Hemicryptocapsa tuberosa Dumitriča, 1970

Pl. I: 3

1963 ? *Xiphostylus* sp.; Geroch Nowak, p. 253, figs. 6, 6ab.

1970 *Hemicryptocapsa tuberosa* n. sp.; Dumitriča, p. 71, pl. 12, fig. 78a, pl. 13, figs. 78b-c, 79a-b pl. 21, fig. 135.

1973 *Hemicryptocapsa tuberosa* Dumitriča; Moore, p. 827, pl. 7, figs. 2, 3.

1975 *Hemicryptocapsa tuberosa* Dumitriča; Dumitriča, figs. 2–3.

1981 *Hemicryptocapsa tuberosa* Dumitriča; Nakaseko & Nishimura, p. 153, pl. 4, fig. 1, pl. 1, pl. 14, fig. 11.

Material. Numerous, well preserved specimens.

Dimensions (in μm). Diameter of abdomen 250–270.

Description of specimens: Cephalis subsphaerical, lacking perforation and apical spine. Thorax squized into abdominal cavity. Abdomen sphaerical to ellipsoidal, surface covered by meshwork of ridges delimiting circular pores.

Remarks. In thin sections, the presence of 3 spines surrounding the abdominal orifice has been noted.

Occurrence. Lower part of Verovice Beds, Barremian (sample L. 34.)

Genus *Holocryptocanium* Dumitriča, 1970

Holocryptocanium japonicum Nakaseko, Nishimura & Sugano, 1979

Pl. I: 1

1963 *Cenosphaera* aff. *micropora* Rüst; Geroch & Nowak, p. 253, fig. 6: 9

1979 *Holocryptocanium japonicum* n. sp.; Nakaseko, Nishimura & Sugano, p. 23, pl. 5, figs. 8, 10.

1982 *Holocryptocanium japonicum* Nakaseko, Nishimura & Sugano; Aoki, p. 345, pl. 4, fig. 15.

Material. A few, well preserved specimens.

Dimensions (in μm). Longer axis of abdomen 240–270, shorter axis of abdomen 210–230.

Description of specimens. Skeletons almost sphaeroidal. Cephalis and thorax occur in abdominal cavity. Abdomen thick walled, with regular meshwork of polygonal pore frames.

Remarks. The described species differs from *H. barbui* Dumitriča (1970, p. 76–77, pl. 17: 105–108a, pl. 21: 136) in having larger pores and hexagonal pore frames.

Occurrence. Lower part of Verovice Beds, Barremian (sample L. 34)

Family THEOPERIDAE Haeckel, 1882 emend. Riedel, 1967

Genus *Protunuma* Ichikava & Yao, 1976

Protunuma sp.

Pl. II: 4

Material. Few, well preserved specimens.

Dimensions (in μm). Complete height 180–200, complete width 160–170.

Description of specimens. Skeletons spindle shaped, with 14 to 16 longitudinal plicae. Between these, there occur rows of circular pores. The apical spine is missing.

Remarks. Due to sparsity of specimens no thin sections have been made, thus, the number of segments in skeletons is unknown.

Occurrence. Lower part of Verovice Beds, Barremian (sample L. 34).

Family ARCHAEODICTYOMITRIDAE Pessagno, 1976 emend. Pessagno, 1977

Genus *Thanarla* Pessagno, 1977

Thanarla conica (Aliev)

Pl. II: 2

1963 ? *Cornutella* sp. Geroch & Nowak, p. 253, fig. 6: 4a–c.

1965 *Cornutana conica* Aliev: Aliev, p. 34–35, pl. 6, fig. 1.

1973 *Dictyomitra* (?) *lacrimula* n. sp.: Foreman, p. 263, pl. 10, fig. 11.

1973 *Cornutana conica* Aliev: Moore, p. 830, pl. 14, figs. 1, 2.

1975 *Dictyomitra* (?) *lacrimula* Foreman, p. 614, pl. 2G, figs. 5, 6, pl. 6, fig. 1.

1977 *Thanarla conica* (Aliev): Pessagno, p. 45, pl. 7, figs. 1, 13, 15.

1979 *Thanarla conica* (Aliev): Mattson & Pessagno, p. 442 fig. 2: A, E, D.

1979 Unnamed *Nassellaria*: Pessagno, Finch & Abbott, pl. 4, fig. 8.

1982 *Thanarla conica* (Aliev): Matsuyama, Kumon & Nakajo, p. 379, pl. 1, figs. 12, 13.

1982 *Thanarla conica* (Aliev): Taketani, p. 369, pl. 3, fig. 1ab.

Material. Numerous, variably preserved specimens.

Dimensions (in μm). Height 200–250, maximum width 120–140.

Description of specimens. Skeletons bell-shaped, consisting of a few segments. Capitulum has rounded apex and lacks apical spine, thorax, abdomen, and widened postabdominal segments. There occur 18 longitudinal costae with rows of circular pores in between.

Remarks. *T. conica* is similar in shape, presence of costae and pores to *T. pulchra* (Squinabol) (Squinabol, 1904, p. 213, pl. 5: 8) but the latter has more distinctly bell-shaped abdomen and more distinct constriction between the 3rd and 4th segment.

Occurrence. Verovice Beds at Lipnik, Barremian (sample L. 34).

Family THEOCORYTHIDAE Haeckel, 1882

Genus *Tricolocapsa* Haeckel, 1887

Tricolocapsa cf. *plicarum* Yao, 1979

Pl. II: 3

Material. Few, well preserved specimens.

Dimensions (in μm). Length 140–160, maximum width 110–125.

Description of specimens. Skeletons sphaerical to spindle-shaped, consisting of three segments. These are: sphaerical cephalis devoid of perforation, small thorax of the shape of truncated cone, and dominating, sphaerical abdomen with longitudinal plicae, between which there occur two rows of alternatively positioned, circular pores. The basal orifice is lacking.

Remarks. The described form differs from *T. plicarum* Yao from the Middle Jurassic of central Japan (Yao, 1979, p. 32–33, pl. 4: 1–11) in having two rows of pores.

Occurrence. Grodziszczce Shales, Hauterivian (sample L. 17).

Tricolocapsa sp.

Pl. II: 1

Material. A few well preserved specimens.

Dimensions (in μm). Length about 200, maximum width 140–150.

Description of specimens. Skeletons pear-shaped. Cephalis and thorax very small, of shape of truncated cone, devoid of perforation. Abdomen dominating, ellipsoidal, with irregularly distributed pores.

Remarks. The described specimens are most similar to *Tricolocapsa* sp. from the Jurassic of the Kanto region in Japan (Sashida *et. al.*, 1982, p. 65, pl. 1: 14).

Occurrence. Grodziszczce Shales at Lipnik, Hauterivian (sample L. 17).

Family PODOCAMPIDAE Haeckel, 1887

Genus *Stichocampe* Haeckel, 1881

Stichocampe cuneatus Smirnova & Aliev 1969

Pl. III: 4

1963 *Lithocampe* sp.; Geroch & Nowak, p. 252, fig. 6: 5a, 5b, 5c.

1969 *Stichocampe cuneatus* n. sp.; Smirnova & Aliev, p. 69–70, pl. 2: figs 5, 5a.

Material. Few specimens, preservation variable.

Dimensions (in μm). Height 330–350, maximum width 150–160.

Description of specimens. Skeletons elongate conical, of triangular transversal section, consisting of more than ten chambers, with basal orifice, and 3 characteristic lateral costae. At the periphery there are more or less distinct incisions. Pores of irregular outline are distributed over the whole skeleton surface.

Remarks. As noted Smirnova & Aliev (in Aliev & Smirnowa, 1969), in this species, the height and width of skeletons vary.

Occurrence. Grodziszczce Beds and Lower Lgota Beds at Lipnik, Hauterivian and Albian (samples L. 17 and L. 50).

CYRTOIDEA incertae sedis
Genus *Pseudocyrtis* Pessagno, 1977

Pseudocyrtis sp.

Pl. III: 1

Material. 1 well preserved specimen.

Dimensions (in μm). Length 320, maximum width 100.

Description of specimens. Skeleton elongate, spindle-shaped. Cephalis unperforated, with a very short horn. Thorax weakly marked. The remaining chambers hardly distinguishable, coarsely perforated. Pores of polygonal outline, irregularly distributed but tending to form transversal rows, which are especially distinct at the widest part of the skeleton. The postcephalic chambers are widest at the middle of skeleton height. The distal end truncated, oral pole invisible.

Remarks: *Pseudocyrtis* sp. differs from *Eucyrtis* (?) *zhamoidai* Foreman (1973, p. 264, pl. 10; 9, 10; pl. 16: 1, 2) in having weakly marked segments.

Occurrence: Grodziszczce Shales at Lipnik, Hauterivian (sample L. 17).

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Streszczenie

RADIOLARIE Z ODSŁONIĘCIA UTWORÓW DOLNOKREDOWYCH W LIPNIKU KOŁO BIELSKA-BIAŁEJ (KARPATY, POLSKA)

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Praca dotyczy radiolarii (Polycystina) z utworów dolnej kredy, odsłoniętych w Lipniku koło Bielska-Białej (Fig. 1). Radiolarie występują w warstwach grodziskich, wierzowskich i dolnych warstwach Igockich, reprezentujących piętra od hoterywu po dolną część albu (Fig. 2). Obecność radiolarii we wspomnianym profilu sygnalizowano już wcześniej (Geroch & Nowak, 1963). Obecnie zrewidowano poprzednie oznaczenia na podstawie obserwacji w mikroskopie skanningowym, znaleziono również gatunki nie notowane uprzednio przez wyżej cytowanych autorów. W pracy przedstawiono opisy 18 gatunków zilustrowanych na Planszach I do III.

W zespołach radiolarii występują gatunki przewodnie dla dolnej kredy, takie jak: *Hemicryptocapsa tuberosa* Dumitriča, *Holocryptocanium japonicum* Nakaseko, Nashimura & Sugano i *Thanarla conica* (Aliev).

EXPLANATIONS OF PLATES

Plate I

- 1 — *Holocryptocanium japonicum* Nakaseko, Nishimura & Sugano. RI/1, ×200
- 2 — *Cenellipsis* sp. RI/2, ×200
- 3 — *Hemicryptocapsa tuberosa* Dumitriča. RI/3, ×200
- 4 — *Cyrtocapsa grutterinki* Tan Sin Hok. RI/4, ×260
- 5 — *Conosphaera* sp. RI/5, ×260
- 6 — *Pseudoaulophacus* sp. RI/10, ×120

Plate II

- 1 — *Tricolocapsa* sp. RI/11, ×200
- 2 — *Thanarla conica* (Aliev). RI/6, ×200
- 3 — *Tricolocapsa* cf. *plicarum* Yao. RI/7, ×360
- 4 — *Protunuma* sp. RI/8, ×260
- 5 — ?*Pyramispongia* sp. RI/12, ×200
- 6 — *Phacotriactis* sp. RI/13, ×200

Plate III

- 1 — *Pseudocyrtis* sp. RI/14, ×160
- 2 — *Stichocapsa* sp. RI/9, ×100
- 3 — *Stichomitra* sp. RI/15, ×150
- 4 — *Stichocampe cuneatus* Smirnova & Aliev. RI/16, ×150
- 5 — *Histiastrum aster* Lipman. RI/17, ×200
- 6 — *Spongodiscus multus* Kozlova. RI/18, ×200

