LATE PLEISTOCENE PROGLACIAL LAKES IN THE SEVERNAYA DVINA RIVER BASIN

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Glaciation lobes entering the river valleys can block the outflow and cause the formation of ice-dammed (or proglacial) lakes. Such lakes occupied the river valleys during the glaciations and their outline usually repeated the river drainage pattern. The proglacial lake evidences are usually represented by "varved clays" i.e. laminated silts or clays alternating with sands deposited in the deep water sedimentary environment, and shoreline which mostly is not well preserved.

The river Severnaya Dvina (SD) catchment basin occupying the vast area in the European North-East affected the influence of Scandinavian Ice Sheet during the Quaternary and thus the proglacial lakes could develop within the valleys of SD river and its large tributaries Vychegda, Sukhona and Vaga. The main goal of this study was to analyze a variety of the Late Pleistocene ice-dammed lake reconstructions in the SD river basin and the results of our field observations of their sediments and pattern.

The idea of proglacial lake formation during the Quaternary glaciations within the Severnaya Dvina catchment area was first proposed by I.I. Krasnov (1948) who reconstructed its outflow rerouting southward into the Kama -Volga - Kaspian Sea basin via the Keltma trough (spillway) after exceeding the water level of 135 m a.s.l. Further studies in this region exploited this idea intensively basing upon the high preservation rate of strandlines in the Keltma spillway, digital elevation models of the Last Glacial Maximum (LGM) limits and various terrace levels in the Vychegda river valley (Kvasov, 1975; Lavrov, Potapenko, 2005; Lysa et al., 2011; 2014; Fredin et al., 2012; Larsen et al., 2013).

Two separate ice-dammed lake systems had been reconstructed inside the SD river basin during the LGM (Kvasov, 1975). Vazhskoe Lake occupied the lowland, enclosing the Vaga and Kokshen'ga river valleys. The drainage threshold was assumed at the elevation of 150 m a.s.l. The lake was also thought to have the reversal drainage to the Sukhona river. Varved clays of this lake were found within the Vaga valley. Kotlasskoe Lake was suggested to occupy the valley of Severnaya Dvina, part of the Malaya Dvina, Vym' and almost the entire Vychegda valley (Kvasov, 1975). Reverse flow was assumed to the south into the Kama-Volga basin through the Keltma spillway, which can be overflowed at 135 m a.s.l. Nevertheless, the deposits of Kotlasskoe Lake had not been documented and all reasoning grounded on landscape topography only.

During our studies of Vychegda – Severnaya Dvina and Vaga fluvial systems we performed the search, identification and observation of deposits related to the Late Pleistocene ice-dammed lakes within the SD river basin.

Working through the Vychegda valley we examined the sections of 1-st and 2-nd river terraces. The 1-st terrace is dated back by ^{14}C and OSL and was forming in two stages: right before the LGM (~23 kyr BP) and right after the LGM (after ~ 17 cal. kyr BP). The composition of the terrace is completely alluvium, without any evidence of proglacial lake deposits such as varved clays. Accumulation of this terrace had probably been promoted by the backwater effect from the proglacial lake forming downstream. The traces of LGM glaciation which could block the river valley and cause the lake formation also had not been identified. The so called Oz'jag terrace (18-20 m above the river bed, 80 m a.s.l.) identified in (Lavrov, Potapenko, 2005) as of LGM-lake origin is composed of coarse alluvium and covered by aeolian cape and is more likely of early Wichselian or post-Saalian age and of fluvial origin. The only section with well-expressed LGM-related varved-like fine interlayering of sands and silts is Tolokonka in middle reaches of Severnaya Dvina river. This evidence is in good agreement with LGM limits reconstructions (Atlasov et al., 1978; Demidov et al., 2007) upstream the Vaga confluence.

Another situation is observed in the Vaga fluvial system. We identified the well-expressed grayish varved clays within the valleys of Vaga and its tributaries Kuloi and Kokshen'ga. The maximum (10 m) thickness of varved clays was observed in the outcrop near the Kuloi-Vaga confluence; thickness of sand and silt layers varies significantly, from several mm to several tens of cm, that means the unstable hydrodynamic regime, with alteration of lacustrine and fluvial sedimentary environment. At the top of the lacustrine unit there are water-escape structures characteristic for the proglacial lake deposits. Upstream the thickness of varved clay layer decreases and then recedes completely. The limit of varved clay deposits goes form SW to NE from Vaga to Kokshen'ga rivers.

Therefore, we can identify one episode of proglacial lake formation in the Late Pleistocene within the Severnaya Dvina catchment area. Two separate lake systems formed during the LGM (~ca 20 kyr BP): the Severnaya Dvina rather small, short-lived and shallow lake occupying only the middle reaches of SD river valley, and large, deep, long-living and braided Vaga lake occupying the valleys of Vaga and its tributaries Kuloi and Kokshen'ga. Such a difference in lake configuration and history could be explained by morphological features of river valleys, runoff volume and position of glacioisostatic forebulge crossing these river systems. The absolute height of water level could reach 80 m a.s.l.

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EXTINCTION AND RECOVERY OF THE CONCHOSTRACAN FAUNA ON THE PERMIAN-TRIASSIC BOUNDARY IN THE LAKES OF NORTHERN EURASIA

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Conchostracans are small crustaceans with a bivalve calcium phosphate chitinous shell. They were widespread in the Paleozoic and Mesozoic lakes in the various regions of the Earth (Lutkevich, 1941; Novozhilov, 1950; Novozhilov, 1959; Novozhilov, 1970; Molin, Novozhilov, 1965; Webb, 1978; Tasch, 1987; Lipatova, Lopato, 2000). At the same time, conchostracans were characterized by a high