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New data on the rise of Lake Ilmen (NW, Russia) in the Holocene

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ABSTRACT. This paper discusses a rise of Lake Ilmen in the Holocene, its origin, and consequences for the Neolithic culture of the region. We assume that in the second half of the Holocene there was a long-lasting level rise of Lake Ilmen. The level rise was associated with the Holocene Ladoga transgression into the Ilmen-Volkhov basin.

Keywords: Lake Ilmen, Ilmen-Volkhov river basin, Neolithic man sites on the Northern Ilmen lakeside, Ladoga transgression, Kolomtsy

1. Introduction

The Kolomtsy is the best known site in the Northern Ilmen lakeside (Borisevich, 2022). The Kolomtsy Neolithic site on the northern Ilmen lakeside was firstly discovered in 1888 by amateur archaeologist V.S. Peredolsky on the right bank of the Volkhov River (Peredolsky, 1898). According to V.S. Peredolsky (1893), it is known that the cultural layer of the site was buried under a layer of ‘brick-colored sandy clay’, which had the same and significant thickness of 1.3–1.5 m all over the site. In 1893, the Imperial Archaeological Commission sent geologist A.A. Inostrantsev to revise the methodology of previous excavations. A.A. Inostrantsev compiled a detailed report about a local stratigraphy and pointed special attention to the red clay layer (Inostrantsev, 1905). Opinions of V.S. Peredolsky and A.A. Inostrantsev about a lifestyle of ancient Kolomtsy were differ. Thus, V.S. Peredolsky assumed that people dwelled there permanently and locally shifted a settlement when a level of Lake Ilmen was high due to heavy rainfalls and flooded the site (Peredolsky, 1893). However, A.A. Inostrantsev convinced that a lifestyle was a semi-nomadic and settlement on lakesides was seasonal when the water level dropped after spring floods. It was confirmed by thin layers of organic debris inside the bed of washed sand (Inostrantsev, 1905).

In 1901, V.V. Peredolsky unearthed a site located three kilometers south of the Kolomtsy. He wrote that “at a depth of 1–7 sazhen (~2–14 m), alluvial deposits was changed by red sandy clay which is as thick as 1 sazhen (2.13 m)” (Peredolsky, 1906).

In the 1920s, geomorphologist N.N. Sokolov (Malakhovsky et al., 1960) who participated in surveying the Ilmen-Volkhov basin before construction of the Volkhov hydropower plant, dug pits at the Kolomtsy site. The pits showed that layers brown clay (1 m) and loam (0.4 m) covered a cultural layer, and these layers were attributed to ‘lacustrine alluvium’ (Sokolov, 1926).

V.S. Peredolsky and V.V. Peredolsky collected and described more than 60,000 artefacts from the both sites (Peredolsky, 1898). Most artefacts were lost during the World War II, but the survived artefacts have great value for researchers. These artefacts were dated the IV–III millenia B.C. (Kashina, 2006; Zhulnikov and Kashina, 2010), and it is obvious that the covering clay layer are the younger than this cultural layer.

The new data is a significant value and they inspire revision and clarification of archival materials unstudied after excavations by V.S. Peredolsky, V.V. Peredolsky and geological survey by N.N. Sokolov.

2. Materials and methods

The Peredolsky’s records indicated that the cultural layer of the site was buried under a 1.3–1.5 m-thick clay layer. To understand this event, many archival materials and publications were studied in addition to fieldworks. Prior to the field studies, the available historical data on the topic were studied using historiographic and problem-chronological methods.

During field works of 2021, we sampled clays from 70-cm-deep pits in various locations within the

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Kolomttsy site. The sampling points were located as follows (Fig.):

- s.p. 1. The Skovorodka hillock (the highest point of the Kolomttsy site);
- s.p. 4. Foot of the Skovorodka hillock;
- s.p. 8. Inferred place of V.S. Peredolsky’s excavations;
- s.p. 9. The Ilmen lakeside. Finding of artefactual remains;
- s.p.10 and 11. The Ilmen lakeside at the Volkhov river outflow. Sample 10 was taken at a depth of 10 cm; sample 11, at a depth of 70 cm.

Visually, the clay deposits look identical. To determine their mineral assemblage in the Laboratory of Soil Science and Technical Soil Reclamation of the Lomonosov State University, Moscow, they were subjected to a XRD analysis.

3. Results

Results of XRD analyses indicated that the clays of the Kolomttsy site are almost identical in mineral assemblage (Table). Quartz varies widely (from 17.2% to 36.2%), and it seems to be associated with an irregular supply of a clastic material to the site. Content of smectite also widely changed, it which may indicate a warm condition during certain periods of the studied record.

4. Discussion and conclusions

The data of previous researchers and our studies show that the Neolithic culture layers were overlapped flooding sediment layer in 1.5-m thickness. We adhere with hypothesis that the superficial sediments deposited

Table. Minerals in clays from the Kolomttsy site, %

	1	8	9	10	11	4
Quartz	17.2	36.2	20.8	35	25.5	35.9
Plagioclase (albite)	6.9	8.8	6.5	6.9	6.7	8.8
K-feldspar (microcline)	11.1	10.8	7.8	10.5	9.7	12.2
Cristobalite	<0.5	-	-	<0.5	<0.5	-
Hematite	<0.5	-	<0.5	<0.5	<0.5	<0.5
Ankerite	<0.5	0.6	<0.5	<0.5	-	<0.5
Pyrite	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Kaolinite	6.9	5.7	5.7	6.7	6.6	4.3
Illite	16.6	13.5	12.6	13.9	14.9	12.5
Chlorite	7.3	2.1	4.7	1.1	2.5	2.5
Smectite + Mixed-layer mineral of illite-smectite type	33.1	22.1	41.6	25.1	33.6	22.8

during the maximum of Ladoga transgression, and raising of e Lake Ilmen was depended from it (Borisevich and Komagorova, 2021).

However, there is a conflicting opinion regarding to the impact of the Ladoga transgression on the Lake Ilmen from “it did not affect at all” (Gerasimov and Subetto, 2009) to “the Lake Ilmen level was 7–12 m higher then the modern” (Vasilyeva et al., 2012). We think that convincing relationship of the Ilmen-Volkhov basin history with the history of Lake Ladoga and the Baltic Sea was described by N.V. Vasilyeva et al. (2012) who also mentioned the Kolomttsy site (with reference to V.S. Peredolsky and N.N. Sokolov).

Further studies of the described deposits, as well as the dating of sites with the use of advanced methods, would make it possible to establish whether the flooding of the site was associated with the Ladoga transgression in the Holocene.



Fig. Kolomttsy site sampling points in 2021.

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Conflict of interest

The authors declare no conflict of interest.

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