

## Biostratigraphy and paleoecology of the Upper Cretaceous Frydek - type marls from the Rajbrot tectonic window (Polish Flysch Carpathians)

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**Abstract.** In the Frydek - type marls, that occur in the Rajbrot tectonic window, the planktonic as well the benthic foraminiferal assemblages were identified. In majority samples, planktonic and benthic calcareous foraminifera are predominant. The foraminiferal assemblages are ranging from the upper part of the Early Campanian to the Late Maastrichtian. The succession examined can be interpreted as a deposit of the shelf and/ or the upper slope on the basis of the paleobathymetrical analysis. The morphotype analysis indicates stable paleoecological conditions during deposition of the Frydek - type marls.

**Key words:** Campanian - Maastrichtian, Subsilesian Unit, Rajbrot tectonic window, Frydek - type marls, Foraminiferida.

### Geological setting

The Subsilesian Unit is exposed in several tectonic windows within the Polish Flysch Carpathians. The Rajbrot tectonic window which forms the most eastern part of the structure called the Lanckorona- Żegocina tectonic zone (Skoczylas-Ciszewska, 1960, 1963) is one of them. This zone occurs in the front of the Magura Nappe and is composed of Silesian and Subsilesian nappes which are folded and overthrust together (Koszarski, 1984). The area studied is located in the Rajbrot tectonic window and examined materials come from the Frydek - type marls that occur along Uswiwa and Boczny creeks in the Rajbrot village ( Fig.1 ).

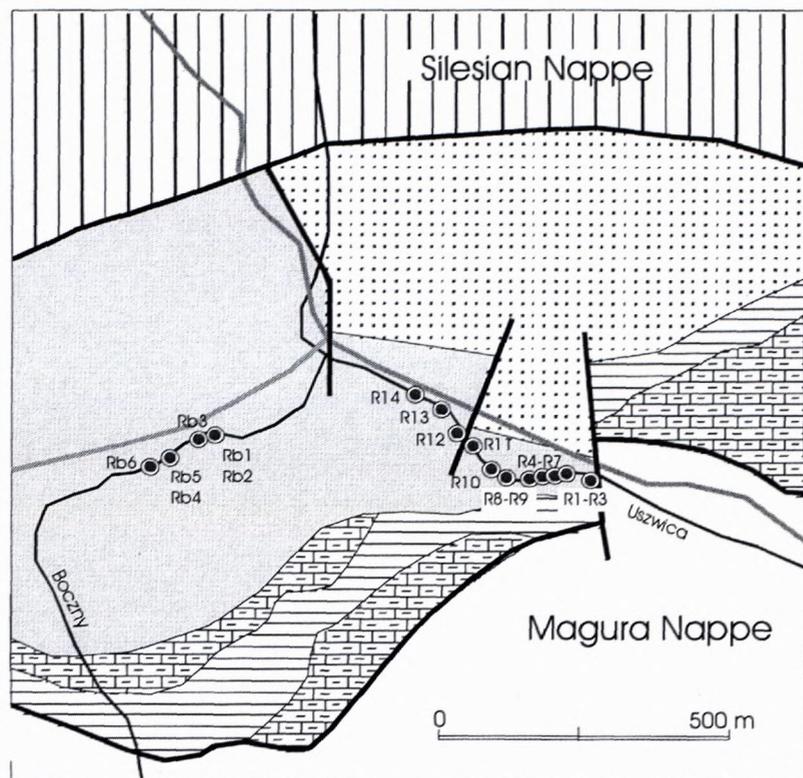
### Methods

Twenty samples have been collected from the Frydek type marls. They are represented by grey and green - grey coloured hard marls and marly-shalls with intercalations of thin - bedded sandstones. All samples were divided into 300 g parts, disintegrated by repeated boiling and drying using  $\text{Na}_2\text{SO}_4 \times \text{H}_2\text{O}$  solution. Then, they were washed over a 63  $\mu\text{m}$  screen and dried. At least all specimens were picked from the dry residue and examined. Most of samples contained relatively abundant and diversified foraminiferal assemblages.

### Micropaleontological analysis

The foraminiferal associations consist of planktonic (up to 60 %) and benthic calcareous as well as agglutinated taxa. The neritic fauna like fragments of echinoids, sponge sclerites, ostracods and radiolarians have been also found. The studies of foraminiferal assemblages have revealed the presence of the stratigraphic sequence of the planktic foraminifera zones from the upper part of the Early Campanian to the Late Maastrichtian (according to Caron, 1985;

Robaszyński & Caron, 1995). Within the succession, examined the benthic foraminifers are represented by: *Ammodiscus* sp., *Arenobulimina dorbigny* (Reuss), *Nothia excelsa* (Grzybowski), *Rzehakina epigona* (Rzehak), *Gyroldinoides nitidus* (Reuss), *Ossangularia florealis* (White), *Quadriformina allomorphinoides* (Reuss), *Dorothia crassa* (Marsson), *Bolivinoidea draco* (Marsson), *Geosella rugosa* (Hanzlikova), *Remesella varians* (Glaessner), *Dentalina* sp., *Stensioeina* sp. It is not able to precise the age of the succession on the base of the composition of benthic foraminifers. The age of the deposits considered has been defined thanks to reach assemblages of planktonic foraminifers. The Globotruncana ventricosa Zone (sensu Caron, 1985) was the oldest foraminiferal biozone within the succession examined. Species like: *Globigerinelloides ultramicra* (Subbotina), *Globotruncana arca* (Cushman), *Archeoglobigerina cretacea* (d'Orbigny), *Heterohelix globulosa* (Ehrenberg) have been identified. They indicate late Early Campanian age. The younger association of planktonic foraminifers is characteristic for Globotruncanita calcarata Zone (Caron 1985) of the Late Campanian. This biozone is represented by: *Archeoglobigerina cretacea* (d'Orbigny), *Globigerinelloides prairiehillensis* Pessagno, *Globotruncanella havanensis* (Voorwijk), *Globotruncana linneina* (d'Orbigny), *G. arca* (Cushman), *Heterohelix globulosa* (Ehrenberg). Within the following Globotruncanella havanensis zone (Caron, 1985) have been identified species: *Globotruncanella havanensis* (Voorwijk), *Hedbergella holmdelensis* Olsson, *Rugoglobigerina rugosa* Plummer, *Heterohelix glabrans* (Cushman), *Globotruncanita stuarti* (Lapparent). This association is characteristic for the early part of the Early Maastrichtian. The assemblage of foraminifers from the next Globotruncana aegyptiaca Zone of the upper part of the Early Maastrichtian contains i.e.: *Globigerinelloides multispina* (Lalicker), *G.prairiehillensis* Pessagno, *Globotruncanella petaloidea* (Gandolfi), *Globotruncana aegyptiaca* Nakkady, *G. linne-*



Subsilesian Unit:

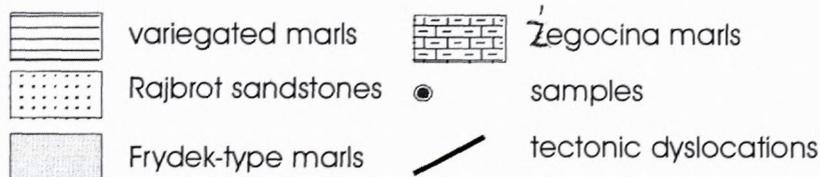


Fig. 1 Location and geological position of the Uszwica and Boczny creeks. (Numbers refer to locations of samples)

iana (d'Orbigny), *Globotruncanita conica* (White), *Rosita contusa* (Cushman), *Heterohelix navarroensis* Loeblich, *Racemiguembelina fructifera* (Egger). The following Gansserina gansseri zone is represented by: *Globotruncana bulloides* Vogler, *Globigerinelloides multispina* (Lalicker), *Heterohelix pulchra* (Brotzen). They indicate early Late Maastrichtian. The youngest association of the planktonic foraminifers that has been found, is characteristic for *Abathomphalus mayaroensis* Zone of the latest Maastrichtian. *Abathomphalus mayaroensis* (Bolli), *Globotruncanella citae* (Bolli), *Globotruncanita stuarti* (Lapparent), *Rosita contusa* (Cushman), *Racemiguembelina fructifera* (Egger) have been identified.

**Paleoecological remarks**

The quantitative analysis of the studied samples from the upper part of the Early Campanian to the Late Maastrichtian has shown paleobathymetrical and paleoecological differences between foraminiferal associations.

The paleobathymetrical analysis within foraminiferal assemblages studied (sensu Sliter & Baker, 1972, Gasiński,

1998) has shown a number of benthic taxa which are characteristic for the shelf and the upper slope. The relation between keeled and non-keeled planktonic taxa has been also studied. Non-keeled forms that are epipelagic dwellers predominate over keeled ones which are bathypelagic.

The morphogroup analysis according to Jones & Charnock 1985 has indicated stable environmental conditions e.g.: sufficient food and oxygen availability during deposition of the deposits studied. Moreover, these conditions have on the Campanian - Maastrichtian boundary and at the beginning of the  $\phi$  ameliorated Maastrichtian. Relatively small amount of the tubular forms and the vagile epifauna within benthic associations have shown a low rate of sedimentation during forming of the Frydek-type marls in the area studied.

**Conclusions**

Within the examined Frydek - type marls from the Rajbrot tectonic window, standard planktonic biozones have been recognised. These foraminiferal assemblages are Campanian-Late Maastrichtian in age.

Predominance of non-keeled taxa have been used as the main criterion among planktonic foraminifers, indicating shallow water environment of deposits studied. Stable paleoecological conditions prevailed during deposition of the Upper Cretaceous Frydek - type marls.

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