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Newly found marine Oligocene deposits in the Carpathian Foreland and its palaeogeographic consequences

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Abstract: Marine Oligocene deposits are described for the first time from the Polish part of Carpathian Foreland bellow the Miocene Foredeeps basin. The age of these deposits is documented by dinocysts found in their lower part. Presence of marine deposits relatively close to the Outer Carpathians Flysch basins throwes some new light on a palaeogeography of the Carpathian northern edge. Comparison of dinocysts from boreholes in Carpathian Foreland with the ones of the coeval Outer Carpathians deposits suggest lack of communication between these two marine basins.

Key words: Oligocene,Carpathian Foreland, Outer Flysch Carpathian basins, palaeogeography, dinocysts

Introduction

Rich and very well preserved Oligocene dinocysts were found during the palynological investigations of the Carpathian Foredeep Miocene deposits near Biłgoraj (Fig. 1). They were found in lowermost part of „Miocene" sequence in few boreholes in this area. Oligocene deposits, up to several meters thick, are developed as brownish (in the lower part) and greyish and whitish loose sands (upper part), lying disconcordantly on the Cambrian substratum (Fig. 2). Transgressive conglomerate is often present in the lowermost part. Oligocene deposits are covered by the Miocene Baranów beds (*sensu* Ney, 1966) developed as *Litothamnium* sandstones and limestones and sandstones with oysters.

Northern Carpathian margin was belived to have been a land since the Laramian phase till the begining of the Miocene sedimentation (e. g. Kwiatkowski, 1985; Moryc, 1985). The find of the marine Oligocene deposits indicate that at least once in the Early Oligocene a part of Carpathians Foreland was flooded by sea (area of the Miocene Foredeep). Although these deposits have been found in one area only, their original extent must have been much larger. Today the marine Oligocene is preserved in isolated tectonic grabens, whereas their majority was eroded from the uplifted parts. It is also very likely, that some of sandy deposits included among the Miocene Baranów beds (especially its lower part: see Ney, 1969) are in fact Oligocene deposits.

Age and palaeoenvironment

Numerous and well preserved dinocysts from the lower, dark coloured sands allow to determine Oligocene age of these deposits. These is based on the presence of following taxa: *Areoligera? semicirculata*, *Chiropteridium galea*, *Chiropteridium lobospinosum*, *Pentadinium laticinctum*, *Pentadinium lophophorum*, *Reticulatosphaera actinocoronata*, *Rhombodinium draco*, *Rhombodinium freienwaldensis*, *Wetzeliella gochtii* and *Wetzeliella symmetrica* subsp. *incisa*.

More precise dating based on known stratigraphic ranges of the above mentioned taxa from north-western Europe suggest Rupelian or Rupelian-earliest Chattian age of studied deposits (Costa & Downie, 1976; Costa & Manum, 1988; Gradstein *et al.*, 1992; Powell, 1992; Stover & Hardenbol, 1993; Stover *et al.*, 1996).

Comparison with the Polish Lowland Oligocene dinocyst assemblages indicate their Rupelian age. Grabowska (1974, 1987, 1996; Grabowska & Ważyńska, 1997) distinguished a dinocyst assemblage characteristic for the Lower Oligocene deposits of the Polish Lowlands: it is dominated by *Chiropteridium lobospinosum*, and subordinarly by following taxa: *Chiropteridium partispinatum*, *Membranophoridium aspinatum*, *Phthanoperidinium amoenum*, *Wetzeliella symmetrica*, *Deflandrea phosphoritica* and *Rhombodinium draco*. Late Oligocene dinocysts described by Grabowska (Ciuk & Grabowska, 1991) are characterized by much lower diversity and the occurrence of such taxa like *Deflandrea phosphoritica*, *Dapsilidinium simplex*, *Hystrichokolpoma rigaudiae* and *Spiniferites ramosus*. *Chiropteridium lobospinosum*, the most frequent taxon in the Lower Oligocene deposits, becomes very rare in lower part of the Upper Oligocene, and disappears in its upper part (Grabowska, 1996).

Thus, the newly described marine Oligocene deposits can be correlated with epicontinental marine Rupel Formation and brackish Czempin Formation and/or the marine Upper Mosina Formation of nort-western Poland being coeval with the Carpathians Menilite beds (cf. Piwocki & Olszewska, 1996).

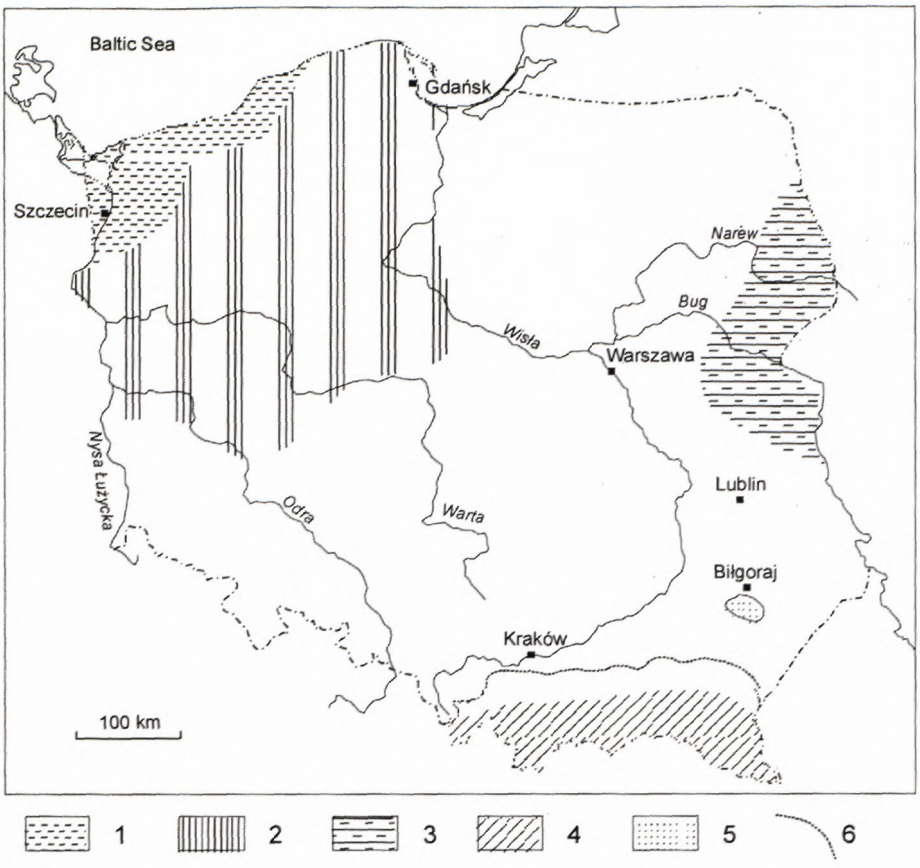

Fig. 1. Distribution of Lower Oligocene deposits in Poland (data concerning Polish Lowlands after Odrzywolska-Bieńkowska et al., 1978): 1 – septarian clays; 2 – glauconitic sands; 3 – sandy deposits with plant debris but without coals; 4 – extent of Carpathian flysch basins; 5 – Oligocene deposits of Carpathian foredeep basin; 6 – recent tectonic border of Flysch Carpathians.

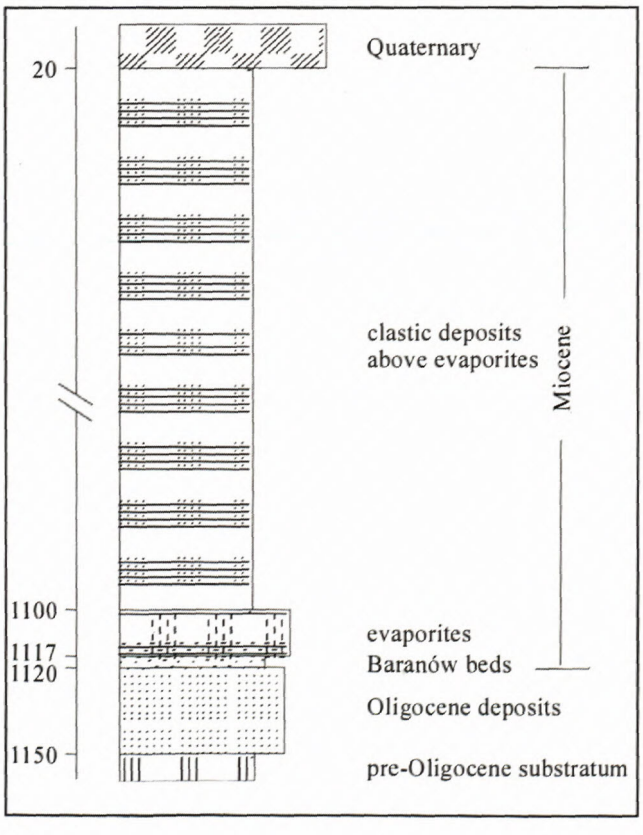

Fig. 2. Schematic profile of Carpathian Foreland deposits in vicinity of Biłgoraj.

Investigated deposits are characterized by two different palynofacies reflecting various palaeoenvironmental conditions. Lower, dark coloured part contains dinocysts whereas the upper one contains much less organic matter which is often composed of black opaque phytoclasts and resin remains only. Rare sporomorphs and sporadic dinocysts are also present in the latter. Diversified dinocyst assemblage from the lower part of the sequence indicate marine conditions of relatively shallow and near shore basin. Dinocyst disappearance upwards reflects presumably a shallowing trend leading to high-energy, aerobic conditions of very near shore environment. Palynofacies composition suggests limited terrestrial input into the basin without fresh water supply.

Palaeogeography

The newly found Oligocene deposits were located approximately 100-120 km from the Oligocene Carpathian basins edge (if distance of 50-75 km between present day Carpathians tectonic edge and their northern sea shore calculated by several authors, e. g. Kotlarczyk [1986], will be taken into acount).

Dinocyst data suggest the lack of communication between these two basins: rich, diversified and very well preserved foredeep dinocyst assemblage versus very poorly preserved, highly impoverished or absent dinocysts from Carpathian Menilite beds (Gedl, 1999). Palynofacies of the latter is 100 % composed of the terrestrial phytoclasts (land plant tissue remains) and palynomorphs

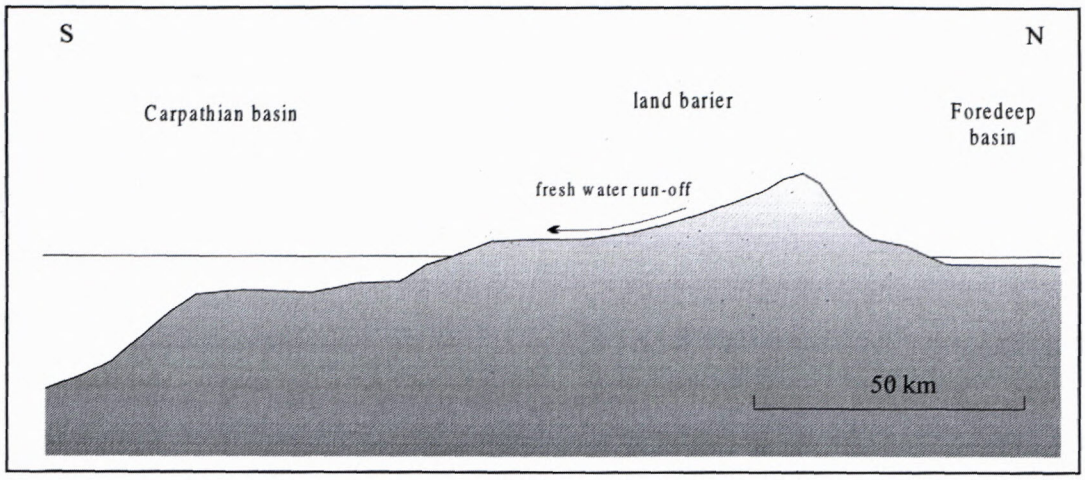

Fig. 3. Schematic reconstruction of northern edge of Carpathian basin during Lower Oligocene.

(mainly bisaccate pollen grains), whereas the one of the Oligocene Foreland deposits is characterized by dominance of black opaque phytoclasts and resin remains with relatively frequent dinocysts (in lower part) and sporomorphs (in upper part). Moreover, no reworked dinocysts from the other basin were found so far. Thus, a land barrier must have separated these two basins (Fig. 3). Since the precise position of southern border of the Oligocene deposits is not known at the present state of knowledge the distance of 100-120 km from the Oligocene Carpathian basin must be taken as its breadth.

Palynofacies of the Menilite beds, rich in terrestrial plant remains, suggests the presence of river system in the southern part of the land barrier mounting into the flysch basin, leading to partial salinity decrease and eutrophication in subsurfal water layer (Gedl, 1999). No major river system was present on the nothern slopes of the land barrier resulting in normal salinity of the Oligocene Foreland basin.

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