Geological Quarterly, Vol. 40, No. 4, 1996, p. 555–574

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Cenomanian Radiolaria from Spława, Polish Carpathians

The radiolarians studied come from non-calcareous greyish green shales from Spława outcrop on Krzeczkówka stream. They belong to Spumellaria (7 species) and Nassellaria (8 species) and are attributable to the *Obesacapsula somphedia* Zone of Cenomanian age.

INTRODUCTION

The material studied comes from a profile of the western folds limb of the Spława fold, cropping out in the bed of Krzeczkówka stream, approx. 650 m NNE from Spława hill (508 m above sea level). The site (Fig. 1) is located within the Krzeczkowa village (Przemyśl region). The sediments belong to the Skole unit of the Outer (Flysch) Carpathians. The geological profile was described in detail by J. Kotlarczyk (1978, 1988). In the middle part of the outcrop there occurs a radiolarite shale of the Dołhe Formation, known throughout the Carpathians. The formation overlies the Spaskie shales, and is overlain by siliceous marls of the Ropianka Formation (Fig. 2).

The radiolarian microfauna occurs in the non-calcareous greyish green shales, above a set of green shales with black streaks, and with thin intercalations of hard siliceous marls. In the latter the following Albian-Cenomanian foraminiferans were found: *Plectorecurvoides alternans* Noth, *P. irregularis* (Geroch), *Bigenerina variabilis* Vašiček, *Thalmannammina neocomiensis* Geroch and *Ammodiscus tenuissimus* Grzybowski.

The radiolarians studied (Spumellaria and Nassellaria) occur most abundantly in the layer sampled by J. Kotlarczyk (1988, fig. A_4).

The microfauna from the bottom of siliceous marls of the Ropianka Formation does not contain index foraminiferan species. The radiolarite shales from Dołhe have been dated on the basis of the calcareous nannoplankton (E. Gaździcka, in preparation; J. Kotlarczyk, E.

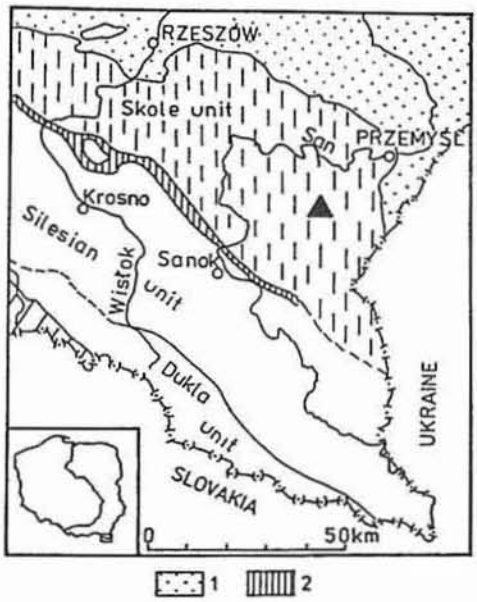

Fig. 1. Tectonic sketch map of the Polish Outer Carpathians (modified after M. Książkiewicz, 1956) with the locality Spława indicated (black triangle)
1 — Upper Tertiary cover; 2 — Sub-Silesian unit
Szkic tektoniczny polskich Karpat zewnętrznych (zmodyfikowany według M. Książkiewicza, 1956) z zaznaczoną miejscowością Spława (czarny trójkąt)
1 — pokrywa górnotrzeciorzędowa; 2 — jednostka podśląska

Gaździcka, 1988) as belonging to the CC9 Zone with *Eiffelithus turriseiffeli* (*sensu* Sissingh 1977), and thus of Cenomanian age.

The sample of the radiolarian assemblage described herein is housed in the Laboratory of Palaeontology of the Institute of Geology of the Warsaw University; the collection acronym is IGPUW-VI.

SYSTEMATIC DESCRIPTIONS

Subclass **Radiolaria** Müller 1858
Superorder **Polycystina** Ehrenberg 1875 emend. Riedel 1967
Order **Spumellaria** Ehrenberg 1875
Family **Praeconocaryommidae** Pessagno 1976
Genus *Praeconocaryomma* Pessagno 1976
Type species *Praeconocaryomma universa* Pessagno 1976

Praeconocaryomma lipmanae Pessagno 1976
(Pl. I, Fig. 1)

1976 *Praeconocaryomma lipmanae* Pessagno; E. A. Pessagno: p. 41–42, pl. 4, figs. 12, 13.
1982 *Praeconocaryomma lipmanae* Pessagno; Y. Taketani: p. 362, pl. I, fig. 19.

Material: 15 well preserved specimens.
Dimensions (in μm): diameter 180–200.

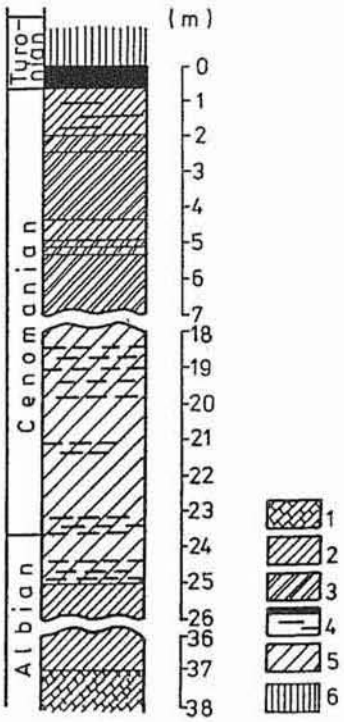

Fig. 2. Lithological section of the Dołhe Radiolarian Shale Formation; Krzeczkówka stream (modified after J. Kotlarczyk, 1988)
Spas Shale Formation: 1 — green-black Lgota shales, 2 — green shales, 3 — greyish-green shales, 4 — red shales with manganese oxides, 5 — green shales with black streaks, 6 — siliceous marls
Profil litologiczny formacji łupków radiolariowych z Dołhego; potok Krzeczkówka (zmodyfikowany według J. Kotlarczyka, 1988)
Formacja łupków spaskich: 1 — czarnozielone łupki lgockie, 2 — łupki zielone, 3 — łupki zielonoszare, 4 — łupki czerwone z nalotami manganowymi, 5 — łupki zielone ze smugami czarnymi, 6 — margle krzemionkowe

D e s c r i p t i o n . — Sphaerical skeleton with pentagonal perforations and mammae with more than dozen perforations each.

R e m a r k s . E. A. Pessagno (1976) observed spines (round in cross section) protruding from each mamma of well preserved specimens of *Praeconocaryomma lipmanae* Pessagno. No such spines have been found in specimens from Spława deposits.

O c c u r r e n c e . — Upper Cenomanian-Lower Turonian.

Praeconocaryomma universa Pessagno 1976
(Pl. I, Figs. 2, 4, 8)

1976 *Praeconocaryomma universa* Pessagno; E. A. Pessagno: p. 42, pl. 6, figs. 14–16.
1982 *Praeconocaryomma universa* Pessagno; M. Yamauchi: p. 395, pl. 3, fig. 1.
1986 *Praeconocaryomma universa* Pessagno; J. Thurow, W. J. Kuhnt: pl. 9, fig. 22.
1989 *Praeconocaryomma universa* Pessagno; H. Górka: p. 334, pl. 9, fig. 8.
1990 *Praeconocaryomma universa* Pessagno; V. S. Vishnevskaya: p. II, pl. 2, fig. 1, ?p. 13, pl. 4, fig. 1.
1991 *Praeconocaryomma universa* Pessagno; H. Górka: p. 42–43, pl. 1, figs. 4, 5.
1992 *Praeconocaryomma universa* Pessagno; V. S. Vishnevskaya: p. 27, pl. 2, fig. 1.
1995 *Praeconocaryomma universa* Pessagno; O. Takahashi, A. Ishii: p. 85, pl. 4, fig. 8.

Material : 70 well preserved specimens.
Dimensions (in μm): diameter 160–200; surface relief height 10–12.

Occurrence. — Albian-Coniacian.

Family **Orbiculiformidae** Pessagno 1973
Genus **Orbiculiforma** Pessagno 1973 emend. Pessagno 1976
Type species *Orbiculiforma quadrata* Pessagno 1973

Orbiculiforma railensis Pessagno 1977*b*
(Pl. I, Figs. 3, 6, 9)

1977*b* *Orbiculiforma railensis* Pessagno; E. A. Pessagno: p. 28, pl. I, figs. 14, 21, pl. 12, fig. 5.
1988 *Orbiculiforma railensis* Pessagno; J. Thurow: pl. 5, fig. 18, pl. 9, fig. 20.

Material : 35 well preserved specimens.
Dimensions (in μm): diameter 320–450; diameter of the central cavity 40–80.

Remarks. — *Orbiculina railensis* Pessagno from Spława show high size variability and faintly visible peripheral spines.
Occurrence. — Albian-Cenomanian.

Family **Dactyliosphaeridae** Squinabol 1904
(= Family **Orbiculiformidae** Pessagno 1973)
Genus *Godia* Wu 1986
Type species *Godia floreusa* Wu 1986 (= syn. *Patellula* (?) *decora* Li et Wu 1986)

Godia concava (Li et Wu 1986)
(Pl. I, Fig. 5)

1985 *Orbiculiforma concava* Li et Wu; H. S. Li, H. R. Wu: p. 73, pl. 2, figs. 22, 23.
1986 *Orbiculiforma depressa* Wu; H. R. Wu: p. 355, pl. I, figs. 3?, 6, 9, 22.
1992 *Orbiculiforma* sp. A; L. Ozvoldova, M. Petercakova: p. 316, pl. 2, figs. 6, 8.
1994 *Godia concava* (Li et Wu); L. O'Dogherty: p. 334–335, pl. 62, figs. 12–15.

Material : 15 well preserved specimens.
Dimensions (in μm): diameter 200–250.

Description. — Skeleton of discoid shape, round contour, with very numerous tiny spines on the periphery. Central cavity wide and well marked. Central area slightly elevated. Polygonal perforation better pronounced on the periphery than within the central area.

Remarks. — The specimens of *Godia concava* (Li et Wu) from Spława are smaller than the holotype and do not exhibit a protruding margin of small protuberances bordering the central cavity.

Occurrence. — Aptian-Cenomanian.

Godia coronata (Tumanda 1989)
(Pl. I, Fig. 7)

1989 *Orbiculiforma coronata* Tumanda; F. Tumanda: p. 29, pl. 5, figs. 12–14, pl. 10. figs. 2, ?5.
1989 *Pseudoaulophacus lenticulatus* (White); F. Tumanda: p. 35, pl. 9, fig. 9.
1994 *Godia coronata* (Tumanda); L. O'Dogherty: p. 335–336, pl. 62, figs. 16–18.

M a t e r i a l : 12 well preserved specimens.
D i m e n s i o n s (in μm): diameter 250–290.

D e s c r i p t i o n . — Discoid biconcave skeleton with rounded contour and very short peripheral spines. Central area relatively wide, slightly elevated. The meshwork is of similar dimensions in both central and peripheral part.

R e m a r k s . — The specimens of *Godia coronata* (Tumanda) from Spława deposits have shallow central cavity. No other structure is visible in the central part. Specimens are slightly smaller than the holotype.

O c c u r r e n c e . — Upper Barremian, Albian, Cenomanian.

Family **Patulibracchidae** Pessagno 1971 emend. Baumgartner 1980
Genus *Crucella* Pessagno 1971 emend. Baumgartner 1980
Type species *Crucella messinae* Pessagno 1971

Crucella hispana O'Dogherty 1994
(Pl. II, Figs. 1–4)

?1981 *Crucella* sp. indet.; A. Schaaf: pl. II, fig. 3.
pars 1981 *Histiastrum aster* Lipman; A. Schaaf: p. 435, pl. 8, fig. 1, non pl. 11, fig. 5.
1984 *Histiastrum aster* Lipman; A. Schaaf: p. 160–161, texte-fig. 2.
1994 *Crucella hispana* O'Dogherty; L. O'Dogherty: p. 365–366, pl. 70, figs. 1–5.

M a t e r i a l : 30 specimens of different state of preservation, often deformed and lacking spines on radial apices.
D i m e n s i o n s (in μm): length of rays along diagonal axis 380–400; rays width 80–120.

D e s c r i p t i o n . — Skeleton made of conical, rather massive rays, situated slightly obliquely and often laterally displaced. Rays round or elliptical in cross-section. In some specimens the apices of rays bear traces of short blade-like spines.

R e m a r k s . — *Crucella hispana* O'Dogherty differs from other congeneric species by its robustness, especially the rays are massive and the central area is large. The specimens from Spława are larger than those described from Spain.

O c c u r r e n c e . — Aptian-Cenomanian.

Family **Cavaspongidae** Pessagno 1973
Genus *Pyramispongia* Pessagno 1973
Type species *Pyramispongia magnifica* Pessagno 1973

?*Pyramispongia glascockensis* Pessagno 1973
(Pl. II, Fig. 9)

1973 *Pyramispongia glascockensis* Pessagno; E. A. Pessagno: p. 79–80, pl. 21, figs. 2–5..
1982 *Pyramispongia glascockensis* Pessagno: Y. Taketani: p. 51, pl. 10, fig. 10.
1986 *Pyramispongia glascockensis* Pessagno: J. Thurow, W. J. Kuhnt: pl. 9, fig. 4.
1988 *Pyramispongia glascockensis* Pessagno; J. Thurow: p. 31, pl. 2, fig. 23.
1995 *Pyramispongia glascockensis* Pessagno; O. Takahashi, A. Ishii: p. 85, pl. 4, fig. 9.

M a t e r i a l : 3 poorly preserved specimens.
D i m e n s i o n s (in μm): maximum width 200–250.

R e m a r k s . — The specimens of ?*Pyramispongia glascockensis* Pessagno from Spława resemble most strongly those from the Cretaceous of Hokkaido, illustrated by Y. Taketani (1982), and from the Cretaceous of the North Atlantic (J. Thurow, 1988). They exhibit wide, rounded cupola like in the holotype, but there is no pronounced narrow shelf around the cupola. Also the lack of spines on the cupola makes the generic and specific identification dubious.

O c c u r r e n c e . — Cosmopolitan species. Cenomanian-Santonian.

Order **Nassellaria** Ehrenberg 1875
Family **Obeliscoitidae** O'Dogherty 1994
Genus *Obeliscoites* O'Dogherty 1994
Type species *Cyrtocapsa turris* Squinabol 1903

Obeliscoites vinassai (Squinabol 1903)
(Pl. II, Fig. 8)

1903 *Halicapsa vinassai* Squinabol; S. Squinabol: p. 128, pl. 8, fig. 29.
1973 *Archacapsa similis* Parona; T. C. Moore: p. 825, pl. 16, fig. 3, 4.
1973 *Sethocapsa dorysphaeroides* Neviani; T. C. Moore: p. 826, pl. 16, figs. 1, 2.
1981 *Archacapsa similis* Parona; A. Schaaf: p. 432, pl. 22, figs. 4, 5, pl. 23, fig. 7.
1983 *Halicapsa vinassai* Squinabol; I. Origlia-Devos: p. 148, pl. 17, fig. 13.
1984 *Stichocapsa euganea* Squinabol; A. Schaaf: p. 158–159, texte-fig. 8.
1985 *Stichocapsa euganea* Squinabol; A. Sanfilippo, W. R. Riedel: p. 622, texte-fig. 13, 4.
1988 *Stichocapsa euganea* Squinabol; J. Thurow: p. 406, pl. 3, figs. 6, 7.
1994 *Obeliscoites vinassai* (Squinabol); L. O'Dogherty: p.190–191, pl. 29, figs. 1–4.

M a t e r i a l : 5 well preserved specimens.
D i m e n s i o n s (in μm): total height 300–410; maximum width 120–180.

D e s c r i p t i o n . — Bottle-shaped skeleton, with elongated conical proximal part and closed, capsulate distal part. Cephalis smooth, narrowing apically, with a small spine.

Thorax and abdomen conical to trapezoid in outline, sparsely perforated. 5 to 7 postabdominal chambers present with poorly delineated borders and hexagonal perforation, arranged in longitudinal rows. Small aperture present.

R e m a r k s . — *Obeliscoites vinassai* (Squinabol) from Spława are smaller than those described by L. O'Dogherty (1994).

O c c u r r e n c e . — Upper Barremian-Cenomanian.

Family **Spongocapsulidae** Pessagno 1977*a*
Genus *Obesacapsula morroensis* Pessagno 1977*a*
Type species *Obesacapsula morroensis* Pessagno 1977*a*

Obesacapsula somphedia (Foreman 1973) Schaaf 1981
(Pl. II, Fig. 11)

1973 *Dictyomitra somphedia* Foreman; H. Foreman: p. 264, pl. 14, fig. 18.
1981 *Dictyomitra somphedia* Foreman; P. De Wever, F. Thiebault: p. 516.
1981 *Obesacapsula somphedia* (Foreman); A. Schaaf: p. 435, pl. 4, figs. 6–9, pl. 20, figs. 1a, b, 2.
1995 *Obesacapsula somphedia* (Foreman); M. Bąk: p. 18, fig. 11g.

M a t e r i a l : 67 well preserved specimens.
D i m e n s i o n s (in µm): total length 315–380; maximum width 150–280.

D e s c r i p t i o n . — Skeleton wide and rather elongated, consisting of undeterminable number of segments. Cephalis rounded, almost hidden in the thorax. The third segment is wide with large irregular perforation and spongy structure.

R e m a r k s . — A. Schaaf (1981) compares *Obesacapsula somphedia* (Foreman) with *Obesacapsula morroensis* Pessagno 1977*a* and with *Spongocapsula palmerae* Pessagno 1977*a*.

O c c u r r e n c e . — Albian-Cenomanian.

Family **Syringocapsidae** Foreman 1973
Genus *Sethocapsa* Haeckel 1881 emend. Foreman 1973
Type species *Sethocapsa cometa* (*Pantanelli*) Rüst 1885

Sethocapsa ?dorysphaeroides Neviani 1900 *sensu* Schaaf 1984
(Pl. II, Fig. 7)

1900 *Sethocapsa dorysphaeroides* Neviani; A. Neviani: p. 660, pl. 10, fig. 14.
1984 *Sethocapsa dorysphaeroides* Neviani; A. Schaaf: p. 154, figs. 6a, b.
1994 *Sethocapsa dorysphaeroides* Neviani *sensu* Schaaf; R. Jud: p. 103–104, pl. 19, figs. 13, 14.

M a t e r i a l : 5 relatively well preserved specimens.
D i m e n s i o n s (in µm): height 190–240; maximum width 120–180.

D e s c r i p t i o n . — Sphaerical skeleton. Cephalis terminating with a conical process. Dominant feature is the sphaerical abdomen with rather large regular perforations. Postabdominal segments are not visible. Aperture absent.

R e m a r k s . — Undefiniable number of segments in specimens from Spława precludes their unequivocal identification as *Sethocapsa dorysphaeroides* Neviani *sensu* Schaaf. The inner and outer layers of the skeleton have not been discerned.

O c c u r r e n c e . — Valanginian-Cenomanian.

Sethocapsa sp. A
(Pl. II, Figs. 5, 6)

M a t e r i a l : 5 well preserved specimens.
D i m e n s i o n s (in μm): total length 420–535; maximum width 310–420.

D e s c r i p t i o n . — Skeleton very wide, subsphaerical. Apical part relatively small, with rather wide frustum-like process. Internal structure not visible, spongy surface.

O c c u r r e n c e . — Cenomanian.

Sethocapsa sp. B
(Pl. II, Fig. 10)

M a t e r i a l : 7 well preserved specimens.
D i m e n s i o n s (in μm): total length 400–480; maximum width 300–380.

D e s c r i p t i o n . — Sphaerical skeleton consisting of a knob-like cephalis with a truncated apex. The next segment is the largest. Internal structure unknown. Polygonal perforations present.

O c c u r r e n c e . — Cenomanian.

Family **Dorypylidae** O'Dogherty 1994
Genus *Hiscocapsa* O'Dogherty 1994
Type species *Cyrtocapsa grutterinki* Tan 1927

Hiscocapsa grutterinki (Tan 1927) O'Dogherty 1994
(Pl. II, Fig. 12)

1927 *Cyrtocapsa grutterinki* Tan; S. H. Tan: p. 64, pl. 13, fig. 110.
non 1981 *Cyrtocapsa grutterinki* Tan; K. Nakaseko, A. Nishimura: p. 149, pl. 13, figs. 9, 10.
1981 *Cyrtocapsa grutterinki* Tan; A. Schaaf: p. 433, pl. 6, figs. 6a, b.
1984 *Cyrtocapsa grutterinki* Tan; A. Schaaf: p. 156–157, figs. 3a, b.
1989 *Cyrtocapsa grutterinki* Tan; H. Górka, S. Geroch: p. 188–189, pl. I, fig. 4.
1990 *Cyrtocapsa grutterinki* Tan; L. Ožvoldová: p. 141, pl. 3, figs. 1, 2.
1993 *Cyrtocapsa grutterinki* Tan; M. Bąk: p. 195, pl. 3, fig. 17.

1994 *Hiscocapsa grutterinki* (Tan); L. O'Dogherty: p. 201–202, pl. 31, figs. 14–16, pl. 32, figs. 1–3.
1995 *Cyrtocapsa grutterinki* Tan; M. Bąk: p. 14, fig. 11h.

Material: 5 well preserved specimens.
Dimensions (in μm): height 200–235; maximum width 130–180.

Remarks. — Specimens of *Hiscocapsa grutterinki* (Tan) from Spława display large variability of the apical portions of the skeleton.

Occurrence. — Barremian-Cenomanian.

Family **Pseudodictyomitridae** Pessagno 1977*b*
Genus *Pseudodictyomitra* Pessagno 1977*b*
Type species *Pseudodictyomitra pentacolaensis* Pessagno 1977*b*

Pseudodictyomitra pseudomacrocephala (Squinabol 1903) Pessagno 1977*b*
(Pl. III, Figs. 1–10)

1903 *Dioctyomitra pseudomacrocephala* Squinabol; S. Squinabol: p. 139, pl. 10, fig. 2.
1975 *Dictyomitra pseudomacrocephala* (Squinabol); P. Dumitrica: p. 87, pl. 12, fig. 19.
1977*b* *Pseudodictyomitra pseudomacrocephala* (Squinabol); E. A. Pessagno: p. 51, pl. 8, figs. 10, 11.
1980 *Pseudodictyomitra pseudomacrocephala* (Squinabol); R. Schmidt-Effing: p. 247, fig. 8.
1981 *Pseudodictyomitra pseudomacrocephala* (Squinabol); P. De Wever, F. Thiebault: p. 592, pl. I, fig. 5.
1981 *Pseudodictyomitra pseudomacrocephala* (Squinabol); K. Nakaseko, A. Nishimura: p. 159–160, pl. 9, figs. 1–4, pl. 16, figs. 5–8.
1981 *Pseudodictyomitra pseudomacrocephala* (Squinabol); A. Schaaf: pl. 24, figs. 1a, b.
1982 *Pseudodictyomitra pseudomacrocephala* (Squinabol); Y. Taketani: p. 61, pl. 5, figs. 4a, b, pl. 12, figs. 7, 8.
1985 *Pseudodictyomitra pseudomacrocephala* (Squinabol); A. Sanfilippo, W. R. Riedel: p. 608, pl. 10, figs. 1a–e.
1986 *Pseudodictyomitra pseudomacrocephala* (Squinabol); W. J. Kuhnt *et al.*: p. 237, pl. 7, fig. t.
1986 *Pseudodictyomitra pseudomacrocephala* (Squinabol); J. Thurow, W. J. Kuhnt: pl. 9, fig. II.
1990 *Pseudodictyomitra pseudomacrocephala* (Squinabol); V. S. Vishnevskaya: p. 5, pl. 4, figs. 4, 5.
1993 *Pseudodictyomitra pseudomacrocephala* (Squinabol); M. Bąk: p. 191–192, pl. 3, figs. 6, 7.
1994 *Pseudodictyomitra pseudomacrocephala* (Squinabol); L. O'Dogherty: p. 108–109, pl. 8, figs. 5–8.
1995 *Pseudodictyomitra pseudomacrocephala* (Squinabol); O. Takanashi, A. Ishii: p. 83, pl. 3, fig. 18.

Material: 180 very well preserved specimens.
Dimensions (in μm): height 350–450; maximum width 140–180.

Description. — Elongated conical skeleton consists of 10–12 segments, the first 4 or 5 of them are enclosed in an arrow-like thickened wall and without perforation. The other segments are low, trapezoid, and of subsequently growing width. At the border between segments there are two series of small perforations and a row of 14-18 depressions separated by protruding edges. Most of the depressions are penetrated by wide, subcircular perforations.

Remarks. — *Pseudodictyomitra pseudomacrocephala* (Squinabol) is the most common species in Spława deposits. The collected specimens display a substantial size range and more or less rounded capitulum. The depressions are best pronounced on the basal segment. For farther discussion remarks see (A. Sanfilippo, W. R. Riedel, 1985, p. 609).

Occurrence. — Albian-Turonian.

Family **Xitidae** Pessagno 1977*b*
Genus *Xitus* Pessagno 1977*b*
Type species *Xitus plenus* Pessagno 1977*b*

Xitus antelopensis Pessagno 1977*b*
(Pl. III, Figs. 11–15)

1977*b* *Xitus antelopensis* Pessagno; E. A. Pessagno: p. 55, pl. 9, figs. 10, 20, 25, pl. 12, fig. 16.
1989 *Xitus antelopensis* Pessagno; H. Górka: p. 345, pl. 13, fig. 7.

M a t e r i a l : 40 well preserved specimens.
D i m e n s i o n s (in μm): maximum height 240–280; maximum width 115–120.

D e s c r i p t i o n . — Elongated conical skeleton; conical cephalis without perforation, usually lacking the apical spine — only spine scar visible. Trapezoid thorax without perforation, abdomen perforated. 7 to 9 distinctly separated postabdominal chambers increasing in both height and width, with two-layered skeleton. The outer layer is nodose, the inner one bears round and elliptical perforations.

O c c u r r e n c e . — Cenomanian-Campanian.

CONCLUSIONS

The analyzed assemblage of Radiolaria, especially a mass occurence of *Obesacapsula somphedia* (Foreman) Schaaf and *Pseudodictyomitra macrocephala* (Squinabol) Pessagno indicate the *O. somphedia* Zone i.e. Cenomanian.

Acknowledgements. I would like to express my sincere gratitude to Prof. J. Kotlarczyk of the Institute of General and Mathematical Geology of the Academy of Mining and Metallurgy in Cracow for providing me the interesting fossil material for study, as well as for his critical remarks concerning the local geology. I am also indebted for their useful taxonomical comments to Dr. L. O'Dogherty (Department of Marine Sciences, Cádiz, Spain) and to M. Bąk, M. Sc. (Institute of Geological Sciences, Jagiellonian University, Cracow, Poland). I also thank Dr. E. Gaździcka of the Geological Institute of Warsaw for discussing the coccolite zonation. Dr. P. Dzierżanowski of the Institute of Geochemistry, Mineralogy and Petrography of the Department of Geology, Warsaw University, kindly produced the SEM micrographs.

Translated by Karol Sabath

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Received: 7.08.1996

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Hanna GÓRKA

PROMIENICE Z CENOMANU SPŁAWY (POLSKIE KARPATY)

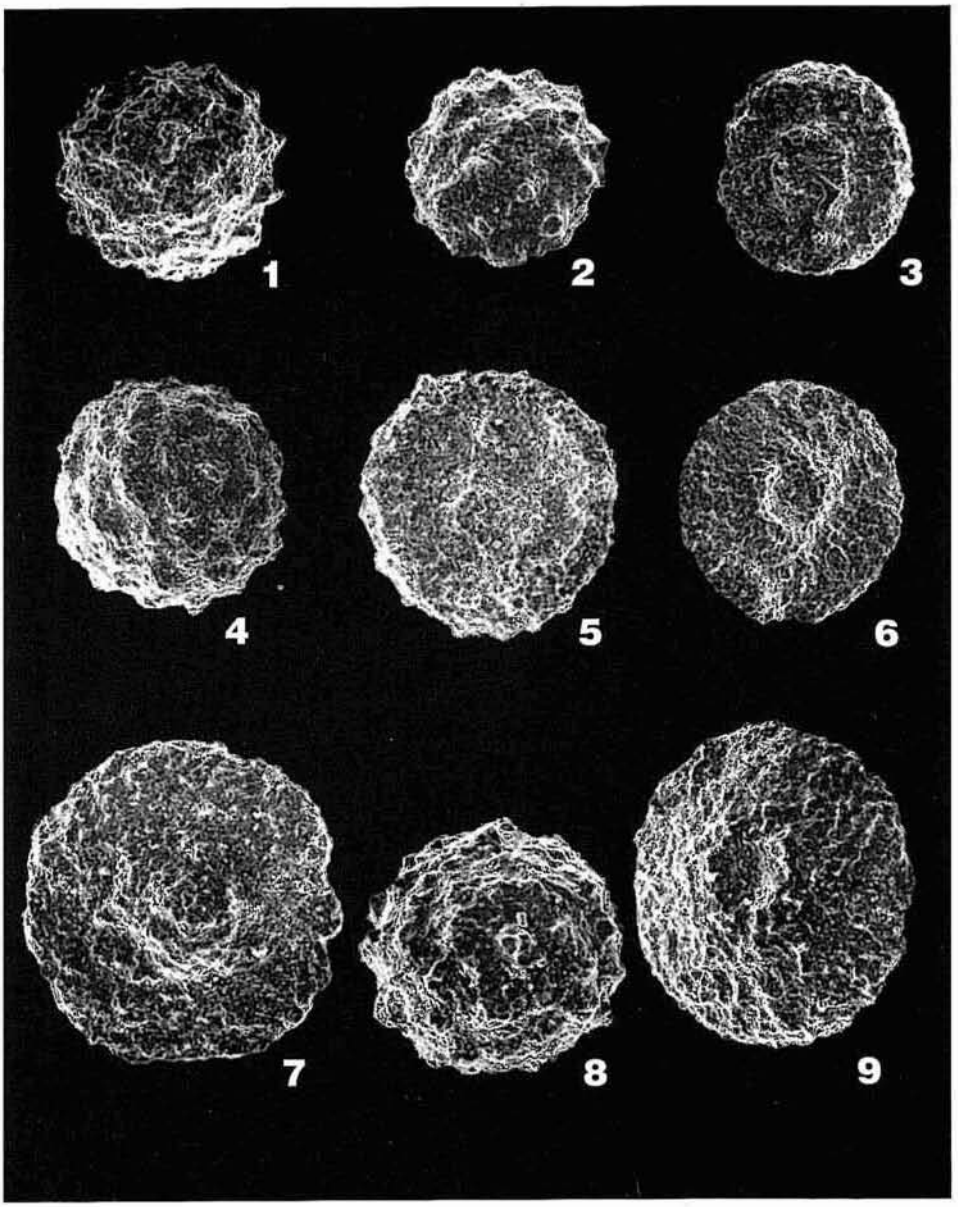
Streszczenie

Opracowane promienice z profilu Spławy (woj. przemyskie), odsłaniającego się w potoku Krzeczkówka, występują w niewapnistych łupkach zielonoszarych, powyżej pakietu łupków zielonych z czarnymi smugami i z wkładkami cienkoławicowych twardych margli krzemionkowych.

Analizowane nagromadzenie promienic (7 gatunków Spumellaria i 8 gatunków Nassellaria) zaklysyfikowano do zony *Obesacapsula somphedia* określając ich wiek na cenoman.

PLATE I

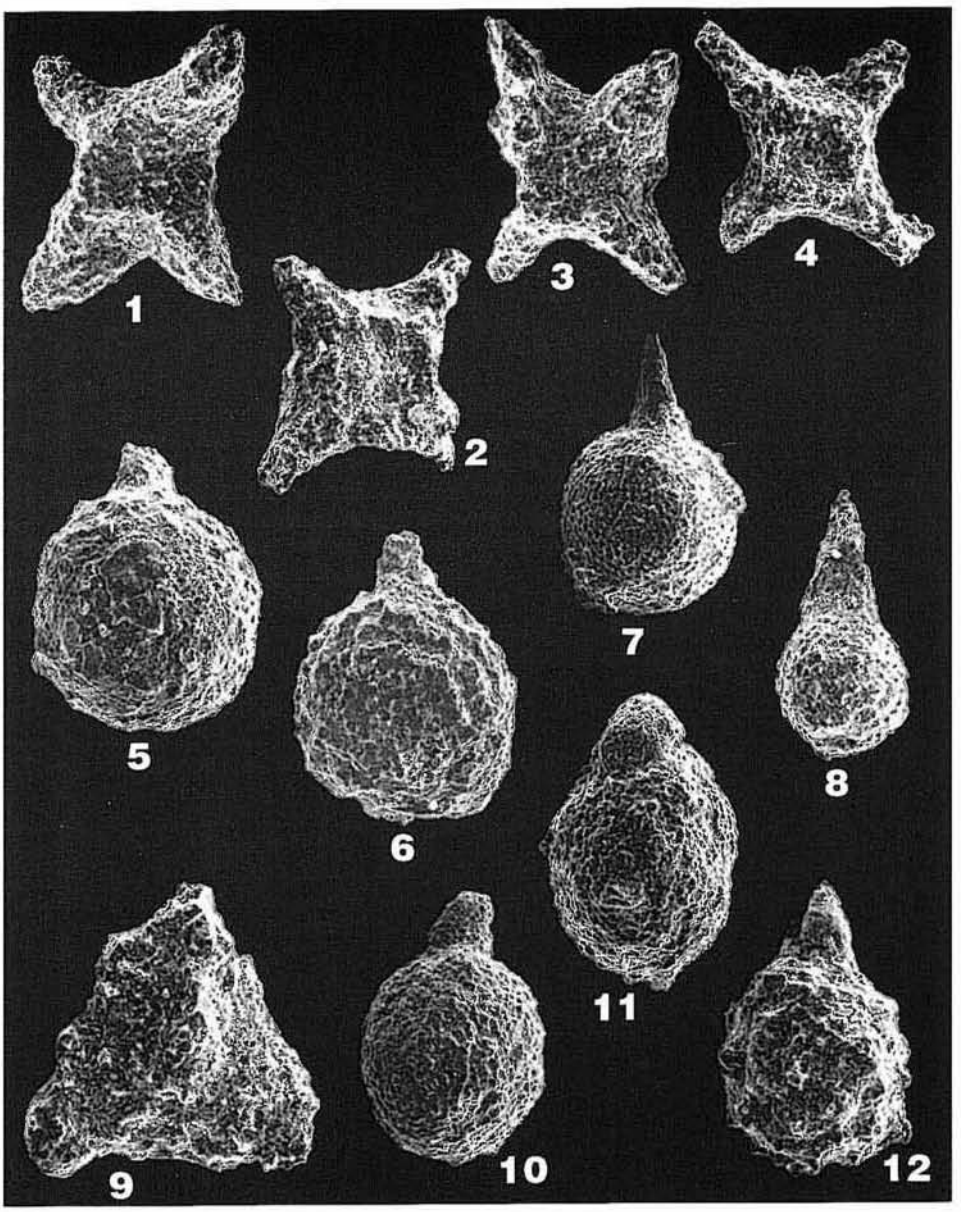
Fig. 1. *Praeconocaryomma lipmanae* Pessagno
IGPUW-VI-32, x 155
Figs. 2, 4, 8. *Praeconocaryomma universa* Pessagno
Fig. 2 — IGPUW-VI-38, x 207; Fig. 4 — IGPUW-VI-33, x 190; Fig. 8 — IGPUW-VI-39, x 205
Figs. 3, 6, 9. *Orbiculiforma railensis* Pessagno
Fig. 3 — IGPUW-VI-34, x 195; Fig. 6 — IGPUW-VI-37, x 207; Fig. 9 — IGPUW-VI-41, x 200
Fig. 5. *Godia concava* (Li et Wu)
IGPUW-VI-29, x 200
Fig. 7. *Godia coronata* (Tumanda)
IGPUW-VI-40, x 207



Hanna GÓRKA — Cenomanian Radiolaria from Spława, Polish Carpathians

PLATE II

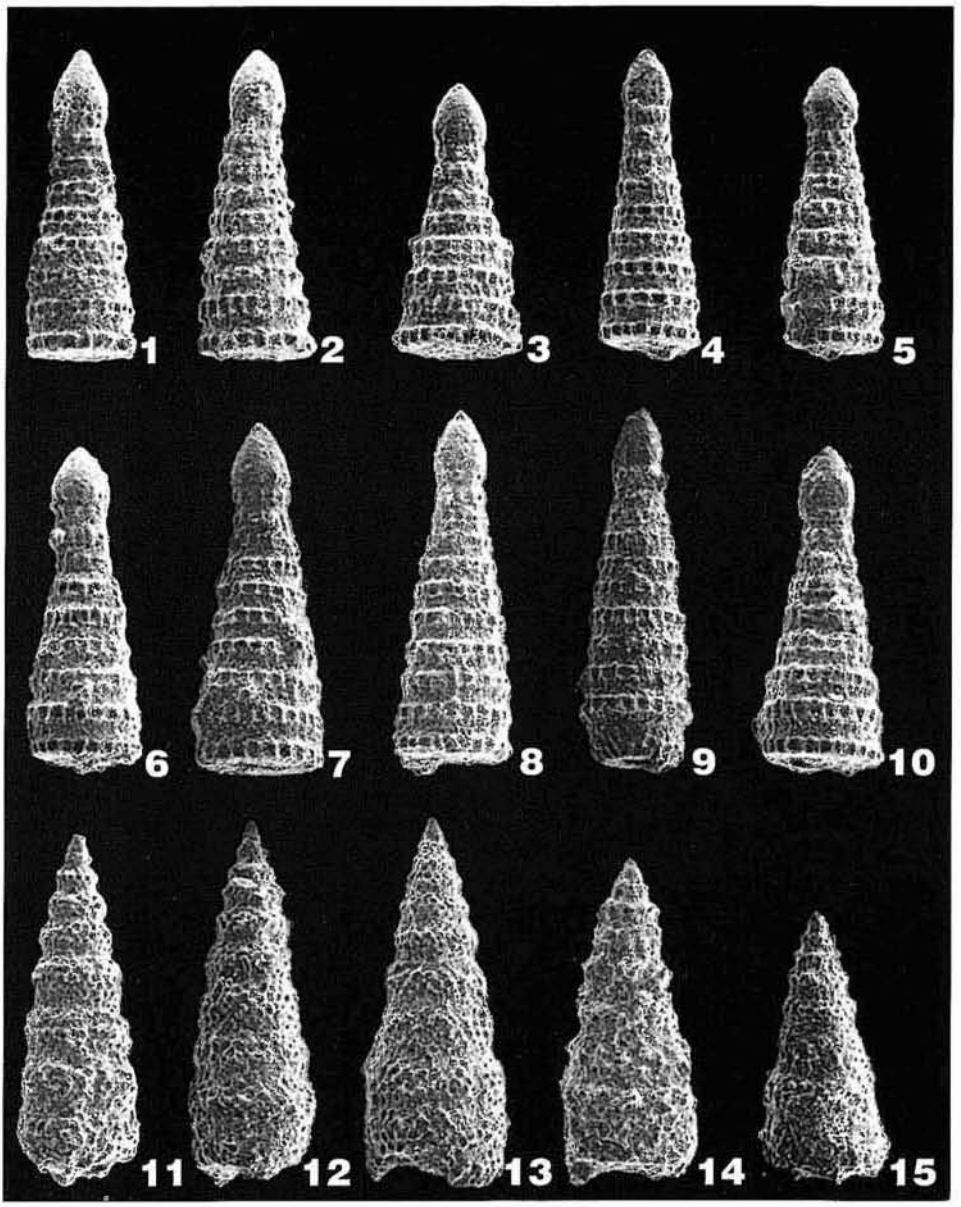
Figs. 1–4. *Crucella hispana* O'Dogherty
Fig. 1 — IGPUW-VI-13, x 185; Fig. 2 — IGPUW-VI-15, x 195; Fig. 3 — IGPUW-VI-14, x 215; Fig. 4 — IGPUW-VI-16, x 205
Figs. 5, 6. *Sethocapsa* sp. A
Fig. 5 — IGPUW-VI-31, x 205; Fig. 6 — IGPUW-VI-35, x 207
Fig. 7. *Sethocapsa ?dorysphaeroides* Neviani
IGPUW-VI-18, x 205
Fig. 8. *Obeliscoites vinassai* (Squinabol)
IGPUW-VI-19, x 190
Fig. 9. *?Pyramispongia glascockensis* Pessagno
IGPUW-VI-30, x 205
Fig. 10. *Sethocapsa* sp. B
IGPUW-VI-36, x 200
Fig. 11. *Obesacapsula somphedia* (Foreman) Schaaf
IGPUW-VI-17, x 200
Fig. 12. *Hiscocapsa grutterinki* (Tan) O'Dogherty
IGPUW-VI-20, x 200



Hanna GÓRKA — Cenomanian Radiolaria from Spława, Polish Carpathians

PLATE III

Figs. 1–10. *Pseudodictyomitra pseudomacrocephala* (Squinabol) Pessagno
Fig. 1 — IGPUW-VI-1, x 205; Fig. 2 — IGPUW-VI-2, x 207; Fig. 3 — IGPUW-VI-10, x 205; Fig. 4 — IGPUW-VI-3, x 207; Fig. 5 — IGPUW-VI-7, x 205; Fig. 6 — IGPUW-VI-6, x 200; Fig. 7 — IGPUW-VI-8, x 170; Fig. 8 — IGPUW-VI-9, x 185; Fig. 9 — IGPUW-VI-5, x 195; Fig. 10 — IGPUW-VI-11, x 200
Figs. 11–15. *Xitus antelopensis* Pessagno
Fig. 11 — IGPUW-VI-26, x 200; Fig. 12 — IGPUW-VI-21, x 205; Fig. 13 — IGPUW-VI-23, x 195; Fig. 14 — IGPUW-VI-24, x 200; Fig. 15 — IGPUW-VI-22, x 212



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