The age and stratigraphic position of Stare Bystre Formation (Magura Nappe, Polish Outher Carpathians) based on calcareous nannofossils

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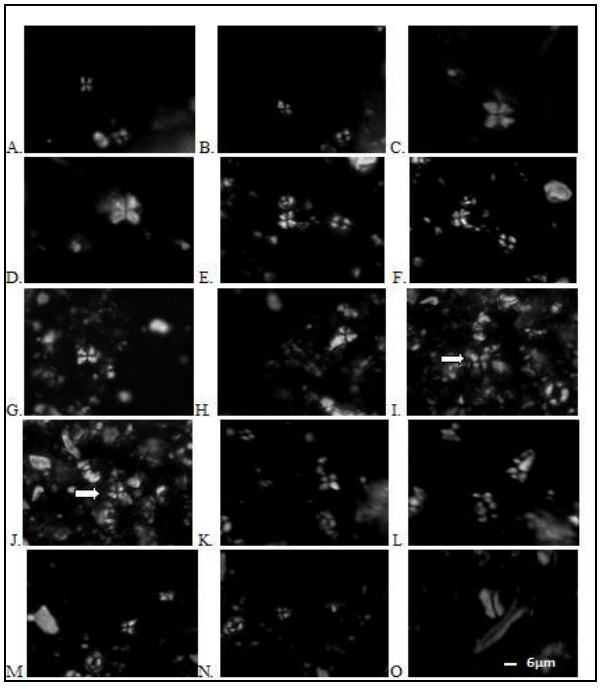
The paper presents biostratigraphic results of studies from Stare Bystre Formation, based on the quantitative calcareous nannofossil analyses. The samples were collected from an outcrop located between Stare Bystre (N49 26.506, E19 55.836) and Rogoźnik, on the left bank of the Rogoźnik Wielki River. The outcrop in Stare Bystre is located in the Orava-Nowy Targ Intramontane Basin which is a part of Krynica zone in the Magura Nappe (Outer Carpathians). In this area marine Miocene deposition emerges to the surface from under the freshwater Neogene and Quaternary lands sediments, which cover the basin area (Cieszkowski, Olszewska 1986, Cieszkowski 1992, Oszczypko 2006). Recently the outcrop has been totally destroyed by mudflows as the results of the expansion of the Rogoźnik River. The samples analysed in the author's master thesis have been collected in 1998 by Marek Cieszkowski and Marta Oszczypko-Clowes. The reason to conduct new investigation in that area was an attempt to clarify the age of the studied formation.

Lithological structure of the Krynica Zone was formalized by Birkemajer and Oszczypko in 1988/89 who distinguished the youngest deposit in Beskid Group of Magura nappe and proposed the name Malcov Formation. The age of formation was defined as Early Oligocene (Birkenmajer & Oszczypko 1988, 1989, Oszczypko-Clowes, 2001, Oszczypko-Clowes & Żydek, 2012).

In 1992 Cieszkowski discovered marine Miocene deposits in the Orava-Nowy Targ intramontane basin on connection with Magura Nappe series and proposed that the marine Miocene founded in that area could be a continuation of the Malcov Formation and named: Waksmund and Stare Bystre Beds (Oligocene – Early/Middle Miocene age) (Cieszkowski 1992). The age of the Stare Bystre Formation, determined by Cieszkowski based on the presence of: *Reticulofenestra pseudoumbilica*, *Sphenolithus abies* and *Discoaster kugleri* – indicates NN7 (Sarmatian) zone sensu Martini & Worsley (1970).

The age of the sediments discussed in this paper has been defined also based of the calcareous nannoplankton assemblages. Eighteen microscope slides were analysed using the standard smear slide technique for light microscope. The investigation was carried out under Nicon Eclipse E600POL (light microscope), at enlargement of 1000x. 128 species of calcareous nannoplankton have been determined: 16 autochtonous, 112 allochtonous. The early Miocene age (NN2) of Stare Bystre beds have been determined on the basis of first occurrence of *Sphenolithus disbelemnos*. The autochtonous assemblage is characterized by the occurence of: *Braarudosphaera bigelowii, Calcidiscus leptoporus, Coronocyclus nitescens, Discoaster deflandrei, Helicosphaera obliqua, Pontosphaera multipora, Reticulofenestra dawiesii, Reticulofenestra haquii, Reticulofenestra minuta, Sphenolithus dissimilis, Sphenolithus belemnos* and *Sphenoliths morriformis.* The presences of that species also suggest early Miocene age of the Stare Bystre beds.

In all the samples *Sphenolithus abies* or *Discoaster kugleri* were not observed.



Tab.1. **Some of the autochtonous species from Stare Bystre Formation (Magura Nappe): A. B.** *Sphenolithus disimilis* (Bukry & Percival, 1971) **C. D. and E. F.** *Sphenolithus moriformis* (Brönnimann & Stradner, 1960) Bramlette & Wilcoxon (1967) **G. H. and I. J.** *Sphenolithus* cf. *belemnos* (Bramlette & Wilcoxon, 1967) **K. L.M.N.** *Sphenolithus disbelemnos* (Fornaciari & Rio, 1996) **O.** *Zygrhabilitus bijugatus* (Deflandre in:Deflandre & Fert, 1954, Deflandre 1959) and *Semihololithus kerabyi* (Pearch-Nielsen, 1971)

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