MIDDLE JURASSIC - LOWER CRETACEOUS DEVELOPMENT
OF THE PRUSKÉ UNIT IN THE WESTERN PART
OF THE PIENINY KLIPPEN BELT

ROMAN AUBRECHT and LADISLAVA ÖZVOLDOVÁ

Department of Geology and Palaeontology, Faculty of Sciences, Comenius University, Mlynská dolina,
842 15 Bratislava, Slovak Republic

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Abstract: Two new lithostratigraphic units were distinguished within the Pruské Unit of the Pieniny Klippen Belt: 1. Samákšky Formation representing crinoidal flysch of Bajocian - Bathonian age; 2. Horné Srnie Limestone Member - a massive pink organodetritic limestone of Berriasian - Lower Valanginian age. New radiolarian species Orbiculiforma crenata Özvoldová, n.sp. was described from the Czajkowa Formation of the Samákšky locality.

Key words: Jurassic, Western Carpathians, Pieniny Klippen Belt, Pruské Unit, stratigraphy, microfacies, radiolarians, sedimentology.

Introduction

The Pruské Unit was first mentioned by Andrusov (1945) as the Pruské development of the Pieniny Unit. Its type locality occurs in the Podhradská Dolina Valley at Pruské village. The presence of grey marls with crinoidal limestone intercalations and the two horizons of nodular limestones is significant. It indicates the transitional character of this unit between the Czorszyn Unit, containing mostly a shallow shelf facies, to the Pieniny Unit, containing mostly a deep pelagic facies. Later Birkenmajer (1953) described the similar Niedzica Unit from the Polish part of the Pieniny Klippen Belt. The occurrences of the Pruské Unit in the Vih Valley were mapped and described also by Began (1969).

A new profile of the Pruské Unit was found at the Samákšky local part near the village Horné Srnie. It represents a roadcut outcrop within the area of the local cement factory quarries. It is very suitable for detailed investigation, for it was not very affected by the tectonic processes.

Description of the lithostratigraphic units based on the Samákšky profile

The profile represents a roadcut along the road connecting the main transport road with an abandoned quarry at Samákšky (Fig. 1). The whole profile is about 400 m long, with layers generally dipping about 30° SSW. It is almost complete, only some interruptions occur, caused by faults, debris and soil cover. Several lithostratigraphic units were recognized (Fig. 2). The detailed description of them is given in the next subchapters.

Harcarushn Shale Formation

The formation is poorly outcropped, only in local excavations at the road. It represents grey spotted marlstones with the local sandy crinoidal limestone turbiditic intercalations of up to 5 cm in thickness. The observable thickness of the whole formation is about 50 m. Frequent shells of Bosiura buchi (Römer) represent the only macrofauna. The formation is very poor also micro-

Fig. 1. Location of the Horné Srnie-Samákšky locality.
scopically. It contains only frequent sponge spicules with some lenticulimid foraminifers. The silt admixture of quartz is frequent also. The sediment is finely laminated.

The age determination of the Horygrund Formation, based only on the analogy with Birkenmajer (1977), is Middle Bajocian. However, this formation was not documented in the Niedźciza (Pruské) Unit (Birkenmajer, l.c.).

**Samásky Formation (new name)**

A regular alternation of crinoidal turbiditic layers and marlstones to claystones signals the beginning of a new formation (Pl. I: Fig. 1). It is about 35 to 40 m thick and was never described in detail in the literature. The first mention of this formation came from Andrusov (1945) from the type locality of the Pruské Unit. He described crinoidal limestones with marly intercalations and regarded it as the lateral equivalent of "Aalenian flysch" (now Szachtiowa Formation) but with a predominance of crinoidal detritus. Began (1969) mentioned that the predominance of shales (in the type locality) changes westward and crinoidal limestones become predominant. Westernmost, at the occurrences near the Horní Šába village, it represents only irregularly bedded crinoidal limestones.

In the described profile, the crinoidal flysch begins with relatively thick turbiditic layers with thick sandy shale intercalations. A slump structure occurs, formed in the second turbiditic layer (No. 5). Several thickening-upward cycles can be distinguished there (beds No. 28 - 35, 36 - 41, 42 - 47, 48 - 59) indicating prograding of the turbiditic fan. The turbiditic layers become thinner upwards and more regularly alternated with shales. In the shale layers, thin sandy intercalations are frequent, especially in the middle part of the flysch sequence. Many of the turbiditic layers contain A and B Bouna intervals; a C interval is absent. That indicates a relatively high progradation index, though in calciturbidites the coarser fraction could be moved to more distal areas than in the siliciclastic ones. The basal parts of the beds are often formed by matrix-supported fine-grained conglomerates with indistinctly graded bedding. The main portion of the bed is usually formed by coarse-grained structureless sandy crinoidal limestone. The upper parts of the layers are often parallelly laminated especially in the upper part of the profile. Diagenetic silification is very frequent in these parts. The SiO₂ comes from sponge spicules, which are abundant mainly in the marly...
intercalations. A small-scale (3 cm) neptunian dyke occurs in layer No. 5 (Pl. I: Fig. 2). It probably originated from a slight slumping of the bed and filling the newly formed small fracture with lime mud before the next turbiditic layer sediments. The mud is perfectly parallelly laminated also by the activity of limnivores, as suggested by faecal pellets arranged along some laminae (Pl. I: Fig. 3).

The crinoidal limestones are of white to light-grey colouration, yellowish if weathered. They represent sandy crinoidal biomicrites, sometimes with unperfectly washed-out lime mud. Rare twinning lamellae are visible in the crinoidal particles and in the sparite, which indicates weak affection by the pressure. From crinoidal particles, cirrals and brachials are relatively frequent, which coincide well with the Zc crinoids accumulation Zone of Gluchowski (1987). The zonation is developed due to the transform sorting of crinoidal detritus. The bivalve shells, thick-shelled ostracodes, echinoid spines, punctate brachiopods, bryozoans, nodosariid and lenticulifer foraminifers and sponge spicules are the main organic remnants besides the crinoidal detritus. Frequent silification of the crinoid particles is observable. It represents post-cementational silification for it cuts the syntial overgrowths (Pl. I: Fig. 5). From the non-skeletal elements a sandy admixture of quartz, also rarely feldspars is abundant. The quartz grains reach up to 3 cm size. In some of them, numerous little zonary zircon grains are present. From the larger-size clasts also the intraclasts of marlstones, spongolites and sandstones are present; they were derived from the sea bottom by turbidity current being moved. The abundant dolomitic clasts are present also.

The marly layers are of a grey to yellowish colouration (if weathered), with a rich silty admixture. They contain abundant sponge spicules, rare crinoidal particles and lenticulifer foraminifers. Sometimes, fibrous-calcite veinslets of 1 cm size occur: they probably originated by dessication and contraction by water being released from clay minerals.

The proposed age of the formation is Bajocian to Bathonian.

Niedzica Limestone

It represents a 75 cm thick layer of red nodular limestone with small nodules of up to 5 cm. They are often formed by indeterminable casts of ammonoids, strongly affected by dissolution. Microscopically it represents biomicrite - wackestone with abundant "fibres" (cross-sections of thin *Bostina* shells), gastropods, juvenile ammonoids, ostracodes, *Globochacte alpina* Lombard and foraminifers, especially *Lenticulina* sp. and nodosariid foraminifers. *Globochacte alpina* sp. is also present, but not in mass. This fact allows the determination of the stratigraphical range of the limestone as Bathonian. The overlying green Podmajerz Radiolarite Member begins in Upper Bathonian - Early Callovian.

Czajakowa Radiolarite Formation

It consists of two members: Podmajerz (green radiolarites) and Buwald (red radiolarites) Members. The Kamionka Radiolarite Member described by Birkenmajer (1977) is absent.
Podmajerz Member is a 60 cm thick layer of 5 to 15 cm thick green radiolarite beds. Locally, thin manganioxide coatings are found. Two clayey intercalations with poor microfauna were found within the radiolaries. Radiolarians are concentrated in laminae. They are usually spherical of bad preservation, filled with chaledony or sometimes with a pyritised centre. Outer parts of tests are often calcified. In the more marly parts, the radiolarians are flattened. In spite of the apparent bad preservation, a relatively rich fauna of radiolarians was separated by dissolution in hydrofluoric acid (Tab. 1; Pl. II - partially IV).

The radiolarian assemblage from the lowermost part of the green radioliters (sample HS-1a) with Guevella nudata (Kocher), Systoca sp. oblongula Kocher, Trilococapsa conesa Matsuoka etc., can be ranked to the Trilococapsa conesa Zone (Matsuoka & Yao 1986). According to the new results of Matsuoka (1992), this zone is ranging from Upper Bajocian to Lower Callovian and corresponding approximately with upper A0 Zone (U.A. 1) and A1 Zone (U.A. 2 - 4) of Baumgarten's zonation (Bauymgarten 1984). The presence of the species G. nudata and T. conesa and the absence of S. secta Matsuoka indicates the middle part of this zone (Matsuoka 1992). Thus, the association could probably represent Late Bathonian.

According to Baumgartner's zonation (Baumgarten 1984) the presence of Mirifusus fragilis Baumgartner, Mirifusus danae (Karrer), Systoca sp. oblongula Kocher and Trilococapsa conesa Matsuoka. The species Podobursa trianalata (Fischli) appears, too. According to our results from the other localities this species appears in the associations which represent U.A. 5. In Baumgarten (1984) the species Systoca sp. oblongula has its last occurrence in U.A. 5. The upper boundary of U.A. 5 is of Callovian age.

From this data, it can be estimated that the associations from Podmajerz Member represent the stratigraphical interval - Late Bathonian - Callovian.

Bulwark Member is about 4 m thick. It is represented by bedded red radiolarite, with beds of up to 15 cm thick. The marginal parts of the beds are sometimes of greenish colour. In the upper part, several thin intercalations of red shales occur. The greenish parts contain a higher portion of calcite, almost twice if compared with the Podmajerz Member. The clay mineral composition is the same in both members. On the basis of the thermal and optical analysis (J. Turan - Geol. Inst., Faculty of Sci., Com. Univ.), they are represented mainly by smectites of the montmorillonite type.

In the thin section, a very well preserved radiolarian fauna together with dispersed broken radiolarian spines is observable. Radiolarians are filled mainly by chaledony; they are commonly selectively calcified near the calcitic veinslets. In the marly parts they are flattened, as so in the shaly intercalations.

The red radiolarite member begins with a 20 cm thick layer of red radiolarite with Mn coatings which contains very poor radiolarian assemblage. Above, an approximately 15 cm thick layer of greenish-gray fine radioliters (sample HS-9b) occurs, containing rich microfauna (Pl. IV). In the rich association the first occurrence of Acarinioyle diaphorogona Foreman, Tetrarhabds bullosa Baumgartner and Tetrarhabds exosta (Pessagno) and the absence of Emiliouia orea Baumgartner and other species which occur higher (U.A. 7 - 8) indicates the appearance U.A. 5 in the continuous section. The lower boundary of the occurrence U.A. 5 (lower A2 Zone, Baumgartner 1984) is placed approximately to the Middle Callovian (O'Dogherty et al. 1989).

In the upper part of this member, a poor association in the sample HS-12b also contained the species Foremanella diaphorogona (Foreman) and Tetrarhabds casulalaeensis (Pessagno) indicating U.A. 8 (upper B Zone, Baumgartner 1984).

The best representation of U.A. 8 was found in the HS-13b sample with Emiliouia orea Baumgartner, Emiliouia prymogens Baumgartner and Tetrarhabds exosta (Pessagno) together with a new species Orcihilliforma catenaria n.sp. (the description is given in the paleontological part).

From the upper more calcareous parts (1 m beneath the top, HS-3 sample), a very poor association with Neopisopycycla echides (Foreman) was extracted. This species already indicates Kimeridgian age.

According to O'Dogherty et al. (1989), A2 Zone approximately begins in the Middle Callovian and B Zone ends in the Upper Oxfordian. Thus the age determination of gained microfauna of the Bulwark Member in the examined locality is Middle Callovian to Upper Oxfordian (?Kimeridgian).

The boundary between Podmajerz and Bulwark Members can be placed into the stratigraphical range U.A. 5 (Middle - Late Callovian) in this locality.

The uppermost part just beneath the Czorsztyn Limestone apparently seems to belong to the radiolarite formation. In fact,

PLATE II: Fig. 1 - Emiliouia sp. - 0897, 130x magn., HS-1a. Fig. 2 - Acanthohicкус suboblongus (Yao) - 0886, 210x magn., HS-1a. Fig. 3 - Systoca sp. trachystraca Foreman - 0891, 280x magn., HS-1a. Fig. 4 - Eustisius hungaricus Kozur - 1162, 300x magn., HS-1a. Fig. 5 - Praecocoryncosoma hexacubica Baumgartner - 0893, 235x magn., HS-1a. Fig. 6 - Systoca sp. decorus Rást - 1144, 280x magn., HS-1a. Fig. 7 - Guevella nudata (Kocher) - 1184, 400x magn. Fig. 8 - Obescucapsa sp. B - 1173, 300x magn., HS-1a. Fig. 9 - Angulobrachidia silica Kito & Dewever - 0883, 150x magn., HS-1a. Fig. 10 - Systoca sp. oblongula Kocher - 0939, 550x magn., HS-1a. Fig. 11 - Systoca sp. cf. catenaria Matsuoka - 1158, 700x magn., HS-1a. Fig. 12 - Eucysticellulium pusillum Baumgartner - 0906, 550x magn., HS-1a. Fig. 13 - Eucysticellulium disparile Nagai & Mizutani - 1142, 500x magn., HS-1a. Fig. 14 - Naporocapsa sp. - 0954, 250x magn., HS-1a. Fig. 15 - Eucysticellulium ununamensis (Yao) - 0901, 430x magn., HS-1a.

PLATE III: Fig. 1 - Systoca sp. convexa Yao - 9348, 320x magn., HS-15. Fig. 2 - Systoca sp. - 9336, 300x magn., HS-15. Fig. 3 - ?Dicytomeryx kanoensis Mizutani & Kido - 9346, 300x magn., HS-15. Fig. 4 - ?Dicytomeryx sp. - 0900, 400x magn., HS-1a. Fig. 5 - Systoca sp. robusta Matsuoka - 9318, 300x magn., HS-15. Fig. 6 - Prontunum sp. - 0944, 400x magn., HS-6a. Fig. 7 - Archaeocysticornicula sp. - 0890, 400x magn., HS-1a. Fig. 8 - Systoca brevicostatum (Ovoldovd) - 0884, 290x magn., HS-1a. Fig. 9 - Obescucapsa sp. A - 0895, 300x magn., HS-1a. Fig. 10 - ?Dicytomeryx sp. - 0900, 400x magn., HS-15. Fig. 11 - ?Dicytomeryx sp. - 0935, 110x magn., HS-15. Fig. 12 - Mirifusus fragilis Baumgartner - 1174, 160x magn., HS-1a. Fig. 13 - Systoca sp. oblongula Matsuoka - 9329, 380x magn., HS-15. Fig. 14 - Praecocoryncosoma yaoi Kozur - 0905, 270x magn., HS-1a. Fig. 15 - Obescucapsa moroensis Pessagno - 1150, 140x magn., HS-1a.
Table 1: Distribution of the radiolarian fauna extracted from the Czajkowa Radiolarite Formation.

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<th>HS 15</th>
<th>HS 6a</th>
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it is completely silicified *Saccocoma* limestone. The *Saccocoma* particles are largely corroded and concentrated in the laminae. The bad preserved flattened radiolarians filled by chaledony are present also. No determinable radiolarian fauna was separated from this part. According to the mass occurrence of *Saccocoma* sp., we can presume, that this part already belongs to Kimmeridgian. It cannot be considered as a separate member for it is macroscopically indistinguishable from the real radiolarite in the field.

It is clear, that the beginning of the radiolarite sedimentation in the Pruské Unit in this locality is earlier than that one in the equivalent Niedzica Unit in the Polish territory (Birkemajer 1977; Wdz 1991; Wdz 1992). However the results of Polish authors demonstrate the diachronous character of this sedimentation (ibidem). Callovian age of the Podmajer Member and the beginning of the Buwald Member in the range of Middle to Late Callovian support this fact.

**Czorsztyn Limestone**

The formation is 170 cm thick. It represents upper red nodular limestone ranging from Kimmeridgian to Berriasian.

In the lower part, it represents *Saccocoma* packstone, with pycthy fragments (*Lamelliptys*, *Laeypytys*), ostracodes and rare particles of other ostracods. The *Saccocoma* particles are often corroded and affected by pressure-solution. The nodules are of larger size (up to 10 cm) than those in the Niedzica Limestone. From the weathered marly parts, the free *Saccocoma* particles together with holothurian sclerites *Theelia* sp. were separated also.

The upper part represents a wackestone with frequent *Calpionella alpina* Lorenz, less *Crassicollaria intermedia* (Durand Delga) (indicating Late Tithonian age), frequent calcified radiolarians, pycthy fragments and ostracodes. Rarely echinoid spines, gastropods fragments, planispiral foraminifers, juvenile ammonoids, some particles of crinoids and ophiurans can be found also. The stratigraphical range of this formation is Kimmeridgian to Late Tithonian.

**Horné Sniež Limestone Member (new name)**

It represents a massive 140 cm thick layer of pink micritic limestone. Skeletal debris and cross sections of ammonoids are visible macroscopically. In thin sections, frequent calcified radiolarians, less crinoidal fragments, bivalve shells, pycthy, byrozooan fragments (*Trepotomata*) and foraminifers e.g. *Lenticulina* sp. are present. Foraminifers *Globuligerina* sp. are relatively frequent in the limestone, which is atypical for this stratigraphical level (Pl. I: Fig. 6). Calpionellids *Calpionellopsis oblonga* (Cadisch), *Calpionellopsis simplex* (Colom), Remaniella dadayi (Knauer), *Tintinopseilla longa* (Colom), *Tintinopseilla carpatica* (Margunau & Filipescu) and rare *Calpionella alpina* Lorenz can be observed in thin sections also. This association indicates Berriasian to Early Valanginian age sensu Borza (1984). It ranks most probably to the Lyša Limestone Formation sensu Birkenmajer (1977) according to its stratigraphical position. No one from the members mentioned by Birkenmajer (Lc.) has the features characteristic for this member. According to the description, it is most similar to the Harbutova Limestone Member, which differs by the thin bedding.

**Pleniiny Limestone Formation**

The 20 cm thick formation of bedded white micritic limestone with black to brownish chert layers, to chert nodules in the upper part, represents the uppermost part of the described profile. It is disturbed by several small faults cutting the layers diagonally. The limestone is pure micritic with rare micromolluska. At the base some calcified radiolarians, ostracodes, thin bivalve shells, rare crinoidal particles and foraminifers *Lenticulina* sp. are present. A rich radiolarian assemblage was extracted from the continuous chert layer about 2 m above the base (Pl. VI): *Acanthocirrus dicranacanthos* (Squinabol), *A. trizonalis* (Rüst), *A. variabilis* Quinabol, *Acanthocirrus umbriciata* Foramen, *Alveillum helenae* Schaff, *Alveillum* sp., *Angulobrachia cf. crassa* (Ovzdová), *Cecrops septemtemporat* (Parona), *Mesorasaurus acutus* (Rüst), *M. hueyi* (Pessagno), *M. furfusus dianae* (Karrier) s.l., *Pantantellam lanceola* (Parona), *Parvicirina hsiu Pessagno, Podobursa aff. tricantana* Foreman, *Praeconocoryphum priscus* Pessagno, *Pseudocerucella procer* Ovzdová, *Taranula conica* (Aliev), *T. pulchra* (Squinabol), *Neooplocyphus echiodes* (Foreman), *Triarbis worzeli* (Pessagno).

The assemblage indicates a stratigraphical range from the Late Valanginian to Hauterivian (U.A. 14, Baumgartner 1984, 1987; Schaaf 1984). According to the occurrence of *Mirusus dianae* Karrer s.l. and the absence of *Sthocapsa uteraula* (Parona), the lower part of this interval is supposed. No calpionellids were found in the limestone; the only age proof is provided by *Colomisphaera cf. vogleri* (Borza) indicating the Hauterivian age. The upper part is almost sterile. It is formed

**PLATE IV**

- Fig. 1 - *Parvicirina decora* (Pessagno & Whalen) - 0921, 300x magn., HS-6a; Fig. 2 - *Parvicirina dittemoanaia Baumgartner* - 0924, 310x magn., HS-6a; Fig. 3 - *Podobura tricantana* (Fichtl) - 1151, 160x magn., HS-6a; Fig. 4 - *Globuligerina* sp. - 1156, 400x magn., HS-6a; Fig. 5 - *Obesacapsula* sp.C - 0923, 320x magn., HS-6a; Fig. 6 - *Napora deveder* Baumgartner - 1170, 175x magn., HS-9b; Fig. 7 - *Acanthocirrus variabilis* (Squinabol) - 1157, 195x magn., HS-6a; Fig. 8 - *Acanthocirrus diaphorogena* Foreman - 9527, 210x magn., HS-9b; Fig. 9 - *Angulobrachia sicula* Kita & Devever - 0911, 195x magn., HS-6a; Fig. 10 - *Archeoplocyphus sima* Pessagno - 1161, 195x magn., HS-9b; Fig. 11 - *Triarbis esotica* (Pessagno) - 1163, 130x magn, HS-9b; Fig. 12 - *Tetrafrab bulbus* Baumgartner - 1169, 90x magn., HS-9b; Fig. 13 - *Homoeoparacotyla* sp. B - 1165, 140x magn., HS-9b; Fig. 14 - *Emulisia sedecimporata* (Rüst) - 1178, 170x magn., HS-9b; Fig. 15 - *Triarbis esotica* (Pessagno) - 1172, 110x magn., HS-9b; Fig. 16 - *Triarbis rhodocactus* Baumgartner - 1182, 140x magn., HS-9b;

**PLATE V**

- Fig. 1 - *Orbiculiforma catenaria* n.sp. - holotype 9569, 210x magn., HS-13b; Fig. 2 - *Orbiculiforma catenaria* n.sp. - side view of Fig. L 9580, 170x magn., HS-13b; Fig. 3 - *Tetrafrab bulbus* Baumgartner - side view of Fig. 5, 9541, 140x magn., HS-13b; Fig. 4 - *Paranella cf. bandyi* Pessagno - 9577, 145x magn., HS-13b; Fig. 5 - *Tetrafrab bulbus* Baumgartner - 9537, 130x magn., HS-13b; Fig. 6 - *Emulisia orea* Baumgartner - 9280, 130x magn., HS-13b; Fig. 7 - *Paranella mulleti* Pessagno - 9545, 160x magn., HS-13b; Fig. 8 - *Emulisia pessagnoi* Foreman - 9582, 125x magn., HS-13b; Fig. 9 - *Podobursa spinosa* Ovzdová - 9590, 125x magn., HS-13b; Fig. 10 - *Hemerasa coronaria* Ovzdová - 9271, 110x magn., HS-13b; Fig. 11 - *Homoeoparacotyla* sp. A - 9583, 115x magn., HS-13b; Fig. 12 - *Emulisia ordinaria* Ovzdová - 9564, 145x magn., HS-13b; Fig. 13 - *Paranella prinidensana* Baumgartner - 9279, 160x magn., HS-13b; Fig. 14 - *Pseudocerucella cf. procer* Ovzdová - 9581, 160x magn., HS-13b; Fig. 15 - *Parvicirina aff. hsiu Pessagno - 9584, 225x magn., HS-13b.
by nanofossils *Nannococcus* sp. *Hedbergella* foraminifers are not present yet in this part, thus it can be ranked to Middle Hauterivian.

### Gelany Formation

This formation is in tectonic contact with the described sequence and represents its relatively soft envelope. It is formed by red marlstones, former known as the Puchov Marls. It contains numerous, but not diversified fauna of foraminifers *Globostracna arca* (Cushman), *Heterohelix globulosa* (Ehrenberg), *Heterohelix ultinmutulida* (White) and *Dorothia acyona* (Reuss) (determined by J. Salaj - D. Štúr Geol. Inst.). The fauna indicates Early Campanian age.

### Paleontological part

**Genus:** *Orbiculoia* Pessagno, 1973

**Typical species:** *O. quadrata* Pessagno, 1973

*Orbiculoia ctenaria* Obvodová, n. sp.

Pl. V. Figs. 1, 2

**Holotype:** No. 9569, 9580 (Pl. V. Figs. 1, 2), deposited in the Slovak National Museum in Bratislava (SNM - Z-21170).

**Type locality:** Horní Smeč - Samšták, Biele Karpaty Mts.

**Stratotype:** Radiolarites - Oxfordian

**Denomination:** Lat. ctenaria = chain; according to the chain of pores around the central cavity.

**Description:** Test is circular in outline. Central cavity form 1/4 of the test diameter. Meshwork of the test consists of large tetragonal to polygonal pore frames of unequal size. The margin of the central cavity is conspicuously raised. It is formed by a chain of large pores of oval to oblong shape. The central cavity is finely porous. Its centre is slightly raised.

**Dimensions:**

- **Holotype**
  - Width of the test: 0.270
  - Width of central cavity: 0.065
- **Min.**
  - Width of the test: 0.230
  - Width of central cavity: 0.050
- **Max.**
  - Width of the test: 0.310
  - Width of central cavity: 0.080

### Conclusions

The described profile confirms the transitional character of the Pruske Unit already in Bajocian-Bathonian time. The Samšták Formation is a transitional link between the Smołegowa and Krupianka Limestone Formations sedimented on the elevated shelf area of the Czorsztyń Unit and Flaki Limestone Formation from deeper-water Kysuca and Pienny Units representing the distal parts of the crinoid turbidites (Fig. 3). A relatively uniform pre-Bajocian sedimentary area was differentiated due to the tectonic tilting probably caused by an advanced opening of Penninic ocean. The Czorsztyń and Pruske Units were divided by the tectonic escarpment, which together with an eustatic sea-level drop in Late Aalenian, provided the main control of facial development in the Penninic units.

On the base of the micropaleontological study in the examined locality, the radiolarite sedimentation begins earlier than in the Niedzica Unit in Poland. However, it is in accordance with its diachronic character expressed by the Polish authors (Birkemajer 1977; Wdz 1991, 1992).

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### References


