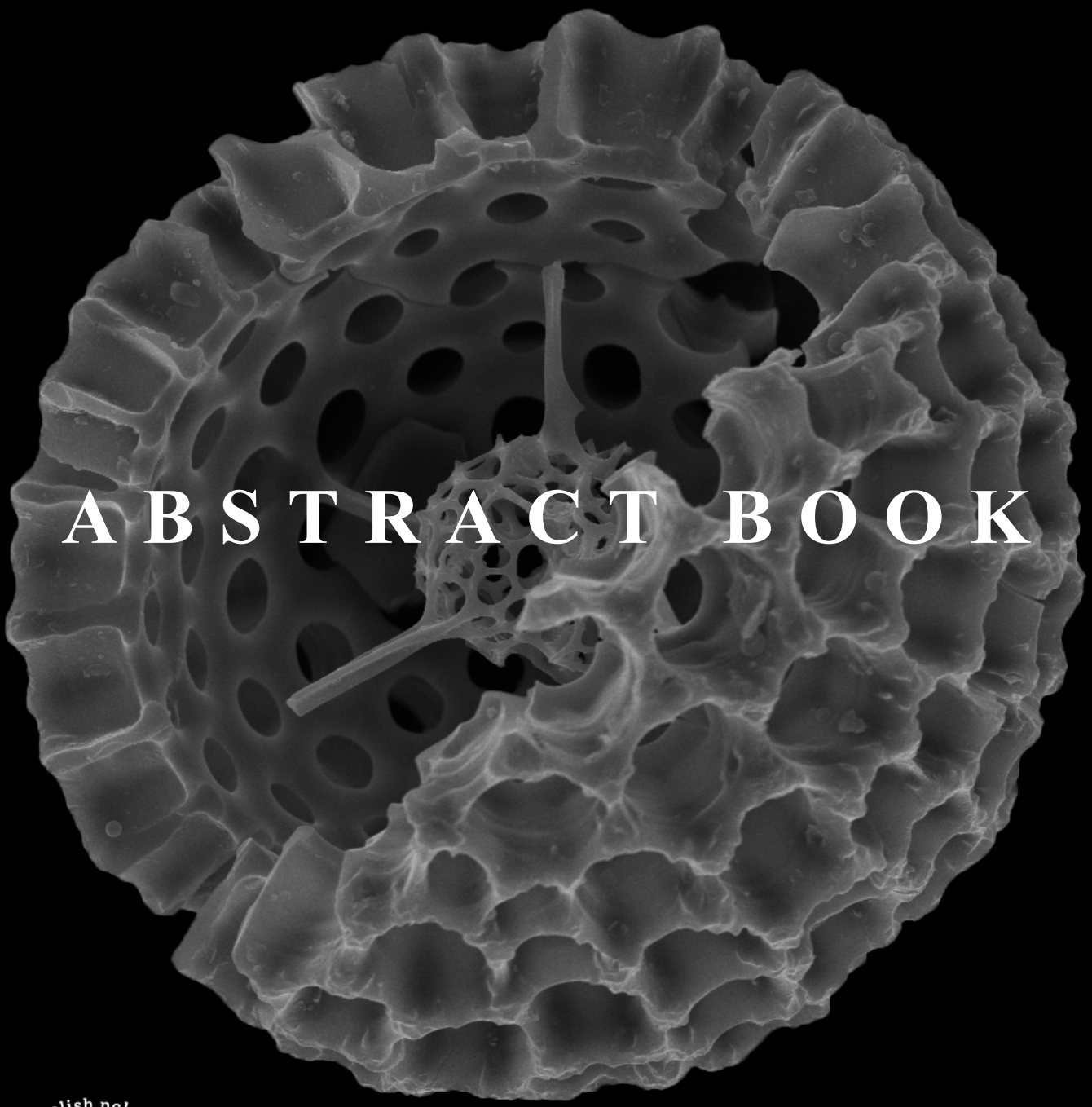
23rd Czech – Slovak – Polish Paleontological Conference
Banská Bystrica, Slovakia

October 15 –17, 2024



ABSTRACT BOOK

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Molecular palaeontology – the use of biomarkers in the reconstruction of the paleoenvironment in the postglacial period

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After the retreat of the glaciers in high mountain areas glacial lakes were created. Deposited lacustrine sediments preserve information about paleoclimate and paleoenvironmental changes in the Postglacial and Holocene periods. By applying an actualistic approach to such archives in Tatra Mts. we interpret the fossil biomarkers through the organic molecular composition of present-day biota.

Sediments from mountain lakes Popradské pleso (1494 m a.s.l.; POP), Trojrohé pleso (1611 m a.s.l.; TROJ) and Batizovské pleso (1884 m a.s.l.; BAT) and 12 ecological vegetation groups collected from their catchments were processed using extraction and separation techniques (Freimuth et al. 2017; Bechtel et al. 2018) and analyzed for molecular and compound-specific isotopic composition by GC/MS and GC/IRMS.

Chemostratigraphic units were defined in POP, TROJ and BAT lakes, with boundaries and environmental changes roughly conforming to paleoclimatic intervals of the Holocene. The dry climate was recorded in the period 13,200 BP–11,500 BP, coincident with Younger Dryas stadial. In the sediment of TROJ lake at ca. 5,200 BP a sharp spike in the abundance of the aromatic terpenoid retene, decoupled from the trend of other abietane-type diterpenoids, may best be explained by episodic flooding due to the rise of the water table.

Appearance and subsequent increase of diploptene concentration suggest a formation and gradual expansion of soil synchronous with deglaciation of the valley (~13,300 cal. yr BP for BAT, ~9,800 cal. yr BP for POP). We assume the delay in the onset of soil formation in the vicinity of the POP lake is due to the shading of the Zlomiskova valley with the subsequent persistence of the glacier cooling the valley for a longer period.

Based on the absence of conifer biomarkers in the sediments of BAT lake, the upper limit of the continuous *Pinus mugo* scrub never reached the altitude above 1900 m a.s.l. between 16,200 and 4,400 BP, whereas conifer canopy was permanently present around TROJ lake at 1611 m a.s.l. between 10,400 and 3,100 BP.

A fingerprint of fossil molecular biomarkers (e.g., n-alkanes, fatty acids, sterols) could enhance the reconstruction of past environmental conditions and the tracing of organic carbon sources.

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