8 GEOARCHAEOLOGICAL ASPECTS OF THE ORIGIN AND SPREAD OF MICROBLADE TECHNOLOGY IN NORTHERN AND CENTRAL ASIA

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INTRODUCTION

Northern and Central Asia is the temperate belt of the Asian continent with some adjacent subtropical areas, such as the central and southern parts of the Japanese Archipelago. It includes the territories of Siberia, the Russian Far East, northern China (north of the Yellow River), Mongolia, the Korean Peninsula, and the Japanese Islands (Figure 8.1). The main aim of this review is *to summarize the state-of-the-art knowledge of the chronology and environment of the earliest microblade complexes in Northern and Central Asia, with the focus on Siberia and the Russian Far East.* The chronological patterns for the appearance of microblade technology are of particular importance in this review. Palaeoenvironmental records are used to understand the relationship between the changing climatic and vegetational conditions and human adaptive strategies in the Upper Palaeolithic of Northern and Central Asia.

Microblade tradition sites are defined for the earliest periods as sites with clearly recognizable wedge-shaped cores or those with wedge-shaped cores and microblades. In this review, I use the following definitions of the term "microblade": "[a] small stone blade, typically several centimetres in length, often produced from a conical or wedge-shaped microcore" (Bahn 2001:292); and "[a] very small, narrow blade" (Darvill 2002:259). This is different from the more general term "microlith", which is defined as: 1) "[a] small later Upper Palaeolithic or Mesolithic stone artifact varying in size from approximately 1 to 5 cm (0.4 to 2 inches), and used as the tip of a bone or wooden implement or as an arrow-point" (Bahn 2001:292); 2) "[S]mal flint blade, or fraction of blade, often defined as less than 5 mm long and 4 mm thick" (Shaw and Jameson 1999:396); and 3) "[A] very small tool made on a blade or flake. Often less than 2 cm long, microliths sometimes occur in geometric shapes (e.g., triangles and trapezes), and few of them could have been used without hafting" (Bray and Trump 1982:156–157). In some sources, a more specific definition of particular kinds of microliths is given, i.e., those found in Northern Asia: "[a] tradition of elaborate core preparation for making bladelets found in Siberia, North China, Korea, Japan, and Alaska where bifacially worked wedge-shaped cores are used" (Reynolds 1996:468).

Radiocarbon (hereafter ^{14}C) dates are employed as the primary means of determining the chronology for the beginning of microblade manufacture. Archaeological and chronological data available for the key microblade complexes are critically evaluated. Palaeoenvironmental records for the key archaeological sites, as well as regional summaries for the Late Pleistocene of Siberia and the Russian Far East, and adjacent northern China, Japan, and Korea, are used.

CHRONOLOGY AND ENVIRONMENT OF THE EARLIEST MICROBLADE SITES IN SIBERIA AND THE RUSSIAN FAR EAST

Radiocarbon Chronology of the Earliest Microblade Complexes

The earliest evidence of microblade technology is represented by a few definite microblades and microcores found at the Ust-Karakol 1 and Anui 2

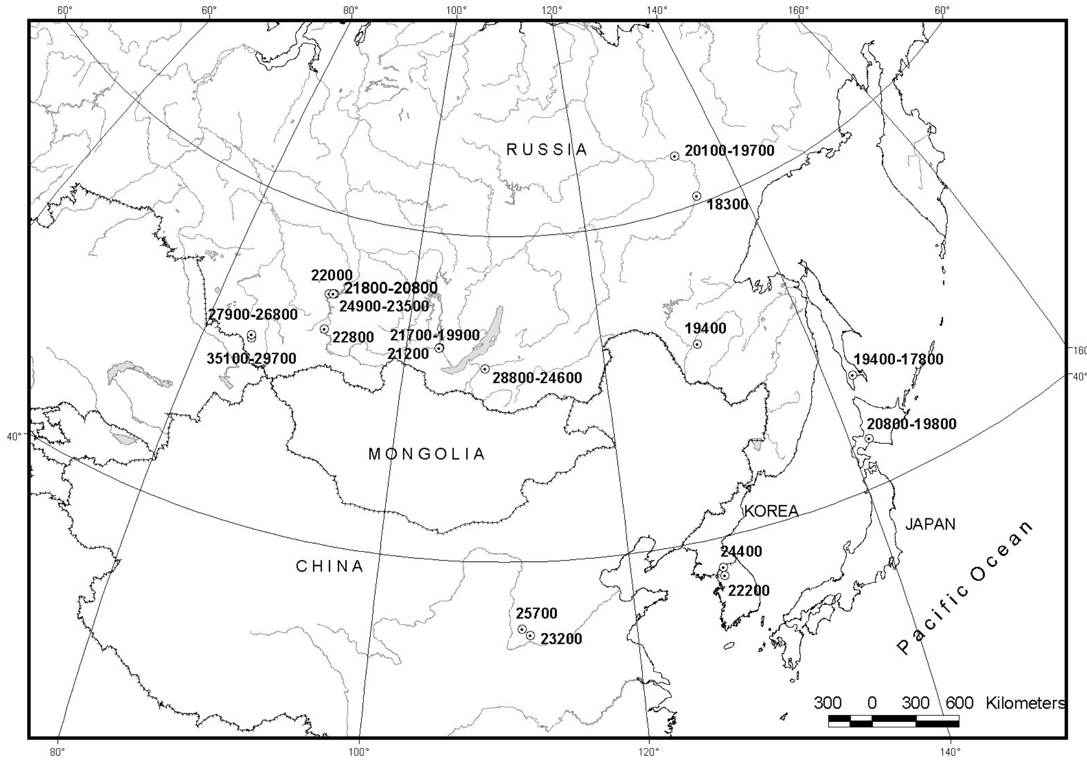

Figure 8.1: ^{14}C dates of the earliest microblade complexes in Northern Asia.

sites in the Altai Mountains in Siberia (Derevianko 2001; Derevianko *et al.* 2003) (Figures 8.1 and 8.2). Layers 11A–9A of the Ust-Karakol 1 site with microblades and microblade cores have ^{14}C dates from hearths: layer 10 – c. 35,100 BP; and layer 9C – from c. 33,400 BP to c. 29,700 BP (Table 8.1) (Derevianko *et al.* 2003:275–298). It should be noted that date AA–32670 (see Table 8.1) was obtained from the hearth in layer 9C (Derevianko *et al.* 2005), and this AMS determination confirms the earlier dates produced by the conventional method (Lab code SOAN). The site of Anui 2, neighbouring Ust-Karakol 1 in the Anui River basin, also has very early ^{14}C dates associated with microblades (Derevianko 2001; Derevianko *et al.* 2003:311–329) (Figures 8.1 and 8.3). For the bottom layer 12 of Anui 2, two ^{14}C values were obtained: c. 27,900 BP and c. 26,800 BP (Table 8.1) (Derevianko *et al.* 2003; see also Keates, this volume). Above layer 12, ^{14}C dates are known for layers 9 through 3, in the general time range of c. 27,100 BP to c. 21,300 BP (Table 8.1). A general taphonomic feature of the Ust-Karakol 1 and Anui 2 sites is that cultural material and associated ^{14}C-dated material have been preserved *in situ*. This can be demonstrated by the good preservation of fossils, which show no traces of rolling or other evidence of re-deposition (Derevianko *et al.* 2003:252).

Microblades might have appeared in the Altai Upper Palaeolithic assemblages even before c. 35,000 BP. This may be true if we take into account their presence in Denisova Cave (main chamber): 15 microblades were found in layer 11 and 67 microblades in layer 9 (Derevianko *et al.* 2003:128–135). Also, seven microblades and one wedge-shaped core were recovered in layer 7 of the entrance part of Denisova Cave (Derevianko *et al.* 2003:172–174; Derevianko and Shunkov 2004). There is one ^{14}C date for the lower part of layer 11 in the main chamber of more than 37,235 BP (SOAN–2504, bone date); and one ^{14}C value of 29,200±360 BP (AA–35321, charcoal date) for the top of layer 11 in the southern gallery (Derevianko *et al.* 2000a). In the entrance to the cave, the age of layer 9 (below layer 7) is 46,000±2300 BP (GX–17602, charcoal date) (Kuzmin and Orlova 1998; Kuzmin 2004).

However, the wide range of ^{14}C dates for layer 11 of the main chamber and lack of wedge-shaped

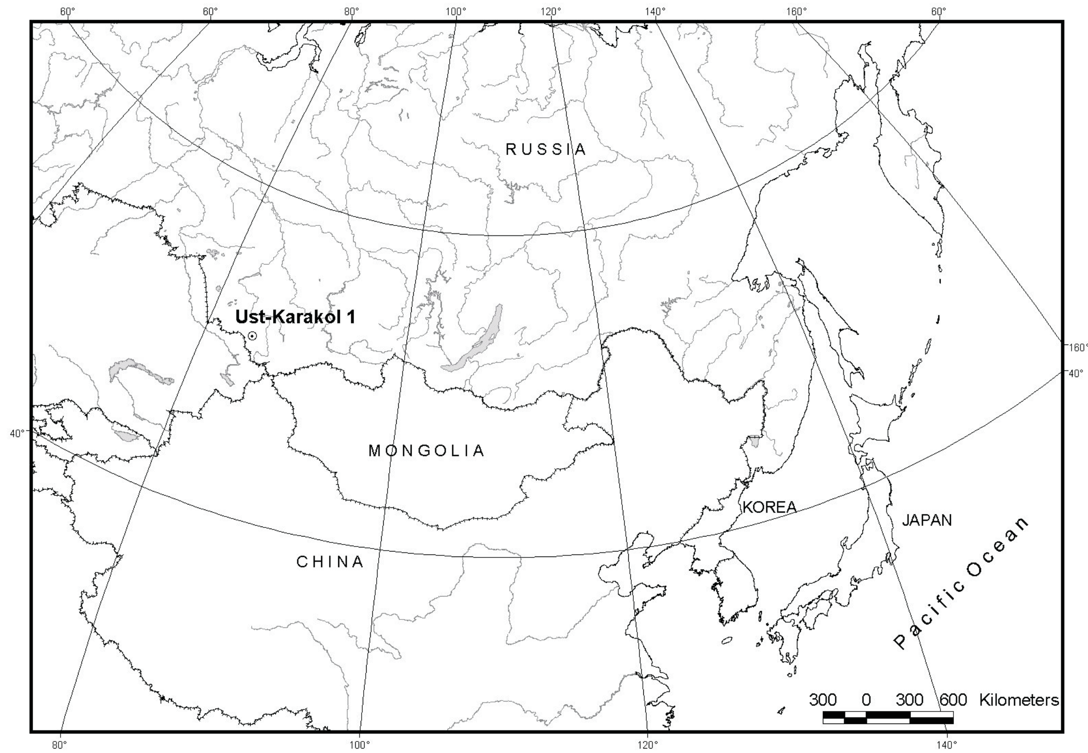

Figure 8.2: **Microblade complexes in Northern Asia, c. 35,000-30,000 BP.**

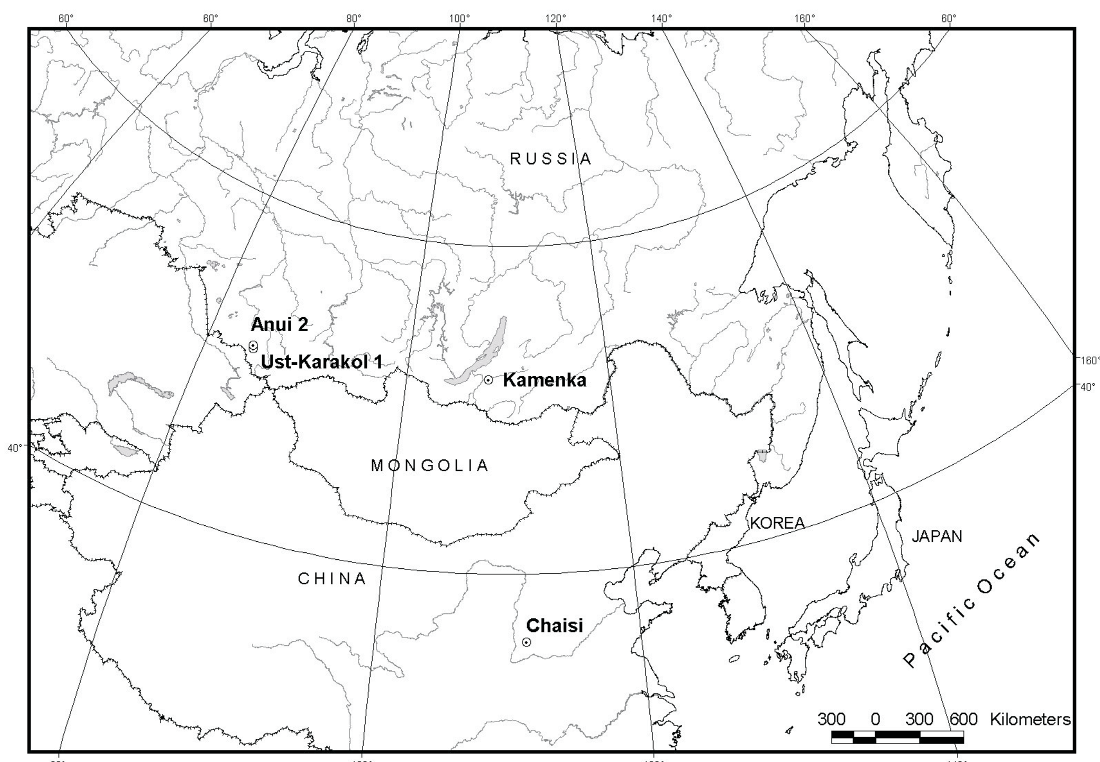

Figure 8.3: Microblade complexes in Northern Asia, c. 30,000-25,000 BP.

Table 8.1: Radiocarbon dates associated with the earliest microblade complexes in Northern Asia.

Region, site, and layer	^{14}C date, BP	Lab Code and No.	Material dated
Siberia			
Ust-Karakol 1, layer 10	35,100±2850	SOAN-3259	Charcoal
Ust-Karakol 1, layer 9C	33,400±1285	SOAN-3257	Charcoal
	31,580±470	AA-32670	Charcoal
	29,860±355	SOAN-3358	Charcoal
	29,720±360	SOAN-3359	Charcoal
Anui 2, layer 12	27,930±1590	IGAN-1425	Humates
	26,810±290	SOAN-3005	Charcoal
Anui 2, layer 9	27,125±580	SOAN-2868	Humates
Kamenka, complex B	28,815±150	SOAN-3032	Bone
	28,060±475	SOAN-2903	Bone
	25,540±300	SOAN-3355	Bone
	24,625±190	SOAN-3031	Bone
Kurtak 4, layer 11	24,890±670	LE-3357	Bone
	24,800±400	GIN-5560	Charcoal
	24,170±230	LE-3351	Charcoal
	24,000±2950	LE-4156	Bone
	23,800±900	LE-4155	Charcoal
	23,470±200	LE-2833a	Charcoal
Ui 1, layer 2	22,830±530	LE-4189	Charcoal
	19,280±200	LE-4257	Bone
	17,520±130	LE-3359	Bone
	16,760±120	LE-3358	Bone
Novoselovo 13, layer 3	22,000±700	LE-3739	Charcoal
Mal'ta, layer 8	21,700±160	OxA-6191	Bone
	21,600±170	GIN-8475	Bone
	21,600±200	GIN-7708	Bone
	21,340±240	OxA-6193	Bone
	21,300±110	GIN-7702	Bone
	21,300±300	GIN-7704	Bone
	21,100±150	GIN-7703	Bone
	21,000±140	GIN-7706	Bone
	20,900±200	GIN-4367	Bone
	20,800±140	GIN-7710	Bone
	20,700±150	GIN-7709	Bone
	20,340±320	OxA-6192	Bone
	19,900±800	GIN-7705	Bone

cores hinders a conclusion about a possible pre-35,000 BP appearance of microblade technology in the Denisova Cave assemblages. Layer 9 of the main chamber so far does not have any ^{14}C dates. Furthermore, the age of layer 7 in the entrance area remains uncertain. Generally, the stratigraphic correlation of the different parts of Denisova Cave is to some extent problematic, and at the present state of research they cannot be directly correlated.

A flat-faced core for chipping off microblades was found in the early Upper Palaeolithic assemblage of layer 6 at the Kara-Bom site, central Altai Mountains (Derevianko and Shunkov 2004:29). Initially, it was identified as a scraper (Derevianko *et al.* 1998a:58). The ^{14}C date of layer 6 at Kara-Bom is c. 43,200±1500 BP (GX–17597) (Goebel *et al.* 1993). Generally, the origin of microblade technology in Northern Asia is closely connected with the appearance of flat-faced

Table 8.1 (continued)

Region, site, and layer	^{14}C date, BP	Lab Code and No.	Material dated
Siberia			
Buret	21,190±100	SOAN-1680	Bone
Krasny Yar, layer 6	19,100±100	GIN-5330	Bone
Ust-Ul'ma 1, layer 2b	19,350±65	SOAN-2619	Charcoal
Ogonki 5, layers 2B-3	19,440±140	Beta-117987	Charcoal
	19,380±190	Beta-115986	Charcoal
	19,320±145	AA-20864	Charcoal
	18,920±150	AA-25434	Charcoal
	17,860±120	AA-23137	Charcoal
Ikhine 2	20,080±150	SOAN-3185	Bone
	19,695±100	SOAN-3186	Bone
Verkhne-Troitskaya, layer 6	18,300±180	LE-905	Wood
China			
Chaisi	25,650±590	ZK-0635	Shell
Xiachuan, layer 2	23,220±1000	ZK-0417	Charcoal
	21,700±1000	ZK-0384	Charcoal
	20,700±600	ZK-0393	Charcoal
	18,560±480	ZK-0497	Peat
	18,375±480	ZK-0494	Silt
	15,940±900	ZK-0385	Charcoal
Japan			
Kashiwadai 1, layer 4	20,790±160	Beta-126175	Charcoal
	20,700±150	Beta-126176	Charcoal
	20,610±160	Beta-126184	Charcoal
	20,370±70	Beta-120883	Charcoal
	20,130±150	Beta-126170	Charcoal
	19,840±70	Beta-120881	Charcoal
Korea			
Janghungri, layer 1	24,400±600	SNU00-381	Charcoal
	24,200±600	SNU00-380	Charcoal
Hopyung, layer 1	22,200±600	SNU02-327	Charcoal
	17,500±200	SNU02-325	Charcoal
	17,400±400	SNU02-326	Charcoal
	16,900±500	SNU02-324	Charcoal

(*tortsovyi*) cores in the early Upper Palaeolithic assemblages (e.g., Derevianko 2001).

Very early animal bone ^{14}C dates were obtained in another area of Siberia, the southern Transbaikal, from the Kamenka site, complex B (Figures 8.1 and 8.3), in direct association with microblades and microcores, from c. 28,800 BP to c. 24,600 BP (Table 8.1) (Lbova 2002). After this time, the earliest microblade sites in Transbaikal are Studenoe 2, layer 4/5, with associated charcoal ^{14}C dates from hearths of 17,225±115 BP (AA–23655) and 17,885±120 BP (AA–23653) (Goebel *et al.* 2000), and Ust-Menza 2, layer 21, with charcoal dates from hearths of 17,600±250 BP (GIN–5464) and 17,190±120 BP (GIN–5464A) (Konstantinov 1994).

In other regions of Siberia (Figures 8.1 and 8.4), the earliest ^{14}C-dated sites associated with microblade technology are:

1) in the Upper Yenisei River basin: a) Kurtak 4, layer 11, with a range from c. 24,900 BP to c. 23,500 BP; b) Ui 1, layer 2, from c. 22,800 BP to c. 16,800 BP; c) Novoselovo 13, layer 3, c. 22,000 BP (Table 8.1); and d) Kashtanka 1, lay-

er 2, 21,800 ± 200 BP (IGAN–1049) and 20,800 ± 600 BP (GIN–6968) (Vasil'ev *et al.* 2002);

2) in the Angara River basin: a) the main component of the Mal'ta site (layer 8), from c. 21,700 BP to c. 19,900 BP ; b) Buret, c. 21,190 BP (Table 8.1, Figure 8.4); and c) Krasny Yar, layer 6, c. 19,100 BP (Table 8.1, Figure 8.5) (Medvedev *et al.* 1996; Hedges *et al.* 1998);

3) in the Russian Far East: a) Ust-Ul'ma 1, layer 2b, c. 19,400 BP, and b) Ogonki 5, layers 2b and 3, from c. 19,400 BP to c. 17,900 BP (Table 8.1) (Derevianko 1996; Vasilevski 2003).

It should be noted that microblade complexes and typical Upper Palaeolithic blade complexes in Siberia coexisted for a long time, until c. 15,000 BP, when microblades and wedge-shaped cores replaced the blade complexes (e.g., Vasil'ev 2001; Zenin 2002).

In Yakutia, the earliest unequivocal ^{14}C dates, associated with the microblade complex of the Dyuktai culture, range in age from c. 24,600 BP (Kuzmin and Orlova 1998) to c. 18,000 BP (Vasil'ev 2001) according to different opinions [for a discussion, see Kuzmin and Orlova (1998:35–37); Vasil'ev *et al.* (2002:508–510)]. Mochanov and Fedoseeva (1996), however, argue for a much earlier age of the Dyuktai complex, that is, c. 35,000–30,000 BP [(for a different opinion, see, for example, Yi and Clark (1985)]. Perhaps the most reliable age estimates for one of the earliest Dyuktai sites, Ikhine 2, may be derived from bone ^{14}C dates, c. 20,100–19,700 BP (Kuzmin and Orlova 1998; Vasil'ev *et al.* 2002; see Table 8.1, Figure 8.5), rather than from possibly 'old' driftwood ^{14}C values of c. 30,200–24,300 BP (see Mochanov and Fedoseeva 1996). In this case, the earliest microblades in Yakutia may now be securely dated from c. 20,100 BP (Ikhine 2) to c. 18,300 BP (Verkhne-Troitskaya, layer 6) (Table 8.1, Figure 8.5).

Thus, it is clear that microblade technology appeared in Siberia long before the Last Glacial Maximum (LGM). At the LGM, c. 20,000–18,000 BP, microblade and non-microblade complexes were contemporaneous in Siberia. Microblade sites are known in several regions – the West Siberian Plain, the Upper Yenisei River basin, the Upper Angara River basin, central Yakutia, southern Transbaikal, the Middle Amur River basin, and Sakhalin Island. Along with the microblade

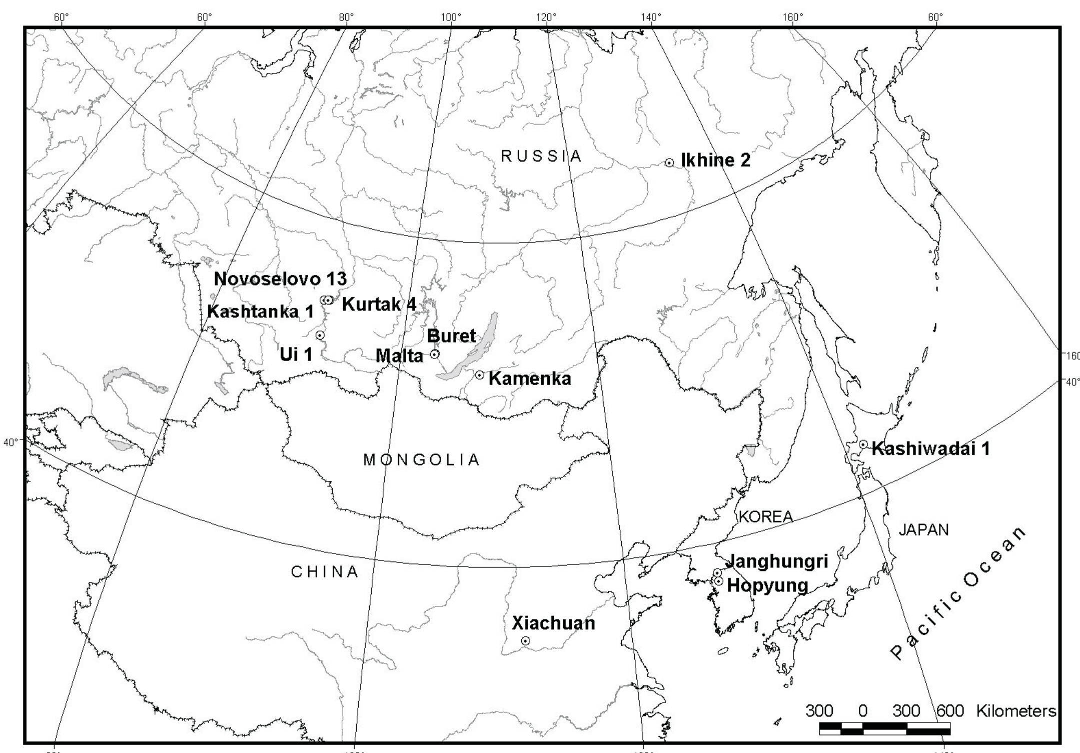

Figure 8.4: **Microblade complexes in Northern Asia, c. 25,000-20,000 BP.**

complexes, sites without microblades have also been identified in different parts of Siberia – the West Siberian Plain (Tomsk and Shestakovo, with charcoal ^{14}C dates) and perhaps the Upper Yenisei River basin (Shlenka and Tarachikha, with mammoth bone ^{14}C dates). Their tool assemblages are dominated by blade and flake industries including small blades (bladelets); these are, however, different from microblades (Zenin 2002).

PALAEOENVIRONMENT OF THE EARLIEST MICROBLADE COMPLEXES

Palaeoenvironmental reconstructions for the earliest microblade sites can be made from records of Siberian Late Pleistocene climates and vegetation (e.g., Kind 1974; Krasnov 1984; Velichko 1993, 2002; see also reviews in Chlachula 2001a, 2001b, 2001c). According to palynological data, at c. 35,000–27,000 BP, the Altai Mountains featured a phytogeographic zone of primarily conifer forests (Derevianko *et al.* 2003:271), with forest steppes and steppes in the Altai Mountain piedmonts (Orlova *et al.* 1998). The environmental reconstruction for layers 11–9 of the Ust-Karakol 1 site is also based on small mammal remains (Agadjanian 2003). It shows that forest and meadow formations existed here at c. 35,000–29,700 BP. Climate at that time was relatively cool and wet compared to the modern one (Derevianko *et al.* 2003). In southern Transbaikal, at c. 28,800–24,600 BP, forest steppe formations dominated the area near the Kamenka site (Lbova *et al.* 2003:184–185). In general, the vegetation of southern Siberia, including Transbaikal and Altai, in the second part of the Karginian Interstadial (c. 35,000–25,000 BP) was represented mainly by forest type formations with a prevalence of conifers (e.g., Tseitlin *et al.* 1984; Belova 1985; Arkhipov and Volkova 1994).

Most of the earliest microblade sites in Siberia correspond to the Sartan Glaciation in a broader sense, c. 24,000–18,000 BP. Gradual cooling caused the diminution of forest formations in Siberia from c. 24,000–22,000 BP. The main vegetation types in central and southern Siberia at the LGM, c. 20,000–18,000 BP, were periglacial steppe and forest steppe (i.e., steppe-type formations with cold-resistant species, such as wormwood and chenopods, and with an admixture of conifers, mainly larch and pine, and some birch); open birch-larch forests; and tundra and forest tundra (Grichuk 1984, 2002:79–89; Tarasov *et al.* 1999, 2000). In the southern Russian Far East, open birch-larch forest with tundra and forest tundra occurred in the higher elevations, with patches of dark-coniferous forest in refugia. Underground permafrost covered most of the northern Asian territory, including all of Siberia and the Russian Far East, northeastern China, and Hokkaido Island, Japan (Velichko 1993).

The concept of a depopulation of Siberia at the LGM was proposed by Goebel (1999, 2002; Goebel *et al.* 2000); a similar view was also expressed by Dolukhanov *et al.* (2002:603). This idea was originally put forward in the 1970s by S. M. Tseitlin (1979). Our data (see Vasil'ev *et al.* 2002; Kuzmin and Keates 2004, 2005) does not confirm a significant decrease in population in Siberia at the LGM, as can be determined by the number of known sites. At least 14 well-dated Upper Palaeolithic sites existed during the LGM in southern and central Siberia, and in the Russian Far East (Figure 8.5). The surface finds of mammoths at the Shlenka and Tarachikha sites, dated to c. 20,100–18,600 BP (Vasil'ev *et al.* 2002:525), and human-modified bison bone at the Tesa site dated to c. 20,000 BP (Belousov *et al.* 2002), also testify in favour of occupation at the LGM. Thus, the model of a "recolonization" of Siberia after c. 18,000 BP by external human populations that had developed microblade technology somewhere south of Siberia at an earlier time (Goebel 2002:122–123) cannot be supported.

CHRONOLOGY AND ENVIRONMENT OF THE EARLIEST MICROBLADE COMPLEXES IN NEIGHBOURING REGIONS OF NORTHERN AND CENTRAL ASIA

Northern China and Mongolia

In northern China, the earliest microblade industries (with "microliths") were found at the Chaisi and Xiachuan sites in the Loess Plateau region (Figures 8.1, 8.3, and 8.4). The ^{14}C dates (given for 5568 years half-life; see Table 8.1) possibly associated with microblade assemblages are c. 25,700 BP for Chaisi (Huang and Hou 1998), and from c. 23,220 BP to c. 15,900 BP for Xiachuan, with the majority of dates within c. 23,200–17,900 BP (Tang 2000).

Tang (2000) roughly dates the Xiachuan site at c. 20,000 BP. The Chaisi ^{14}C value, obtained on shell, could be up to 1000–2000 years too "old", due to a combination of reservoir and hard-water effects (e.g., Taylor 1987). In this case, it is more secure to consider the Xiachuan ^{14}C dates, run mostly on charcoal, as the most reliable age estimate of the earliest microblade technology in northern China.

Environmental conditions in northern China slowly deteriorated beginning at c. 30,000 BP – broadleaf formations decreased, conifers expanded, and the area with underground permafrost increased (e.g., Cui and Xie 1985; Liu 1988). From c. 23,000 BP, climatic cooling accelerated. At the LGM, c. 20,000–18,000 BP, permafrost covered all of the northeastern part of China, southward to 40^0N latitude (Cui and Xie 1985; Cui and Song 1991). The LGM vegetation was represented by tundra north of 45^0N, and by forest tundra and open spruce-fir forests south of 45^0N, with large areas occupied by grass formations (Cui and Xie 1985; Liu 1988; Winkler and Wang 1993).

Data about the age and environment of the earliest microblade assemblages in Mongolia are still scanty. Recently, a microcore and several microblades were identified at the Chikhen Agui site in the Gobi Altai Mountains (Derevianko *et al.* 2001, 2004:217–220). The ^{14}C date associated with this stone artifact complex is 27,430 ± 870 BP (AA–26580).

THE JAPANESE ISLANDS

Recent extensive ^{14}C dating of the microblade complexes in Japan, particularly on Hokkaido Island (Figures 8.1 and 8.4), allows us to establish the age of the earliest microblade sites as c. 20,500 BP (Ono *et al.* 2002). This is the mean value of six individual ^{14}C determinations of layer 4 of the Kashiwadai 1 site, ranging from c. 20,800 BP to c. 19,800 BP (Table 8.1). On Honshu, Kyushu, and Shikoku islands, microblade industries appeared at c. 15,500–13,000 BP (Ono *et al.* 2002; see Sato and Tsutsumi, this volume; Sano, this volume).

Figure 8.5: **The Upper Palaeolithic sites in Siberia during the Last Glacial Maximum, c. 20,000-18,000 BP.**

The appearance of microblades on Hokkaido thus coincides with the LGM. At this time, a land-bridge connected Hokkaido with Sakhalin Island and mainland Northern Asia, and the width of the Tsugaru Strait, which separates Hokkaido and Honshu, was probably less than 5 km wide (e.g., Tsukada 1985; Kuzmin 1997). Detailed palaeoenvironmental reconstruction for the LGM in Japan (Tsukada 1983, 1985) shows that the eastern part of Hokkaido, affected by the cold water mass of the Sea of Okhotsk, was covered mainly with tundra and forest tundra. Similar vegetation surrounded the earliest microblade site of Ogonki 5 on neighbouring Sakhalin Island (Kuzmin *et al.* 1998). In western Hokkaido, there were boreal conifer forests with a dominance of spruce and fir (Tsukada 1983, 1985).

THE KOREAN PENINSULA

In Korea, recent progress with typological studies and ^{14}C dating of the microblade complexes found there (Seong 1998; Choi 2001; Hong *et al.* 2002; Bae and Kim 2003; Kim *et al.* 2004) makes it possible to establish the first appearance of microblade technology at c. 24,000 BP (but see Seong, this volume). The earliest microblade-associated sites are known from the central part of the Korean Peninsula, northeast of the city of Seoul (Figures 8.1 and 8.4). At the Jangheung-ri site, two ^{14}C dates were obtained, c. 24,400 BP and c. 24,200 BP, and at the Hopyeong site, ^{14}C dates from layer 1 range from c. 22,200 BP to c. 16,900 BP (Choi 2001; Hong *et al.* 2002; see Table 8.1). It is worth highlighting that both of these sites include a high percentage of obsidian tools and flakes in the assemblages. At the Janghungri site, for example, the total frequency of obsidian artifacts is 26.5%. The proportion of obsidian material among some of the artifacts is as follows: 80% of microblade cores, 91% of microblades, 60% of arrowheads, and 48% of flakes (Choi 2001:172). It is now obvious that the earliest microblades in Korea are associated with the wide use of obsidian as a raw material, perhaps due to the very suitable quality of obsidian for manufacturing tools with a sharp edge. Other important sites with quite early microblades in Korea are Sokchangni, layer 12 (dated to 20,830 ± 1880 BP; AERIK–8) and Suyanggae (dated to 18,630 BP; UCR–2078) (Bae and Kim 2003).

Environmental data for the second part of the Late Pleistocene in Korea are still insufficient for a detailed reconstruction of the vegetation. If we assume that the vegetation was similar to adjacent northeastern China (e.g., Liu 1988; Winkler and Wang 1993), it is possible to say that during the c. 24,000–20,000 BP time period conifer-broadleaved formations dominated in Korea. During the LGM, the territory north of 38–40^{0}N was covered with predominantly conifer forests, and south of 38–40^{o}N conifer-broadleaved vegetation prevailed (Reynolds and Kaner 1990). At the Suyanggae site, wood macrofossils of pine and spruce species were identified (Park *et al.* 2003). Open spaces, occupied by grass formations, were an important part of the LGM landscapes in Korea, as well as in neighbouring northeastern China (Winkler and Wang 1993).

CONCLUSION

Using the current geoarchaeological data on the oldest microblade complexes in Northern Asia, it is possible to conclude that the earliest evidence of microblade technology is now known for the Altai Mountains region of southern Siberia, dated to c. 35,000 BP, and which existed in quite favourable environmental conditions (conifer forests). Microblade technology subsequently appeared in another area of southern Siberia, the Transbaikal, at c. 28,800 BP in a forest steppe environment. At the same time, blade and flake assemblages continued to be made in Siberia, especially on the West Siberian Plain. The first appearance of microblade technology in Western Siberia is known at c. 15,000 BP.

By about 25,000–20,000 BP, microblade complex sites had appeared across all of Northern Asia, including Korea (c. 24,400 BP) and the Yenisei River basin (c. 24,900 BP). This time period is characterized by the deteriorating climatic conditions at the beginning of the last glaciation. Microblade sites are known from the time of the height of the last glaciation in Japan (c. 20,500 BP), Yakutia (c. 20,100–18,300 BP), and the Russian Far East (c. 19,400 BP). In northern China, the most reliable age estimate of the earliest microblade sites is c. 23,200 BP.

It appears that environmental conditions were not the only factor which may have caused the emergence of microblade technology in Northern Asia. The origin and spread of this new technology over vast territories with different terrains, climates, vegetation, and animals, was a long-term process rather than a sudden appearance just before or during the LGM. Microblade manufacture started in southern Siberia at c. 35,000 BP, and expanded continent-wide at about 25,000–20,000 BP (Figures 8.4 and 8.6). Perhaps environmental conditions were partly responsible for the process of the wide distribution of microblades in Northern Asia after c. 25,000 BP through the mechanism of the diversification of human adaptive strategies under deteriorating climatic conditions. However, more effort is needed to study this process in detail.

At the LGM, microblade complexes were already in place across Northern Asia. Climatic deterioration did not cause a depopulation of the southern part of Siberia and the Russian Far East. Some populations with microblade technology continued to live in the dry and cold environment in different places, including central Yakutia, which featured a very cold continental-type climate. The degree of human adaptation at the time of the LGM was high enough for people to cope with the harsh Siberian environment.

ACKNOWLEDGEMENTS

I am grateful to colleagues who discussed with me problems of the earliest microblade complexes of Siberia, the Russian Far East, Korea, China, and Japan. Among them are Prof. S. A. Vasil'ev (St.-Petersburg, Russia); Prof. L. V. Lbova (Ulan-Ude, Russia); Profs. V. N. Zenin and A. V. Tabarev, and Dr. S. A. Gladyshev (Novosibirsk, Russia); Drs. E. V. Artemiev and E. V. Akimova (Krasnoyarsk, Russia); Dr. I. Y. Shewkomud (Khabarovsk, Russia); Prof. A. M. Kuznetsov (Vladivostok, Russia); Mr. V. G. Petrov (Blagoveshchensk, Russia); Prof. A. A. Vasilevski (Yuzhno-Sakhalinsk, Russia); Dr. H. Kato and Mr. M. Izuho (Sapporo, Japan); Dr. D. J. Cohen (Boston, USA); Dr. A. J. T. Jull (Tucson, AZ, USA); Dr. Choi B.-K. (Chuncheon, Korea); and Dr. Hong M.-Y. (Seoul, Korea). I acknowledge Prof. L. V. Lbova, and Drs. S. G. Keates, D. J. Cohen, and J. Chlachula (Zlin, Czech Republic) for grammar correction, and useful comments and suggestions of the earlier version of this paper. This research was supported in part by grants from the Russian Foundation for Basic Sciences (# 06–06–80108, 96–06–80688, 99–06–80348, 06–06–80258, and 02–06–80282), the Japan Foundation (1996), the Korea Foundation (2002), the Ministry of Education, Science, Culture and Sport of Japan (2003), U.S. National Science Foundation (# EAR97–30699 and EAR01–15488), U.S. Civil Research and Development Foundation (RG1–2538–VL–03), and the U.S. Fulbright Program (1997, # 96–21230; and 2004, # 03–27672).

This paper is the expanded version of the author's presentation at the Symposium "Origin and Spread of Microblade Technology in Northern Asia and North America", which took place at the 69th Annual Meeting of the Society for American Archaeology, Montreal, Canada, April 1, 2004.

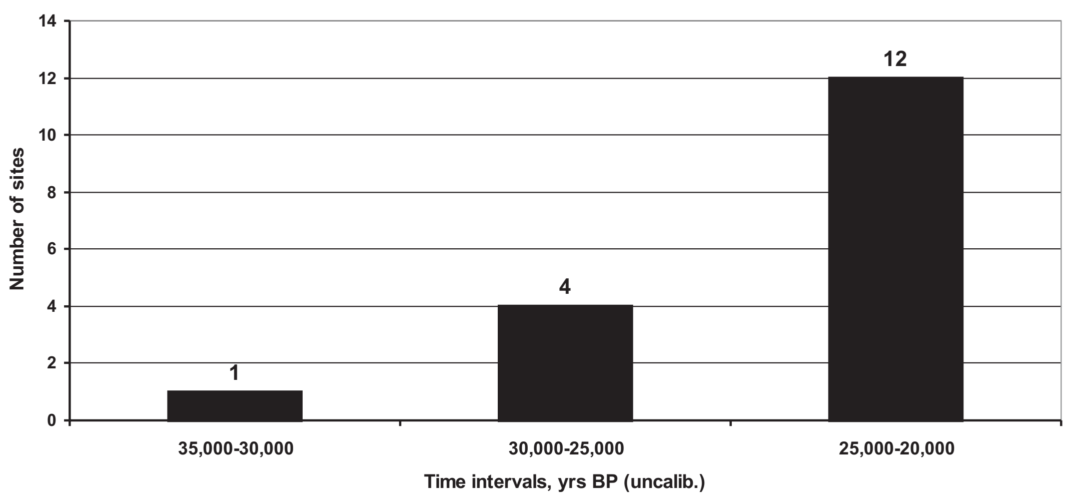

Figure 8.6: **Histogram showing the number of ^{14}C-dated microblade sites in Northern Asia for c. 35,000-20,000 BP.**