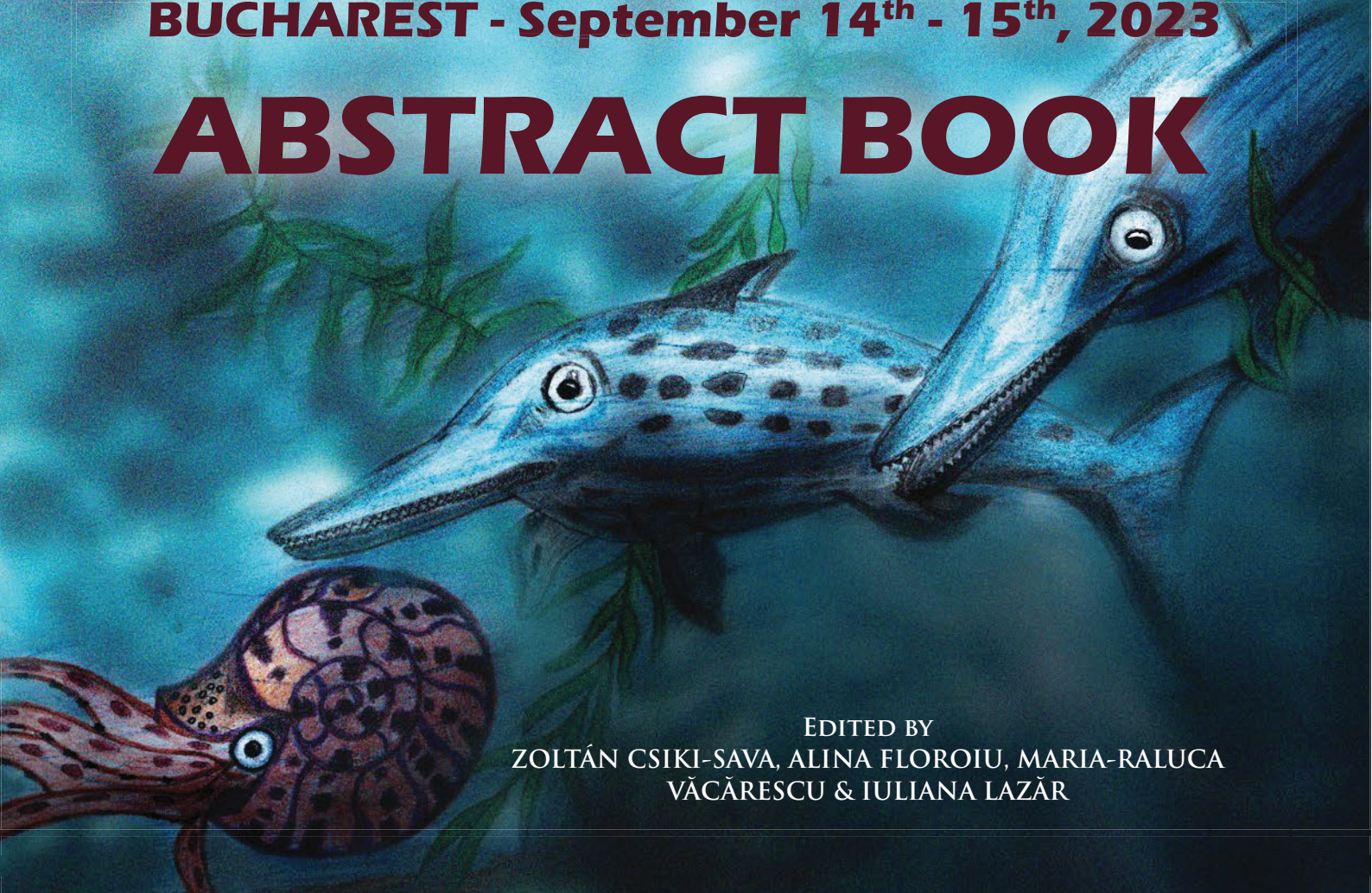




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Palynostratigraphic and palaeoenvironmental investigations of the Maastrichtian from Oarda de Jos (southwestern Transylvanian Basin)

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Detailed biostratigraphic studies concerning the Upper Cretaceous vertebrate-bearing continental deposits in the southwestern Transylvanian Basin are almost inexistent. The only information was previously provided by Antonescu (1973) and Antonescu et al. (1983) who assigned the “Red Clastic Formation” exposed along Pâclișa Valley, southwest of Alba Iulia (= basal part of the Sebeș, or Șard, Formation) to the upper Maastrichtian, based on the presence of the angiosperm pollen taxon *Pseudopapillopollis praesubhercynicus* which showed a frequency of about 40% of the total identified assemblage. This study presents new biostratigraphic data obtained from the continental deposits of the Sebeș Formation located along the Sebeș River west of Oarda de Jos.

The investigated outcrop (ODA) consists of a succession of mudstones, sandstones, and sandy clays that yielded large coaly or silicified tree trunks, and a rich vertebrate assemblage (Antonescu, 1973; Codrea et al., 2010). The ODA outcrop, one of the most important vertebrate localities from the southwestern Transylvanian Basin, hosts in its uppermost part the type locality of several taxa (the lizard *Oardasaurus*, the pterosaur *Albadraco*, and the multituberculate *Barbatodon oardaensis*; Codrea et al., 2014, 2017; Solomon et al., 2020).

The palynological assemblage reported here consists of well-preserved palynomorph specimens of continental origin, identified in a mudstone bed located in the lowermost part of the outcrop, near water level. This assemblage includes 62 taxa (22 spores, 9 gymnosperms, and 31 angiosperms). Fern spores are dominated by various species of *Deltoidospora* and *Polypodiaceoisporites*, whereas among the angiosperm pollen, various taxa of the Normapolles group (*Oculopollis minoris*, *Trudopollis nonperfectus*, *Trudopollis minimus*), as well as Myricaceae (*Myricipites* div. sp.) and Juglandaceae (*Subtriporopollenites* div. sp.), show quite high frequencies.

This palynological assemblage contains few taxa that represent biostratigraphical markers within the Upper Cretaceous. The fern spore *Polypodiaceoisporites hojrupensis* (Fig. 1d) has its first occurrence across the Campanian–Maastrichtian boundary of the Tercis les Bains section (France; Siegl-Farkas, 2001; Méon et al., 2001), and was considered a characteristic taxon for the upper Maastrichtian in Hungary (Góczán & Siegl-Farkas, 1990). Another biostratigraphic marker assigned to the Normapolles group is *Oculopollis praedicatus* (Fig. 1a). This taxon is generally considered to indicate a Santonian–Campanian age (Polette & Batten, 2017), occurring in the Upper Campanian deposits in Ukraine (Shevchuk, 2018) and southwestern Transylvanian Basin (Țabără et al., 2022; Bălc et al., 2023), but persists up into the early Maastrichtian in the Hațeg area (Antonescu et al., 1983; Botfalvai et al., 2021) and Eastern Carpathians (Țabără et al., 2023). Thus, according to these biostratigraphic data, the age of the palynological assemblage at Oarda de Jos can be assessed as early Maastrichtian – older than previously considered.

The palynological organic matter content exhibits a moderate abundance, with a value of Total Organic Carbon (TOC) of 0.81%, consisting of a mixture of often lath-shaped opaque phytoclasts (~90%), and large translucent phytoclasts of continental origin; this palynofacies suggests a short transport of these organic particles and a lacustrine/deltaic palaeoenvironment. Geochemical analysis (gas chromatography–mass spectrometry GC–MS) shows the predominance of short-chain *n*-alkanes (*n*-C₁₆ and *n*-C₁₈) that can derive from freshwater green algae (Love et al., 2005). According to the same geochemical data (i.e., pristane/phytane ratio, cross-plot of TOC vs. sulfur content), the studied lower Maastrichtian mudstone sediments from Oarda de Jos were deposited under anoxic to relatively suboxic conditions.

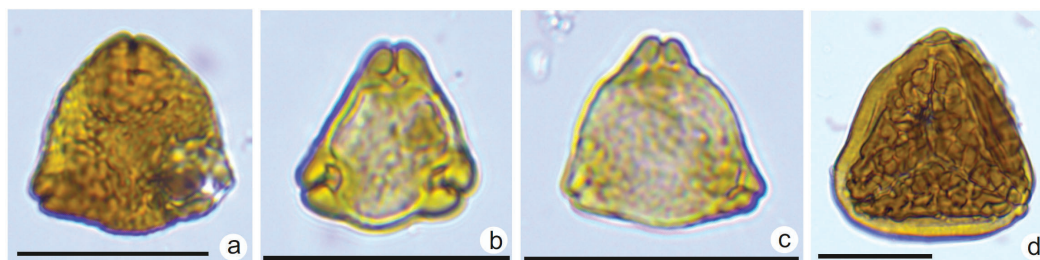


Figure 1. Representative taxa of the palynological assemblage (scale bar 30 μm). a - *Oculopollis praedicatus*; b - *Trudopollis nonperfectus*; c - *Trudopollis granulosus*; d - *Polypodiaceoisporites hojrupensis*.

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