PALEOLIMNOLOGICAL RESEARCH: NEW POSSIBILITIES AND POSSIBLE MISTAKES

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In recent years, new methods of paleolimnological research have been developing. In addition, new approaches and the improvement of old classical methods are proposed. With the advent of new methods, the conclusions about the lakes development sometimes changes and sometimes the conclusions are confirmed or not confirmed.

All steps that paleolimnologists follow in analyses, including core collection, core sampling, dating, a summary of the main indicators and climate proxies, are very important. In the last years, there have been significant advances made in the development and application of new approaches in paleolimnology. Multy-proxi method of lakes study includes few new techniques and new combination of methods. We studied several Holocene sequences of small lakes in Russia using pollen analysis, the results of which we compared with the analysis of macrofossils, phytolites, algae, fungal spores. As a result, additional information was obtained on the reconstruction of vegetation. The climatic reconstructions performed on pollen analysis are compared with climatic reconstructions performed according to chironomid analysis. The use of rizopods analysis, a new method in studying the history of lakes, made possible to determine the change in the trophic status of the lake and the dynamics of the lake bogging processes. The available radiocarbon dates allowed the construction of age models for the studied lakes. The specifics of sedimentation were clarified by studying the dynamics of phosphorus and metals, which allowed us to confirm the conclusions drawn on lithology. All the new additional methods allowed obtaining a more correct lakes history reconstruction.

As research shows, lake sediments most adequately reflect changes in the natural environment, and island lakes because of their isolation are the best archives for testing methods of environmental reconstruction (Sapelko, Anisimov, 2011). Since 2015, complex paleolimnological studies have been conducted on the Solovetsky Islands in the White Sea (Subetto et al., 2012). In the framework of these studies, pollen data were obtained from island lakes, over which the paleoclimate reconstruction was carried out over the last 8 thousand years for three lakes located on one island (Sapelko et al., 2017). Data from surface samples of lake sediments located in different parts of the island were also obtained (Fig.1). For the reconstruction of climatic parameters based on copyright materials (Sapelko, Subetto, 2014), the Russian pollen base ((http://pollendata.org) and the European pollen database (http://www.europeanpollendatabase.net/wiki/doku.php?id=epd_surface_samples_contents), the data relating to the territory of the northern part of the Russian Plain to the latitude of Minsk and also of Fennoscandia to the Scandinavian mountains were selected.

As a result of the reconstruction, some problems were identified

1. Surface samples do not always correctly reflect the current state of natural vegetation and climate due to the high contribution of anthropogenic factors to the development of vegetation at the present time.

2. The number of surface samples used for reconstructions should be large enough for all reconstructed natural areas.

3. The sections with interruptions of sedimentation are unpromising for the paleoclimate reconstructions.

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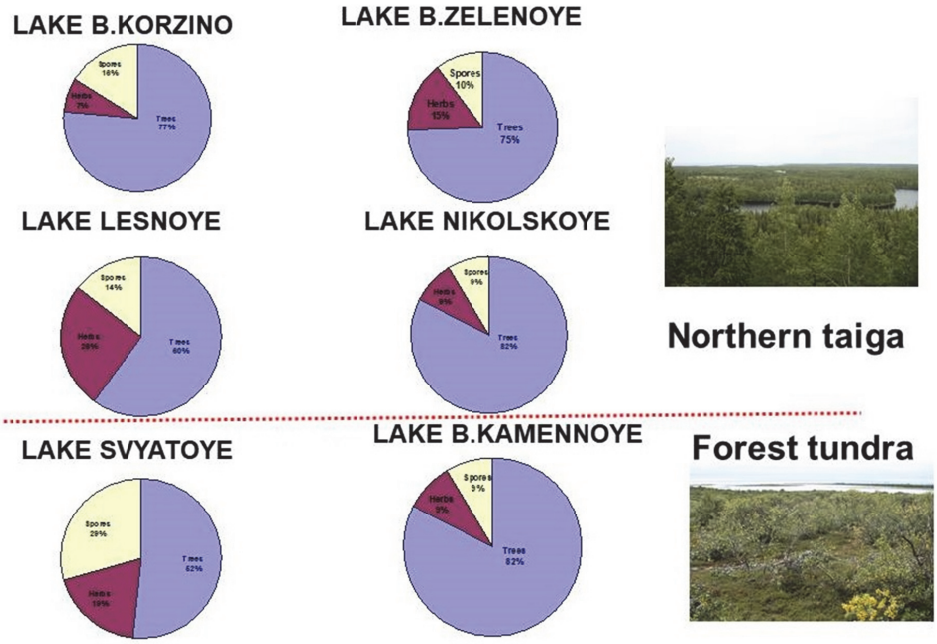

Fig. 1. Subrecent pollen spectra. Total percentage

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RESPONSE OF VEGETATION TO CLIMATE CHANGES DURING LATE GLACIAL AND HOLOCENE INFERRED FROM POLLEN RECORD OF LAKE ONEGA

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The seven cores of bottom sediments were collected for comprehensive studies during the joint expedition of the Saint-Petersburg State University, Center for Analysis of Seismic Data (Lomonosov Moscow State University) and Northern Water Problems Institute (Karelian Research Centre of RAS) in Lake Onega (Petrozavodsk bay) in 2016.

Basing on the seismic results, the two cores 3.2 m (ONG2) and 3.04 m (ONG5) thickness were selected. The water depth at the coring sites was 22 m and 23.3 m correspondingly. The ONG2 core is represented by Holocene sediments whereas the ONG5 core is represented mainly by late Glacial sediments. The excavated sediments in both cores are consisted on silt and clay with an admixture of sand, and underlying 1.12 m of the ONG-5 includes clay layers.