Short communication

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Lake sediments as archives of early anthropogenic impact on the landscapes of the Vishtynets Upland (Kaliningrad region RF, SE Baltic)

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ABSTRACT. The study of lake sediments contributes to the understanding of the types and intensity of anthropogenic impact on the landscapes of the Vishtynets Upland (Southeastern Baltic) in prehistoric times and the Middle Ages by combining available paleoecological and archaeological information. The results of lithological, paleobotanical and geochemical studies, together with archaeological data, have allowed a deeper understanding of the dynamics of anthropogenic impact in the area, including the emergence of agriculture and ancient metallurgy. Archaeological data testify to the presence of human activity on the Vishtynets Upland from the Late Paleolithic, and applied paleolimnological analysis revealed the first signs of anthropogenic impact, starting from the Late Mesolithic and Neolithic, and intensifying it from the Bronze Age.

Keywords: lake sediments, anthropogenic impact, palaeoecology, prehistory, emergence of agriculture, emergence of metallurgy

1. Introduction

A review of archaeological and paleo-environmental evidence shows that during at least 12000 years, all human societies have transformed the environment using land use practices, including forest burning, hunting, domestication, cultivation, and others (Ellis et al., 2021). Anthropogenic changes in the environment have regional and temporal differences, and both major and minor traces of anthropogenic impact are recorded in numerous natural archives, such as lake sediments. The study of the lakes situated in the southeastern Baltic provides a new insight into the history of nature and population interaction in this part of Europe during the Holocene.

2. Materials and methods

The main objects of palaeolimnological research in the Kaliningrad region are lakes located on the Vishtynets Upland (the northern part of the Baltic Moraine Ridge). In 2010 – 2015, the coring on Lakes Kamyshovoe (N 54°22`; E 22°42`; 192 m a.s.l.) and Chistoe (N 54°38`; E 22°72`; 202 m a.s.l.) took place. Sampling was carried out from the raft and from the ice using Russian peat corer (sampler diameter 5 cm, length 1 m); cores of bottom sediments with a lenght of 9.6 m (Kamyshovoe) and 4.1 m (Chistoe) were selected. The lakes have been studied in detail in terms of lithology, geochronology and palynology (Druzhinina et al., 2022). For Lake Kamyshovoe, the complex of analytical methods also included diatom, chironomid, geochemical, paleomagnetic, and paleoisotope analyses (Druzhinina et al., 2020).

3. Results and discussion

The obtained palynological and geochemical data have shown that the first signs of human impact on landscapes date back to the Early Mesolithic (approximately from 10,000 cal yr. BP), indicating the presence of local deforested areas. Pollen from plants-indicators of open habitats and pastures, as well as *Pteridium* and *Corylus*, combined with elevated Ba and Sr values as indicators of fuel burning, suggests the deliberate burning of forests for the enhancement of hunting and mobility, and probably for the propagation of edible plants. The correlation of microcharcoal and pollen data for the Neolithic reveals several peaks of anthropogenic activity on the Vishtynets Upland: ~ 6300, 5900, 5700, 5200, 4700, 4300, 4000 cal. BP. The study also showed that the cultivation of *Cerealia* in this area began no later than 5100 cal BP.

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Geochemical data from Lake Kamyshovoe probably testify the emergence of ancient metallurgy in the region and its influence on the palaeoenvironment. The analysis of lake sediments revealed increasing concentrations of Cu, Ni, Pb, As and, in general, a group of heavy metals from depths corresponding to the Bronze Age. A clear correlation of the Ni and Pb content peaks with the maximum values of microcharcoal was also traced. Preliminary results show that in the Vishtynets Upland, ancient metallurgy could have been an environmental transformation process since at least the Iron Age (Druzhinina et al., 2022).

4. Conclusions

Our study emphasises the effectiveness of applying an integrated approach to study lake sediments as archives of data on early anthropogenic impact on the landscapes. According to palaeolimnological data, the first signs of anthropogenic impact in the the Vishtynets Upland appear in the Mesolithic and essentially increase from the Bronze Age. The main types of anthropogenic activity during prehistory traced by lake sediment study were deforestation, early agriculture and probably metal smelting.

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Conflict of interest

The authors declare no conflict of interest.

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