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Revising the archaeological record of the Upper Pleistocene Arctic Siberia: Human dispersal and adaptations in MIS 3 and 2

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ABSTRACT

As the main external driver, environmental changes largely predetermine human population distribution, especially in the Arctic, where environmental conditions were often too extreme for human survival. Not that long ago the only evidence of human presence here was the Berelekh site in the lower reaches of the Indighirka River. This landmark dates to 13,000–12,000 years ago but it was widely accepted as documentation of the earliest stage of human dispersal in the Arctic. New research discussed here, shows that humans began colonizing the Siberian Arctic at least by the end of the early stage of MIS 3 at around 45,000 years ago. For now, this earliest known stage of human occupation in the arctic regions is documented by the evidence of human hunting. The archaeological record of continued human occupation is fragmentary; nevertheless, evidence exists for each significant phase including the Last Glacial Maximum (LGM). Siberian Arctic human populations were likely supported by the local mammoth population, which provided humans with food and raw material in the form of mammoth tusks. Processing of mammoth ivory is recognized widely as one of the most important peculiarities of the material culture of ancient humans. In fact, ivory tool manufacturing is one of the most important innovations of the Upper Palaeolithic in northern Eurasia. Technology that allowed manufacturing of long ivory shafts – long points and full-size spears – was critical in the tree-less open landscapes of Eurasian mammoth steppe belt. These technological skills reach their greatest extent and development shortly before the Last Glacial Maximum but are recognizable until the Pleistocene-Holocene boundary across Northern Eurasia in all areas populated by mammoths and humans. Loss of this stable source of raw material due to the late Pleistocene mammoth extinction may have provoked a shift in post-LGM Siberia to the Beringian microblade tradition. This paper reviews the most important archaeological findings made in arctic Siberia over the last twenty years.

1. Introduction

Arctic Siberia can roughly be defined as the vast area north of the Arctic Circle that spans between the Ural Mountains in the west and the Bering Strait in the east. The Upper Pleistocene Arctic Siberia was even larger when shelf areas were exposed during the cold stages of this time period, but shrunk as a result of the post-LGM transgression that started 15,000 years ago. Dramatic environmental changes, which took place in this area in the past 60,000–50,000 years, were likely the most powerful driving factors for cultural changes. Unfortunately, until now, Arctic Siberian prehistory remained largely unexplored. Thus, Arctic West Siberia had not produced any Pleistocene archaeological data while there are finds of Pleistocene animals dated to MIS 3 and 2 (e.g., Astakhov and Nazarov, 2010). Although fragmented, this record suggests environmental conditions suitable for humans, too, at least in certain periods.

Until recently, the Taimyr Peninsula, which constitutes a significant part of the Arctic, was lacking any evidence for human habitation before 6000 years BP except for a few very provisional finds that can be attributed to the terminal Pleistocene (Khlobystin, 2006). Again, there are many radiocarbon-dated remains of the Upper Pleistocene fauna which successfully survived in the area until the Pleistocene/Holocene boundary and even into the

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Holocene (e.g., MacPhee et al., 2002; Mol et al., 2006; Nikolskiy et al., 2011; Sulerzhitsky, 1995). However, clear indication of prehistoric human presence in the western Taimyr Peninsula was recently demonstrated by the discovery of mammoth remains with human-inflicted injuries at Sopochnaya Karga in the Yenisei river mouth (Pitulko et al., 2016a,b). This find expanded the record far beyond the Pleistocene/Holocene boundary down to almost 50 ka. Further east, there is no indication for a Pleistocene occupation before entering the coastal plain commonly known as the Yana-Indighirka-Kolyma lowland. This part of Arctic Siberia lies in the northernmost areas of the Upper Pleistocene Western Beringia (see, e.g. West, 1996).

Relatively recently, the archaeological record of Arctic Western Beringia literally consisted of a single pre-Holocene site, discovered by Vereschagin in the 1970's, while studying the Berelekh "mammoth graveyard" (Vereschagin, 1977; Vereschagin and Mochanov, 1972). This site was considered to be approximately 13,000–12,500 years old (Mochanov, 1977; Mochanov and Fedoseeva, 1996); however, human habitation episodes near the "mammoth graveyard" are actually no older than 12,100–11,800 ^{14}C years BP and thus largely post-date the accumulation of mammoth remains (Pitulko, 2011; Pitulko et al., 2014a).

Archaeological exploration of the arctic and sub-arctic regions of Western Beringia, including those closest to the Bering Land Bridge, resulted only in few discoveries in undateable contexts (Dikov, 1979, 1997). Realistically, only the Kymyneikey site (Laukhin et al., 1989; Laukhin and Drozdov, 1991), similarly to the Berelekh site, could be more or less confidently interpreted as evidence of earliest pre-Holocene human diffusion in the Far East Siberian Arctic. This information allowed Goebel and Slobodin (1999) to estimate the timing of entry into Western Beringia no earlier than 14,000 years ago. Most of the evidence discovered by that point related to the Beringian microblade tradition, defined by West (1981, 1996) based on wedge-shaped core technology. Goebel (2002) interpreted the appearance of this tradition as an adaptation to the MIS 2 cold conditions, firmly connecting most important visible cultural change in the material culture of the Late Pleistocene Beringia inhabitants and the environmental conditions.

Beringian microblade tradition was thought to be replaced by micro-prismatic knapping during the Pleistocene-Holocene transition, in which case it could serve as a chronological marker and as evidence for a cultural response to the major environmental changes. However, is the tradition persisted in different areas of South (Ineshin and Tetenkin, 2010), sub-Arctic (Dikov, 1979), and Arctic Western Beringia (Kiryak et al., 2003) throughout the Holocene.

By the beginning of the 21st century, nothing was known about the Upper Pleistocene Arctic Siberia occupation, save for a few temporary human habitation episodes during the Terminal Pleistocene. The question of LGM and pre-LGM habitation remained unanswered.

The discovery of late MIS 3 Yana RHS (Pitulko et al., 2004) changed this situation, doubling the length of known human habitation in Western Beringia and prompting further investigation of the area. As a result, convincing evidence for earliest human habitation in Arctic Siberia now dates to approximately 50,000–45,000 (Fig. 1). Most of the newly discovered sites except for one of the two oldest localities (Bunge-Toll 1885 site, 68° N), are located north of the 70° N. This includes Sopochnaya Karga site in western Taimyr Peninsula. The Upper Paleolithic archaeological record starts in the late initial MIS 3 and continues to the end of the Pleistocene, including the most unfavorable conditions of MIS 2 (LGM, or Sartan glacial of the Siberian geochronological scheme). The latest sites in the record that pre-date the Holocene are also the most numerous. Human dispersal within the Arctic Siberia and the archaeologically visible changes in the material culture seen as adaptations are clearly driven by the Late Quaternary environmental changes in the area.

Environmental changes in Arctic Siberia through MIS 3 as a driving factor for human populations.

Successive large-scale complex restructuring of the environment in Arctic Siberia within the last 60,000 years, which included the global MIS 4 to MIS 3 transition, the LGM, the post-glacial and the Pleistocene to Holocene transition (Fig. 2), certainly contributed to human dispersal within the Arctic Siberia and affected the cultural development of the region's human population. Living in a changing environment obviously encouraged the development of new skills and changes in subsistence economy needed to maintain survival. Climate, vegetation, and landscape changes were important by themselves, but together they also contributed to changes in abundance and the spatial distribution of prey species.

Based on the Western Beringian paleoenvironmental record (Figs. 2–4), environmental conditions during MIS 3 can be characterized as follows. During the Karginsk Interglacial (MIS 3, 57-24 kya), due to the 55–80 m drop in global sea level, arctic Western Beringia stretched to the very northern islands of the New Siberian archipelago and the Wrangel Island (Fig. 3). During the second part of MIS 3, after 31,000 years ago, global sea level drop reached 100–110 m below relative to modern (Clark et al., 2009). Relatively warm and dry climate characterized the western part of this area; summer temperatures were similar to the modern ones or exceeded them by 4–4.5°C. Annual precipitation was also similar to modern levels and could exceed it by 50–100 mm/year (Fig. 2). In the eastern part of the region, climate varied throughout this interval, with conditions that were sometimes cooler and sometimes warmer than present.

Thus, Andreev et al. (2001) have documented graminoid-rich tundra vegetation covering wide areas of the emergent shelf of East Siberian Sea during MIS 3. Reconstructed summer temperatures then were possibly 2 °C higher than during the 20th century. Further south, at Elikchan 4 Lake in the upper Kolyma drainage, Anderson and Lozhkin (2001) have retrieved a sediment record (bottom core), that contains at least three MIS 3 intervals when summer temperatures and treeline reached late Holocene conditions. At the same time, MIS 3 fossil insect faunas studied in the lower Kolyma are thought to have thrived in summers that were 1–4.5 °C higher than recently (Alfimov et al., 2003). This is also found for the Yana site area as well (Pitulko et al., 2013a,b). It is widely recognized that variable paleoenvironmental conditions were typical of the MIS 3 (Karginsk) period throughout Arctic Russia (Hubberten et al., 2004; Miller et al., 2010).

The warmest widespread MIS 3 interval in Beringia occurred 44-35 ka ago (Anderson and Lozhkin, 2001); it is well represented in proxies from interior sites although there is little or no vegetation response in areas closest to Bering Strait. Although MIS 3 climates of western Beringia achieved modern or near modern conditions during several intervals, climatic conditions in eastern Beringia appear to have been harsher than modern conditions for all of MIS 3. Consistent with this pattern, the transition from MIS 3 to MIS 2 is marked by a shift from warm-moist to cold-dry conditions in western Beringia (Anderson and Lozhkin, 2001). These observations are cited widely by Miller et al. (2010). Anderson and Lozhkin (2001) often stress 'mosaic' character of the vegetation across Western Beringia where different habitats may be presenting at the same time (see also Hubberten et al., 2004). These are basically treeless tundra landscapes where sparce forested areas were generally developed in valleys (gallery forest).

Plant communities were slightly different in the western and eastern parts of Arctic Western Beringia (Figs. 2 and 4). The vast western part was characterized by open tundra-steppe herb-