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MIDDLE AND EARLY UPPER PALAEOLITHIC CRIMEA: THE RADIOCARBON CHRONOLOGY

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INTRODUCTION

The purpose of this paper is to examine the available radiocarbon measurements for archaeological assemblages of Middle Palaeolithic, 'transitional' and Early Upper Palaeolithic (Aurignacian and Gravettian) character. Obviously questions to bear in mind when doing so are, of course, those such as when the Middle Palaeolithic ends, when the Upper Palaeolithic begins, and how the Middle Palaeolithic variants, 'transitional' industries and Aurignacian interact chronologically. It will be seen below that the database as it stands is not robust enough to allow more than a coarse evaluation of the simplest of these questions, and any conclusions at this stage must inevitably be provisional. What follows is a basic presentation and evaluation of the data as it stands, and discussion of the potential meaning of this.

Despite a well-researched and understood site database, radiocarbon dates are scarce for the Crimea - especially for the Middle Palaeolithic - and any chronological reconstruction at this time must inevitably be provisional. Given this, a most important chronological sequence for the Steppes and Crimea on the basis of faunal and environmental data has been provided by Cohen and Otte (1996: 367) who note the following separate chronological horizons:

Shan Koba	End of Late Glacial.
Kamennaya Balka	Early Late Glacial - Dryas I/Bolling
Anetovka-Amvrosievka	End of Ostashkovo cold maximum
Sagaidak	Beginning-middle of Ostashkovo cold maximum
Zeleniy Hutor	Possibly end of Mologoshekskinskogo interstadial
Siuren I	Stillfried B interstadial (30-28 kyr BP)
Bacho Kiro	ca 44 kyr BP

Most assemblages have been assigned to such stages on the basis of geological data. The earlier range of this scheme - notably the Siuren I and Bacho Kiro horizons - will serve as a point of comparison for the radiometric data presented and discussed below.

The wider chronological context, i.e. of the Upper Palaeolithic Eastern European (Russian) Plain in general, has been provided by Svezhentsev (1993), from which it is clear that, in general terms, the chronology of the region *as a whole*, with some 200 dates, is fairly well-understood. A number of problems do exist, which hamper any reliable understanding of the overall chronological sequence of the region. In a general dating project of a number of Upper Palaeolithic sites in the Eurasian Plain, from Central Europe to Siberia, Damblon *et al.* (1996) found generally that AMS radiocarbon dates tended to be somewhat younger than

conventional ones, e.g., as at Willendorf (Austria), Pavlov (Czech Republic), and Mitoc Malul Galben (Romania). There are a number of subtle differences between the pretreatment, sample preparation and measurement techniques of conventional and AMS radiocarbon dating, and there is no *a priori* reason to believe that this might be so. One should certainly not assume that it is a systematic problem and, in fact, there are a number of reasons to believe that the AMS radiocarbon technique is *more* successful in controlling for background radioactivity than the conventional method.

THE NATURE OF THE ARCHAEOLOGY

Traditionally, the Ak-Kaya, Kiik-Koba and Staroselian assemblages are seen as Middle Palaeolithic variants. It is important to note that they are based on the same manner of bifacial tool production and core technologies and are discriminated solely on the basis of differing frequencies of these traits (Chabai 1996). As Stepanchuk (1993:36) has noted, it is permissible to see the Ak-Kaya and Kiik-Koba assemblages as variants of the Eastern Micoquian, and more generally in association with the Staroselian as parallel developments from an Acheulean ancestry. Such an identification as Middle Palaeolithic is crucial in the discussion of the chronology of Crimea as discussed below. The chronological position of these industries is most poorly understood: whilst a relative techno-typological development of the Ak-Kaya variant is observable stratigraphically, it has to be noted that no absolute chronology exists for this, save for the observation that an earlier techno-typological stage of the Ak-Kaya variant appears to predate Oxygen Isotope substage 5c (the Brorup Interstadial) at Prolom II (Stepanchuk 1993). The chronology of the Kiik-Koban and Staroselian is not much better understood, and it should be remembered that the radiocarbon dates that do exist for these variants and which are discussed below potentially only inform about the latest stages of these variants, the earlier range of which falls outside of the range of radiocarbon.

That the chronology of the Middle Palaeolithic industries is poorly understood is well-known, although it is generally assumed that the variants were coexistent in various combinations over the first half of the Last Glacial period (Chabai 1996; Demidenko 1996). The question as to whether any chronological patterning is visible in this period is considered in the treatment of the available radiocarbon chronology below.

RADIOCARBON DATA FOR THE CRIMEAN MIDDLE AND EARLY UPPER PALAEOLITHIC

In this section, available radiocarbon dates are presented and discussed on a site by site basis. The implications of such results are discussed in a more integrative way below. Data is available from five sites.

Siuren I

Two samples of bone have been dated from an Early Upper Palaeolithic context:

OxA-5154	Bone, layer G, $\delta^{13}C$= -19.2 per mil	28450 ± 600	Aurignacian
OxA-5155	Bone, layer F, $\delta^{13}C$= -19.2 per mil	29950 ± 700	Aurignacian

Siuren I is one of the most important sites in the Crimea, and has been used to establish a general chronostratigraphic scheme (Otte *et al.* 1996; Cohen and Otte 1996). Both of the above dates fall within the Stillfried B/Kesselt/Bryansk interstadial between 30-28kyr BP (Cohen and Otte 1996:365). When one takes the errors into account, at two standard deviations the results indicate the presence of an Early Upper Palaeolithic at the site in the time range c. 31-28 kyr BP. It is not inconceivable that the two results pertain to one occupation in this period.

Buran-Kaya III

The sequence at Buran-Kaya III produced a series of Upper Palaeolithic assemblages from cultural layer 6, and Middle Palaeolithic assemblages from the underlying cultural layer 7. The bifacial points of the lowest layer 6 assemblage (horizon 10) are similar to those of the Streletskaya culture; in any case, there would appear to be a 'transitional' industry in this level, although they are described as being of Upper Palaeolithic nature by Yanevich *et al.* (1996).

OxA-6674	bone, layer B1,	$\delta^{13}C$= -18.4 per mil	28520 ± 460	Kiik-Koba
OxA-4128	bone, cult. layer 6, H10,	$\delta^{13}C$= -19.2 per mil	28700 ± 620	Bifacial points
OxA-6673	bone, layer B1,	$\delta^{13}C$= -18.3 per mil	28840 ± 460	Kiik-Koba
OxA-6882	Bone 1,	$\delta^{13}C$= -19.6 per mil	30740 ± 460	Gravettian
OxA-6672	Bone, level C,	$\delta^{13}C$= -18.4 per mil	32350 ± 700	'Szeletian'
OxA-4129	tooth, layer 7, horizon 1,	$\delta^{13}C$= -20.1 per mil	33210 ± 900	Middle Pal.
OxA-4130	bone, layer 7, horizon 2,	$\delta^{13}C$= -19.7 per mil	32710 ± 940	Kiik-Koba.
OxA-6990	Bone 2,	$\delta^{13}C$= -19.0 per mil	34400 ± 1200	Aurignacian

Previous dating results of the Buran-Kaya III sequence (including the later Upper Palaeolithic horizons) have been presented by Yanevich *et al.* (1996). Earlier Oxford measurements (OxA's -4128, -4129 and -4130) were undertaken as part of a joint project between the McDonald Institute for Archaeological research and the Institute of Archaeology of the Ukrainian Academy of Sciences in Kiev involving the Oxford Radiocarbon Accelerator Unit and reported in *Archaeometry* datelist number 21 (Hedges *et al.* 1996).

Taking the radiocarbon determinations at face value, at two standard deviations the following age ranges are obtained:

OxA-6674	29440 - 27600 BP	Kiik-Koba
OxA-4128	29940 - 27460 BP	Bifacial points ('Transitional' industry)
OxA-6673	29760 - 27920 BP	Kiik-Koba
OxA-6882	31660 - 29840 BP	Gravettian
OxA-6672	33750 - 30950 BP	'Szeletian' ('Transitional')
OxA-4129	35010 - 31410 BP	
OxA-4130	34590 - 30830 BP	Kiik-Koba
OxA-6990	36800 - 32000 BP	Aurignacian

It can be seen that the results fall into three age ranges, c. 29-27, 31-29 and 35-30 kyr BP. The measurements in the youngest group are statistically the same age, and one cannot therefore eliminate the possibility that they relate to one occupation, as with the solitary measurement in the 31-29 kyr BP range. The occupation(s) represented by the first group fall into the Stillfried B interstadial (Siuren I horizon). The oldest group is more heterogeneous, as one might expect in the case of a number of occupations in the c. 25-30 kyr time range, although this may be simply the result of the relatively large error for OxA-6990. The group falls into a time range between the Bacho Kiro and Siuren I horizons. If one takes this into account, the resulting measurements are again of statistically similar age. Comparing this to the archaeological reality, however, produces a more problematic picture. It is interesting to note that the one date for an Aurignacian assemblage - OxA-6990 - is the oldest in the sequence. Of the three dates for the Kiik-Koba variant, two are statistically younger than the Aurignacian, and one (OxA-4130) statistically the same age. Given that OxA-6882 places the Gravettian in the period 31 - 29 kyr BP, one might infer from this that the Kiik-Koba variant persisted longer - by up to five millennia - than the Aurignacian in the area. The data are obviously insufficient to demonstrate with any certainty whether the Kiik-Koba variant is a later phenomenon than the Aurignacian in general in Crimea. Given that the Kiik-Koba is considered to be a Middle Palaeolithic variant, this relative persistence in relation to both types of Early Upper Palaeolithic at the site is particularly interesting. In all, accepting the results at face value, one must infer repeated use of the site by makers of the Kiik-Koba variant between c. 34 - 27 kyr BP, or, at the very least, between c. 31 - 29 kyr BP. This having been said, one cannot eliminate the possibility that OxA's -4129 and -4130 are erroneously young: the opinion of Yanevich *et al.* (1996:318) is that they are "*...on the young side, but not impossible...*". At present it remains impossible to evaluate as to whether the results are in error, or that the Kiik-Koba variant remains coincident with the transition to the Upper Palaeolithic, and, as Yanevich *et al.* conclude, this question will only be answered by more research at the site itself.

Onto this picture one must superimpose the 'transitional' industries represented by bifacial point production and a 'Szeletoid' industry. Although it is possible that the 'Szeletian' dated by OxA-6672 is of the same age as the Aurignacian dated by OxA-6990, it is again interesting to note that both measurements for transitional industries fall later than the appearance of the Upper Palaeolithic, even if one assumes that the 'real' radiocarbon age of

the Aurignacian falls towards the younger end of its age range, i.e., around 32 kyr BP. It is conceivable that the Gravettian dated by OxA-6882 is of similar age to the Szeletian of OxA-6672, but of interest that this Early Upper Palaeolithic assemblage appears to predate the 'transitional' industry of bifacial points from cultural layer 6, horizon 10 dated by OxA-4128. Yanevich *et al* (1996, 318) have noted that the "*...date of 28700 ± 620 BP for cultural layer 6 horizon 10 seems quite acceptable for Upper Palaeolithic material of the kind discovered at this point...*".

Starosel'e (Formozov)

Two bone samples of *Asinus hydruntinus* have been dated at Oxford, from the two arbitrary layers in which the site was excavated. Both samples come from the upper part of the roof collapse layer, and are associated with a Middle Palaeolithic assemblage:

OxA-4134	bone, horizon 1	$\delta^{13}C$= -20.3 per mil	35510 ± 1170
OxA-4133	bone, horizon 2	$\delta^{13}C$= -18.9 per mil	36160 ± 1250

As one might expect, the dates are statistically identical, and demonstrate a Middle Palaeolithic at the site in the period c. 37 - 34 kyr BP. Furthermore, Oxford have measured two samples from the later excavations at the site by a joint Southern Methodist University/Ukrainian Institute of Archaeology team. These samples originate from the uppermost Pleistocene layer, and were taken about two metres away from the gridsquare from which OxA-4134 came:

Starosel'e (SMU)

OxA-4775	bone, level 1,	$\delta^{13}C$= -19.4 per mil	41200 ± 1800
OxA-4887	bone, level 1,	$\delta^{13}C$= -18.9 per mil	42500 ± 3600

Concern has been expressed as to why the results for these two samples should be older than those for the sample from the earlier excavations of Formozov (Housley, in Hedges *et al.* 1996:189). If, however, one examines the resulting age ranges at two standard deviations, the measurements are closer than they initially seem:

OxA-4134	37850 - 33170 BP
OxA-4133	38660 - 33660 BP
OxA-4775	44800 - 37600 BP
OxA-4887	52400 - 38000 BP

Clearly, the problem relates to the large errors of these particular measurements; they stand as a good example of the poor chronological resolution of radiocarbon determinations as applied to Palaeolithic materials. Taking the full age ranges into account, it is not inconceivable that all four samples have the same age, although this, on balance, is unlikely, at least in the case of OxA-4887 which is the clearest outlier. Taken as a whole, the most cautious reading of

the series of results is to take them as representing a *terminus ante quem* of at least 33 kyr BP for the Middle Palaeolithic of Starosel'e. A more detailed discussion of the AMS dating of Starosel'e has been provided by Gvozdover *et al.* (1996).

Kabazi II

Oxford have dated five samples of bone from excavations in 1986 and 1988 (Kolosov *et al.* 1988; 1993). The resulting measurements are:

OxA-4135	bone, cult. layer I, H3,	$\delta^{13}C$= -20.2 per mil	34940 ± 1020	Staroselian
OxA-4770	bone, cult. layer II, H1,	$\delta^{13}C$= -19.7 per mil	31550 ± 600	Kabazi variant
OxA-4771	bone, cult. layer II, H2,	$\delta^{13}C$= -20.5 per mil	35100 ± 850	Kabazi variant
OxA-4858	bone, cult. layer II, H4,	$\delta^{13}C$= -20.1 per mil	32200 ± 900	Kabazi variant
OxA-4859	bone, cult. layer II, H5,	$\delta^{13}C$= -20.2 per mil	33400 ± 1000	Kabazi variant

The Kabazi II sequence as a whole enables the evaluation of the Middle Palaeolithic sequence of the Crimea, which has been undertaken by Chabai (1996). It contains 21 occupation levels within 5 archaeological layers, of which layers I and II are relevant to this discussion, but are not as informative as the sequence as a whole. The Staroselian industry recovered from layer I was in derived colluvial deposits in secondary position (Chabai 1996), so one should therefore exercise some caution as to the association of the radiocarbon determination with the lithic industry, especially as the resulting age is earlier than all the determinations from layers stratified below it. In short, it is not a reliable age for the Staroselian. On the other hand, the remaining four determinations securely place the Kabazi variant between 31 and 36 kyr BP. In fact, when one takes the errors into account, at two standard deviations OxA's -4770, -4858 and -4859 are statistically the same age. As this is the case, the possibility that the bone measured by OxA-4771 is an outlier cannot be eliminated, and if one assumes this is so, a consideration of OxA's -4770, -4858 and -4859 alone would place the Kabazi variant in a tighter time period, i.e., 31-34 kyr BP. The available data from Kabazi II do not allow an evaluation of the chronological place of the Staroselian assemblage in relation to the Kabazi variant, i.e., one cannot establish whether it is contemporary with it or chronologically discrete. As noted in Hedges *et al.* (1996:190), two discrete chronological sequences can be discerned: one of OxA's -4135 and -4171, and another of OxA's -4770, -4858 and -4859. That these two sequences are stratigraphically inconsistent with each other may indicate some sorting of dated materials at the site, but whether this is due either to residuality or intrusion is impossible to ascertain. Overall, one must simply conclude that the Middle Palaeolithic at Kabazi II dates to the period 35-31 kyr BP.

Zaskal'naya VI

Samples of bone from the Ak-Kaya cultural layers of Zaskal'naya VI were measured by the standard Oxford AMS radiocarbon dating procedure as well as the 'tripeptide' procedure aimed at isolating a specific amino acid (van Klinken *et al.* 1994). This dual approach was taken due to the possibility that poor collagen preservation in the bone samples might affect the resulting ages.

OxA-4131	Layer II, bone, standard method	$\delta^{13}C$= -20.1 per mil	30110 ± 630
OxA-4772	Layer III, bone, GPH tripeptide	$\delta^{13}C$= -20.1 per mil	35250 ± 900
OxA-4773	Layer IIIa, bone, GPH tripeptide	$\delta^{13}C$= -19.1 per mil	39100 ± 1500
OxA-4132	Layer IIIa, bone, standard method	$\delta^{13}C$= -20.3 per mil	30760 ± 690

An initial glance at the results reveals that there is a general chronological sequence in accord with the stratigraphy, i.e., trending from c. 30 kyr through to 39 kyr down the sequence (Hedges *et al.* 1996). The site is important both for the abundant archaeological material contained in its layers, and for the remains of two adolescent and three juvenile Neanderthals in layer IIIa. Taken at face value, OxA-4132, which dates a sample that was recovered from the same gridsquare as the Neanderthal remains, would make these some of the latest known Neanderthal fossils, i.e., around 30-31 kyr BP. Kolosov (comment in Hedges *et al.* 1996) considered that the actual age of the cultural layers dated was much older than the resulting ages indicates, and the discrepancy between both standard and tripeptide ages (compare OxA-4773 and -4132) supports the notion that radiometric dating has been particularly problematic at the site. A conventional radiocarbon age of >45 kyr BP was obtained on a 1 kg bulk sample of burnt bone from layer II (KI-856) but is in itself problematic as one cannot eliminate the inclusion of residual material in such bulk samples as well as the poor suitability of burnt bone for dating purposes. In view of the fact that a further ten samples were selected for dating from the site but failed to yield sufficient collagen, one might cautiously conclude that bone diagenesis and poor collagen preservation has resulted in erroneously underestimated ages for the samples, and the dating should therefore be treated with extreme caution, at best as *minimum* ages. Consequently, the possibility that these represent some of the latest Neanderthal fossils is impossible to evaluate with the existing measurements. In view of these problems, the site should certainly not be considered as being securely dated, and the results are therefore ignored for the purposes of the integrative discussion below.

DISCUSSION

From the limited data presented above, one might tentatively conclude that the Middle Palaeolithic - in whatever form - persists down to c. 33 kyr at Starosel'e, c. 31 kyr at Kabazi II and c. 29 kyr (or even later) at Buran-Kaya III. Of the Crimean variants of the Middle Palaeolithic, the Kiik-Koba is the best understood chronologically, with a range from at least 31 -29 kyr or as much as from 34 - 27 kyr BP at Buran-kaya III. At Kabazi II, the Kabazi variant has a chronological range between c. 34-31 kyr, and in this light, if the Kiik-Koba variant has an actual chronological range of 30-29 kyr, one cannot eliminate the possibility that

the Kiik-Koba variant - at least at Buran-Kaya III - postdates the Kabazi variant, at least as found at Kabazi II. Another possibility is that there is some overlap, with the Kiik-Koba variant occurring towards the end of this range of the Kabazi variant. Further research is clearly necessary to address this particular question. In all, one might tentatively conclude that the *terminus ante quem* for the Middle Palaeolithic of Crimea is c. 29 kyr or even a little later. Even at 29 kyr this is still a relatively late persistence of the Middle Palaeolithic.

In contrast, the Upper Palaeolithic is present by c. 32 kyr at Buran-Kaya III (possibly two or three millennia earlier), and by 31-28 kyr at Siuren I. Both of these fit within the Stillfried B interstadial: the possibility remains that the Upper Palaeolithic appeared in the region in this period, i.e., the Siuren I horizon, and a tentative conclusion must be that the *terminus post quem* for the appearance of the Crimean Upper Palaeolithic is c. 32 kyr. Within the Upper Palaeolithic complex, 'transitional' industries reminiscent of the Szeletian appear to be present as early as 34 kyr, and those characterised by bifacial points by 29 kyr. The Aurignacian of Buran-Kaya III is present between 36 - 32 kyr, and the Gravettian c. 31-29 kyr.

In general, the AMS radiocarbon measurements for the Crimean Middle and Early Upper Palaeolithic mainly group to between 36 - 28 kyr BP, with a small outlying group at 42-40 kyr BP as represented by the material from the later excavations at Starosel'e. Within the main cluster, there are small peaks in the numbers of dates for given one thousand year time blocks, centring upon 33-32 kyr and 29-28 kyr BP. Given the paucity of radiocarbon determinations for the Crimean Middle and Early Upper Palaeolithic in general, such a distribution needs to be treated with caution, as each 'peak' represents only 3 or 4 radiocarbon determinations for a given time block as opposed to 1 or 2 - hardly a significant difference. It follows that the data are simply not robust enough to facilitate any confident analysis of chronological clustering. It also remains possible that any such clustering as may emerge in the future may relate more to fluctuations in the atmospheric production of radiocarbon than to crude measures of human demography (e.g., Geyh and Schluchter 1997; Goslar *et al.* 1997; Jöris and Weninger 1997).

In summary, Oxford AMS radiocarbon determinations on materials from four Crimean sites enable one to tentatively conclude that the Crimean Middle Palaeolithic persists down to around 29 kyr, by which time the Upper Palaeolithic and, certainly, transitional industries seem to have existed in the region for over 2000 radiocarbon years. Although the database clearly has to improve considerably before such conclusions can be evaluated at all confidently, it would seem that the region may play a crucial role in discussions of the Middle to Upper Palaeolithic in general and specifically to questions about the interaction between Neanderthals and anatomically modern humans.

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