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"The Good, the Bad, and the Ugly": evaluating the radiocarbon chronology of the middle and late Upper Paleolithic in the Enisei River valley, south-central Siberia

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ABSTRACT

The ^{14}C record for the Upper Paleolithic in Siberia has remained largely unevaluated and includes good, bad, and ugly dates. Too often researchers accept either all published dates or only those dates that tend to support proposed chronological hypotheses, regardless of sample quality and association. This article systematically evaluates all published ^{14}C dates (including several newly obtained AMS dates) from middle and late Upper Paleolithic sites in the Enisei River valley of south-central Siberia to establish a reliable chronology for the region and address the tempo of modern human dispersals in Siberia during late Pleistocene times. The revised chronology indicates humans were present before and after the Last Glacial Maximum, but absent during this climatic event. Results also suggest that human population in the region may have increased during the Oldest Dryas.

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1. Introduction

During late marine isotope stage (MIS) 3 (26,000–21,000 ^{14}C [31,000–24,500 cal] BP), middle Upper Paleolithic (MUP) hunter-gatherers occupied the Enisei region of south-central Siberia. They procured a variety of faunal resources and supported their subsistence with flake and blade core technologies to make unifacial, bifacial, and burin tools. Following the Last Glacial Maximum (LGM) of MIS-2, after about 17,500 ^{14}C (21,000 cal) BP, the region was inhabited by late Upper Paleolithic (LUP) foragers equipped with microblade technologies. They, too, exploited a diversity of fauna; however, they primarily focused their attention on a narrower set of resources.

Recent debate has centered on whether people were capable of inhabiting Siberia during the intervening LGM (Dolukhanov et al., 2002; Goebel, 1999, 2002; Graf, 2005; Kuzmin, 2008; Kuzmin and Keates, 2005a,b; Vasil'ev et al., 2002). Opinions are linked to acceptance or rejection of ^{14}C assays dating from 20,000 to 18,000 ^{14}C (24,000–21,500 cal) BP. Based on a perceived lack of unequivocally dated, LGM-aged cultural occupations, Goebel (1999, 2002) argues MUP hunter-gatherers depopulated Siberia as a result of harsh climatic conditions; an interpretation first suggested by Russian geologist Tseitlin (1979) and one that continues to find support (Dolukhanov et al., 2002; Graf, 2005; Surovell et al., 2005). Conversely, Kuzmin (2008) (Kuzmin and Keates, 2005a,b) argues there are 18 sites in Siberia and the Russian Far East dating to the LGM, for example Tarachikha, Shlenka, Ui-1 (MUP), and Novoselovo-6 (LUP) in the Enisei River valley. In each of these cases there are problems, primarily contextual in origin. Pettitt et al. (2003) warned against blind acceptance of ^{14}C dates, arguing archaeologists need to critically evaluate ^{14}C determinations and reject those potentially unreliable or unsupportable. Most Siberian studies have largely ignored such warnings, instead treating ^{14}C dates as if they were never problematic, which has been repeatedly shown not to be the case (Goebel and Aksenov, 1995; Goebel et al., 1993, 2000, 2003).

Another problem is that typically most analyses of Siberian Upper Paleolithic chronology concentrate on dates from all of Siberia, glossing over important geologic and taphonomic contextual information regarding each date's reliability, as well as important regional environmental and climatic differences (e.g., including sites from Sakhalin Island and central Siberia in the same analysis) (Dolukhanov et al., 2002; Goebel, 1999; Kuzmin, 2008; Kuzmin and Keates, 2005a; Kuzmin and Orlova, 1998; Vasil'ev et al., 2002; but see Goebel, 2002, 2004). A regional perspective, weighing strengths and weaknesses of chronological data on a site-by-site basis, is needed to effectively evaluate the ^{14}C record. As Kuzmin and Keates (2005a: p. 773) so aptly state in their article

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title, "Dates are not just data," critical evaluation of specific chronological data is needed to establish reliable age estimates for chronology building (Pettitt et al., 2003). In this paper, therefore, I evaluate the MUP and LUP chronology for a single region of Siberia, the Enisei River valley (Fig. 1). First, I present new accelerator-mass-spectrometry (AMS) ^{14}C dates from five sites. Second, I use a modified version of Pettitt et al.'s (2003) criteria to objectively evaluate the current MUP and LUP ^{14}C data set for the region and reject obviously aberrant dates. Finally, because the criterion-based evaluation was not effective in this case, I provide a second evaluation that takes a more in-depth look at important site-specific information to help ensure site context and stratigraphic integrity of accepted date samples. The result is a relatively reliable chronology for the region, though one that will need continued refinement and rigorous testing.

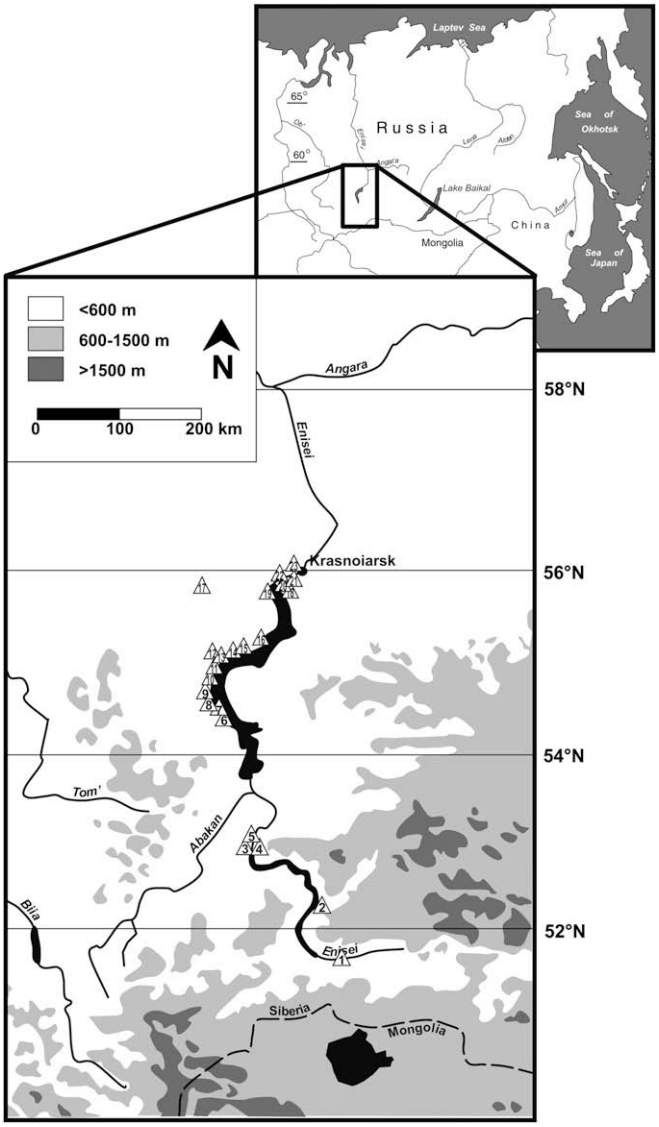

Fig. 1. Map of Enisei River sites mentioned in text and tables. 1: Kuilug Khem-1; 2: Nizhnii Idzhir-1; 3: Ui-1, Ui-2, Maininskaia East and West; 4: Golubaia-1; 5: Oznachennoe-1; 6: Pritubinsk; 7: Sabanikha; 8: Tashtyk-1, Tashtyk-2, Tashtyk-4; 9: Pervomoiskoe-1; 10: Kokorevo-1, Kokorevo-2, Kokorevo-3, Kokorevo-4a, Kokorevo-4b; 11: Novoselovo-6, Novoselovo-7, Novoselovo-13; 12: Tarachikha; 13: Divnyi-1; 14: Kashtanka-1; 15: Kurtak-3, Kurtak-4; 16: Shlenka; 17: Berezovyi Ruchei-1; 18: Konzhul; 19: Biriusa-1; 20: Listvenka; 21: Bolshaia Slizneva; 22: Eleneva Cave; 23: Afontova Gora-2.

2. Absolute dating of Upper Paleolithic sites from the Enisei

2.1. Existing record

The ^{14}C method has been employed to date most Upper Paleolithic sites in Siberia, primarily because the time period of concern falls well within the accepted age range of the method ($\leq$45,000 ^{14}C BP) (Bronk Ramsey et al., 2004a; Mellars, 2006). The existing chronology, however, has been built almost exclusively on conventional ^{14}C dates because there are no AMS ^{14}C laboratories in Russia. In the Enisei region, only 11 of 161 ^{14}C dates previously reported from MUP and LUP contexts were obtained using AMS methods (Table 1). The AMS method permits dating of significantly smaller samples than the conventional method, thereby allowing for selection of more suitable samples and obviating the need to pool samples for bulk dates (Mellars, 2006). It also facilitates more effective sample pretreatment, especially small samples of bone protein (Bronk Ramsey et al., 2004b; Mellars, 2006). Bone is inherently porous with high potential for contamination by recent carbon. In conventional analysis whole bone samples (including apatite and collagen) were traditionally used. Contamination can occur in bone apatite during recrystallization and surface exchange reactions (Haynes, 1968). As a result, recent efforts have concentrated on separating various small fractions (i.e., humates, apatite, collagen, specific amino acids) of a sample and dating them with AMS methods (Long et al., 1989; Stafford et al., 1982, 1987, 1988, 1991; Taylor, 1992). For the Enisei data set 74 samples were bone; some were pre-treated collagen while many others were combined collagen and apatite.

2.2. New AMS dates

Preserved samples from several collections of previously excavated MUP and LUP sites were re-dated using the AMS method. Samples came from curated collections housed in the Institute for Material Culture History and Hermitage State Museum, St. Petersburg, Russia (Table 2). Pretreatment and AMS analyses of wood charcoal and bone samples were conducted at the NSF-Arizona AMS Facility, University of Arizona, Tucson, and followed standard methods described by Jull et al. (1983) and Long et al. (1989). Of the 17 samples, only 14 dates were obtained because three bone samples contained insufficient collagen for dating. Results are discussed below on a site-by-site basis.

2.2.1. Sabanikha

Three dispersed charcoal samples from the Sabanikha cultural layer yielded dates of 26,520 $\pm$ 250 (AA-68665), 25,960 $\pm$ 240 (AA-68666), and 25,660 $\pm$ 250 (AA-68667) BP (Table 2). D. Rhode (Desert Research Institute [DRI], Reno, U.S.A.) identified the samples as conifer (spruce, larch, or pine). New dates overlap with two previously obtained, conventional dates at 2-σ. Therefore, five of the seven age estimates now available for Sabanikha suggest an age of 27,000–24,500 ^{14}C BP (Tables 1 and 2).

2.2.2. Kurtak-4

Five hearth charcoal samples from Kurtak-4 (cultural layer 1), produced dates of 27,770 $\pm$ 310 (AA-68668), 25,160 $\pm$ 280 (AA-68669), 21,270 $\pm$ 160 (AA-72147), 20,690 $\pm$ 240 (AA-72146), and 17,740 $\pm$ 120 (AA-68670) BP (Table 2). These results are perplexing since only two assays overlap (2-σ) despite that all were collected from the same hearth feature and derived from the same charcoal type. Together, one new (AA-68669) and five previously reported dates (Table 1) that overlap (2-σ) suggest an age for cultural layer 1 of 26,000–24,000 ^{14}C BP. Radiocarbon dating of Kurtak-4 provides a good example of potential problems with dating charcoal from

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