

Short communication

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The development of island lakes of Lake Ladoga during the Late Pleistocene – Holocene

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ABSTRACT. Lake Ladoga, the largest lake in Europe, has about 500 islands. In the northern part of Lake Ladoga, the large islands have small lakes that gradually were isolated from Ladoga during the Holocene. In recent years, we have obtained the results of the lakes sediments studies in the Putsaari, Lunkulansaari and Valaam islands. We present the results of lithological, radiocarbon, pollen, macrofossil and diatom analyzes of islands lakes' sediments sequences. The island lakes have the features associated which eliminates some of the factors influencing the development of these lakes' ecosystems. And therefore island lakes are a unique archive for the reconstruction of the paleoenvironment

Keywords: lake sediments, Ladoga islands, AMS data, multi-proxy analysis

1. Introduction

At ca 11700 cal BP, Lake Ladoga was an easternmost extension of the Baltic Ice Lake. The shoreline of Baltic Ice Lake reached ca 50-60 m a.s.l. The emergence of the Ancylus Lake at around 10700 cal BP. The Ancylus Lake level was about 15-25 meters. The beginning with 5900 cal BP the Lake Saimaa started to drain into the Lake Ladoga via the Vuoksa River. The resulting influx of fresh water led to the rapid rise of the Ladoga Lake and thus contributed to the ensuing Ladoga transgression. The maximum Ladoga transgression level was about 15-22 m a.s.l. (Saarnisto, Grönlund, 1996; Subetto, 2009; Saarnisto, 2012). The present Ladoga water level is 5 m a.s.l.

According to the studies of the small lakes at the islands Valaam (Vuorela et al., 2001), Mantsinsaari (Delusin, Donner, 1995), Riekkalansaari (Alenius et al., 2004), Kilpolansaari (Saarnisto, Grönlund, 1996) and Putsaari (Ludikova et al., 2005) at the Lake Ladoga were isolated from Lake Ladoga at different times during the Holocene.

2. Materials and methods

Multi-proxy paleolimnological studies have been carried out on the islands of Putsaari, Lunkulansaari and Valaam by the Institute of Limnology, the Russian Academy of Sciences, for ten years. On the Putsaari Island (Sapelko et al., 2014) we studied lakes Laurinlampi (St. Sergey) (15.8 m a.s.l.), Tervalampi (21 m a.s.l.) Vuorenlampi (49 m a.s.l.) and Pikalalampi (57 m a.s.l.). On the Lunkulansaari Island (Sapelko

et al., 2018) we studied lakes Kuikkalampi (17 m a.s.l.), Sokkasenlampi (14 m a.s.l.) and Hovatanlampi (10 m a.s.l.). On the Valaam Island we studied lakes Antonievskoye (13 m a.s.l.) and Vitalievskoye (10,8 m a.s.l.). Lakes' sediments studied included lithological, radiocarbon, pollen, macrofossil and diatom analyzes. All used radiocarbon datings of lakes isolation were calibrated using a general IntCal13 calibration curve using OxCal version 4.3 software (Bronk Ramsey, 2009; Reimer et al, 2013).

3. Results

According to our reconstruction ca. 3100 ± 200 cal. BP. Lake Kuikkalampi and Lake Sokkasenlampi on the Lunkulansaari Island, as well as Lake Kirkkolampi (19 m a.s.l.) in the north of a large swamp in the central part of the Mantsinsaari Island (Delusin and Donner, 1995) were isolated from Lake Ladoga. Ca 2800 ± 200 cal BP Lake Peipposenlampi (9 m a.s.l.) on the Mantsinsaari Island and Lake Hovatanlampi on the Lunkulansaari Island were also isolated.

Lake Antonievskoe located above the rest of the lakes of the Valaam Island was isolated from Lake Ladoga ca. 3100 ± 200 cal BP. Lake Vitalievskoe at the Valaam Island was isolated from Lake Ladoga ca. 2800 ± 200 cal BP. The small lakes at the Valaam Island emerged from Lake Ladoga when the water level fell 12 m in connection of the formation of River Neva, the current outlet of the lake (Saarnisto, 2012).

Previously, 9842 ± 61 C¹⁴ years ago (ca. 11270 cal BP) Lake Picalalampi on the island of Putsaari was isolated. The established isolation time of Lake

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Vuorenlampi is 9004 ± 56 C¹⁴ (ca 10140 cal BP). Then 8570 C¹⁴ years ago, Lake Tervalampi was isolated. Isolation of Lake Laurinlampi was took place 2740 ± 70 C¹⁴ (ca. 2848 cal BP).

4. Conclusions

As a result of our paleolimnological studies at the islands of Lake Ladoga, stages of small island lakes isolation from Lake Ladoga during the Holocene were established. The new data gave us the opportunity to reconstruct the time, isolation conditions, as well as the development of lakes after isolation

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