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RADIOCARON DATES AND ARCHAEOLOGY OF THE LATE PLEISTOCENE IN THE JAPANESE ISLANDS

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ABSTRACT. We discuss the radiocarbon chronology of Late Pleistocene archaeology in the Japanese islands. In sum, 429 samples from more than 100 archaeological sites were compiled and then divided into three periods and four stages. The Early Upper Paleolithic, characterized by Trapezoid industries, lasted during approximately 34–26 ka. The Late Upper Paleolithic period includes both the backed-blade stage and point-tool stage, the latter appearing chronologically later than the former. This stage covers ~25–15 ka. The Final Upper Paleolithic and Incipient Jomon are distinguished by the appearance of microblade industries and the emergence of pottery at the end of this period. This period covers approximately 14–12 ka. The microblade tradition, in the broadest sense, is strongly connected to the background of peopling of the New World. New data on the transitional stage from the Middle to the Upper Paleolithic are also discussed in regards to three archaeological sites. Issues on the application of the ^{14}C calibration to the whole Japanese Upper Paleolithic are critically evaluated.

INTRODUCTION

The intent of this paper is to clarify the background of the peopling of the New World in relation to the archaeological records, with particular emphasis on radiocarbon dates from the Japanese islands. Chronometric foundations of the Japanese Upper Paleolithic have been developed during the last three decades. Compilation of ^{14}C dates, together with the stratigraphic sequence of lithic industries, illustrates the board-spectrum of the background of the topic (Kuzmin et al. 1998).

Some framework should be noted. First, we discuss the Japanese Upper Paleolithic in as simplified a way as possible in an attempt to summarize and focus on the relevant subjects. Second, we limit the geographical area within the Japanese islands. Although this area reflects only the boundaries of the present nation state, we have kept this framework because most of the Japanese Paleolithic research has been carried out in this field since 1949. Third, the time range of this paper covers the final phase of the Middle Paleolithic to the entire Upper Paleolithic and Incipient Jomon, i.e., the latter half of OIS3 to the end of OIS2. The criterion for the subdivision of the Japanese Paleolithic are controversial in regards to whether they should be divided into three or two periods (Sato 2001). The term used here, "final phase of the Middle Paleolithic" indicates in any case a phase before the emergence of the blade technique. Fourth, the ^{14}C results cited in this paper are uncalibrated dates despite the conventional or accelerator mass spectrometry (AMS) determinations. Prior to the advent of AMS, conventional ^{14}C dates for the Upper Paleolithic in Japanese islands were of variable quality.

THE PRESENT STATE OF RADIOCARBON DATING

The number of Pleistocene sites in the Japanese islands has been estimated at 4500. Each year, more than 100 additional sites are excavated. However, not many of these sites have been dated by the ^{14}C method (see Table 1 in Appendix).

Almost all Japanese Late-Pleistocene archaeological sites belong to the Upper Paleolithic with the exception of some Middle Paleolithic sites (Ono et al. 1992; Japan Association for Quaternary Research 1987). The reasons why there are few examples of ^{14}C dating in the Late Pleistocene of the Japanese islands are as follows.

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First, the establishment of the local chronology within the Japanese islands has to be mentioned. Many Upper Paleolithic sites have been excavated since the first Paleolithic excavation was carried out at the Iwajuku site in Gunma Prefecture in 1949. The massive volcanic eruptions in the Pleistocene are traceable in many archaeological layers. Extensive studies of the tephrochronology have clarified the distinctive cultural layers in thick loam with many marker-tephra (Machida and Arai 1992). Widely distributed key tephra covered almost all the Japanese islands and they functioned as the time-marker. Archaeological artifacts from different areas have been combined and given exact chronological positions (Machida et al. 2000). At the same time, the archaeological chronology of each area has been completed by the progression of techno-typological studies of lithic artifacts.

Second, the persistent condition of carbonized materials for ^{14}C dating in the Japanese Late Pleistocene under the periglacial environment provides fewer advantages for preservation. Cultural layers consist of acid soils that originated from volcanic ash, and no organic materials such as wood or bone are preserved at all. In the early period of ^{14}C dating, results often conflicted with the archaeological chronology. At that time, the effectiveness of ^{14}C dating was questioned by many archaeologists because of the inconsistency of sampling bias and preservation issues before the 1970s.

Third, Japanese Paleolithic research began in pursuit of the regional chronology, and comparative studies between neighboring Asian countries were not active before the 1980s. Over the past two decades, research developments in China, Korea, and the Russian Far East have forwarded the development of intercontinental chronological comparison both by morpho-typological and ^{14}C dating.

KEY RADIOCARBON DATES OF THE UPPER PALAEOLITHIC

Chronology of the Upper Paleolithic in the Japanese Islands

Upper Paleolithic chronological studies have been advanced in most areas that have well-stratified thick loam layers made up of volcanic ash, aeolian dust/or loess from China, and fine sand blown in from river terraces near the studied area. In the central part of the Japanese islands, and in the Tokyo area in particular, detailed chronologies have been established both on a stratigraphic and a morpho-typological basis. The widely distributed key marker tephra provides excellent chronological synchronicity among separated areas. The basic chronological sequence of the Upper Paleolithic follows four stages: 1) in the early phase, trapezoid industries covered whole Japanese islands; 2) backed-blade industries became common and stable during the early-to-later phase of the Upper Paleolithic; 3) point-tool industries have developed particularly in Central Japan; and 4) microblade industries have successfully spread over the Japanese islands until the emergence of incipient Jomon cultural elements.

The distinction between the Early and Late Upper Paleolithic is characterized as the formation of local varieties of lithic assemblage and social change, reflecting settlement patterns, and this occurred in the middle phase of the backed-blade sequence.

The huge volcanic eruption occurred from the Aira caldera, south Kyushu, in the following sequence. The eruption spread volcanic ash over most of the Japanese islands as well as the Korean peninsula, a part of east China, and southern Primorye in the Russian Far East. This key tephra is called Aira-Tn tephra (AT), which is critically important for the Upper Palelithic chronology. Recent AMS determination of the AT-tephra was found to be 25–24 ka (Japan Association for Quaternary Research 2000). This time range coincides well with the transition from OIS3 to OIS2, which includes LGM period. Key ^{14}C dates are compiled in Table 1. The table lists 429 samples from more than 100 archaeological sites. Figure 1 shows the chronology of Upper Paleolithic development of lithic assemblage.

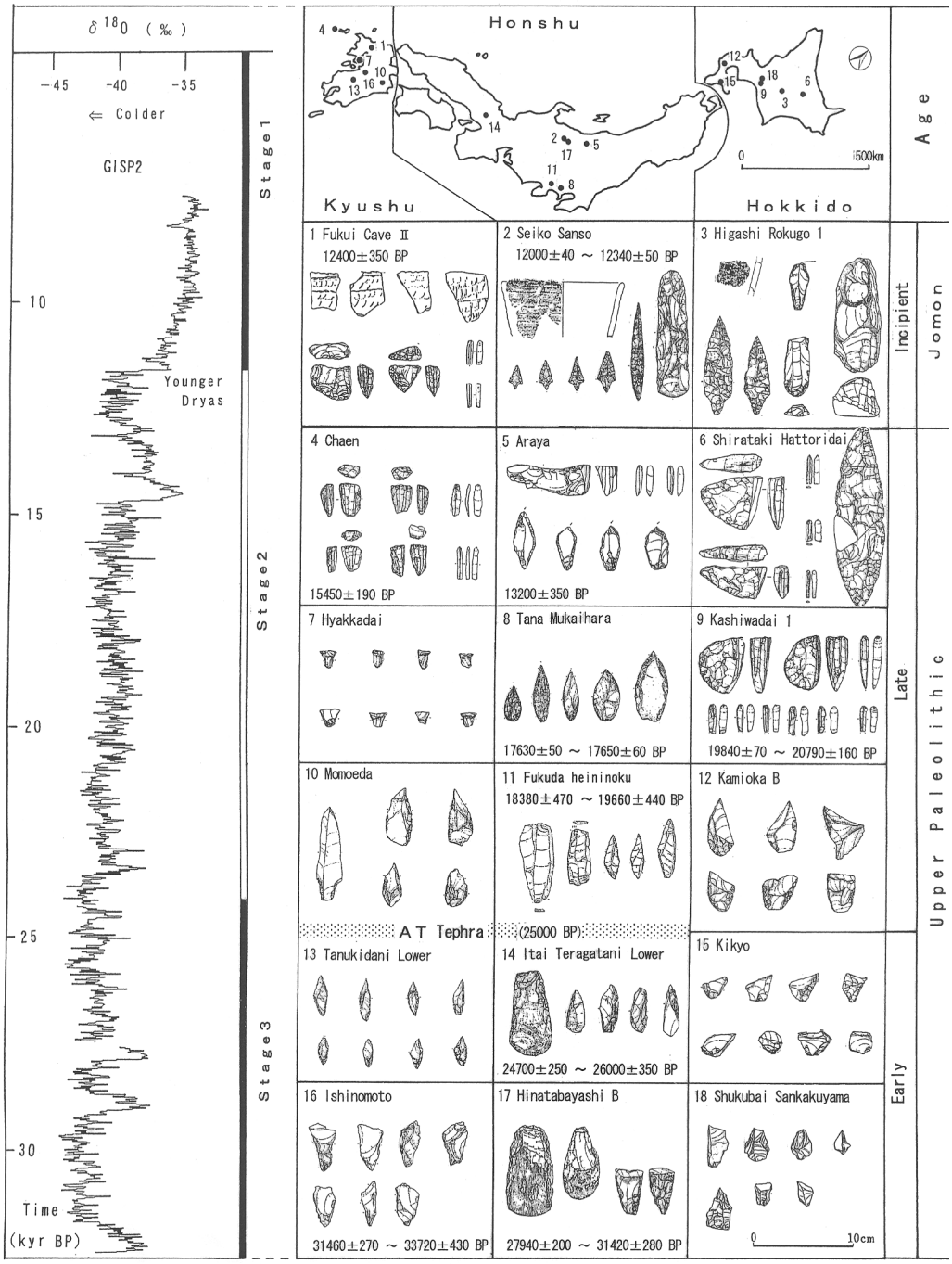

Figure 1 Chronology and ^{14}C dates of the Upper Paleolithic and Incipient Jomon in the Japanese islands. Left: climatic change shown by the $\delta^{18}O$ record of the GISP2 ice core (after Stuiver and Grootes 2000). Note that the ^{14}C dates of archaeological sites are uncalibrated AMS measurements.

Early Upper Paleolithic: ~34–26 ka

The earliest period of the Upper Paleolithic is distinguished by trapezoidian lithic industries of in which trapezoids and edge-round stone tools were used (Sato 1992). One of the representative sites from the Kyushu, the Ishinomoto site (Figure 1:16), is AMS dated to 31,460 ± 270 ~ 33,720 ± 430 BP (Ikeda 1999). Sixty edge-ground stone tools (axes) and many trapezoids have also been excavated from the early Upper Paleolithic site Hinatabayashi B (Figure 1:17) in north-central Japan. Its AMS determination was 27,940 ± 200 ~ 31,420 ± 280 BP (Tsuchiya and Tani 2000). These ^{14}C dates suggest that the beginning of the Japanese Upper Paleolithic is older than 30 ka.

In the later phase of the early period of the Upper Paleolithic, Hatsunegahara, a unique open-air site, explicitly showed that 56 trap-pits with almost 1.5-m depths have been unearthed beneath the AT tephra horizon. These provide key evidence for re-evaluating the site function as well as the hunting system in the Upper Paleolithic. ^{14}C dates detected from the bottom of one of these pits show 27,200 BP and 29,750 ± 210 BP (Suzuki and Maejima 1999). The foundation of these trap-pits can therefore be suggested between 27 ka and 25 ka.

In the western part of the Japanese islands, an industry from the lower cultural horizon of the Itai-Teragatani site is a representative one that belongs to the later phase of early Upper Paleolithic. ^{14}C dates from this site were 24,700 ± 250 BP and 26,000 ± 350 BP (Yamaguchi and Kishimoto 1991). Though the edge-ground stone tools (axes) and backed-blades have been excavated from this site, a specific "Setouchi technique," characterized by an oblong blade-detaching or a side-blow flaking technique, in western Japan in particular, had already emerged in its germinal stage.

The foundation of the "Setouchi technique" could threfore suggest that it can be set back to 26–25 ka. Contrary to the "Setouchi side-blow technique", the blade technique was developed in the latter half of the early Upper Paleolithic in eastern Japan.

Late Upper Paleolithic: ~25–15 ka

After the huge AT ash fall, i.e., in the latter half of the Upper Paleolithic, the upper cultural layer of the Itai-Teragatani site contains backed blades and many denticulated points (*Kakusuijo-sekki*). ^{14}C measurement of the peat layer, which is included these lithic industries, indicates 22,700 ± 330 BP and 20,400 ± 260 BP. The Tomizawa site in northern Japan also belongs to the latter Upper Paleolithic. A buried forest was discovered at this site with backed-blades and a fireplace. This is a unique hunting site that has great potential for reconstructing the paleoenvironment and human activities in the Upper Paleolithic (Ota 1992). ^{14}C dates from the site are 23,870 ± 860 BP and 19,430 ± 400 BP, and these fall in the LGM period. In the same horizon around Tomizawa, the subarctic coniferous buried forest of *Picea* has been excavated. There, droppings of Shika deer (*Cervus nippon*) and the fossils of insects that lived in the aquatic environment have been found.

After backed-blades diminished in the later Upper Paleolithic, point-tool industries came about mainly in central Japan. These bifacially retouched leaf shape points are usually about 10 cm long. Two dwelling structures were recently excavated at the Kogure-Higashi-Arayama site in Gunma Prefecture and at the Tana-Mukaihara site in Kanagawa Prefecture. The two dwelling sites belong to the point-tool industry and AMS determination indicates that the former is 17,950 ± 60 BP (Hosono 1999), and the latter are 17,650 ± 60 and 17,630 ± 50 BP (Tsuji 2000). As a result of these measurements, point-tool industries can be dated back to about 18–17 ka.

Final Upper Paleolithic and the Incipient Jomon: ~14–12 ka

The microblade industry represents the final period of the Upper Paleolithic in the Japanese islands. The sites of Yasumiba 14,300 ± 700 BP (Sugihara and Ono 1965), Araya (Figure 1:5) 13,200 ± 350 BP (Serizawa 1959), and Tsukimino-Kamino 13,570 ± 410 BP (Aida 1986) offer key ^{14}C dates for this period. Contrary to these dates, recent AMS determination at the Kashiwadai site (Figure 1:9) in Hokkaido reveals 20,790 ± 160 ~ 19,840 BP. These results imply that the microblade industry in Hokkaido, at the northern extreme of the Japanese islands, begins with about 21–20 ka, and this means a few thousand years earlier than Honshu area (Fukui and Koshida 1999). In Chaen at the extreme southern tip of the Kyushu (Figure 1:4), an early microblade industry dated to 15,450 ± 190 BP (Kawamichi and Araki 1998).

The duration of microblade industries in Kyushu covers approximately 15–12 ka, and in the latter phase of this period nail-patterned incipient Jomon pottery had already been associated with the microblade technique at the Fukui cave site Layer II (Figure 1:1). A ^{14}C date at Fukui cave is 12,400 ± 350 BP (Kamaki and Serizawa 1965).

New AMS dates have recently become available for the terminal Upper Paleolithic and/or the incipient phase of Jomon. The earliest undecorated pottery and the Mikoshiba-type axe, with its humped cross-section and points, have been excavated at the Odai-Yamamoto site in the northern extreme of the Japanese main island Honshu. Carbon adhesions on pottery fragments were dated by AMS and the results are shown as 13,780 ± 170 ~ 12,680 ± 140 BP (Taniguchi 1999). Furthermore, carbon adhesions on linear-relief pottery from the Seiko-Sanso site in central-northern Japan have also been tested by AMS, and the results are 12,340 ± 50 ~ 12,000 ± 40 (Tsuchiya and Nakajima 2000). Direct AMS dating of carbon adhesions on the earliest potsherds shows that the emergence of pottery in the Japanese islands dates from ~13,000 BP.

It should be emphasized that the Upper Paleolithic of the Japanese islands began before ~30 ka and developed for over 20,000 years before diminishing in the transition to the Jomon age at about 13 ka.

DISCUSSION

The Origin of Blade and Microblade Technology in Hokkaido: Kashiwadai 1 Site

Hokkaido is located at the northern tip of the Japanese islands. The soil formation there was not well developed in the later Pleistocene. Lithic artifacts from different periods, therefore, were sometimes unearthed from the same layer. Recently, however, the result of good carbonized materials of AMS determination from fireplaces allows one to re-examine the chronology of the microblade industry that had been established mostly by typological classification of cores and reduction technology.

In the case of the Kashiwadai 1 site, Chitose City in Hokkaido, the carbonized materials of 13 samples were found in fireplaces associated with lithic concentrations and Rankoshi-type microblade cores. AMS results are 20,790 ± 160 to 19,840 ± 70 BP. The mean value is ~20,500 BP (Hokkaido Center for Archaeological Operations 1999). This indicates the Rankoshi-type microblade core is older than the Shirataki type.

The detaching face of the Rankoshi type is set on the long axis, but the Shirataki type is set on the minor axis. This change so far seemed to be caused by gradual evolution of the effective utilization of raw materials. Furthermore, the blade technique is evident in the initial flaking stage of the Rankoshi micro core production in Kashiwadai 1 Site. Therefore, the emergence of the blade technique in Hokkaido suggested that it was older than 20 ka. The first appearance of microblade industry in

Hokkaido, in this context, seems to show no large time discrepancy compared to East Siberia, and inflow of microblade industries to Hokkaido was comparatively earlier than in other parts of the Japanese islands. Hokkaido microblade industries might have shared the same cultural traditions of East Siberia. These cultural traditions, in the broadest sense, are strongly connected to the theme of peopling the New World crossover to the Beringia.

New Data on the Transitional Stage from Middle to Upper Paleolithic

The Lake Nojiri Site Group

Lake Nojiri in central north Japan lies in the flat highland of the northern Fossa Magna at 654 m above sea level. The Nojiriko Formation is divided into three members: the Lower, Middle, and Upper, with marked inconformities. Furthermore, each member is subdivided into three or four parts. The chronometric framework of the Nojiri-ko Formation can be attributed as follows by AMS determination: the Lower Member covers ~50,000–42,000 BP, the Middle Member covers ~42,000–35,000 BP, and the Upper Member covers ~35,000–12,000 BP (Sawada et al. 1992). The Tategahana site on the shore of Lake Nojiri is, in particular, is unique with well-preserved organic materials.

Most of the mammal fossils are made up of two species. Bones of Naumann's elephant (*Palaeoloxodon naumanni*) represent 91.9%, and Yabe's giant deer (*Sinomegaceros yabei*) form 7.9% of the total mammal fossils. This faunal assemblage suggests that the selective big game hunting by Paleolithic hunters reflected the composition of the faunal remains. Lithic tools and flakes such as scrapers and drills have been excavated with bone materials in the same layer. In the Middle Nojiri-ko, Member I in particular, a bone cleaver and refitted bone flake with retouched base, and refitted bone chips were also found at same concentration. All bone tools were made by direct flaking, but the so-called "groove and splinter technique" had not yet appeared (Ono 2001). These pieces of evidence suggest that the site functioned as a killing and butchering place on a lake shore in the final stage of Middle Paleolithic (Nojiri-ko Excavation Research Group 1984, 1994; Ono and the Nojiri-ko Excavation Research Group 1991).

Ishinomoto Site

A recent investigation of South Kyushu reveals new aspects of the early Upper Paleolithic. More than 3000 lithic artifacts have been unearthed at the Ishinomoto site in Kumamoto Prefecture. This industry includes many trapezoids that have distinguishing features of the early Upper Paleolithic viewed from the techno-typology (Sato 1992). AMS dates (33,720 ± 430 and 31,460 ± 270 BP) are reported (Ikeda 1999), and these are good examples of the beginning of the Upper Paleolithic.

Trapezoid industries are possible to evaluate as an index of the early Upper Paleolithic from Kyushu to Hokkaido. At the same time, some characteristic industries were discovered from Kyushu as shown below.

Yokomine C, Tachikiri, and Ushiromuta Sites

At Tanegashima island, in the ocean to the south of Kyushu, three pebble clusters, some pounding stones, and pebble tools were excavated from the early Upper Paleolithic cultural layer I (Dogome 1998). AMS dates for carbonized materials from the pebble clusters are 31,280 ± 690 and 29,670 ± 540 BP. Another AMS determination from cultural layer II is 30,490 ± 590. The stratigraphic level of this horizon is just above the Tane IV volcanic ash, and found three pebble clusters and anvil stones, pounding stones, grinding stones, and flakes (Sakaguchi and Dogome 2000).

The same chronological layer to the culture layer I of Yokomine C site, a pebble cluster, two pits, 14 fire places, and about 50 stone tools were excavated from Tachikiri site. An AMS date for this site is 30,480 ± 210 BP.

The Ushiromuta site also has many grinding and pounding stones from culture layer III, and four AMS dates are available from 30,290 ± 200 to 28,900 ± 150 BP (Sato 1999). These industries are very different from other parts of Japan (Tachibana 1999) and they suggest that the early Upper Paleolithic people had adapted to the plant resource acquisition strategy. This should be a key to discuss the possibilities of a southern route of peopling modern humans to the Japanese islands.

CONCLUSION

We discussed mainly the determination of the chrono-stratigraphic sequence of the Upper Paleolithic of the Japanese islands by ^{14}C dating. Recent progress and the increasing number of AMS dates bring about a new horizon in ^{14}C dating for a whole range of the Upper Paleolithic. High-precision ^{14}C dates and their calibration lead us to new critical issues with particular reference not only to the framework of the Pleistocene/Holocene transition, but the Paleolithic/Jomon transition. In this paper, ^{14}C dates have been discussed with uncalibrated ones. When the calibration applied to the earliest pottery such as the Odai-Yamamoto I site, the dates calculate between 16,500 and 16,000 cal BP. This suggests that the earliest potteries in East Asia are preceded by the Oldest Dryas period in terms of northwest Europe. ^{14}C dating is widely applicable among different disciplines. Correlations between high-precision dating, calibration, exact sampling from the sound archaeological context and their interpretations are, therefore, more critically evaluated.

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APPENDIX

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Table 1 Radiocarbon dates for the Upper Paleolithic and Incipient Jomon. Dates are uncalibrated.

	NO	Site name	Coordinates		Sample position	Measured	Conventional	Lab Code and No.	Material dated	Cultural affiliation	β	AMS	Reference
			Latitude	Longitude		C14 age	C14 age						
1	1	Kamiitaira	42° 43′	143° 14′	Cultural layer	11410±440	—	GaK-7076	charcoal	Microblade industry	β		[1]
2					Cultural layer	12530±490	—	GaK-7075	charcoal	Microblade industry	β		[1]
3					stone heap	32500±inf,-12000	—	KSU-1336	charcoal	Upper Paleolithic	β		[11]
4	2	Kitakami B	43° 46′	143° 52′	Cultural layer?	10300±1300	—	GaK-331	charcoal	Microblade industry	β		[2]
5	3	Mosanru	44° 19′	142° 43′	Cultural layer	13270±420	—	GaK-8722	charcoal	Upper Paleolithic	β		[3]
6					Cultural layer	15080±450	—	GaK-8723	charcoal	Upper Paleolithic	β		[3]
7					Cultural layer	14430±350	—	GaK-8724	charcoal	Upper Paleolithic	β		[3]
8	4	Shirataki 31	43° 52′	143° 08′	depth 3.4m	15820±400	—	GaK-212	peat	Microblade industry	β		[4]
9					depth 3.77m	15800±400	—	GaK-160	wood	Microblade industry	β		[4]
10					depth 3.38m	14800±330	—	GaK-210	wood	Microblade industry	β		[4]
11	5	Obihirokuko Minami A	42° 43′	143° 13′	Cultural layer	23850±4480/-2850	—	GaK-10747	charcoal	Upper Paleolithic	β		[5]
12					Cultural layer	19420±1770	—	GaK-10746	charcoal	Upper Paleolithic	β		[5]
13	6	Shukubai Sankakuyama	42° 50′	141° 11′	Cultural layer	21450±750	—	GaK-4346	charcoal	Upper Paleolithic	β		[6]
14	7	Hirosato 8	43° 45′	143° 48′	Cultural layer	13560±360	—	GaK-11568	charcoal	Upper Paleolithic	β		[7]
15	8	Kyoei 3	42° 57′	142° 55′	Cultural layer	>18000	—	KSU-2167	charcoal	Upper Paleolithic	β		[8]
16					Cultural layer	>18000	—	KSU-2168	charcoal	Upper Paleolithic	β		[8]
17	9	Akatsuki	42° 55′	143° 12′	Cultural layer	14700±250	—	KSU-717	charcoal	Microblade industry	β		[9]
18					Cultural layer	14700±130	—	KSU-718	charcoal	Microblade industry	β		[9]
19					Cultural layer	10900±500	—	KSU-889	charcoal	Microblade industry	β		[10]
20	10	Obihirokuko Minami B	42° 43′	143° 14′	Cultural layer	9150±600	—	KSU-890	charcoal	Microblade industry	β		[12]
21					Cultural layer	9500±650	—	KSU-891	charcoal	Microblade industry	β		[12]
22	11	Minamimachi 2	42° 54′	143° 10′	fireplace	13790±190	—	GaK-18247	charcoal	Microblade industry	β		[13]
23					fireplace	19610±270	—	GaK-18248	charcoal	Upper Paleolithic	β		[13]
24	12	Maruokayama	42° 52′	141° 42′	Cultural layer	—	21940±250	NUTA-2801	charcoal	Upper Paleolithic	AMS		[14]
25	13	Osatsu 16	42° 50′	141° 35′	pit	14590±200	—	GaK-19469	charcoal	Microblade industry	β		[15]
26					pit	10600±8650	—	GaK-19468	charcoal	Microblade industry	β		[15]
27	14	Kamioka 2	42° 25′	139° 59′	Cultural layer	9130±50	—	KSU-1995	charcoal	Upper Paleolithic	β		[16]
28	15	Pirika 1	42° 28′	140° 13′	Cultural layer Ⅰ	20100±335	—	N-4937	charcoal	Microblade industry	β		[17]
29					Cultural layer Ⅰ	20900±260	—	KSU-689	charcoal	Microblade industry	β		[17]
30					Cultural layer ⅡB	19800±380	—	KSU-687	charcoal	Microblade industry	β		[17]
31					Cultural layer ⅢA	18200±230	—	N-4936	charcoal	Point industry	β		[17]
32					Cultural layer ⅢA	17500±200	—	KSU-688	charcoal	Point industry	β		[17]
33	16	Ishikawa 1	41° 50′	140° 44′	Cultural layer	13400±160	—	KSU-1652	charcoal	Microblade industry	β		[18]
34	17	Shinmichi 4	41° 40′	140° 25′	Cultural layer	8320±280	—	KSU-1430	charcoal	Microblade industry	β		[19]
35	18	Oribe 16	43° 13′	143° 22′	Cultural layer	5630±90	—	KSU-759	charcoal	Microblade industry	β		[20]
36					Cultural layer	5300±550	—	KSU-760	charcoal	Microblade industry	β		[20]
37					Cultural layer	23600±700	—	KSU-761	charcoal	Microblade industry	β		[20]
38	19	Nitto	43° 50′	142° 47′	Cultural layer	16940±80	16940±80	Beta-136453	charcoal	Microblade industry		AMS	[21]
39					Cultural layer	980±40	980±40	Beta-136454	charcoal	Microblade industry		AMS	[21]
40					Cultural layer	16570±120	16560±120	Beta-136455	charcoal	Microblade industry		AMS	[21]
41	20	Kashiwadai 1	42° 48′	141° 41′	Layer Ⅰ	22190±210	22210±210	Beta-112913	charcoal	—		AMS	[22]
42					Layer Ⅰ	19650±130	19660±130	Beta-112915	charcoal	—		AMS	[22]
43					Layer Ⅳ	20910±190	20900±190	Beta-126178	charcoal	—		AMS	[22]
44					Layer Ⅰ	20200±120	20180±120	Beta-112919	charcoal	Microblade industry		AMS	[22]
45					fireplace	31350±330	31350±330	Beta-126182	charcoal	Microblade industry		AMS	[22]
46					Layer Ⅱ～Ⅲ	20700±210	20680±210	Beta-112922	charcoal	Microblade industry		AMS	[22]
47					Layer Ⅳ	20500±160	20510±160	Beta-112920	charcoal	Microblade industry		AMS	[22]
48					Layer Ⅳ～Ⅴ	20500±130	20490±130	Beta-112921	charcoal	Microblade industry		AMS	[22]
49					Layer Ⅳ	20570±160	20580±160	Beta-126167	charcoal	Microblade industry		AMS	[22]
50					fireplace	20140±150	20130±150	Beta-126170	charcoal	Microblade industry		AMS	[22]
51					fireplace	20790±160	20790±160	Beta-126175	charcoal	Microblade industry		AMS	[22]
52					fireplace	20600±160	20610±160	Beta-126184	charcoal	Microblade industry		AMS	[22]
53					fireplace	19850±70	19840±70	Beta-120881	charcoal	Microblade industry		AMS	[22]
54					fireplace	20370±70	20370±70	Beta-120883	charcoal	Microblade industry		AMS	[22]
55					fireplace	20700±150	20700±150	Beta-126176	charcoal	Microblade industry		AMS	[22]
56					fireplace	18840±150	18830±150	Beta-126177	charcoal	Microblade industry		AMS	[22]
57					fireplace	22340±170	22340±170	Beta-126168	charcoal	Endscraper		AMS	[22]
58					fireplace	22300±180	22300±180	Beta-126169	charcoal	Endscraper		AMS	[22]
59					fireplace	22550±180	22550±180	Beta-126171	charcoal	Endscraper		AMS	[22]

	NO	Site name	Coordinates Latitude	Longitude	Sample position	Measured C14 age	Conventional C14 age	Lab Code and No.	Material dated	Cultural affiliation	β AMS	Reference
60					Layer Ⅱ～Ⅲ	20600±120	20570±120	Beta-112914	charcoal	Endscraper	AMS	[22]
61					fireplace	22330±200	22340±200	Beta-126173	charcoal	Endscraper	AMS	[22]
62					Layer Ⅰ	20300±150	20320±150	Beta-112916	charcoal	Endscraper	AMS	[22]
63					fireplace	21790±230	21790±230	Beta-126174	charcoal	Endscraper	AMS	[22]
64					fireplace	22180±170	22200±170	Beta-126183	charcoal	Endscraper	AMS	[22]
65					fireplace	20410±70	20390±70	Beta-120880	charcoal	Endscraper	AMS	[22]
66					fireplace	21000±100	21000±100	Beta-120881	charcoal	Endscraper	AMS	[22]
67					Layer Ⅴ	33020±540	33030±540	Beta-126181	charcoal	—	AMS	[22]
68					Layer Ⅵ	28200±480	28200±480	Beta-112918	charcoal	—	AMS	[22]
69					Layer Ⅶ	32500±360	32490±360	Beta-126180	charcoal	—	AMS	[22]
70					Layer Ⅹ	37350±550	37350±550	Beta-126179	charcoal	—	AMS	[22]
71	21	Miyako	43° 3′	140° 49′	Layer	37610±350	37590±430	Beta-138112	organic sediment	?	AMS	[23]
72	22	Kawanishi C	42° 52′	143° 11′	fireplace	21800±90	21780±90	Beta-106506	charcoal	Upper Paleolithic	AMS	[24]
73					fireplace	21420±190	21400±190	Beta-107731	charcoal	Upper Paleolithic	AMS	[24]
74					Cultural layer	13070±40	13020±40	Beta-126150	charcoal	Microblade industry	AMS	[25]
75					pebble cluster	16940±50	16920±50	Beta-126151	charcoal	Microblade industry	AMS	[25]
76					Cultural layer	12920±50	12900±50	Beta-127399	charcoal	Microblade industry	AMS	[25]
77	23	Ochiai	42° 53′	143° 11′	Layer	18570±140	18590±140	Beta-111832	charcoal	Upper Paleolithic	AMS	[26]
78	24	Beppu 1	42° 51′	143° 9′	Cultural layer	13460±70	13400±70	Beta-149443	charcoal	Upper Paleolithic	AMS	[27]
79					Cultural layer	3730±40	3750±40	Beta-149444	charcoal	Upper Paleolithic	AMS	[27]
80	25	Odaiyamamoto Ⅰ	43° 3′	140° 33′	pottery	—	13210±160	NUTA-6515	charcoal	Incipient Jomon	AMS	[28]
81					pottery	—	13030±170	NUTA-6507	charcoal	Incipient Jomon	AMS	[28]
82					pottery	—	12720±160	NUTA-6509	charcoal	Incipient Jomon	AMS	[28]
83					pottery	—	12680±140	NUTA-6506	charcoal	Incipient Jomon	AMS	[28]
84					pottery	—	13780±170	NUTA-6510	charcoal	Incipient Jomon	AMS	[28]
85					Layer Ⅲ	—	13480±70	Beta-125550	charcoal	Incipient Jomon	AMS	[28]
86	26	Togeyamabokujyo ⅠA	39° 17′	140° 50′	Layer Ⅱb	30550±1190	—	Gak-18479	charcoal	Upper Paleolithic	β	[29]
87	27	Kashiwayamatate-ato	39° 10′	141° 05′	Layer Ⅱa	12150±950	—	Gak-18460	charcoal	Upper Paleolithic	β	[30]
88					Layer Ⅱa～Ⅱb	17010±1210	—	Gak-18461	charcoal	Upper Paleolithic	β	[30]
89	28	Mimitori ⅠB	39° 17′	140° 50′	Layer Ⅱ1	13650±60	13630±60	Beta-89465	charcoal	Point industry	AMS	[31]
90	29	Odaino	39° 40′	141° 05′	Cultural layer Ⅱ	18500±450	—	GaK-3780	charcoal	Upper Paleolithic	β	[32]
91	30	Kanedori	39° 10′	141° 20′	Cultural layer Ⅱ	23580±450	—	GaK-13090	charcoal	Upper Paleolithic	β	[32]
92	31	Hanaizumi	38° 40′	141° 05′	Cultural layer	24670±1310	—	GaK-14565	wood	Upper Paleolithic	β	[32]
93					Cultural layer	>35770	—	GaK-14566	charcoal	Upper Paleolithic	β	[32]
94					Cultural layer	11690±360	—	GaK-14567	wood	Upper Paleolithic	β	[32]
95					Cultural layer	24920±810	—	GaK-14568	charcoal	Upper Paleolithic	β	[32]
96					Cultural layer	13890±270	—	GaK-14569	wood	Upper Paleolithic	β	[32]
97					Cultural layer	12220±180	—	GaK-14571	wood	Upper Paleolithic	β	[32]
98					Cultural layer	12700±190	—	GaK-14572	wood	Upper Paleolithic	β	[32]
99					Cultural layer	12500±140	—	GaK-14573	wood	Upper Paleolithic	β	[32]
100					?	18470±660	—	GaK-15798	bovid tooth	Upper Paleolithic	β	[32]
101					?	21430±1260	—	GaK-15893	elephant tooth	Upper Paleolithic	β	[32]
102	32	Owatari 2	39° 18′	140° 45′	?	13830±220	—	GaK-16961	wood	Upper Paleolithic	β	[32]
103					?	18940±370	—	GaK-16962	wood	Upper Paleolithic	β	[32]
104					?	26490±910	—	GaK-16963	wood	Upper Paleolithic	β	[32]
105					Cultural layer	24740±600	—	GaK-17720	charcoal	Upper Paleolithic	β	[32]
106					Cultural layer	26000±760	—	GaK-17721	charcoal	Upper Paleolithic	β	[32]
107					Cultural layer	21500±470	—	GaK-17722	charcoal	Upper Paleolithic	β	[32]
108					Cultural layer	17740±270	—	GaK-17723	charcoal	Upper Paleolithic	β	[32]
109					Cultural layer	27740±920	—	GaK-17724	charcoal	Upper Paleolithic	β	[32]
110					Cultural layer	26150±900	—	GaK-17725	charcoal	Upper Paleolithic	β	[32]
111					Cultural layer	27780±1060	—	GaK-17726	charcoal	Upper Paleolithic	β	[32]
112					Cultural layer	22750±430	—	GaK-17727	charcoal	Upper Paleolithic	β	[32]
113					Cultural layer	27330±970	—	GaK-17728	charcoal	Upper Paleolithic	β	[32]
114					Cultural layer	24560±450	—	GaK-17729	charcoal	Upper Paleolithic	β	[32]
115					Cultural layer	22710±480	—	GaK-17730	charcoal	Upper Paleolithic	β	[32]
116					?	11510±150	—	GaK-17731	peat	Upper Paleolithic	β	[32]
117					?	23090±590	—	GaK-17732	peat	Upper Paleolithic	β	[32]
118	33	Matsukidai 3	39° 40′	140° 15′	?	22750±620	—	GaK-12702	charcoal	Upper Paleolithic	β	[32]

	NO	Site name	Coordinates Latitude	Longitude	Sample position	Measured C14 age	Conventional C14 age	Lab Code and No.	Material dated	Cultural affiliation	β	AMS	Reference
119	34	Kamonokodai	40° 05′	139° 50′	?	8420±380	—	GaK-15404	charcoal	Upper Paleolithic	β		[32]
120	35	Tomizawa	38° 13′	140° 52′	Cultural layer	21110±590	—	GaK-13766	wood	Upper Paleolithic	β		[32]
121					Cultural layer	21670±750	—	GaK-13767	wood	Upper Paleolithic	β		[32]
122					Cultural layer	23770±760	—	GaK-13768	wood	Upper Paleolithic	β		[32]
123					Cultural layer	19500±560	—	GaK-13769	wood	Upper Paleolithic	β		[32]
124					Cultural layer	23870±870	—	GaK-13770	wood	Upper Paleolithic	β		[32]
125					Cultural layer	21760±490	—	GaK-13860	wood	Upper Paleolithic	β		[32]
126					Cultural layer	19430±400	—	GaK-13861	wood	Upper Paleolithic	β		[32]
127					Cultural layer	20590+600/−560	—	NU-119	wood	Upper Paleolithic	β		[32]
128					Cultural layer	19730+440/−410	—	NU-120	wood	Upper Paleolithic	β		[32]
129					Cultural layer	19470+470/−440	—	NU-121	wood	Upper Paleolithic	β		[32]
130					Cultural layer	27300+1810/−1480	—	NU-122	charcoal	Upper Paleolithic	β		[32]
131					Cultural layer	23300+1400/−1190	—	NU-123	charcoal	Upper Paleolithic	β		[32]
132					Cultural layer	19970+930/−840	—	NU-124	charcoal	Upper Paleolithic	β		[32]
133					Cultural layer	23270+700/−640	—	NU-125	wood	Upper Paleolithic	β		[32]
134					Cultural layer	23610+730/−670	—	NU-126	wood	Upper Paleolithic	β		[32]
135					Cultural layer	23010+940/−840	—	TH-1442	wood	Upper Paleolithic	β		[32]
136					Cultural layer	20380±290	—	GaK-16925	wood	Upper Paleolithic	β		[32]
137					Cultural layer	20420±280	—	GaK-16926	wood	Upper Paleolithic	β		[32]
138					Cultural layer	18270±210	—	GaK-16927	wood	Upper Paleolithic	β		[32]
139					Cultural layer	14500±320	—	GaK-16928	wood	Upper Paleolithic	β		[32]
140					Cultural layer	22180±1330	—	GaK-16929	conifer	Upper Paleolithic	β		[32]
141					?	20530±360	—	NU-670	wood	Upper Paleolithic	β		[32]
142					?	24610±490	—	NU-671	wood	Upper Paleolithic	β		[32]
143					?	22620±425	—	NU-672	wood	Upper Paleolithic	β		[32]
144					?	20850+710/−650	—	NU-673	charcoal	Upper Paleolithic	β		[32]
145	36	Owatari	37° 40′	140° 55′	Cultural layer	>26000	—	?	charcoal	Upper Paleolithic	β		[32]
146	37	Sanganchi	37° 50′	140° 50′	?	19470±400	—	GaK-13136	wood	Upper Paleolithic	β		[32]
147	38	Araya	37° 16′	138° 52′	Cultural layer	13200±350	—	GaK-948	charcoal	Microblade industry	β		[32]
148	39	Osaka Uemachi	37° 40′	139° 10′	Cultural layer	26810±970	—	GaK-17474	charcoal	Upper Paleolithic	β		[32]
149	40	Uenotaira	37° 45′	139° 10′	peat	>38280	—	GaK-17472	wood	Upper Paleolithic	β		[32]
150					peat	36070±2250	—	GaK-17473	wood	Upper Paleolithic	β		[32]
151	41	Tategahana	37° 00′	138° 10′	Upper Nojiri-ko Member Ⅰ	—	34500±670	NUTA-1281	elephant molar tooth	Middle Paleolithic		AMS	[33]
152					Upper Nojiri-ko Member Ⅰ	—	38820±1580	NUTA-1263	elephant molar tooth	Middle Paleolithic		AMS	[33]
153					Upper Nojiri-ko Member Ⅰ	—	38310±1400	NUTA-1262	elephant molar tooth	Middle Paleolithic		AMS	[33]
154					Upper Nojiri-ko Member Ⅰ	—	42540±1420	NUTA-1317	elephant molar tooth	Middle Paleolithic		AMS	[33]
155					Upper Nojiri-ko Member Ⅰ	—	31920±700	NUTA-1299	elephant molar tooth	Middle Paleolithic		AMS	[33]
156					Upper Nojiri-ko Member Ⅰ	—	30580±1290	NUTA-1194	bone fragment of giant deer	Middle Paleolithic		AMS	[33]
157					Upper Nojiri-ko Member Ⅰ	—	33660±1850	NUTA-1190	antler fragment of giant deer	Middle Paleolithic		AMS	[33]
158					Middle Nojiri-ko Member Ⅱ	—	40700±1200	NUTA-1280	elephant molar tooth	Middle Paleolithic		AMS	[33]
159					Middle Nojiri-ko Member Ⅱ	—	41700±1260	NUTA-1294	elephant molar tooth	Middle Paleolithic		AMS	[33]
160					Middle Nojiri-ko Member Ⅱ	—	40130±1080	NUTA-1296	elephant molar tooth	Middle Paleolithic		AMS	[33]
161					Middle Nojiri-ko Member Ⅱ	—	40560±1500	NUTA-1261	antler fragment of giant deer	Middle Paleolithic		AMS	[33]
162					Middle Nojiri-ko Member Ⅰ	—	40860±1170	NUTA-1231	elephant molar tooth	Middle Paleolithic		AMS	[33]
163					Middle Nojiri-ko Member Ⅰ	—	41520±1020	NUTA-1282	elephant molar tooth	Middle Paleolithic		AMS	[33]
164					Middle Nojiri-ko Member Ⅰ	—	35570±790	NUTA-1077	elephant tusk	Middle Paleolithic		AMS	[33]
165					Middle Nojiri-ko Member Ⅰ	—	35410±1550	NUTA-1195	bone fragment of giant deer	Middle Paleolithic		AMS	[33]
166					Lower Nojiri-ko Member ⅢB3	—	45120±1350	NUTA-1267	elephant molar tooth	Middle Paleolithic		AMS	[33]
167					Lower Nojiri-ko Member ⅢB3	—	45810±1290	NUTA-1279	elephant molar tooth	Middle Paleolithic		AMS	[33]
168					Lower Nojiri-ko Member ⅢB3	—	35140±910	NUTA-1232	elephant tusk	Middle Paleolithic		AMS	[33]
169					Lower Nojiri-ko Member ⅢB3	—	37420±910	NUTA-630	elephant tusk	Middle Paleolithic		AMS	[33]
170					Lower Nojiri-ko Member ⅢB2	—	45100±1190	NUTA-1252	elephant molar tooth	Middle Paleolithic		AMS	[33]
171					Lower Nojiri-ko Member ⅢB2	—	42670±1120	NUTA-1269	elephant molar tooth	Middle Paleolithic		AMS	[33]
172					Lower Nojiri-ko Member ⅢB2	—	42250±990	NUTA-1283	elephant molar tooth	Middle Paleolithic		AMS	[33]
173					Lower Nojiri-ko Member ⅢB2	—	33540±620	NUTA-631	elephant tusk	Middle Paleolithic		AMS	[33]
174					Lower Nojiri-ko Member ⅢB1	—	48800±1950	NUTA-1278	elephant molar tooth	Middle Paleolithic		AMS	[33]
175					Lower Nojiri-ko Member ⅢB1	—	42420±1500	NUTA-1254	elephant molar tooth	Middle Paleolithic		AMS	[33]
176					Lower Nojiri-ko Member ⅢB1	—	30540±1430	NUTA-1192	elephant molar tooth	Middle Paleolithic		AMS	[33]
177					Lower Nojiri-ko Member ⅢB1	—	43350±1160	NUTA-1340	elephant molar tooth	Middle Paleolithic		AMS	[33]

	NO	Site name	Coordinates Latitude	Longitude	Sample position	Measured C14 age	Conventional C14 age	Lab Code and No.	Material dated	Cultural affiliation	β AMS	Reference
178					Lower Nojiri-ko Member ⅢB1	—	41250±1190	NUTA-1316	antler fragment of giant deer	Middle Paleolithic	AMS	[33]
179					Lower Nojiri-ko Member ⅢA2	—	43520±1340	NUTA-1295	elephant molar tooth	Middle Paleolithic	AMS	[33]
180					Lower Nojiri-ko Member ⅢA1	—	43310±1200	NUTA-1268	elephant molar tooth	Middle Paleolithic	AMS	[33]
181					Lower Nojiri-ko Member ⅢA1	—	37250±1280	NUTA-1230	elephant tusk	Middle Paleolithic	AMS	[33]
182					Lower part of Lower Nojiri-ko Member Ⅲ	—	41770±1470	NUTA-1329	elephant molar tooth	Middle Paleolithic	AMS	[33]
183					Lower part of Lower Nojiri-ko Member Ⅲ	—	43460±1630	NUTA-1330	elephant molar tooth	Middle Paleolithic	AMS	[33]
184					Lower part of Lower Nojiri-ko Member Ⅲ	—	46230±2430	NUTA-1328	elephant molar tooth	Middle Paleolithic	AMS	[33]
185					Botom of Lower Nojiri-ko Member Ⅲ	—	39180±1370	NUTA-1251	elephant molar tooth	Middle Paleolithic	AMS	[33]
186					Botom of Lower Nojiri-ko Member Ⅲ	—	43640±920	NUTA-1189	elephant molar tooth	Middle Paleolithic	AMS	[33]
187					J-line Formation	—	8260±140	NUTA-1298	wood	Middle Paleolithic	AMS	[33]
188					Upper Nojiri-ko Member Ⅲ	—	17460±340	NUTA-1391	wood	Middle Paleolithic	AMS	[33]
189					Upper Nojiri-ko Member Ⅲ	—	16860±250	NUTA-1392	wood	Middle Paleolithic	AMS	[33]
190					Upper Nojiri-ko Member Ⅱ	—	28350±350	NUTA-1305	wood	Middle Paleolithic	AMS	[33]
191					Upper Nojiri-ko Member Ⅰ	—	32750±490	NUTA-1297	wood	Middle Paleolithic	AMS	[33]
192					Upper Nojiri-ko Member Ⅰ	—	38490±520	NUTA-1240	wood	Middle Paleolithic	AMS	[33]
193					Upper Nojiri-ko Member Ⅰ	—	39290±480	NUTA-1237	wood	Middle Paleolithic	AMS	[33]
194					Middle Nojiri-ko Member Ⅰ	—	39420±950	NUTA-1239	wood	Middle Paleolithic	AMS	[33]
195					Lower Nojiri-ko Member ⅢB2	—	42550±530	NUTA-1242	wood	Middle Paleolithic	AMS	[33]
196					Lower Nojiri-ko Member ⅢA2	—	43070±570	NUTA-1241	wood	Middle Paleolithic	AMS	[33]
197					Lower part of Lower Nojiri-ko Member Ⅲ	—	47150±810	NUTA-1273	wood	Middle Paleolithic	AMS	[33]
198					Botom of Lower Nojiri-ko Member Ⅲ	—	49410±970	NUTA-1274	wood	Middle Paleolithic	AMS	[33]
199					Botom of Lower Nojiri-ko Member Ⅲ	—	51260±1150	NUTA-1276	wood	Middle Paleolithic	AMS	[33]
200	42	Shimomouchi	36° 24′	138° 38′	Chltural layer	16250±180	—	NUTA-1515	charcoal	Upper Paleolithic	AMS	[34]
201	43	Kannoki	36° 49′	138° 12′	Chltural layer	35050±90	—	GaK-4985	wood	Upper Paleolithic	β	[32]
202	44	Nakamachi	36° 50′	138° 13′	Chltural layer	32200	—	GaK-5638	wood	Upper Paleolithic	β	[32]
203					Chltural layer	31140+2790/-2060	—	GaK-5639	wood	Upper Paleolithic	β	[32]
204					Chltural layer	22860±840	—	GaK-5640	wood	Upper Paleolithic	β	[32]
205					Chltural layer	22140±760	—	GaK-5641	peat	Upper Paleolithic	β	[32]
206	45	Sugikubo	36° 30′	138° 10′	Chltural layer	17700±500	—	GaK-812	peat	Upper Paleolithic	β	[32]
207					Chltural layer	15100±300	—	GaK-813	wood	Upper Paleolithic	β	[32]
208					Chltural layer	32540	—	GaK-6920	wood	Upper Paleolithic	β	[32]
209					Chltural layer	13660±310	—	GaK-6921	wood	Upper Paleolithic	β	[32]
210					Chltural layer	18640±530	—	GaK-6922	wood	Upper Paleolithic	β	[32]
211					Chltural layer	16760±490	—	GaK-6923	wood	Upper Paleolithic	β	[32]
212	46	Happusan Ⅱ	36° 16′	138° 36′	Cultural layer	34840±250	31860±250	Beta-86229	charcoal	Backed blade industry	AMS	[35]
213					Cultural layer	32220±260	32240±260	Beta-86230	charcoal	Backed blade industry	AMS	[35]
214					Cultural layer	31380±230	31360±230	Beta-86231	charcoal	Backed blade industry	AMS	[35]
215					Cultural layer	32200±260	32190±260	Beta-86232	charcoal	Backed blade industry	AMS	[35]
216					Cultural layer	32180±260	32180±260	Beta-86233	charcoal	Backed blade industry	AMS	[35]
217	47	Happusan Ⅳ	36° 16′	138° 36′	Cultural layer	12230±240	—	JAS212	charcoal	Point industry	β	[35]
218					Cultural layer	11020±290	—	JAS203	charcoal	Point industry	β	[35]
219	48	Kosakayama	36° 16′	138° 36′	Cultural layer	31650±190	31860±250	Beta-109376	charcoal	Backed blade industry	AMS	[36]
220					Cultural layer	30950±170	30950±170	Beta-109377	charcoal	Backed blade industry	AMS	[36]
221					Cultural layer	30570±160	30510±160	Beta-109378	charcoal	Backed blade industry	AMS	[36]
222					Cultural layer	31630±180	31630±180	Beta-109379	charcoal	Backed blade industry	AMS	[36]
223	49	Hinatabayashi B	36° 48′	138° 14′	Cultural layer	—	29870±250	Beta-120858	charcoal	Backed blade industry	AMS	[37]
224					Cultural layer	—	31420±280	Beta-120859	charcoal	Backed blade industry	AMS	[37]
225					Cultural layer	—	2500±50	Beta-120860	charcoal	Backed blade industry	AMS	[37]
226					Cultural layer	—	19600±100	Beta-120861	charcoal	Backed blade industry	AMS	[37]
227					Cultural layer	—	27950±210	Beta-120862	charcoal	Backed blade industry	AMS	[37]
228					Cultural layer	—	28230±210	Beta-120863	charcoal	Backed blade industry	AMS	[37]
229					Cultural layer	—	29820±250	Beta-120864	charcoal	Backed blade industry	AMS	[37]
230					Cultural layer	—	28400±210	Beta-120865	charcoal	Backed blade industry	AMS	[37]
231					Cultural layer	—	29640±240	Beta-120866	charcoal	Backed blade industry	AMS	[37]
232					Cultural layer	—	27940±210	Beta-120867	charcoal	Backed blade industry	AMS	[37]
233					Cultural layer	—	28540±220	Beta-120868	charcoal	Backed blade industry	AMS	[37]
234					Cultural layer	—	27940±200	Beta-120869	charcoal	Backed blade industry	AMS	[37]
235	50	Higashiura	36° 48′	138° 12′	Layer 15	29330±1060	—	GaK-17715	wood	Backed blade industry	β	[38]
236					Layer 4	17290±330	—	GaK-17716	wood	Backed blade industry	β	[38]

	NO	Site name	Coordinates Latitude	Longitude	Sample position	Measured C14 age	Conventional C14 age	Lab Code and No.	Material dated	Cultural affiliation	β	AMS	Reference
237					Layer 6	18130±330	—	GaK-17717	wood	Backed blade industry	β		[38]
238					Layer 4	17430±240	—	GaK-17718	soil	Backed blade industry	β		[38]
239					Layer 4	21830±480	—	GaK-17719	soil	Backed blade industry	β		[38]
240	51	Kannoki	36° 49′	138° 11′	Layer Ⅴc	33050±530	33040±530	Beta-82577	charcoal	Upper Paleolithic		AMS	[39]
241					Layer Ⅴa	5450±50	5430±50	Beta-82578	charcoal	Upper Paleolithic		AMS	[39]
242					Layer Ⅴa	3060±60	3040±60	Beta-82579	charcoal	Upper Paleolithic		AMS	[39]
243					Layer Ⅴb	33090±540	33070±540	Beta-82580	charcoal	Upper Paleolithic		AMS	[39]
244					Layer Ⅳ	—	32260±590	Beta-109414	charcoal	Upper Paleolithic		AMS	[39]
245					Layer Ⅴa	—	32110±610	Beta-109415	charcoal	Upper Paleolithic		AMS	[39]
246					Layer Ⅴa	—	8020±80	Beta-109416	charcoal	Upper Paleolithic		AMS	[39]
247					Layer Ⅴb	—	30510±510	Beta-109417	charcoal	Upper Paleolithic		AMS	[39]
248					Layer Ⅴb	—	160±50	Beta-109418	charcoal	Upper Paleolithic		AMS	[39]
249					Layer Ⅴc	—	32410±340	Beta-109419	charcoal	Upper Paleolithic		AMS	[39]
250	52	Seko-sanso B	36° 49′	138° 11′	pottery	—	12340±50	Beta-133847	charcoal	Incipient Jomon		AMS	[40]
251					pottery	—	12000±40	Beta-133848	charcoal	Incipient Jomon		AMS	[40]
252					pottery	—	12160±40	Beta-133849	charcoal	Incipient Jomon		AMS	[40]
253	53	Yokohari-maekubo	35° 50′	138° 22′	Cultural layer	39900±1300	39930±1300	Beta-124569	charcoal	Backed blade industry		AMS	[41]
254					Cultural layer	29720±190	29720±190	Beta-132116	charcoal	Backed blade industry		AMS	[41]
255					Cultural layer	41140±800	41140±800	Beta-132117	charcoal	Backed blade industry		AMS	[41]
256					Cultural layer	27800±290	27810±290	Beta-136079	charcoal	Backed blade industry		AMS	[41]
257	54	Kogure-higashiarayama	36° 27′	139° 6′	pit	17930±60	17950±60	Beta-121133	charcoal	Point industry		AMS	[42]
258	55	Goshinden	36° 45′	139° 55′	Cultural layer	17800±190	—	GaK-13013	loam	Upper Paleolithic	β		[32]
259	56	Fujioka Kitayama B	36° 20′	138° 50′	Cultural layer	—	20420±330	NUTA-2528	charcoal	Upper Paleolithic		AMS	[32]
260					Cultural layer	—	19880±330	NUTA-2482	charcoal	Upper Paleolithic		AMS	[32]
261					Cultural layer	—	19260±490	NUTA-2526	charcoal	Upper Paleolithic		AMS	[32]
262					Cultural layer	—	19940±340	NUTA-2483	charcoal	Upper Paleolithic		AMS	[32]
263					Cultural layer	—	19450±290	NUTA-2527	charcoal	Upper Paleolithic		AMS	[32]
264	57	Tanashi Minamicho	35° 45′	139° 32′	Cultural layer	10060±340	—	GaK-14430	charcoal	Upper Paleolithic	β		[43]
265	58	Nishinodai B	35° 42′	139° 31′	Cultural layer	24740±1330	—	I-8794	charcoal	Upper Paleolithic	β		[44]
266	59	Suzuki	35° 43′	139° 30′	Cultural layer Ⅴ	21200±355	—	N-2997	humic acid	Upper Paleolithic	β		[45]
267					Cultural layer Ⅸ	25500±500	—	N-2998	humic acid	Upper Paleolithic	β		[45]
268					Cultural layer Ⅹ	17900±270	—	N-3090	humic acid	Upper Paleolithic	β		[45]
269					Cultural layer Ⅴ	17300±185	—	N-2999	humic acid	Upper Paleolithic	β		[45]
270					Cultural layer Ⅹ	18000±240	—	N-3006	humic acid	Upper Paleolithic	β		[45]
271	60	Tokyo Tenmondai Konai	35° 41′	139° 31′	Cultural layer Ⅵ	23500±300	?	TK-468	charcoal	Upper Paleolithic	β		[46]
272					Cultural layer Ⅵ	23900±300	?	TK-469	charcoal	Upper Paleolithic	β		[46]
273					Cultural layer Ⅹ	28300±600	?	TK-471	charcoal	Upper Paleolithic	β		[46]
274	61	Takaido Higashi	35° 41′	139° 37′	Cultural layer Ⅸ	21160±820	—	GaK-6435a	humus	Upper Paleolithic	β		[47]
275					Cultural layer Ⅸ	22340±1310	—	GaK-6435b	humic acid	Upper Paleolithic	β		[47]
276					Cultural layer Ⅸ	32150±2549	—	GaK-6435	humic acid	Upper Paleolithic	β		[47]
277					Cultural layer Ⅹ	23210±1680	—	GaK-6437	charcoal	Upper Paleolithic	β		[47]
278					Cultural layer Ⅹ	29000±925	—	N-2651	charcoal	Upper Paleolithic	β		[47]
279					Cultural layer Ⅹ	25000+2050/−1650	—	N-2652	humic acid	Upper Paleolithic	β		[47]
280	62	Hikageyama	35° 41′	139° 28′	Layer Ⅳa	16680±120	16660±120	Beta-119975	charred material	Backed blade industry		AMS	[48]
281	63	Hashimoto	35° 20′	139° 20′	Cultural layer	13500±290	—	N-4680	loam	Upper Paleolithic	β		[32]
282					Cultural layer	13200±365	—	N-4681	loam	Upper Paleolithic	β		[32]
283					Cultural layer	15100±890	—	N-4682	loam	Upper Paleolithic	β		[32]
284					Cultural layer	23600+1580/−1320	—	N-4683	loam	Upper Paleolithic	β		[32]
285					Cultural layer	25200+1200/−1050	—	N-4684	loam	Upper Paleolithic	β		[32]
286					Cultural layer	24900+1550/−1310	—	N-4685	loam	Upper Paleolithic	β		[32]
287	64	Daikanyama	35° 25′	139° 30′	Cultural layer Ⅵ	26840±1200	—	GaK-12429	soil	Upper Paleolithic	β		[32]
288					Cultural layer Ⅸ	18750±420	—	GaK-12430	soil	Upper Paleolithic	β		[32]
289	65	Kamisoyagi	35° 27′	139° 25′	Cultural layer	19410±530	—	GaK-10134	charcoal	Upper Paleolithic	β		[32]
290					Cultural layer	18820±720	—	GaK-10136	charcoal	Upper Paleolithic	β		[32]
291					Cultural layer	14400±590	—	GaK-10137	charcoal	Upper Paleolithic	β		[32]
292	66	Tsukimino Kamino	35° 30′	139° 30′	Cultural layer Ⅳ	16370±680	—	GaK-10532	charcoal	Upper Paleolithic	β		[32]
293					Cultural layer Ⅳ	15060±1530	—	GaK-10537	charcoal	Upper Paleolithic	β		[32]
294					Cultural layer Ⅳ	14480±650	—	GaK-10533	charcoal	Upper Paleolithic	β		[32]
295					Cultural layer Ⅳ	15510±490	—	GaK-10534	charcoal	Upper Paleolithic	β		[32]

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296					Cultural layer Ⅳ	16380±730	—	GaK-10535	charcoal	Upper Paleolithic	β		[32]
297					Cultural layer Ⅳ	16470±470	—	GaK-10536	charcoal	Upper Paleolithic	β		[32]
298					stone heap	15840±640	—	GaK-10440	charcoal	Upper Paleolithic	β		[32]
299					stone heap	15510±1060	—	GaK-10541	charcoal	Upper Paleolithic	β		[32]
300					stone heap	19710±680	—	GaK-10546	charcoal	Upper Paleolithic	β		[32]
301					Cultural layer	24140±1750	—	GaK-10544	charcoal	Upper Paleolithic	β		[32]
302	67	Shimotsuruma Nagahori	35° 27′	139° 25′	Cultural layer	17570±440	—	GaK-8957	charcoal	Upper Paleolithic	β		[32]
303					Cultural layer	18040±510	—	GaK-8595	charcoal	Upper Paleolithic	β		[32]
304					Cultural layer	18040±520	—	GaK-8594	charcoal	Upper Paleolithic	β		[32]
305					Cultural layer	14530±350	—	GaK-8598	charcoal	Upper Paleolithic	β		[32]
306					Cultural layer	14900±1300	—	GaK-8593	charcoal	Upper Paleolithic	β		[32]
307					Cultural layer	15860±340	—	GaK-8596	charcoal	Upper Paleolithic	β		[32]
308					Cultural layer	14230±430	—	GaK-8599	charcoal	Upper Paleolithic	β		[32]
309					Cultural layer	17670±460	—	GaK-8600	charcoal	Upper Paleolithic	β		[32]
310	68	Miyagase Sazaranke	35° 30′	139° 15′	fire place	17460±330	—	GaK-18281	charcoal	Upper Paleolithic	β		[32]
311					Cultural layer Ⅲ	15470±290	—	GaK-18282	charcoal	Upper Paleolithic	β		[32]
312					stone heap	18780±370	—	GaK-18283	charcoal	Upper Paleolithic	β		[32]
313	69	Hayakawa Tenjinmori	35° 26′	139° 25′	Cultural layer	22150±1600	—	GaK-10370	charcoal	Upper Paleolithic	β		[32]
314					Cultural layer	20460±450	—	GaK-10371	charcoal	Upper Paleolithic	β		[32]
315	70	Miyakubo	35° 25′	139° 25′	Cultural layer	21520±550	—	GaK-17605	peat	Upper Paleolithic	β		[32]
316	71	Toriimae	35° 24′	139° 25′	Layer B1	—	19440±220	NUTA-5102	charcoal	Backed blade industry		AMS	[49]
317					Layer B1	—	19540±170	NUTA-5103	charcoal	Backed blade industry		AMS	[49]
318					Layer B1	—	19390±170	NUTA-5104	charcoal	Backed blade industry		AMS	[49]
319					Layer B1	18730±170	—	NUTA-5109	charcoal	Backed blade industry		AMS	[49]
320					Layer B1	—	18360±170	NUTA-5110	charcoal	Backed blade industry		AMS	[49]
321					Layer B1	—	19350±170	NUTA-5127	charcoal	Backed blade industry		AMS	[49]
322	72	Tanamukaihara	35° 30′	139° 22′	dwelling pit №2	—	17650±60	Beta-127792	charcoal	Point industry		AMS	[50]
323					dwelling pit №4	—	17630±50	Beta-127793	charcoal	Point industry		AMS	[50]
324	73	Miyagase Kitahara	35° 30′	139° 14′	Cultural layer Ⅰ	13070±80	13060±80	Beta-105398	charcoal	Incipient Jomon		AMS	[51]
325					Cultural layer Ⅰ	9660±0	9480±80	Beta-105399	charcoal	Incipient Jomon		AMS	[51]
326					Cultural layer Ⅰ	13020±80	13050±80	Beta-105400	charcoal	Incipient Jomon		AMS	[51]
327					Cultural layer Ⅰ	13170±100	13060±100	Beta-105401	charcoal	Incipient Jomon		AMS	[51]
328					Cultural layer Ⅰ	13030±80	13020±80	Beta-105402	charcoal	Incipient Jomon		AMS	[51]
329					Cultural layer Ⅰ	13060±80	13050±80	Beta-105403	charcoal	Incipient Jomon		AMS	[51]
330	74	Miyagase Nakappara	35° 31′	139° 13′	fireplace	18950±100	18920±100	Beta-97116	charcoal	Backed blade industry		AMS	[52]
331	75	Miyagase Ueppara	35° 31′	139° 13′	fireplace	19270±100	19240±100	Beta-97117	charcoal	Backed blade industry		AMS	[52]
332					pebble cluster	19500±100	19470±100	Beta-97118	charcoal	Backed blade industry		AMS	[52]
333	76	Heiwazaka	35° 29′	139° 23′	Layer	14630±70	14610±70	Beta-134486	charcoal	Upper Paleolithic		AMS	[53]
334	77	Fukudaheininoku	35° 26′	139° 27′	CL Ⅱ pebble cluster	—	19440±430	Tka-11591	charcoal	Backed blade industry		AMS	[54]
335					CL Ⅱ pebble cluster	—	18970±440	Tka-11598	charcoal	Backed blade industry		AMS	[54]
336					CL Ⅱ pebble cluster	—	19240±700	Tka-11601	charcoal	Backed blade industry		AMS	[54]
337					CL Ⅱ pebble cluster	—	18770±330	Tka-11602	charcoal	Backed blade industry		AMS	[54]
338					Cultural layer Ⅱ	—	19220±330	Tka-11603	charcoal	Backed blade industry		AMS	[54]
339					Cultural layer Ⅱ	—	19460±350	Tka-11605	charcoal	Backed blade industry		AMS	[54]
340					Cultural layer Ⅰ	—	18100±210	Tka-11607	charcoal	Backed blade industry		AMS	[54]
341					Cultural layer Ⅰ	—	17880±220	Tka-11666	charcoal	Backed blade industry		AMS	[54]
342					Cultural layer Ⅰ	—	18960±480	Tka-11525	charcoal	Backed blade industry		AMS	[54]
343					Cultural layer Ⅰ	—	19410±250	Tka-11594	charcoal	Backed blade industry		AMS	[54]
344					Cultural layer Ⅰ	—	19480±490	Tka-11608	charcoal	Backed blade industry		AMS	[54]
345					Cultural layer Ⅰ	—	18380±470	Tka-11609	charcoal	Backed blade industry		AMS	[54]
346					Cultural layer Ⅰ	—	18820±290	Tka-11597	charcoal	Backed blade industry		AMS	[54]
347					CL Ⅱ pebble cluster	—	19300±270	Tka-11611	charcoal	Backed blade industry		AMS	[54]
348					CL Ⅱ pebble cluster	—	19660±440	Tka-11537	charcoal	Backed blade industry		AMS	[54]
349					CL Ⅰ pebble cluster	—	17920±320	Tka-11612	charcoal	Backed blade industry		AMS	[54]
350					Layer L2	—	19340±350	Tka-11548	charcoal	Upper Paleolithic		AMS	[54]
351					Layer L2	—	18900±270	Tka-11595	charcoal	Upper Paleolithic		AMS	[54]
352	78	Teradani	34° 25′	137° 40′	Cultural layer Ⅲ	9540±190		GaK-?	soil	Upper Paleolithic	β		[32]
353					Cultural layer Ⅳ	18090±550		GaK-?	soil	Upper Paleolithic	β		[32]
354					?	16300±1000	—	KSU-334	ash	Upper Paleolithic	β		[32]

	NO	Site name	Coordinates Latitude	Longitude	Sample position	Measured C14 age	Conventional C14 age	Lab Code and No.	Material dated	Cultural affiliation	β AMS	Reference
355	79	Hironokita	34° 25′	137° 40′	stone heap	22300+800/−700	—	KSU-671	charcoal	Upper Paleolithic	β	[32]
356					stone heap	22100+800/−700	—	KSU-672	charcoal	Upper Paleolithic	β	[32]
357					stone heap	25300+3500/−2000	—	KSU-673	charcoal	Upper Paleolithic	β	[32]
358	80	Shimizuyanagi Kita	35° 10′	138° 50′	Cultural layer	22980±2540	—	GaK-13712	?	Upper Paleolithic	β	[32]
359					Cultural layer	27860±1710	—	GaK-13713	?	Upper Paleolithic	β	[32]
360					Cultural layer	28300±930	—	GaK-13714	?	Upper Paleolithic	β	[32]
361	81	Yamadahara 2	34° 50′	137° 40′	Cultural layer	9190±175	—	N-4844	charcoal	Upper Paleolithic	β	[32]
362					Cultural layer	8070±280	—	N-4845	charcoal	Upper Paleolithic	β	[32]
363					stone heap	9520±350	—	N-4846	charcoal	Upper Paleolithic	β	[32]
364					Cultural layer	10000±325	—	N-4847	soil	Upper Paleolithic	β	[32]
365	82	hatunegahara	35° 07′	135° 58′	pit	29720±210	29750±210	Beta-104086	charcoal	Upper Paleolithic	AMS	[55]
366					Cultural layer	18600±295	—	N-5447	soil	Backed blade industry	β	[55]
367					Cultural layer	23400±405	—	N-5448	soil	Upper Paleolithic	β	[55]
368					Cultural layer	20200±355	—	N-5449	soil	Upper Paleolithic	β	[55]
369					Cultural layer	21700±400	—	N-5450	soil	Upper Paleolithic	β	[55]
370					pit	22500±415	—	N-5451	soil	Upper Paleolithic	β	[55]
371					pit	24100±435	—	N-5452	soil	Upper Paleolithic	β	[55]
372	83	Takamigaoka Ⅲ	34° 44′	137° 50′	pebble cluster	12900±60	12850±60	Beta-92768	charcoal	Backed blade industry	AMS	[56]
373					Layer	12870±60	21810±60	Beta-92769	charcoal	Backed blade industry	AMS	[56]
374					Cultural layer	12950±70	12940±70	Beta-106411	charcoal	Backed blade industry	β	[56]
375					Cultural layer	18520±70	18480±70	Beta-92767	charcoal	Backed blade industry	AMS	[56]
376					pit	13160±100	13120±100	Beta-106416	charcoal	Backed blade industry	AMS	[56]
377					Cultural layer	22680±520	22660±510	Beta-106414	charcoal	Backed blade industry	β	[56]
378					pebble cluster	22090±470	22090±470	Beta-106413	charcoal	Backed blade industry	β	[56]
379					Cultural layer	25460±670	25430±670	Beta-106415	charcoal	Backed blade industry	β	[56]
380					Cultural layer	12570±1180	12560±180	Beta-106412	charcoal	Backed blade industry	β	[56]
381	84	Takamigaoka Ⅳ	34° 44′	137° 50′	Cultural layer	13060±60	13020±60	Beta-93765	charcoal	Backed blade industry	AMS	[56]
382					Cultural layer	17020±60	17000±60	Beta-92766	charcoal	Backed blade industry	AMS	[56]
383					pit	39460±460	39460±460	Beta-92767	charcoal	Backed blade industry	AMS	[56]
384	85	Kannonbora	35° 10′	139° 00′	fire place	23700±680	—	N-5605	?	Upper Paleolithic	β	[32]
385					fire place	24400±570	—	N-5605	?	Upper Paleolithic	β	[32]
386	86	Kagebora	35° 10′	139° 00′	Cultural layer	17100±470	—	N-5443	?	Upper Paleolithic	β	[32]
387					Cultural layer	14200±190	—	N-5444	?	Upper Paleolithic	β	[32]
388	87	Nishibora B	35° 09′	138° 51′	Cultural layer BBⅥO	30200±360	30200±360	Beta-122043	charcoal	Upper Paleolithic	AMS	[57]
389					Cultural layer BBⅥO	29700±210	29690±210	Beta-122044	charcoal	Upper Paleolithic	AMS	[57]
390					Cultural layer BBⅥO	30400±230	30390±230	Beta-122045	charcoal	Upper Paleolithic	AMS	[57]
391	88	Itaiteragatani	35° 10′	135° 00′	Cultural layer	25100±360	—	KSU-1139	soil	Upper Paleolithic	β	[32]
392					Cultural layer	26000±350	—	KSU-1140	soil	Upper Paleolithic	β	[32]
393					Cultural layer	25000±1100	—	KSU-1141	soil	Upper Paleolithic	β	[32]
394					Cultural layer	24700±250	—	KSU-1142	soil	Upper Paleolithic	β	[32]
395	89	Nanokaichi	35° 10′	135° 10′	Cultural layer	23970+460/−440	—	GS-213	soil	Upper Paleolithic	β	[32]
396	90	Hase	35° 30′	133° 45′	Cultural layer	23340±650	—	GaK-17163	charcoal	Upper Paleolithic	β	[32]
397					Cultural layer	23610±1320	—	GaK-17164	charcoal	Upper Paleolithic	β	[32]
398	91	Yokotani	35° 30′	133° 45′	pyroclastic flow	20420±420	—	GaK-19091	?	Upper Paleolithic	β	[32]
399					Cultural layer	9150±310	—	GaK-19100	?	Upper Paleolithic	β	[32]
400	92	Todani	35° 17′	133° 12′	Cultural layer	23400±500	—	KSU-612	?	Upper Paleolithic	β	[32]
401	93	Fukui Cave	33° 10′	129° 40′	Cultural layer Ⅳ	13600±600	—	GaK-949	charcoal	Upper Paleolithic	β	[32]
402					Cultural layer ⅩⅤ	>31900	—	GaK-949	charcoal	Upper Paleolithic	β	[32]
403	94	Hyakkadai Higashi	32° 50′	130° 05′	Cultural layer Ⅲ	10200±60	—	KSU-1603	soil	Upper Paleolithic	β	[32]
404					Cultural layer Ⅶ	24400±230	—	KSU-1604	soil	Upper Paleolithic	β	[32]
405	95	Chaen	32° 44′	128° 46′	Layer Ⅴ	15470±190	15450±190	Beta-107730	charcoal	Microblade industry	AMS	[58]
406	96	Yanoharu	32° 35′	131° 30′	Cultural layer Ⅷ	24290±680	—	GaK-?	soil	Upper Paleolithic	β	[32]
407					Cultural layer Ⅸ	21850±530	—	GaK-?	soil	Upper Paleolithic	β	[32]
408	97	Kurata	32° 35′	131° 30′	Cultural layer Ⅶ	15190±220	—	GaK-?	soil	Upper Paleolithic	β	[32]
409	98	Mimikiri	33° 7′	131° 5′	Layer	9500±60	9600±60	Beta-116660	soil	Point industry	β	[59]
410					Layer	23200±220	23290±230	Beta-116661	soil	Backed blade industry	β	[59]
411	99	Ishinomoto Ⅱ	32° 50′	130° 48′	Layer Ⅳb	32750±1060	32740±1060	Beta-84289	charcoal	Backed blade industry	β	[60]
412					Layer Ⅳb	33710±430	33720±430	Beta-84290	charcoal	Backed blade industry	β	[60]
413					Layer Ⅳb	33180±560	33140±550	Beta-84291	charcoal	Backed blade industry	β	[60]

	NO	Site name	Coordinates Latitude	Longitude	Sample position	Measured C14 age	Conventional C14 age	Lab Code and No.	Material dated	Cultural affiliation	β AMS	Reference
414					Layer IVb	31600±270	31460±270	Beta-84292	charcoal	Backed blade industry	β	[60]
415	100	Shimonjo	33° 9′	131° 4′	?	13700±200	—	N-3718	?	?	β	[61]
416	101	Yokomine C	30° 26′	130° 52′	Cultural layer I	>30260	—	GaK-16775	charcoal	Upper Paleolithic	β	[62]
417					pebble cluster	>31080	—	GaK-16776	charcoal	Upper Paleolithic	β	[62]
418					pebble cluster	>28110	—	GaK-16777	charcoal	Upper Paleolithic	β	[62]
419					Cultural layer I	31290±690	31280±690	Beta-102399	charcoal	Upper Paleolithic	AMS	[62]
420					Cultural layer I	29660±540	29670±540	Beta-102400	charcoal	Upper Paleolithic	AMS	[62]
421					Cultural layer II	30480±590	30490±590	Beta-102401	charcoal	Upper Paleolithic	AMS	[62]
422					Cultural layer II	29300±520	29300±520	Beta-102402	charcoal	Upper Paleolithic	AMS	[63]
423	102	Tachikiri	30° 26′	130° 52′	Cultural layer	30500±210	30480±210	Beta-114267	charcoal	Upper Paleolithic	AMS	[64]
424	103	Ushiromuta	32° 12′	131° 30′	Layer 8 Middle	28920±150	28900±150	Beta-131409	charcoal	Upper Paleolithic	AMS	[65]
425					Layer 7b Lower	29540±160	29520±160	Beta-142857	charcoal	Upper Paleolithic	AMS	[65]
426					Layer8	29440±150	29470±150	Beta-142856	charcoal	Upper Paleolithic	AMS	[65]
427					Layer 10a	22660±80	22640±80	Beta-142855	charcoal	Upper Paleolithic	AMS	[65]
428					Layer 10 Upper	30310±200	30290±200	Beta-142854	charcoal	Upper Paleolithic	AMS	[65]
429	104	Chochi	31° 18′	130° 33′	Layer 17	24550±130	24690±130	Beta-105068	soil	Upper Paleolithic	AMS	[66]