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The Last Glacial Ecosystems of North Siberia: Permafrost-Sealed Evidence from Fossiliferous Cryolithic Formations

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Multi-proxy palaeoecology and geoarchaeology records released from degrading permafrost in the Yana River Basin and the tributary valleys (66-67ºN) confirm the past existence of natural conditions for sustainment of the Pleistocene megafauna as well as the last glacial peopling of this sub-polar area. Well-preserved and taxonomically diverse large fossil fauna skeletal remains sealed in the Pleistocene colluvial and alluvial-plain formations in intact geological positions 10-20 m above the present river and scattered on gravelly river banks after their erosion from the primary geo-contexts attest to a high biotic potential of the Late Pleistocene (MIS 3-2) sub-Arctic forest-tundra. Pollen records from the ancient interstratified boggy sediments and megafauna coprolites (14C-dated to 41-38 ka BP) show a predominance of the Siberian larch, dwarf birch and willow in the local vegetation cover accompanied by grassy communities during the mid-Last Glacial stage not dissimilar from the present northern taiga forest. Articulated and humanly used/worked fauna bones (mammoth, rhinoceros, horse, bison and reindeer among other species) point to co-existence of the large animals with the Upper Palaeolithic people within the mosaic open riverine ecosystems of the late Last Ice Age. The time-trangressive macro-lithic stone industry produced from pre-selected river gravel cobbles document some specific ways of human environmental adjustment to past periglacial settings. Geomorphology and hydrogeology indices of field mappings in congruence with the long-term statistical meteorology data illustrate a steadily increasing annual temperature trend in the broader Yana-Adycha Basins (current MAT -14.5ºC) that triggers accelerated permafrost thaw across the Verkhoyansk Region of NE Siberia, particularly the lowlands, similarly as in the Indigirka and Kolyma Basins further East. The regional fluvial discharge is most dynamic during late spring due to the cumulative effects of snow-melting and solar radiation exposing buried palaeo-surfaces. This process has a fundamental bearing for an increased visibility and frequency of the encountered occurrences of fossil fauna as well as the early cultural records released from the permafrost grounds precipitating a more systematic Quaternary geology–palaeoecology research. The Palaeolithic finds from the Bytantay River valley are the first ones documenting the local pre-Holocene prehistoric occupation. The new data add to present knowledge on the initial colonization process of the sub-Arctic and Arctic regions of Siberia.