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Environmental, Structural and Stratigraphical Evolution of the Western Carpathians

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Brachiopods internal skeletal structures: testing the microCT method on Eocene and Miocene specimens from Croatia

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Croatian Natural History Museum (CNHM) houses abundant collections of Cenozoic (Eocene and Miocene) brachiopods from Croatia. Recently, we started the revision of the Middle Miocene (Langhian and lower Serravallian/Badenian) brachiopod collection from the Čučerje locality near Zagreb. Preliminary results showed a predominance of the order Terebratulida (Bošnjak et al. 2022) with more than 900 specimens. The classification criteria for these brachiopods include their internal shell structure, with the brachidium as an important element. Traditional methods for examining the interior of the shell involve destructive transverse serial sectioning (e.g., Cooper 1983 and references therein). However, X-ray tomography has also been conducted in more recent studies (e.g., Błażejowski et al. 2011, Gaspard 2013). In order to test the potential for gaining better insight into the taxonomy of fossil brachiopods from the CNHM, the inner shell structure was observed using a micro-computed tomography (microCT) device at the Natural History Museum of Vienna. For this analysis, we selected 13 terebratulid specimens of different ages and localities, including both Eocene and Middle Miocene specimens, along with one representative of the Rhynchonellidae. To compare the resolution of the shell interior based on the type of the sediment infill, we chose 6 Eocene terebratulids from the Island of Krk, Croatia, with a limestone infill, and the seven Middle Miocene terebratulids from Zagreb, with mostly sandstone infill. Preliminary results indicate that the Eocene terebratulids are not suitable for microCT analysis due to the similar mineral composition of the loop and the infill, and hence, invisible internal shell elements on CT images. Numerous Middle Miocene terebratulids have poorly preserved inner shell structures due to the fossilization processes, but some specimens retain recognizable parts of the brachidium providing the possibility to reconstruct these elements using 3D modeling. A similar result was observed in scans of the Middle Miocene rhynchonellid. Therefore, the preliminary results of this study demonstrate the microCT as a promising non-destructive tool for further taxonomic studies of the observed Middle Miocene brachiopods from the CNHM.

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