



The natural environment of Northern Yamal during the Holocene climatic optimum

Andrey Yurtaev (1) and Alexander Alexandrovskiy (2)

(1) Tyumen State University, Tyumen, Russia (yurtaevgeo@yandex.ru), (2) Institute of Geography, Russian Academy of Sciences, Moscow, Russia (alexanderl.al@mail.ru)

The evolution of the natural environment during the late Pleistocene and the Holocene transpired differently in different parts of the Arctic (Kaufman et al., 2004). Ice sheets in the western part of the Arctic had a cooling effect on the surrounding territories, resulting in the late onset of the thermal maximum in those areas - at the end of the middle Holocene. In the eastern plains of the Arctic, which did not witness wide-spread glaciation, the thermal maximum occurred early - beginning at the end of the Pleistocene.

The Arctic areas where the Holocene Thermal Maximum (HTM) occurred early spread over vast distances – from Alaska to the Laptev Sea (Alekseev, 1997; Wetterich et al., 2008; Naidina, 2014). Indicators of the early onset of the HTM have been encountered in more westerly areas as well. For example, peat sediments, some of which are as old as 9-11 kyr, have been revealed on various islands in the Kara Sea region (Tarasov et al., 1995; Serebryanny et al., 1998; Pavlova et al., 2010).

New data challenge traditional understanding of the territorial spread of the last continental glaciation in the Arctic, the eastern border of which is considered to reach the western part of the Kara Sea (Svendsen et al., 2004; Astakhov et al., 2015). In light of these data, northern Yamal, and especially Belyi Island, present themselves as territories that are key to our understanding of the paleogeography of the Late Pleistocene and Holocene. Compared to other territories, Belyi Island is located in the maximal proximity to the supposed border of the last continental ice sheet (i.e., less than 200 km away).

We have conducted research across practically the entire island. Modern soils and well as peat horizons have been sampled for radiocarbon dating. Among the obtained radiocarbon dates (more than 40), 14-9 kyr-old samples prevail. This fact points the processes of intensive peat accumulation occurring as early as the end of MIS-2. This observation is further confirmed by the paleobotanical analysis of peat deposits. We have encountered macrobotanical remains of willow and birch, as well as pollen of such plant groups as Umbelliferae, Chenopodioideae, Cichorioideae, *Artemisia* spp., which are absent in the modern tundra. In fact, the closest areas where they grow presently are located more than 500 km to the south of the research zone.

Thus, the paleoarchives of Belyi Island indicate that plants preferring warmer climate conditions (warmer than the current climate on the island) were present in the research area as early as the end of the Pleistocene – beginning of Holocene. These findings confirm the early onset of the HTM in the research zone, as well as challenge the notion of a continuous ice sheet covering the Kara Sea during MIS-2.

This research was done with the support of the Russian Foundation for Basic Research (project no. 16-45-890312).