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Allerød interstadial vegetation and lacustrine palaeoenvironment of the central Mologa-Sheksna Lowland (East-European Plain)

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Across the northern East-European Plain, and especially in the Mologa-Sheksna Lowland (MSL), short-term climate variability in the Late Glacial caused significant palaeohydrological alterations, which drove vegetation successions. The MSL is prominent for the dense river and lake network, which have evolved through multiple water level and sedimentation regime oscillations since the Last Glacial Maximum. Extensive bogs inherit morphology of the basins, which had been filled with paleolakes for several millennia until their ultimate drainage in the early Holocene. Correspondingly, intricate morphology of lakes and deltas conditioned mosaic distribution of vegetation across the MSL.

Continuous palaeoenvironmental record for the Holocene in the MSL has been derived from several peat and lacustrine sites. The data regarding the Late Glacial is much more scarce, due to the low abundance of the relevant deposits, and poor state of preservation. Except for the MSL bog plains, pronounced evidence for the short-term palaeoenvironmental offset was discovered in the section of the sand terraces in the Mologa River catchment. The onset of Allerød warming has been traced via an organomineral layer, which was confirmed to have a continuous bedding over the area of 100 km^2 in the central MSL, as revealed by auger drilling and ground-penetrating radar survey at eight sites. This layer dates back to 13.4– 12.1 cal ka BP, and is represented by interbedding of fine sand with medium decomposed peat. Palynological and plant macrofossil studies of the buried peat from three boreholes reveal several inferences about the formation of this layer and the general palaeohydrology of the MSL in the Late Glacial.

The first palaeoclimatic evidence is provided by the high abundance of spruce pollen and bark pieces, supporting the hypothesis that the layer formation occurred during the Allerød interstadial, which was characterized by a rapid expansion of spruce in the region. Secondly, high abundances of pollen and remains of hydrophytes or hydrophilous lacustrine vascular plants (Cyperaceae,

Poaceae, Potamogetonaceae), mosses (*Sphagnum sp., Drepanocladus aduncus* and *Calliergonella cuspidatum*) and chara algae indicate lentic shallow water environment or the proximity of the paleolake shoreline. In general, a transition from shallow lacustrine environments, surrounded by spruce-birch forests, to tundra steppes and bogged grasslands can be deduced, based on the pollen spectra and subfossils assemblages. Third, true altitude of the buried peat layer (96.5 – 102.5 m above sea level) may be considered as a limit for the paleolake water level in the Allerød, because it delineates the surface uncovered from water or proximate to the shoreline. Thus, its lowermost discovered position can trace the extent to which the paleolake level had dropped in the Allerød. The peat was rapidly formed and buried during the late Allerød, which makes it a reliable regional isochronous stratigraphic level for the poorly studied Late Glacial sedimentary successions. This level can be used as a reference point for tracing recent short-term climate-environment interactions and effects.