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„The origin of Lake Nowowarpieńskie and the reconstruction of its natural development in relation to the major environmental changes in the Late Glacial and Holocene"

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Summary

In the postglacial history of the Baltic Sea's development, significant changes in its spatial extent and hydrographic, hydrochemical, and biological conditions occurred over just a few thousand years. Particularly valuable areas for recording sedimentary evidence of Late Glacial and Holocene environmental changes are the lagoons and river estuaries situated at the interface of marine and terrestrial influences. One of the most important lagoonal bodies on the southern shore of the Baltic is the Szczecin Lagoon, along with a bay called Lake Nowowarpieńskie, which is the subject of this study.

The aim of the research on Lake Nowowarpieńskie was to determine the origin of this water body and to identify the stages of its development against the backdrop of postglacial environmental changes in the southern Baltic region. This goal was achieved through the interpretation of results from geochemical analyses (AAS, FIA, CNS, EDS-SEM) conducted on four sediment cores (JNW1, JNW2, JNW3, JNW4) with a total length of 19,4 m. These results were supplemented by Cladocera analysis and analysis of plant and animal macrofossils. The identified stages of the basin's evolution were dated using the radiocarbon method. The obtained results were subjected to statistical analyses, including multivariate analyses (PCA, CCA) and species diversity analyses (rarefaction analysis, Shannon-Wiener index).

As a result of the research, depth-age models were developed, and the geochemical characteristics of the analyzed sediments were presented, including the division of profiles into geochemical levels and a description of the statistical relationships between the studied geochemical components of the sediment. The geochemical analyses were complemented by information on the taxonomic composition of Cladocera communities (JNW1) and macrofossil remains of plants and animals (JNW3). The combination of geochemical data with paleoecological data allowed for the identification of statistical relationships between the taxonomic composition of the identified subfossil remains and the geochemical components of the sediment.

Based on the interpretation of the obtained results, seven stages of the development of Lake Nowowarpieńskie were distinguished:

- pre-lacustrine sedimentation,
- initial lacustrine sedimentation,
- carbonate lacustrine sedimentation,

- initial marine-lagoon sedimentation,
- transition from marine-lagoon to lagoon sedimentation,
- lagoon sedimentation,
- lagoon sedimentation with increasing human impact.

Changes in trophic conditions, redox conditions, and water salinity were reconstructed, and the factors responsible for the observed environmental transformations were identified. Changes in water levels and the extent of the water body over time and space were also determined. The studied sediments revealed a clear geochemical transition zone indicating a change from sedimentation in terrestrial conditions to sedimentation in a marine-lagoon environment, induced by the Littorina transgression. Radiocarbon dating allowed for the precise determination of the timing of this event (7060 cal. BP) and the approximate sea level at the first stage of the transgression (max. 4.5 m below present sea level).

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