4 THE JAPANESE MICROBLADE INDUSTRIES: TECHNOLOGY, RAW MATERIAL PROCUREMENT, AND ADAPTATIONS

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INTRODUCTION

Microblade Industries in the Japanese Archipelago

A microblade industry was first found in the Japanese Archipelago in 1953 at the Yadegawa site in Nagano Prefecture. There are a total of 1792 microblade sites in Japan as of 2003, 50 years after the first discovery (Tsutsumi 2003a, 2003b; Figure 4.1). These sites are distributed all over the Japanese Archipelago, except for the Ryukyu Islands, from the Toyobetsu A site at the northern end of the Soya Hills in Hokkaido in the far north to the Zenigame site on the isolated small island of Tanegashima just south of Kyushu and north of the Ryukyu Islands. Looking at the regional composition, there are 251 sites on Hokkaido, 815 sites on Honshu and Shikoku, and 726 sites on Kyushu.

Microblade sites are clustered in several regions of the archipelago, especially in eastern Hokkaido, central Honshu, and northern and southern Kyushu (Figure 4.1). At the Microblade Industry stage, these four regions appear to have been densely populated, forming a number of socio-economic territories. On the other hand, only a few small-scale sites are found in the Hokuriku, San'in, Kinki, Pacific coast of Tohoku, and Shikoku regions, which seems to indicate that they were sparsely populated. These regions could not have been the main living territories, because they lacked convenient sources of good quality lithic and other usable resources.

The 1792 microlithic sites in Japan have yielded 83,137 microblades and 8225 microcores. The total number of microblades is known for 357 sites. Of these sites, 172 (48%) yielded less than 10 microblades, 282 sites (79%) have less than 100 microblades, at 309 sites (87%) less than 200 microblades were found, and at the remaining 48 sites (13%) there are 200 or more microblades. Sites with less than 100 microblades are generally interpreted as small camp sites or transit sites, since they have scarcely any remains of habitation, but the 20% of sites with 100 or more microblades may have had a different function, such as base camps or cashes.

Of the 1792 microlithic sites, 622 have definite descriptions of the number of microcores found. At 537 sites (86%) less than 10 microcores were found, while only 55 sites (9%) yielded 10 or more microcores, at 13 sites (2.1%) 30 or more, at 10 sites (1.6%) 50 or more, and at seven sites (1.1%) 100 or more microcores were discovered. Thus, fewer than ten microcores were found at most of the sites.

The average Japanese microblade measures 2.80 cm in length, 0.55 cm in width, and 0.16 cm in thickness. There are two types of microblades: the "narrow type" , which is longer and narrower than the average, and the "wide type" , which is shorter and wider (Orikasa 1983). While the wide type microblades were mainly detached using the Yadegawa method, producing Nodake and Yasumiba type microcores, the Yubetsu and other methods resulted in narrow type microblades. Based on the results of archaeological experiments, it was determined that pressure flaking was used to manufacture Yubetsu method microblades at the Shirataki-Hattoridai site on Hokkaido (Onuma 1993). It may be presumed that microblade technology was developed on the basis of the pres-

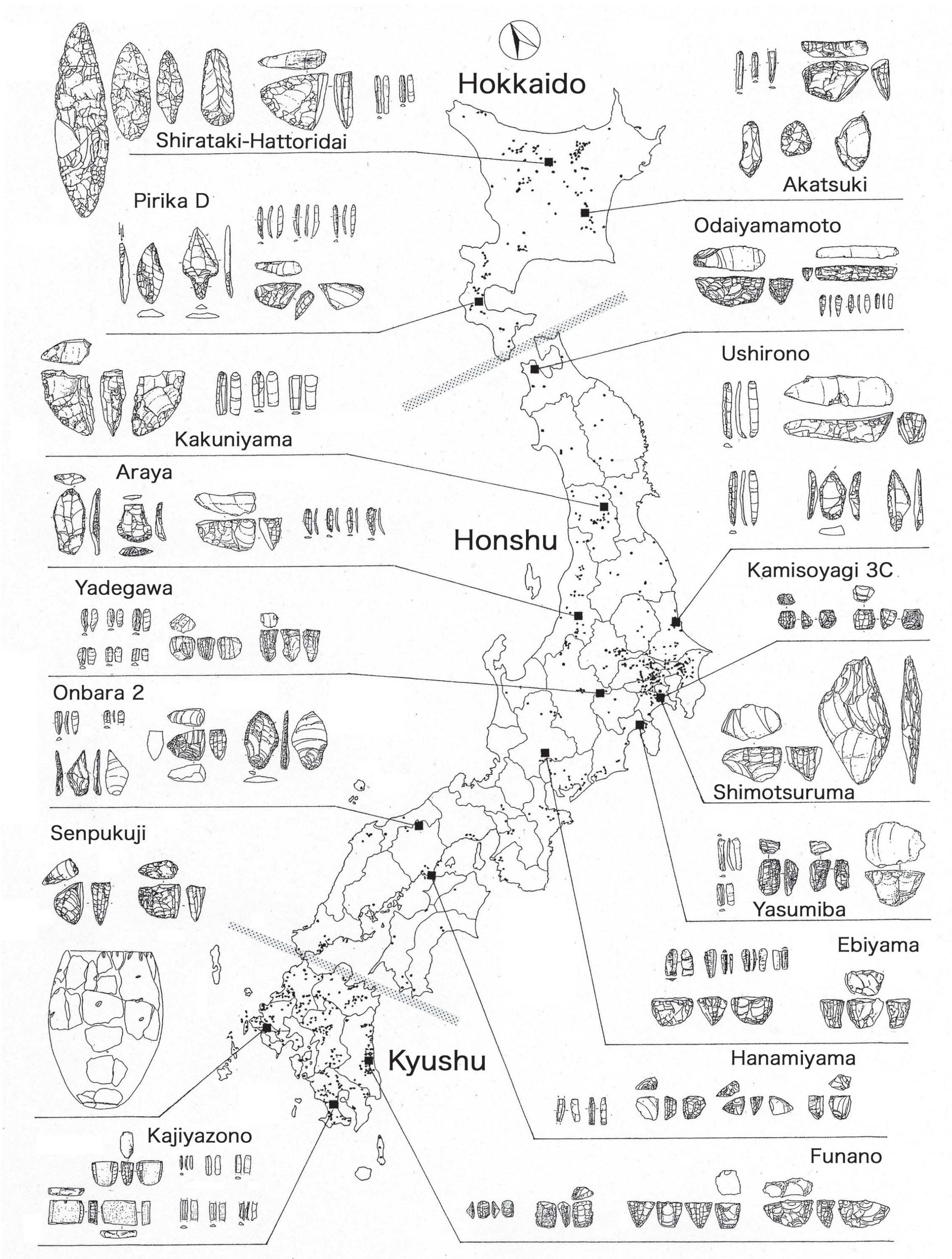


Figure 4.1: Distribution of Japanese microblade industry sites in 2003. (The grey lines are boundaries between the main microblade industry regions.)

sure flaking technique. In most cases, both ends of a microblade were removed, probably because they prevented smooth hafting. In the Japanese Archipelago, however, no examples of slotted organic tools with inserted microblades have been found to date. The unique example of Palaeolithic adhesive in Japan is a paste of animal origin, presumably hide glue, attached to microblades from the Kashiyamadate site of Iwate Prefecture in northeastern Japan (Kikuchi 1996). Ethnological evidence shows that the Ainu people in Hokkaido used hide glue, *kaputama*, made from the well-chewed skin of small size salmon.

Duration of Microblade Industries

The Yubetsu, non-Yubetsu, and Yadegawa methods belong to the early stage of microblade industries in the Japanese Archipelago. The duration of microblade industries differs among the various regions. On Honshu, uncalibrated radiocarbon dates have been obtained from several microblade sites: 14,300 ± 700 BP (Gak–604) for the Yasumiba site in Shizuoka Prefecture, 14,250 ± 105 BP (GrA–5713) for the Araya site in Niigata Prefecture, and 13,570 ± 410 BP (Gak–10545) for the Tsukimino Kamino site in Kanagawa Prefecture. In addition, the Ryusenmon (linear relief decoration) pottery, which emerged immediately after the Microblade Industry period, is radiocarbon dated to 12,000 ± 40 BP (Beta–133848) at the Seikosanso B site in Nagano Prefecture. Therefore, the duration of microblade industries on Honshu is estimated to have been approximately 3000 years, from c. 15,000 BP to c. 12,000 BP.

The oldest radiocarbon date was obtained from Hokkaido, which is adjacent to Sakhalin Island. The microblade industry of the Kashiwadai 1 site in Chitose City was AMS radiocarbon dated from 19,840 ± 70 BP (Beta–120881) to 20,790 ± 160 BP (Beta–126175). This means that the Hokkaido microblade industry emerged at approximately 20,000 BP, earlier than on Honshu by several thousand years. Since the end of the microblade industry in Hokkaido is estimated to be approximately 11,000–12,000 BP, its duration was about 10,000 years, from c. 20,000 BP to c. 11,000 BP, several times longer than on Honshu. It can be said that the late Upper Palaeolithic of Hokkaido is almost synonymous with the microblade culture. On Kyushu Island, which is adjacent to the Korean Peninsula, few radiocarbon dates have been obtained. However, since tephrochronology shows that microblade industries had appeared by c. 16,000–15,000 BP at the latest and persisted until the Incipient Jomon period, dated to c. 13,000–10,000 BP, it is certain that the microblade industries of Kyushu outlasted those of Honshu (Ono *et al.* 2002; Figure 4.2).

While the radiocarbon dates given above are all uncalibrated, the date obtained for the Araya site, c. 14,100 BP, is calibrated to 16,000–17,000 cal BP according to Serizawa and Sudo (2003). This result is only provisional, however, since the calibration curve based on dendrochronology reaches only 11,980 cal BP, even though the calibration curve of INTCAL98 (Stuiver *et al.* 1998) itself reaches 24,000 cal BP. Based on this provisional calibration curve, it is estimated that the microblade industry appeared approximately 25,000 years ago on Hokkaido, and lasted from c. 20,000–15,000 years ago on Honshu (Kudo 2003).

Taking an overview of the Japanese Archipelago, the microblade period on Hokkaido and Kyushu started earlier and lasted longer than on Honshu. While it persisted for almost 10,000 years on Hokkaido, it is highly probable that its duration was at most 3000 years on Honshu and 5000 years on Kyushu.

HOKKAIDO: MICROBLADE INDUSTRY EXPLOITING OBSIDIAN AND SHALE

Microblade industries in the Japanese Archipelago can be largely divided into two categories based on their technological features. In the Yubetsu method group, spalls were removed from a blade, flake, or bifacial blank to prepare a platform for microblade flaking, while the non-Yubetsu group lacks this process of spall removal. Each group consists of several techniques, and they show regional variation (Figure 4.2).

Technological Features of Developed Microblade Industries

In the Upper Palaeolithic of Hokkaido (c. 30,000–

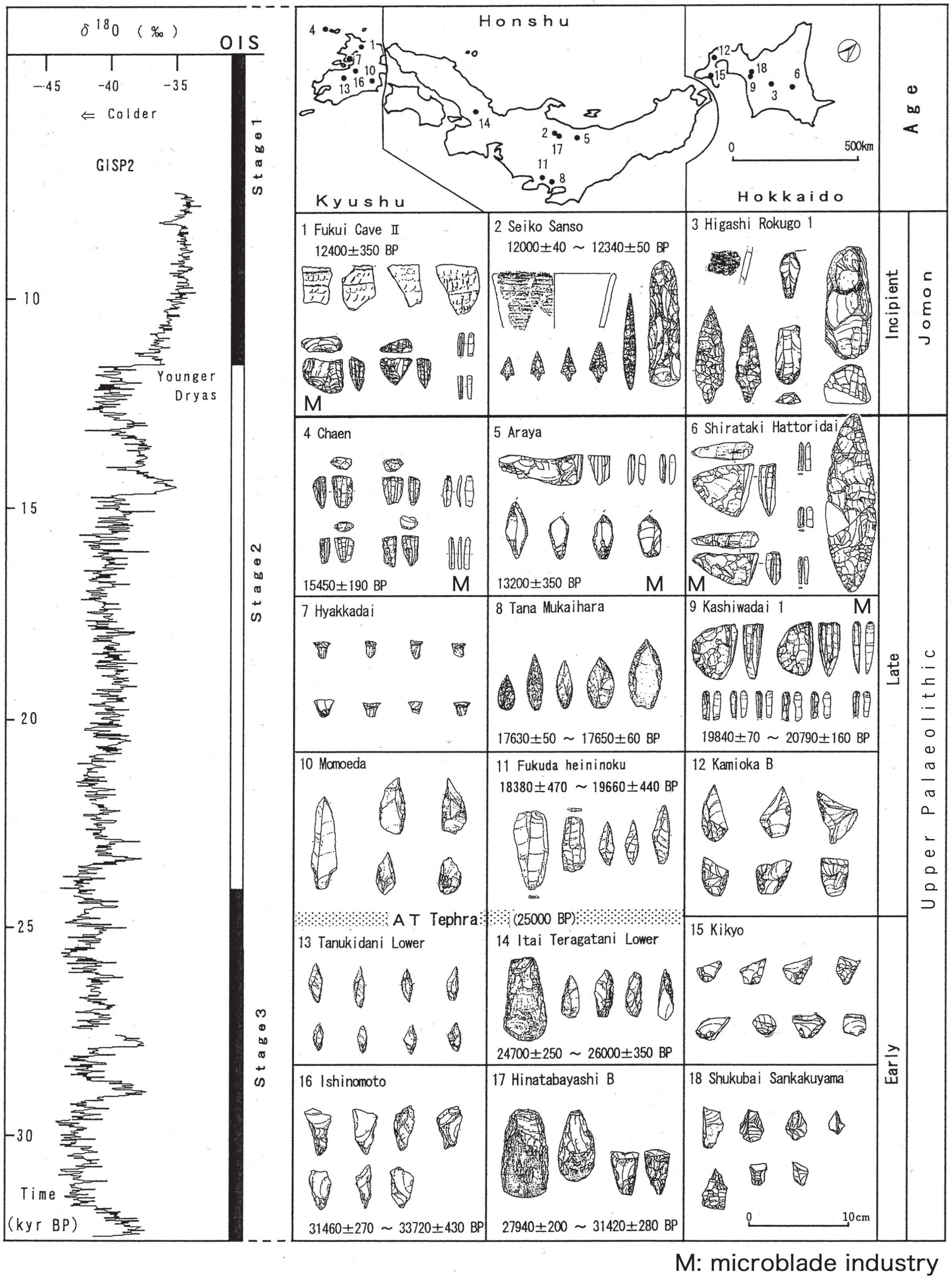


Figure 4.2: Chronology and ^{14}C dates of the Upper Palaeolithic and Incipient Jomon in Japan (after Ono *et al.* 2002).

10,000 BP), the predominant lithic raw material was obsidian from eastern and central Hokkaido and oil shale from southern Hokkaido. Obsidian represents a raw material that was transported over long distances, and was used not only on Hokkaido, but also on Sakhalin (Kuzmin *et al.* 2002). The microblade industry on Hokkaido developed a variety of detaching techniques, as described below, to adapt to the utilization of these two kinds of raw material.

The Yubetsu method group

The Yubetsu method consists of the strict Yubetsu technique, which involved forming a striking platform for detaching microblades by removing spalls from the lateral edge of a bifacial blank, and the Togeshita technique, which involved detaching spalls in the same way but choosing a blade or flake blank (Figure 4.3). The Yubetsu technique comprises various sub-techniques. While the Oshorokko sub-technique involves partial spalling on the lateral edge, in a group of some other sub-techniques the entire lateral edge was spalled. The latter group is subdivided based on the direction of spalling. In the Rankoshi sub-technique, spalls were detached along the short axis of a bifacial blank, and this is distinct from a group of techniques where spalls were removed along the long axis. The latter group is subdivided by the shape of their blanks. Boat-shaped bifacial blanks were produced with the Pirika sub-technique, whereas the strict Yubetsu technique manufactured point-shaped bifacial blanks. The strict Yubetsu technique is also subdivided according to certain attributes of microcores: while a Shirataki type microcore shows obvious traces of rubbing on the striking platform, assumed to be an anti-slip treatment for microblade flaking, a Sakkotsu type microcore lacks these traces (Figure 4.4). The relationship between these techniques is shown in Table 4.1.

The Non-Yubetsu method group

This group is typified by (1) the Horoka technique, where a flat platform was set up and then a boat-shaped microcore prepared by retouching the edges, (2) the Hirosato technique, where microblades were detached from the end of a large blade blank as in the case of a multiple burin (Sato 2004a), and (3) the Momijiyama technique, which produced pencil-shaped and other microcores (Figure 4.4).

Raw Material Exploitation Strategy and Technological Organization

The microblade industry of Hokkaido is characterized by its long duration and the develop-

Table 4.1: Technological classification of Yubetsu method in Hokkaido*.

Criteria	blank (biface or not)	spalling area type (small or long)	spalling direction to morphological axis	bifacial blank type (boat-shaped or biface)	platform preparation (abrasion or not)
Core Type	Togeshita				
	Yubetsu technique	Oshorokko			
			Rankoshi		
				Pirika	
				Strict Yubetsu	Shirataki
					Sakkotsu

* Underlined core types are found near the continent (i.e., excluding Honshu).
Curve-underlined core types are from Honshu.

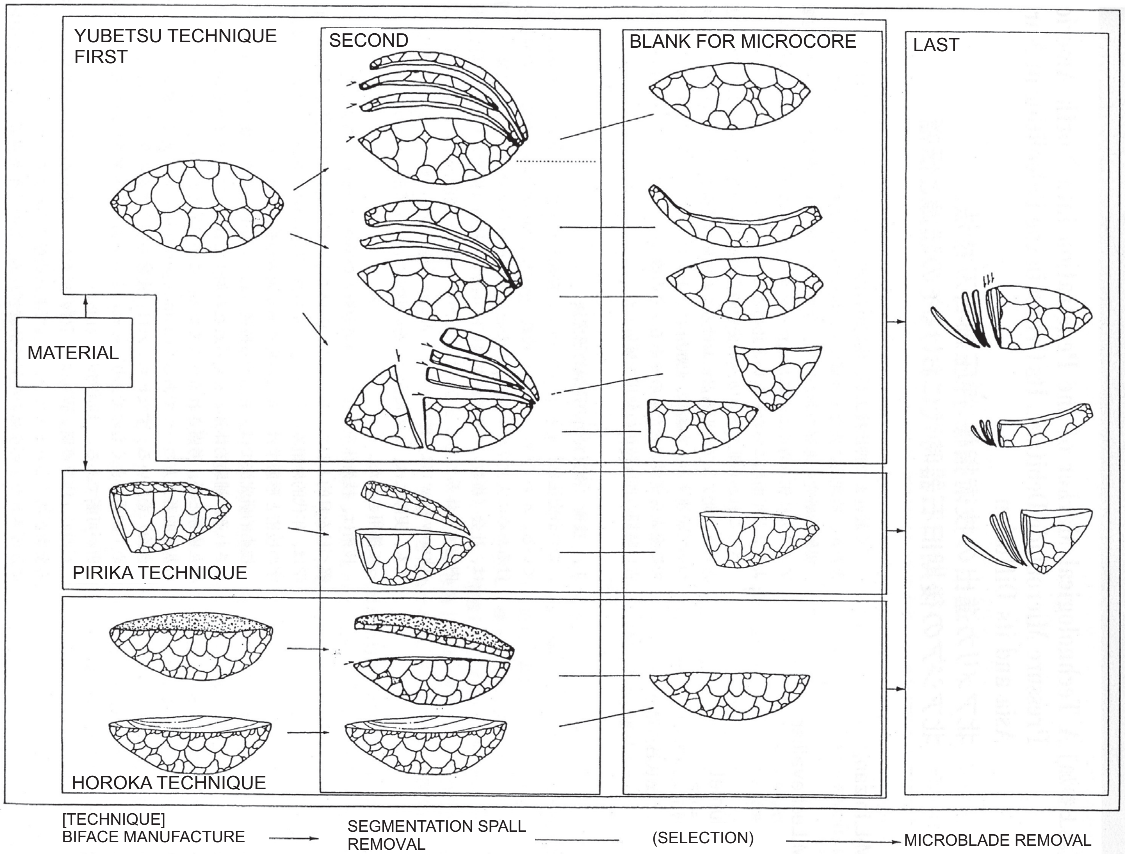


Figure 4.3: Part of the Yubetsu method including the Yubetsu technique, Pirika sub-technique, and Horoka technique (after Kimura 1993).

ment of a wide variety of microblade techniques. Microblade technology originated on the Asian continent, and became predominant in the second half of the Japanese Upper Palaeolithic (Sato 2003a). The oldest microblade industry, dated to c. 21,000–19,000 BP, was found at the Kashiwadai 1 site. It has features of the Rankoshi and Pirika sub-techniques of the Yubetsu method. The Shirataki and Sakkotsu sub-techniques, Togeshita and Horoka techniques, and other techniques and sub-techniques, appeared immediately after c. 19,000 BP. The Momijiyama technology also seems to have appeared in this time period. Microblade industries were still dominant on Hokkaido in the time period corresponding to the Incipient Jomon period (c. 13,000–10,000 BP) elsewhere in Japan. The Hirosato technique and part of the Oshorokko sub-technique are typical of the Incipient Jomon. However, details of the chronological sequence and the first and last appearance of the various microblade techniques on Hokkaido remain unclear.

Among the many obsidian sources known on Hokkaido (e.g., Hall and Kimura 2002), obsidian from the Shirataki (Kuzmin *et al.* 2002) and Oketo sources in eastern Hokkaido was transported over long distances because of its high quality and quantity. The distribution of the Shirataki and Oketo obsidian extends to Sakhalin and possibly further north to the mainland (Sato 2004b). On the other hand, the northern end of high quality and quantity oil shale sources, which are distributed along the Japan Sea coast of northeastern Honshu, extends to southern Hokkaido. It is presumed that the development of the various microblade techniques of Hokkaido was caused by the technological adaptation to exploit obsidian or oil shale. For example, at the Shirataki sites, located at the Shirataki obsidian sources, bifacial blanks were consistently produced with the Yubetsu method.

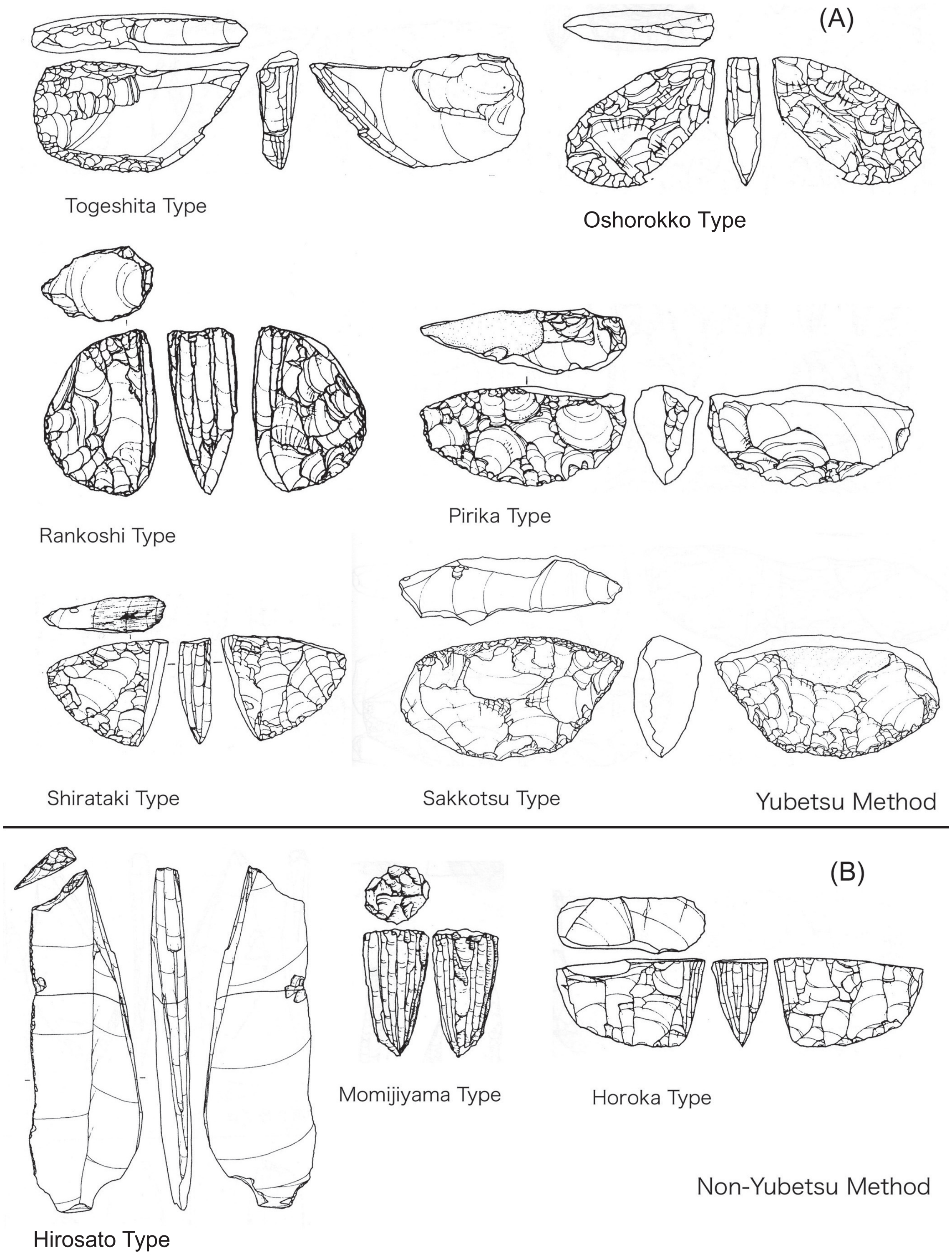


Figure 4.4: The types of microblade core from Hokkaido.

Humans adopted a behavioural strategy to carry these blanks as portable preforms to neighbouring residential base camps, where they produced microblades (Kimura 1995). As for the obsidian from the Oketo sources, the large blades often manufactured from this obsidian were used to produce microcore blanks of the Hirosato and Togeshita types. Although we believe that the Pirika sub-technique was probably specifically adopted to exploit the oil shale of southern Hokkaido, further details are needed to confirm this hypothesis.

Microblade industries on Hokkaido are always associated with a variety of abundant flake tools, such as end scrapers, side scrapers, and burins. Though this may seem to be in the natural order of things, the microblade industries of Honshu and further south show a different feature in that there are remarkably few flake stone tools in association. This phenomenon may be interpreted as follows. On Hokkaido, where, in common with the Asian continent, an organized hunting strategy of large mammals such as deer was embedded in the behavioural strategy as a main subsistence approach, people chose a technological organization less affected by the procurement of lithic raw material, which enabled them to move long distances. On the other hand, other behavioural and mobile strategies were adopted on Honshu and further south, reflecting the climatic fluctuations and different resource structure of fauna and flora.

Of the various microblade sub-techniques used on Hokkaido, the Togeshita, Oshorokko, Rankoshi, Hirosato, and Momijiyama types are not found in other parts of Japan, while similar examples are known from sites on the Asian continent. In contrast, a group of the strict Yubetsu technique, that is, the Pirika, Shirataki, and Sakkotsu sub-techniques, spread south to Honshu. Since the central Honshu site of Araya, where the Yubetsu type of microblade technique was found, is radiocarbon dated to c. 14,000 BP, it is presumed that humans using a group of the Yubetsu technique may have moved from Hokkaido to Araya. It is assumed that the group of late Microblade Industry with the Hirosato technique or the Oshorokko sub-technique ceased moving south over the Tsugaru Strait, because the Incipient Jomon period started at approximately 13,000 BP. Figure 4.5 shows the archaeological regions of Japan with characteristic microblade industries.

HONSHU: TWO DIFFERENT TRADITIONS OF THE MICROBLADE INDUSTRY

Overview

Microblade technology on Honshu can also be largely divided into two categories, the Yubetsu method group and the non-Yubetsu method group. Unlike the case of Hokkaido and Kyushu, however, the manufacturing technique is subdivided into fewer categories and these have a more limited timespan. The Yubetsu method consists of two techniques, Fukui and strict Yubetsu. The latter has three sub-techniques, Pirika, Shirataki, and Sakkotsu. The non-Yubetsu method also comprises two techniques, called Nodake-Yasumiba (Yadegawa method), and Horoka or Funano.

The geographic distribution of the Yubetsu method microblade technology is a similarly complex situation as the Horoka and Funano types. On Honshu, the Yubetsu technique is very much like the original Yubetsu on Hokkaido, and is distributed in the Tohoku region on the Pacific coast, and also extends to the San'in region in southwest Japan on the Japan Sea coast. The Sakkotsu sub-technique is found in all of these regions, but the Pirika sub-technique is known only from the northernmost part of Honshu, and the Shirataki sub-technique only in Niigata Prefecture. Because the Fukui technique – called a variation of the Yubetsu method of northern Kyushu – was brought to the Inland Sea area, it has been debated whether or not it belongs to the Yubetsu technique group known from the islands of the eastern Inland Sea and the coast of Osaka Bay.

The Yadegawa method is distributed from Kyushu to the northernmost point of Honshu. It has a sparse occurrence in northeastern Japan and a dense distribution in southwestern Japan to the west of the Chubu and Kanto regions. The Yadegawa method is the oldest microblade technology throughout the region of its geographical distribution. Though microblade technology itself is con-

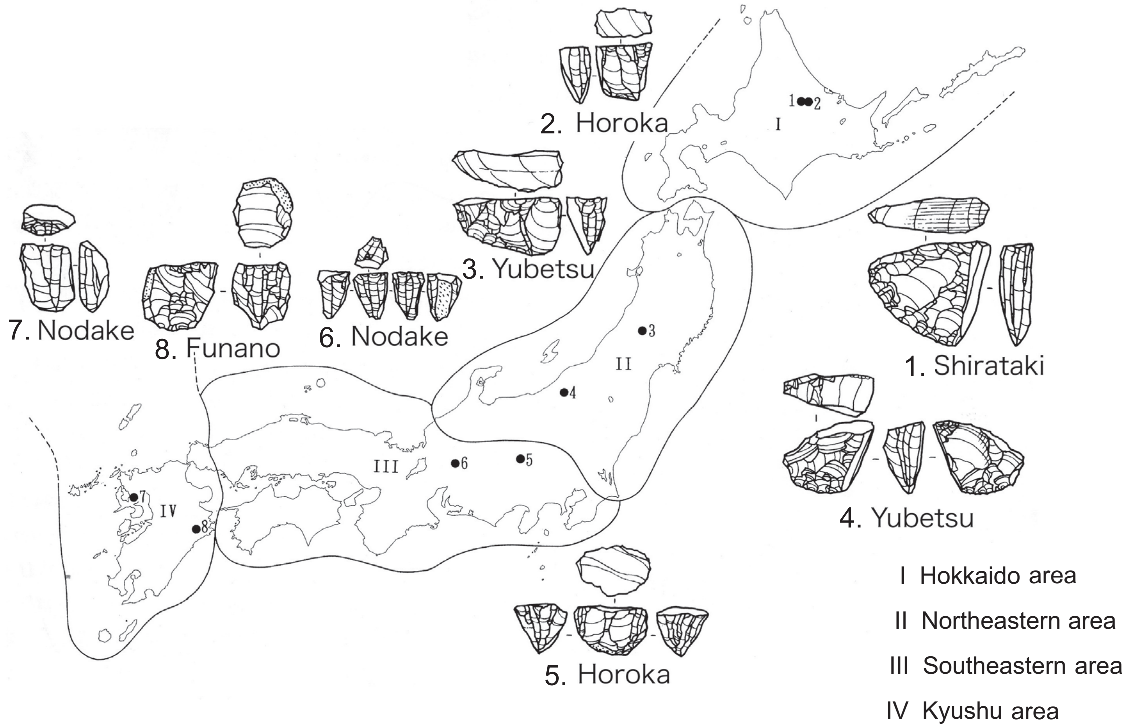


Figure 4.5: Archaeological areas of Japanese microblade industries.

sidered to have been brought from the continent, the place of origin of the Yadegawa method on the continent is unknown. Therefore, it is also possible to assume that the presence of the Yadegawa method in Japan was stimulated by information of the technical and behavioural strategies of the Microblade Industry on the continent. The Yadegawa industry is characterized by its poor stone tool assemblages. Several or dozens of microcores and few microblades are usually found, sometimes associated with tools on large flakes. There exist, therefore, various conflicting perspectives on the behavioural strategy of the group which manufactured these industries.

The Horoka and Funano techniques have an interesting feature of geographical distribution. While the Horoka technique is found most abundantly on Hokkaido, the Funano technique is prevalent on Kyushu. A reduction in the frequency of both types has been noted with increasing distance from their centre of distribution. Since they show a continuous distribution, however, it is difficult to decide on the technical affiliation of a given industry in the intermediate regions such as Kanto. Although it is possible to distinguish technologically and morphologically between the Horoka and Funano techniques at the centre of each geographical distribution, the distinction is less clear in the central part of Honshu, where both have different attributes.

Northeastern Honshu Region

Microblade sites in northeastern Honshu are represented by the Odaiyamamoto 2, Kakuniyama, Taruguchi, and Araya sites. While the Yubetsu method was predominant (Figure 4.5), the Horoka technique was also used. It is to be noted that evidence of the Yadegawa method is not found in this region, though it is widely distributed in central Honshu. Microblades are mainly made of hard shale (oil shale), but in some cases obsidian was used.

Microblade industries in northeastern Honshu typically contain transverse type burins called Araya type, along with end scrapers and drills. These flake tools are made of biface thinning flakes produced in the process of bifacial reduction to manufacture microcores and microblades (Figure 4.6). This indicates a specialized techno-

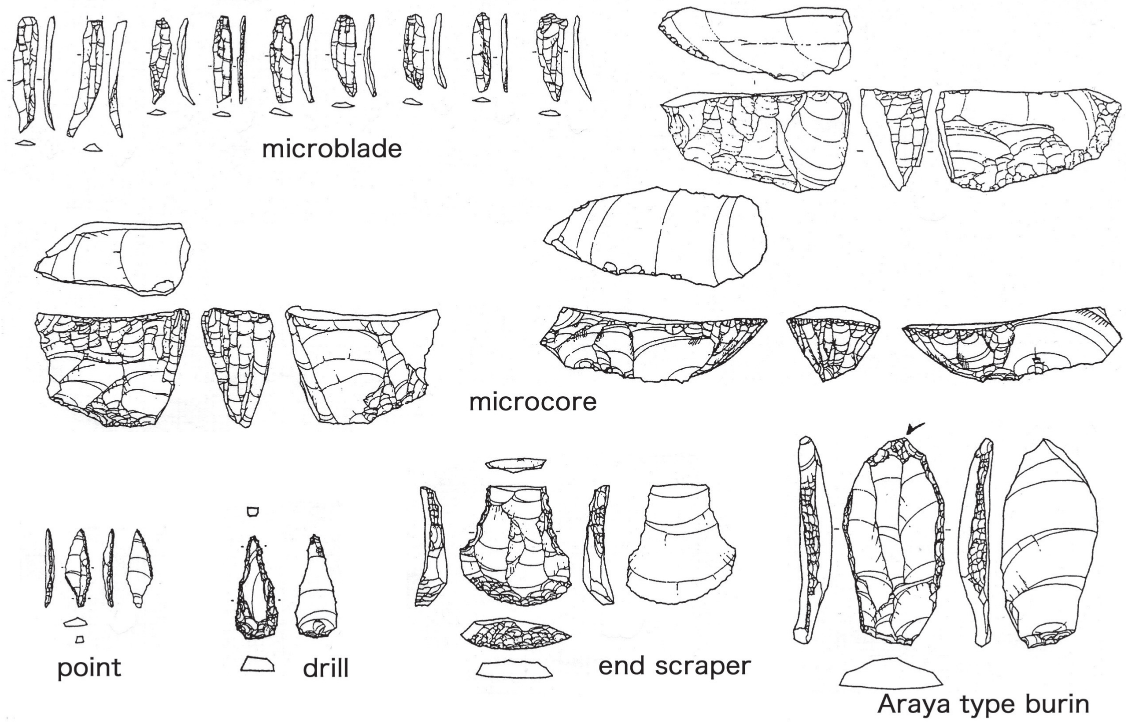


Figure 4.6: The Yubetsu method industry of Araya site in Tohoku.

logical organization of a unified lithic manufacturing strategy, which is called the mobile tool operating strategy.

The Araya type burin is a characteristic stone tool widely distributed over Northeast Asia. It has steep flaking along the edges and a facet on the left shoulder (see Figure 4.6). The reduction process of the Araya burin indicates that it was a repeatedly used “curated tool”. It had been assumed that it functioned as a grooving tool, with the tip of the cutting edge used. Usewear analysis conducted by Tsutsumi (1997), however, identified no edge wear marks on the tips, while prominent gloss was found on the lateral edges. This indicates that Araya burins were employed to scrape bone or antler, using its nearly right angled lateral edge. The Araya burin may thus be characterized as a tool with “functional speciality”, in contrast to a tool with “functional flexibility”, the bifacial tool, for example, with various functions of cutting, scraping, and dressing hides (Tsutsumi 1997).

Microblade sites with Yubetsu method artifacts in this region are often located at the confluences of rivers, which suggests a location well-suited for fishing of salmonids and other species. Since Kato (1981) first raised the hypothesis about Late Palaeolithic fishing activity in the archipelago, it had been assumed that the exploitation of river resources, including anadromous fish, was related to the cultural dispersal of the Yubetsu industry across North Asia and northern Japan. The adoption of inland fishing of anadromous species is understood in the context of the transition process to the Jomon according to the following hypothesis: the inland fishing system worked as a releaser of the social change from the nomadic Palaeolithic society to the residential Jomon society (Sato 1992a).

The adoption of fishing in the subsistence activities of the Late Palaeolithic society in Japan is still controversial. It was necessary, however, to adopt new techniques for the exploitation of multiple food resources, because most of the large game went extinct by the end of the Pleistocene, causing a shift in the procurement system to the hunting of agile medium-sized animals. This situation probably gave rise to a focus on inland fish resources, especially salmonid species with a highly predictable and stable resource abundance, and the development of new fishing techniques. Considering this subsistence background of inland fishing, it is reasonable to suppose that the Araya type burin played an important role as a tool to make bone and antler fishing equipment.

The adaptation of microblade industries to new food resources was very different in northeastern and southwestern Japan with their own distinct environments. In contrast to possible inland fishing of salmonids in northeast Japan, in southern Kyushu, which lies at a lower latitude and has a warmer climate, nuts were heavily exploited and pitfall hunting evolved in the emerging temperate forest. It is likely that a maritime adaptation gradually developed in this region. The results of dietary analysis show that adaptation to the local environment progressed independently in each region of the archipelago at the Microblade Industry stage at the end of the Late Palaeolithic, and various types of ecology and resource subsistence in different localities began appearing in the Jomon period (Tsutsumi 2002).

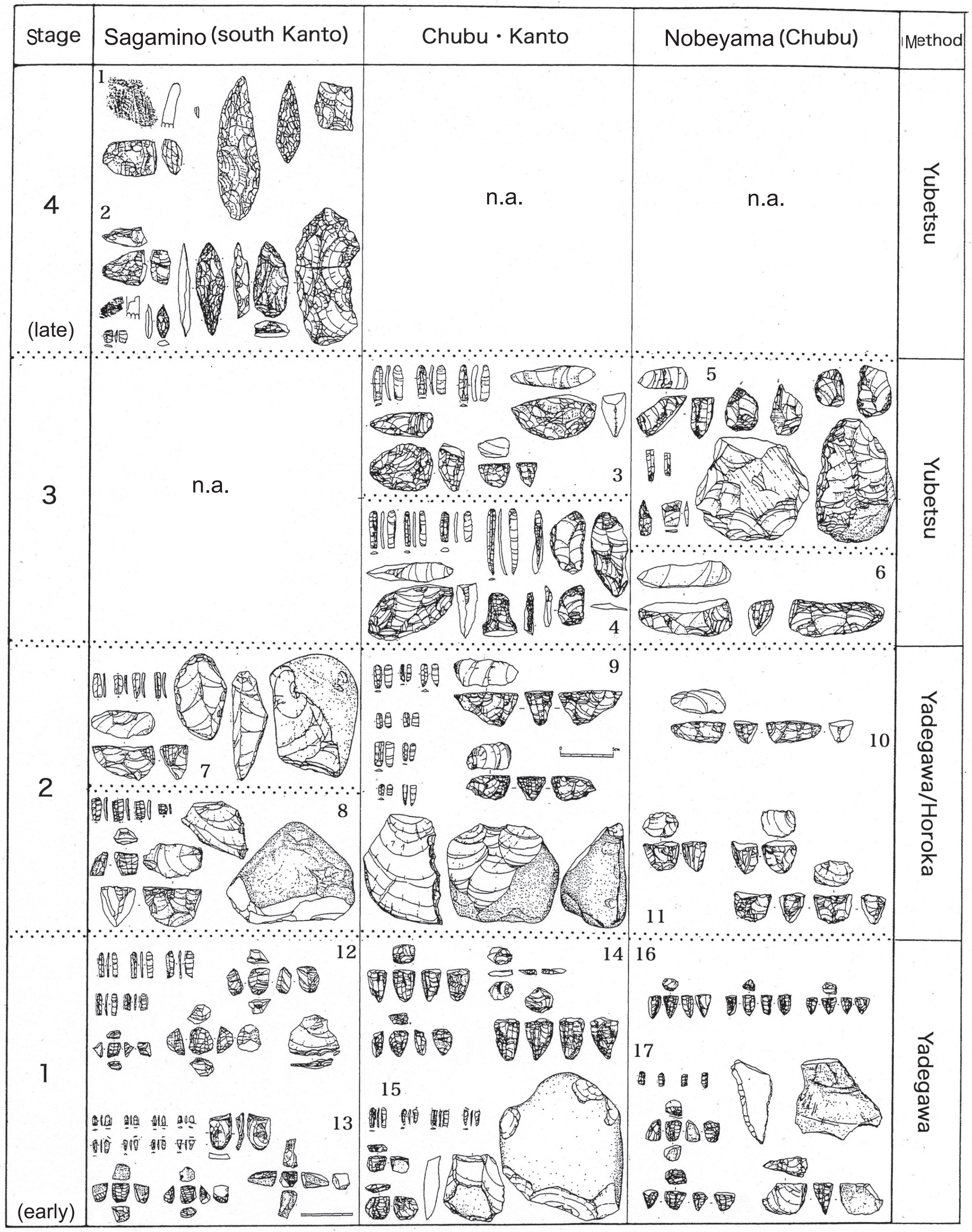
Central Honshu Region

In central Honshu, microblade sites are concentrated in several regions: Nobeyama and Wada-toge in the Central Highlands in Nagano Prefecture, northern Kanto, the Sagamino, Musashino, and Shimofusa plateaus in southern Kanto, and at the bases of the Hakone and Ashitaka mountains. The microblade industries in these regions were mainly produced with the Yadegawa and Yubetsu methods. In this section, we will discuss the microblade industries of the Sagamino Plateau and the Nobeyama region.

The Sagamino Plateau is an excellent research field for Late Palaeolithic study, blessed with thick loam sediments containing Palaeolithic finds. Based on the stratigraphy, the Sagamino microblade industries can be divided into four chronological stages. The first and second stages contain microblade industries with Yadegawa method microcores; in the third stage, Yadegawa boat-shaped microcores of the Horoka technique are characteristic; and in the fourth stage, the Yubetsu method with Sakkotsu type microcores, associated with the oldest pottery, is found (Suwama 1991; Figure 4.7). In central Honshu, we can observe a chronological order of microblade industries: the Yadegawa method in the first half and the Yubetsu method in the last stage. As for lithic exploitation, while obsidian-oriented utilization was predominant in the first half, a switch to local raw material, such as tuff, occurred in the second half. This seems to reflect some changes in the raw material procurement system, territorial system, and other behavioural aspects.

Over 40 microblade sites have been found in the Sagamino area; they contain settlements distributed along medium-sized and small rivers, working camps with pebble tools, and transit camps along migratory pathways. These sites are small, consisting of one or more spots of lithic concentration. Japanese Palaeolithic camp sites are generally categorized into three types – A: circular type settlement (clustering type), B: parallel type settlement (returning type), and C: single type settlement (small-scale type) (Figure 4.8). The circular type (A) is a home base with many households clustering around an open space, consisting of lithic concentrations in a circular arrangement. The returning type (B) is a residential camp to which humans repeatedly came back. The single type (C) is a transit camp, consisting of one or more small lithic concentrations. While most sites can be classified as settlement types A, B, or C, only the small-scale type (C) microblade sites are distributed on the Sagamino Plateau. This indicates a scattered settlement system without a home base or residential camp strategy. It is highly probable that several small groups spent a nomadic life on the plateau. This type of settlement system seems to have been a behavioural adaptation to the dispersed resources of low predictability, for example, deer hunting in a tree-covered environment. This contrasts with the settlement system in northeastern Japan, where microblade sites occupied river confluences with possible adaptation to inland fishing (see above).

In the Nobeyama region, located in the highlands 1300 m above sea level



1: Katsusaka; 2: Kamino; 3: Yanagimata A; 4: Kashiranashi; 5: Nakappara 5B; 6: Kashiwadare; 7: Shimotsuruma-nagabori 1; 8: Kamisoyagi 1; 9: Masugata; 10: Yadegawa 4; 11: Yadegawa 1; 12: Kamisoyagi 3; 13: Daikanyama; 14: Yanagimata C; 15: Ichinoseki-maeda; 16: Yadegawa 1; 17: Yadegawa 1.

Figure 4.7: Chronology of microblade industries in southern Kanto (after Suwama 1991).

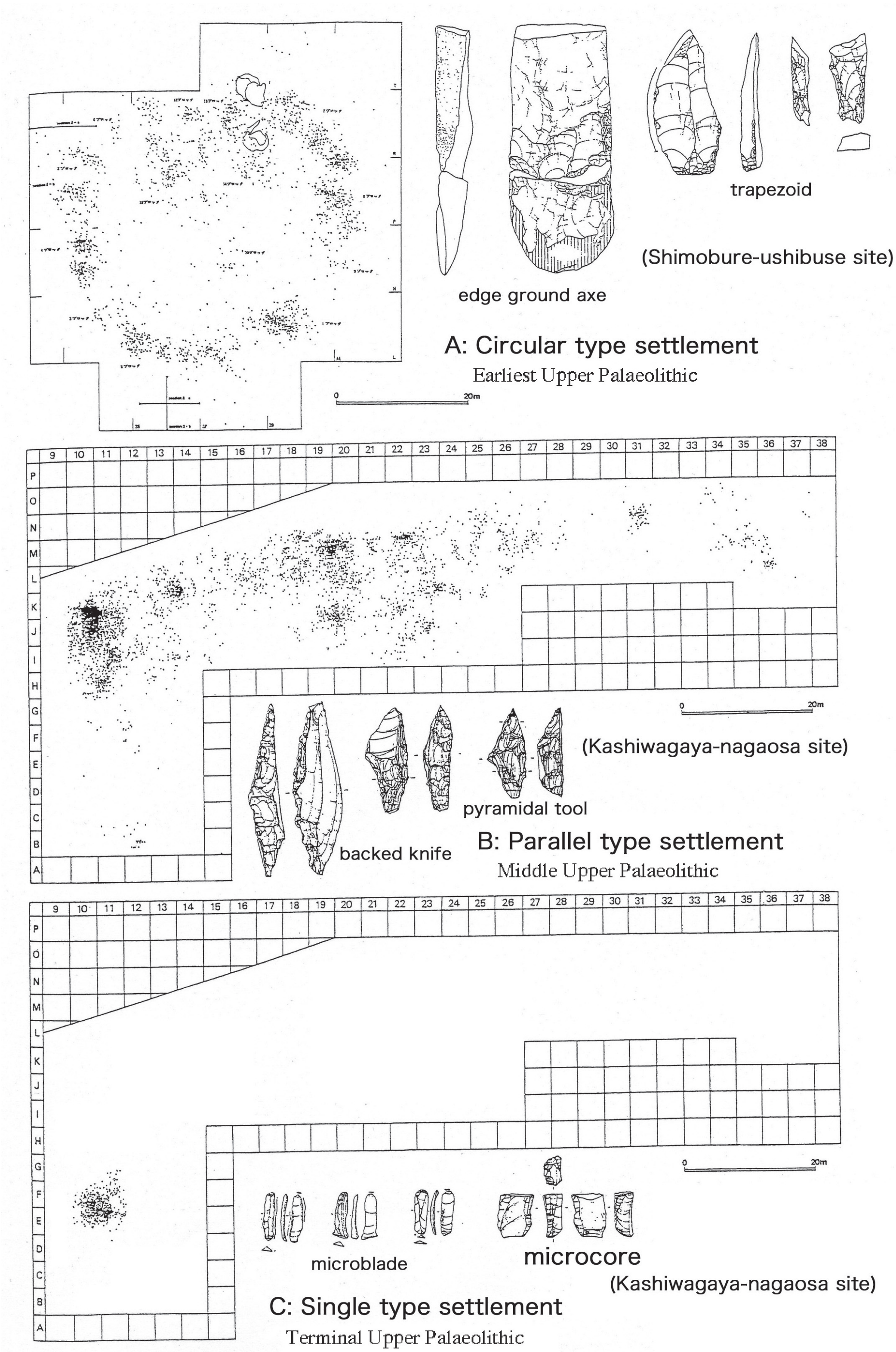


Figure 4.8: Settlement system of southern Kanto in the Upper Palaeolithic.

(asl), the Yadegawa and Yubetsu methods with Sakkotsu type microblade industries show a concentrated distribution. Discussing the geographical background of Japanese microblade industries, Suzuki (1983) pointed out that most of the microblade sites occur in low altitude areas below 200 m asl. Among the 482 sites he examined, 245 sites (51%) were less than 100 m asl and 372 sites (77%) less than 200 m asl. High altitude microblade sites over 1000 m asl were found only in the Nobeyama region; they number only 23, which is less than 5% of the total. Suzuki (1983) concluded that the living space (territory) and land utilization pattern of the Nobeyama microblade industries was a "low and flat land type = plain type" in principle (Suzuki 1983). It is to be noted that the "high and flat land type = highland type" site location in the Central Highlands is a very special case. There is no doubt that these sites were seasonal camps used except in winter, a phenomenon probably related to raw material procurement at the nearby obsidian sources.

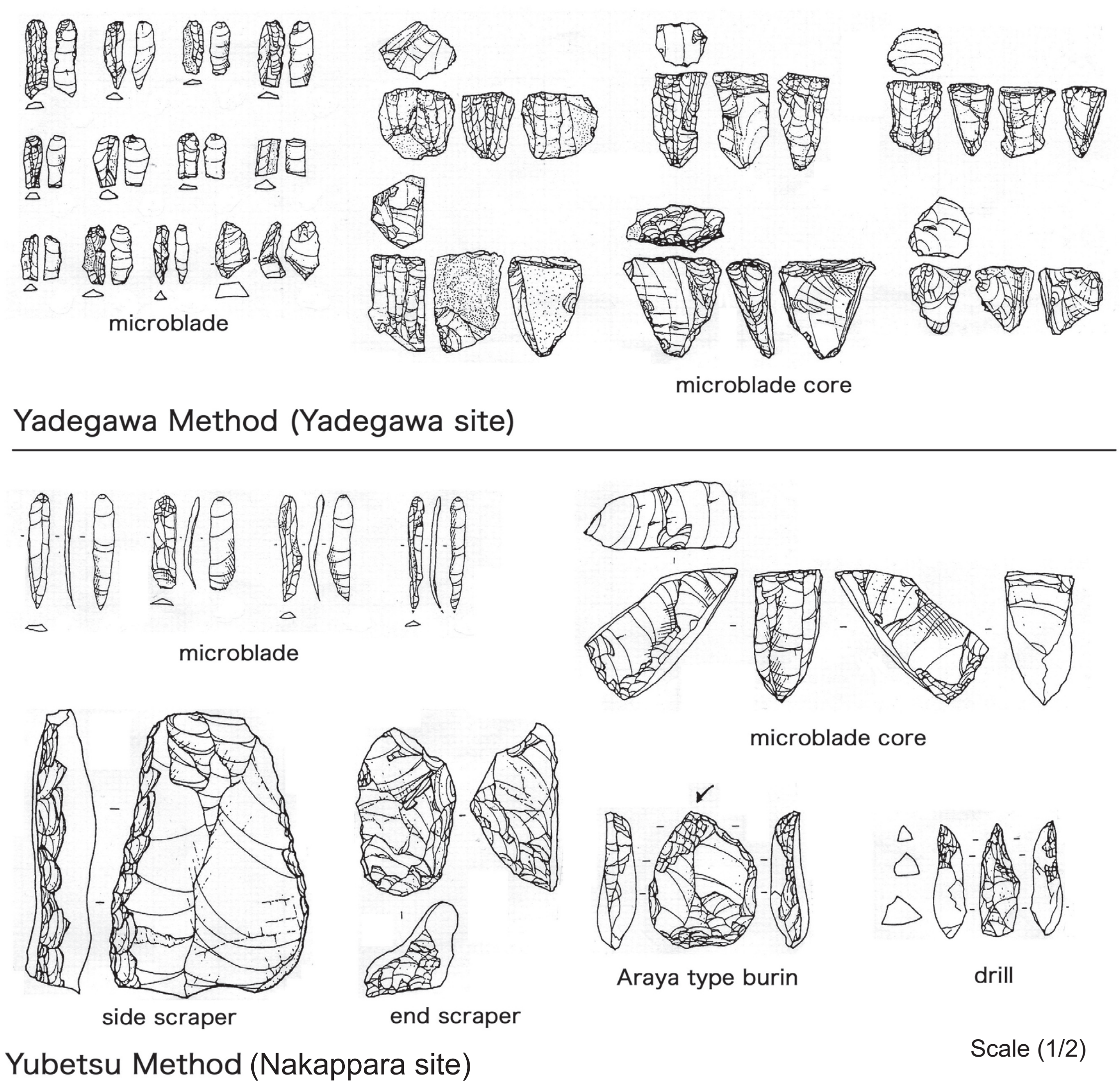


Figure 4.9: Comparison between the Yadegawa and Yubetsu method industries in central Japan.

The Yadegawa microblade industry at the Yadegawa site shows a very simple composition, containing only side scrapers and pebble tools. The Yubetsu microblade industry at the Nakappara site cluster has a strikingly different composition, containing end scrapers and burins along with microblades, side scrapers, and pebble tools (Figure 4.9). As for their chronological sequence, the Yadegawa method precedes the Yubetsu method microblade industry at the Nakappara site cluster, corresponding to the case in Sagamino.

The Yubetsu method microblade technique, utilizing oil shale, is characterized as a system in which biface thinning flakes were used to produce side scrapers, end scrapers, burins, and other tools (e.g., Otsuka 1968; Hashimoto 1988). At the Nakappara sites with Yubetsu method artifacts, however, it was pointed out that microblade and flake tool production went through separate processes (Nagatsuka 1996). These two production processes were distinct in terms of raw material selection, with obsidian used for microblades and chert for flake tools. We can observe that the retouching process of a microcore blank is simplified, compared to that of the Yubetsu method of the Araya type site (Figure 4.10); this is probably

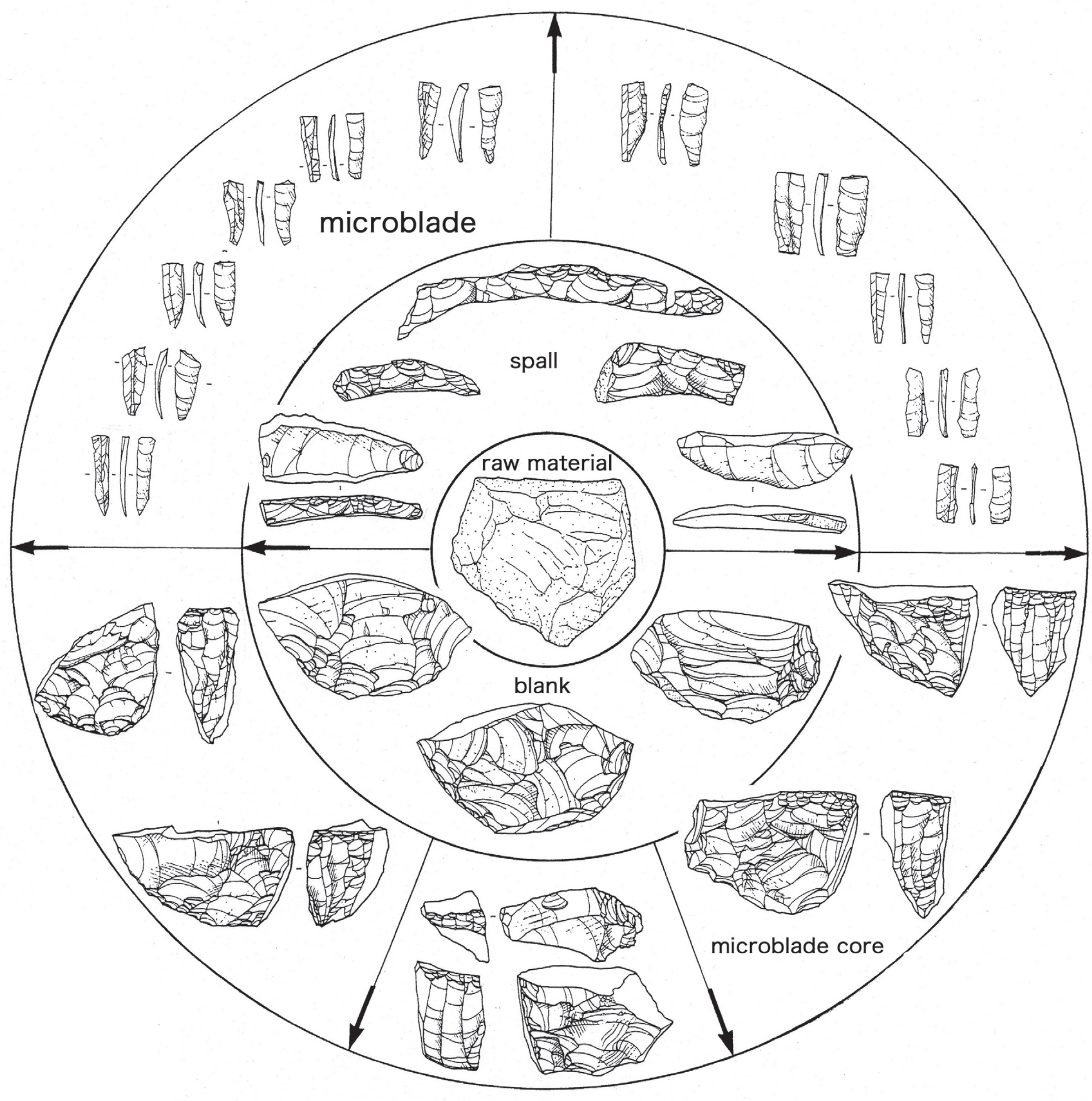


Figure 4.10: Bifacial reduction technique of the Nakappara site.

a technological response to the lack of the need to supply biface thinning flakes for flake tool production.

Biface reduction technology, a characteristic of the Yubetsu method used at the Araya site, is assumed to have been a well-established curation system advantageous to a nomadic strategy, for the following reasons: (1) a biface itself can be used as a tool, not only as a bifacial blank; (2) a well-retouched biface reduces the risk of breakage during transportation and manufacture; and (3) a rational manufacturing process and effective raw material utilization became possible as a result of the unification of microblade and flake tool production (Sato 1992a, 1995). In other words, this system is assumed to be well-suited to a highly mobile lifestyle.

The Yadegawa industry spreading over the Nobeyama region introduced a new technical system, probably as a result of contact with the Araya type industry. Flake tool and microblade production, however, went through separate processes in the indigenous Yadegawa method manufacturing system. Therefore, when the Yubetsu method was introduced to Nobeyama, the unified system of flake tool and microblade production became separated. In addition, very sharp obsidian was selected for microblade manufacture, and non-glassy and non-frangible chert was used to make flake tools such as scrapers. This kind of raw material management appears to have been a technological organization adapted to a multiple lithic environment, that is, an environment with abundant nearby lithic sources, not only obsidian but also chert and other materials.

Southwestern Honshu and Shikoku Region

In the Kinki region of southwestern Honshu, the Nijo Mountains yield glassy raw material called sanukite, a black glassy andesite. A great number of sites of the Backed Knife Industry with artifacts made mainly of sanukite are found in this region. In the Microblade Industry period, which appeared immediately after the Backed Knife Industry period, however, only few microblade sites were known in the Kinki region. It may be assumed that sanukite was not suited for delicate microblade production using pressure flaking. It is quite likely that no sites were formed in this region in the Microblade Industry period, because of its lithic environment, lacking dense and fine-grained raw material.

Microblade sites, however, are distributed in the Setouchi region to the west of Kinki, where glassy andesite sources exist. Microblade industries here were manufactured mainly with the Yadegawa method, widely distributed over western Honshu, and microblade industries with features of the Fukui technique (a variation of the Yubetsu method of northern Kyushu, see above), with a small number of Yubetsu microblade sub-techniques resembling those of northeastern Japan.

The Onbara 2 site in Okayama Prefecture has yielded the southernmost evidence of the Yubetsu method of the northeastern Japan type. At this site, Araya type burins are associated with wedge-shaped microcores (Figure 4.11). Based on the results of the Onbara 2 site excavation, Inada (1996) proposed that Palaeolithic human groups at this site may be classified broadly into two categories based on their migration style: returning-nomad groups and colonist groups. According to this hypothesis, Yubetsu method microblade sites outside the area with hard shale contain sites left by both groups. Cultural layer M at the Onbara 2 site, where mainly local lithic raw material was exploited, is assumed to have been left by a colonist group that had dispersed from northeastern Japan. Correspondingly, the assemblages from the Yanagimata, Nakappara 5B, and Nakappara 1G sites in Nagano Prefecture, also with local raw material use, are understood as assemblages left by colonist groups. On the other hand, in the Kanto region, it is assumed that the nomad groups shuttling between the Kanto and Tohoku regions manufactured microblade industries exploiting hard shale, for example, at the Ushirono, Kidoba, Shirakusa, and Kashiranashi sites (Inada 1996).

Yadegawa method microblade sites also occur on Shikoku Island.

MICROBLADE INDUSTRIES ON KYUSHU

Abundant microblade industries are found on Kyushu, an island adjacent to the Asian continent. Microblade technology on Kyushu is largely divided into two categories, the Yubetsu and the non-Yubetsu method groups (Figure 4.12).

The non-Yubetsu method group is subdivided into several techniques. The production system with Nodake-Yasumiba type microcores, which is called the Yadegawa method, involved processing a prism or cube-shaped blank by splitting the raw material and detaching microblades without preparing the striking platform. Artifacts manufactured with these techniques are distributed all over Kyushu, made on obsidian exploited from sources in various areas of the island (Figure 4.13). In contrast, the Funano technique – which is very similar to the Horoka technique – is mainly found in eastern and southern Kyushu (Figure 4.13). This technique exploited local fine-grained raw material such as rhyolite or shale, not relying on obsidian. Although in previous times it was assumed that the Funano technique was part of the early stage of the Japanese Microblade Industry, and had possibilities to be associated with the preceding Backed Knife Industry, more recently it is thought to have existed also in the transition to the Jomon period. In addition, two specialized microblade techniques show limited distribution in Kagoshima Prefecture and the southern part of Miyazaki Prefecture, both in southern Kyushu. While the Unewara technique exploited coarse-grained raw material, mainly sandstone, the Kajiyazono technique was adapted to using very thin plates of shale (Figure 4.13). Both microblade detaching techniques were technologically well adapted to the local raw materials, and are dated to the final stage of the Microblade Industry. Figure 4.14 illustrates the microblade manufacturing techniques which were used on Kyushu.

The Yubetsu method group on Kyushu is called the Fukui or Saikai technique, as the formation process of the microcore blank is different from that on Hokkaido. It is presumed that this unique Yubetsu method was brought from the Asian continent. Since the Yubetsu method in Korea contains a variety of techniques common to Hokkaido, it is quite probable that only part of these techniques were carried to Kyushu.

Outside the Japanese Archipelago, the Yadegawa method is also known from southern China (Tang 1996). Therefore, the Yadegawa method was thought to have originated from a similar microblade industry in southern China. However, since recent studies make it clear that Chinese examples are mainly from the Neolithic period (Tang 1996), southern China cannot be the place of the origin of the Yadegawa method, among the oldest microblade industries in Japan.

While the Kyushu microblade industries were based on the Fukui/Saikai technique, the complex landforms and varied climate and ecology

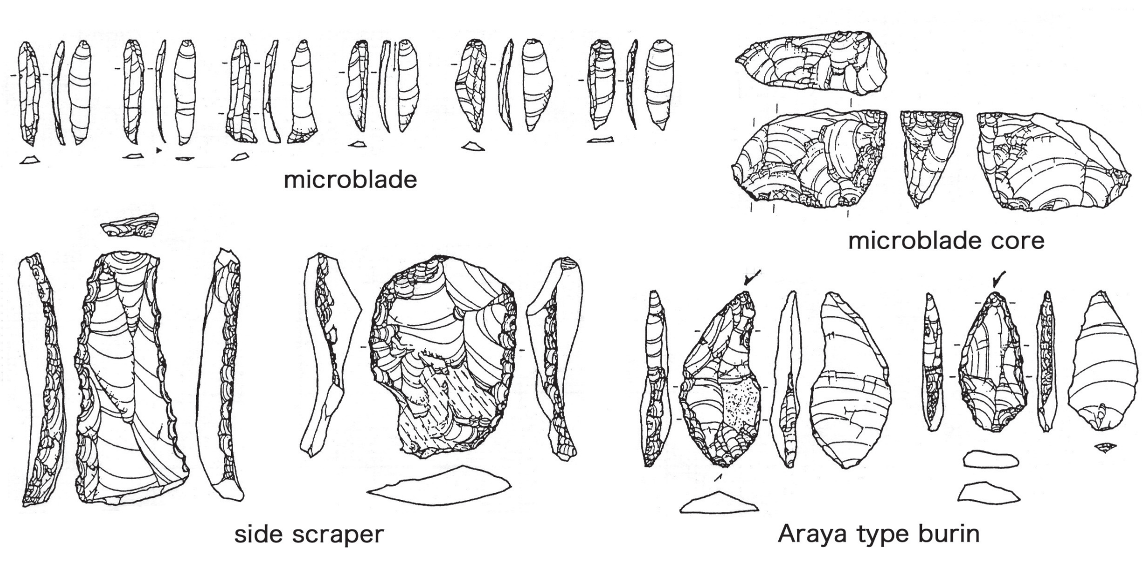


Figure 4.11: Yubetsu method industry of Onbara 2 site in southwestern Japan.

affected the manufacture of a diversity of local microcore types. The relationship between these local industries remains unclear, partly because the poor sedimentary environment has made inter-site stratigraphic comparison difficult and few results of absolute dating have been obtained.

Recently, excavations of Upper Palaeolithic sites in Korea, including microblade sites, have strikingly increased, and Korean Palaeolithic study has shown a rapid development (see Chapters 6 and 7). As a result, the following theory is gaining wide acceptance: blade points, the main stone tool category of the Korean Upper Palaeo-

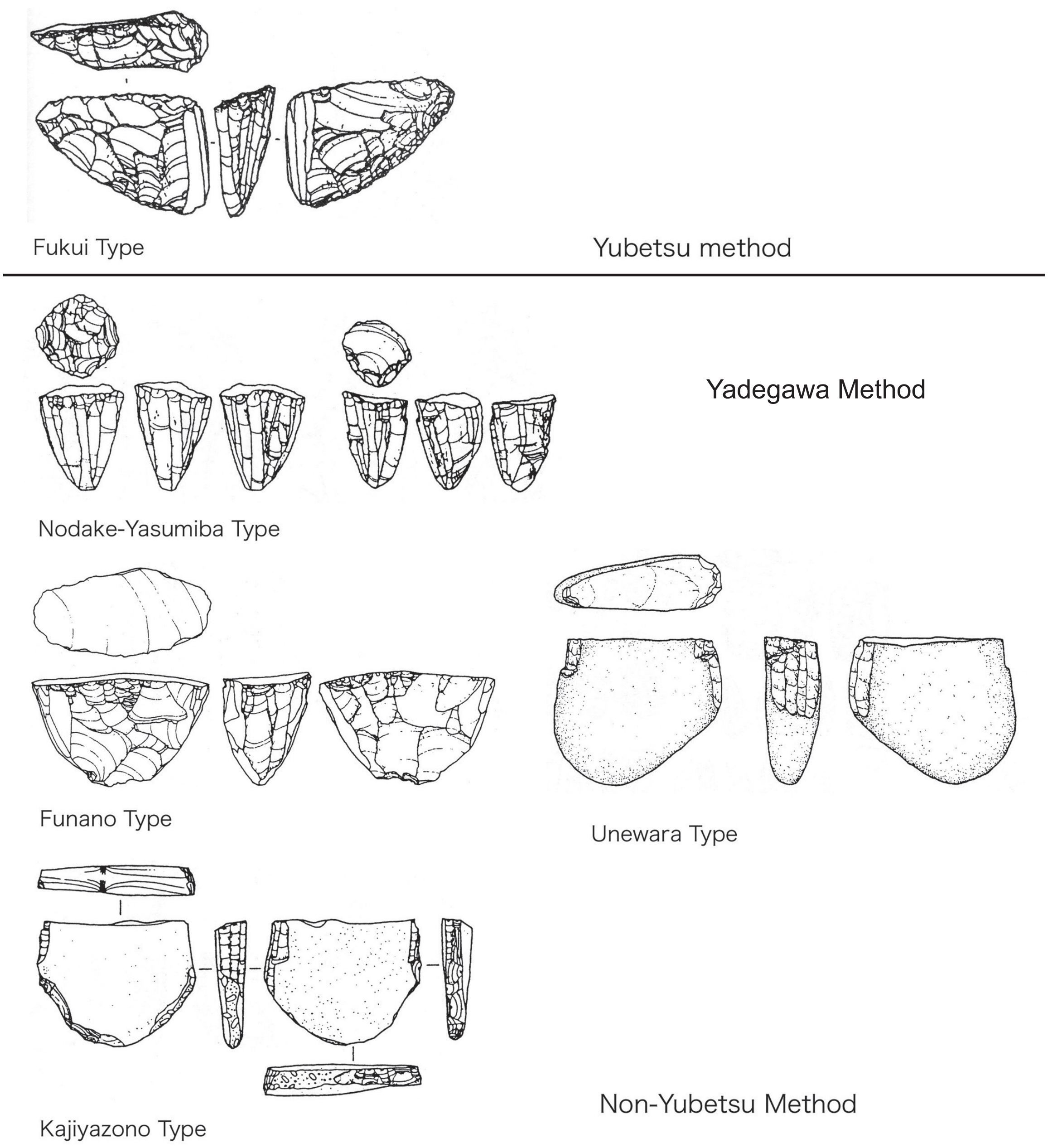


Figure 4.12: The types of microblade core of Kyushu.

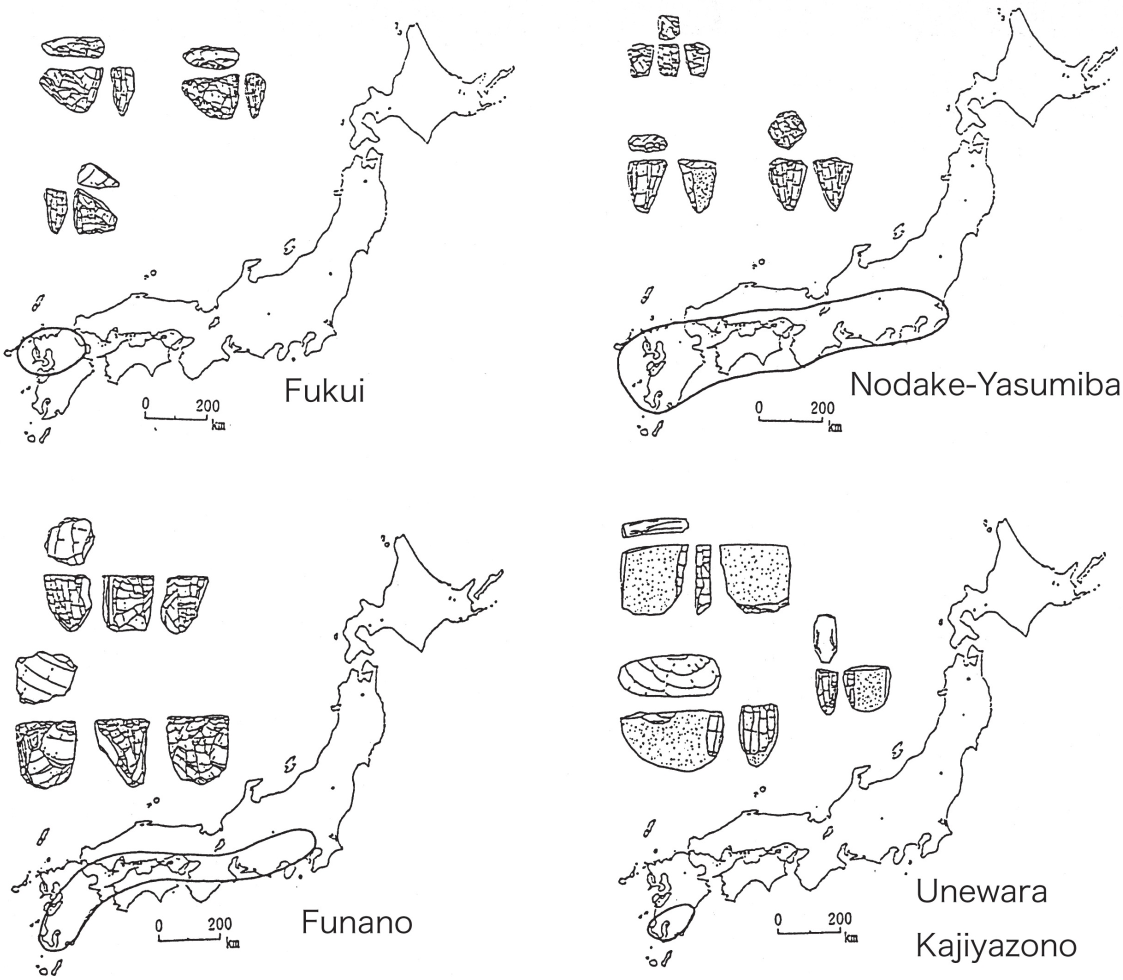


Figure 4.13: Distribution of microblade core types in southwestern Japan.

lithic, were associated with the Yubetsu method Microblade Industry since the early Upper Palaeolithic (c. 20,000 BP and earlier). On the other hand, though blade points appeared on Kyushu at the beginning of the late Upper Palaeolithic (c. 24,000–13,000 BP), they are not found associated with microblade industries. It is therefore assumed that blade points were brought to Kyushu without microblade technology. However, the examples from Korea suggest that the Yubetsu microblade technology on Kyushu is probably earlier than assumed according to the traditional view.

Microblades on Kyushu were used until the beginning of the Jomon period, which corresponds to the case on Hokkaido. On Hokkaido, humans appear to have maintained a mobile strategy even after the transition to the Jomon period on Honshu and Kyushu, especially in its southern part which was the first region of Japan to adopt a sedentary strategy. In other words, the microblade operating strategy represents a sedentary adaptation. Microblade technology at the beginning of the Jomon differs qualitatively from microblade technology in the Upper Palaeolithic. Since the microcore form becomes less standardized and the distinction between the two methods mentioned above becomes indistinct, intermediate-form microcores, difficult to categorize, increase in number. At this stage, microblade technology seems to lose its behavioural advantage inherent in the Microblade Industry, that is, economical exploitation of lithic raw material suited for a mo-

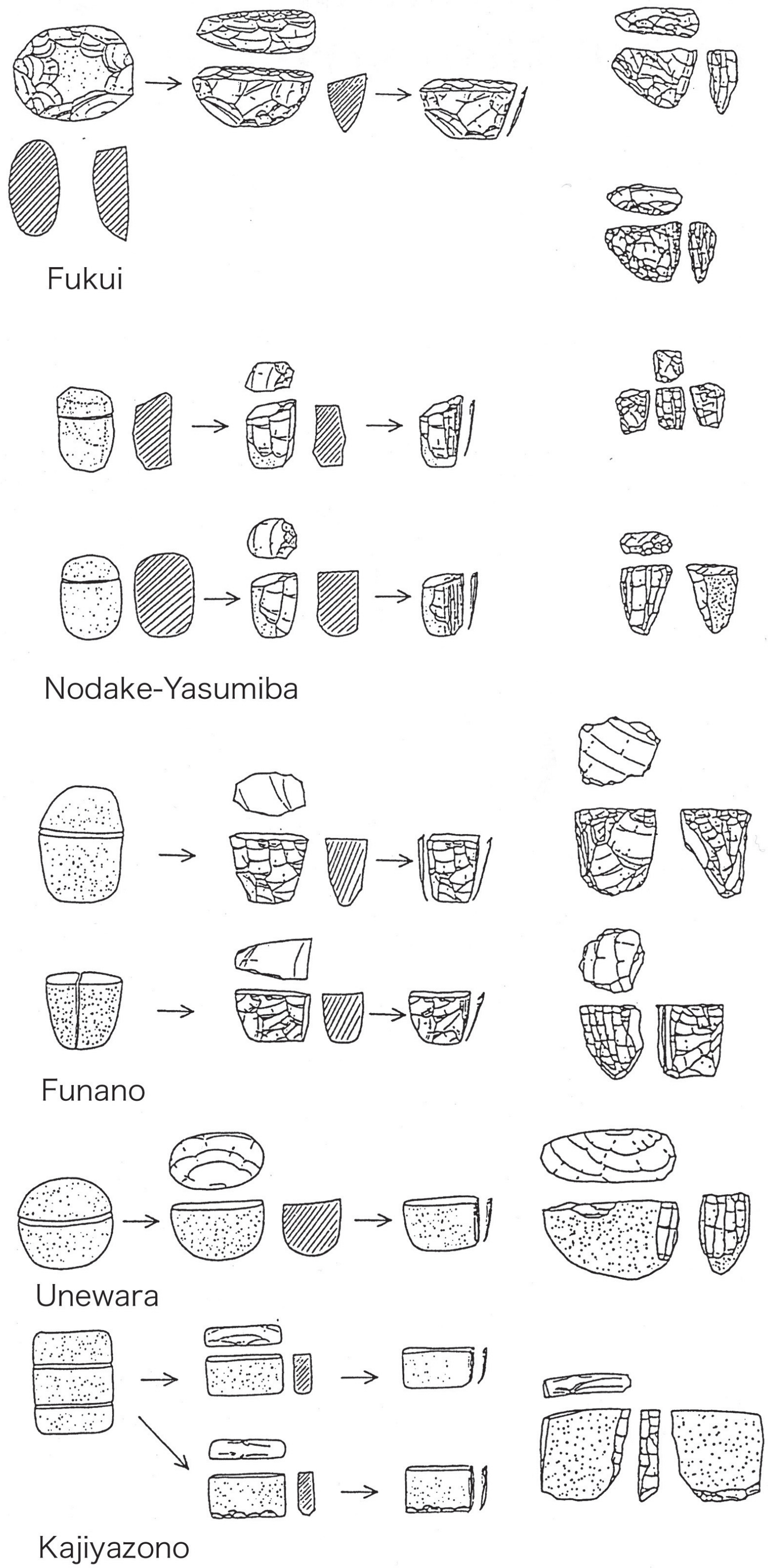


Figure 4.14: Microblade detaching techniques of Kyushu (after Tachibana 1993).

bile strategy, and to persist as a small-sized blade producing technique. A summary of Japanese microblade techniques is given for the convenience of readers in Table 4.2.

GEOGRAPHICAL ENVIRONMENT OF THE JAPAN SEA REGION AND THE INFLOW OF MICROBLADE INDUSTRY

There appear to have existed two inflow routes of the Microblade Industry to the Japanese Archipelago, that is, through Sakhalin Island and the Korean Peninsula. However, since detailed analyses are difficult to make, several aspects of how microblade technology was introduced from the central and lower parts of the Amur River basin via Sakhalin Island (the Hokkaido route), and from northeastern China via the Korean Peninsula (the Korean Peninsula route), remain unknown.

In discussions of how the Microblade Industry spread across the Japanese Archipelago, it is important to consider the role of the Japan Sea. The present condition of the Japan Sea was probably formed around the Pleistocene-Holocene transition. From the information now obtained, it is assumed that landbridges did not exist between the Asian continent and the Japanese Archipelago except for Hokkaido. Even at the Last Glacial Maximum (LGM), the Korea Strait between the Korean Peninsula and Tsushima Island, and the Tsugaru Strait between Hokkaido and Honshu islands, there were very narrow seas separating both sides. But the Tsugaru Strait probably had an ice bridge in the winter season. While the palaeo-Yellow River flowed into the Korea Strait, the palaeo-Amur River flowed into the Mamiya (Tatar) Strait. Since these two rivers flowed into the palaeo-Japan Sea, increasing its freshwater content, the northern part of the Japan Sea was

Table 4.2: Classification of microblade techniques in Japan.

Method	Technique	Sub-technique	Core type
Hokkaido Island			
Yubetsu	Strict Yubetsu	Oshorokko	Oshorokko
		Rankoshi	Rankoshi
		Pirika	Pirika
		Shirataki	Shirataki
		Sakkotsu	Sakkotsu
	Togeshita		Togeshita
Non-Yubetsu	Horoka		Horoka
	Hirosato		Hirosato
	Momijiyama		Momijiyama
Honshu Island			
Yubetsu	Strict Yubetsu	Pirika	Pirika
		Shirataki	Shirataki
		Sakkotsu	Sakkotsu
	Fukui		Fukui
Non-Yubetsu	Nodake-Yasumiba		Nodake-Yasumiba
(Yadegawa)	Horoka/Funano		Horoka/Funano
Kyushu Island			
Yubetsu	Fukui/Saikai		Fukui
Non-Yubetsu	Nodake-Yasumiba		Nodake-Yasumiba
(Yadegawa)	Funano		Funano
	Unewara		Unewara
	Kajiyazono		Kajiyazono

probably covered with vast drift ice fields in winter. Hokkaido became a northern peninsula projecting from the Asian continent, since the Soya Strait formed a landbridge between Hokkaido and Sakhalin, connecting to the continent north of the palaeo- Amur River. These geographic conditions had a strong influence and basically characterized the microblade industry of Hokkaido, which has many features in common with the continent. Microblade technology was introduced to Japan through the Korean Peninsula and the "Hokkaido Peninsula".

OBSIDIAN RESOURCES AND LITHIC EXPLOITATION TERRITORY

A large number of obsidian sources have been studied in detail in the Japanese Archipelago, from Hokkaido in the north to Kyushu in the south (Figure 4.15). This is partly because of the intensive archaeological research conducted all over this relatively small country. The obsidian sources are classified into more than 100 groups by the elemental chemical composition of the raw material. In recent years, a large number of non-destructive X-ray fluorescence spectrometry analyses of stone implements from archaeological sites have been conducted, making it possible to reconstruct the obsidian supply from the sources to the archaeological sites.

Here, we will describe raw material exploitation of the microblade industry from central Honshu, where many source analyses have been conducted. Obsidian sources in this region are as follows (Figures 4.15 and 4.16): (1) the Wada-toge sources in the Central Highlands, which comprise the Wada-toge, Hoshigato, Kirigamine, and Omegura sources; (2) the Yatsugatake sources, also in the Central Highlands, which consist of the Mugikusa-toge, Futagoike, and Tsumetayama sources; (3) the Izu-Hakone sources at the border of Kanagawa and Shizuoka prefectures are the Hatajuku and Kashiwa-toge sources; (4) the Kozu Island (Kozu-jima) sources on the Pacific Ocean coast

Figure 4.15: The major obsidian sources in Japan.

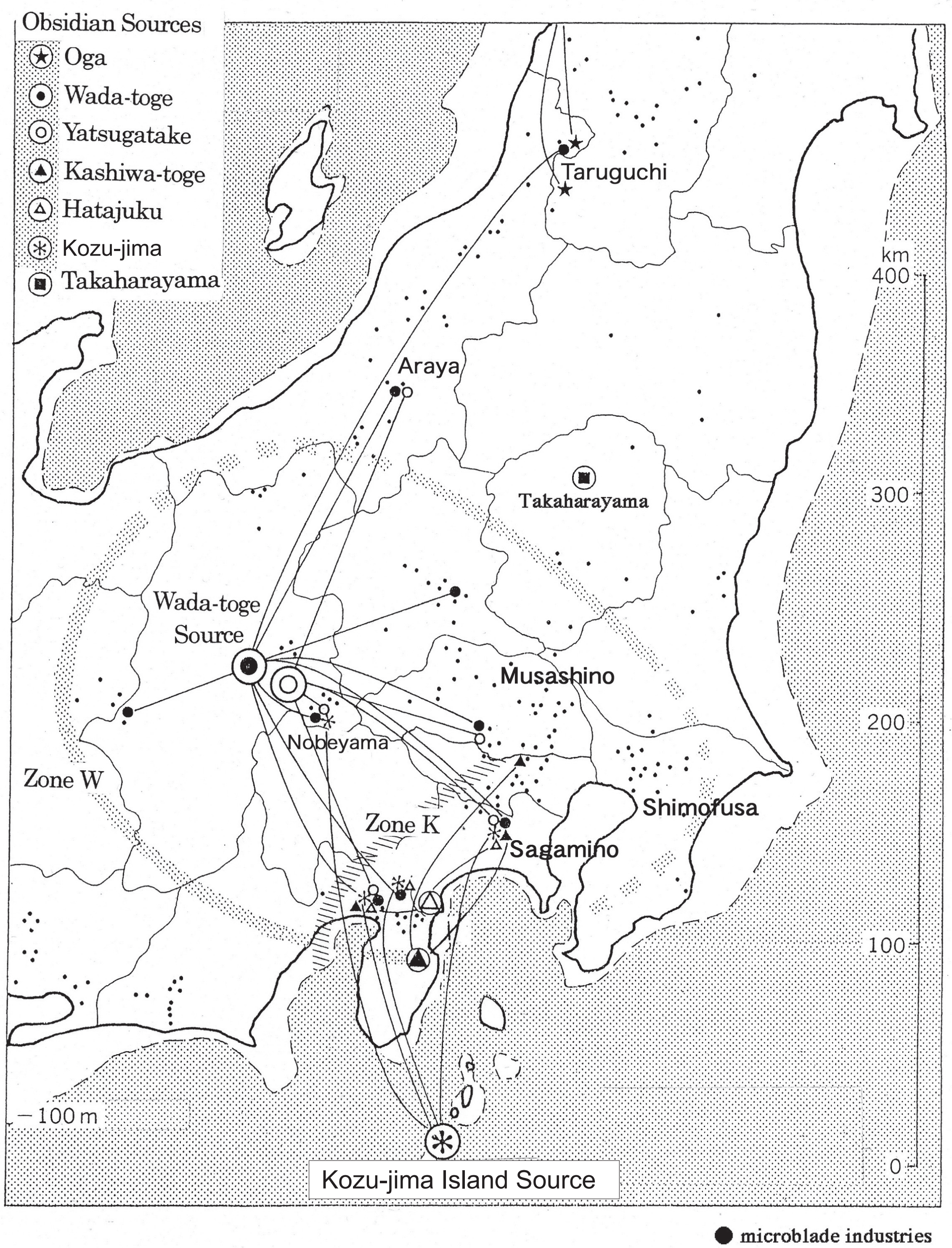


Figure 4.16: Obsidian procurement system in central Honshu.

comprising the Onbase-shima and Sanukazaki sources; and, (5) the Takaharayama sources in the mountains of northern Kanto. The Wada-toge and Yatsugatake sources are located in the Central Highlands of Nagano Prefecture, also called Shinshu, with the former 1200–1500 m asl and the latter approximately 2000 m asl. The Takaharayama sources are also located in a mountainous region, c. 1000 m asl. The Izu-Hakone sources are situated on the Izu Peninsula on the Pacific coast of Honshu, approximately 500 m asl. The Onbase-shima source on Kozu Island is located on the Pacific Ocean coast, 50 km from Honshu in a straight line.

Obsidian procurement was restricted by these geographical conditions. In the Shinshu region (Nagano Prefecture) obsidian sources seem to have been seasonally limited, because of their high altitude location in the mountains. This means that lithic procurement activity was seasonally regulated. In the glacial age, it is assumed that the Wada-toge source group and Mugikusa-toge source were located in the periglacial region near the treeline of the subarctic coniferous forest. Despite the decrease in the amount of snowfall caused by the arid glacial climate, lithic procurement from winter to early spring would have been still extremely difficult. Thus, it is highly probable that humans procured lithic raw material mainly in the summer. In recent years, numerous obsidian mines have been found around Wada-toge, for example, Hoshikuzu-toge, Hoshigato, and Hoshigadai, which all belong to the Jomon period. However, no obsidian mines dating back to the Palaeolithic have been found to date. It is assumed that the utilization of cobbles from around the outcrops and rivers was the most effective lithic procurement strategy to reduce loss of time and optimize the cost-benefit relationship.

Source analyses were conducted by Mochizuki and Tsutsumi (1997) of 2357 obsidian artifacts from nine microblade sites on the Sagamino Plateau, in order to clarify the obsidian supply system of the microblade industry of central Honshu. The analyses identified 718 items of Shinshu origin, 470 items of Izu-Hakone origin, and 1169 items of Kozu Island origin (Mochizuki and Tsutsumi 1997; Table 4.3). Including the results of other source analyses, we were able to reconstruct the system of obsidian procurement in central Honshu (Figure 4.16, Table 4.3). The lithic exploitation pattern at each site may be classified as follows – 1: Shinshu origin, 2: Izu-Hakone origin, 3: Kozu Island origin, 4: Shinshu origin and Izu-Hakone origin, 5: Kozu Island origin and Izu-Hakone origin, and 6: Shinshu and Kozu Island origin. While obsidian from a single origin was exploited predominantly at the 1–3 pattern sites, obsidian from different origins was used at the sites of patterns 4 and 5. Pattern 6, exploiting obsidian of both Shinshu origin and Kozu Island origin, was not found on the Sagamino Plateau; this indicates that obsidian supplies from Shinshu (mountainous zone) and Kozu Island (oceanic zone) are incompatible with each other.

The varied composition of obsidian sources at the microblade sites in Sagamino, containing obsidian of Shinshu, Izu-Hakone, and Kozu Island origins, is sometimes explained as reflecting their different ages. However, the issue does not seem to be that simple. In the authors' opinion, the fact that obsidian from Kozu Island and Shinshu are not found together at the same site was based on the lithic procurement strategy – the season of procurement at Shinshu and Kozu Island may have been different, that is, it was related to the mountain location of the Shinshu source and the Kozu Island source being on an isolated island. Given that seasonality existed in lithic procurement, it may be assumed that Shinshu obsidian was exploited mainly in the summer, because of the difficulties of winter procurement, while obsidian of Kozu Island origin was selected in other seasons.

Based on source analyses at consumer sites (see above), obsidian sources in central Honshu are classified into two categories: major sources, with a distribution range exceeding 100 km and accounting for one-third of the total microblades excavated, and minor sources, locally exploited within a 100 km range accounting for the other two-thirds.

The Wada-toge sources are classified as major sources, supplying obsidian not only to places close to the sources but also to the Nobeyama Highlands 40 km away and to the plateaus of southern Kanto 100–150 km away (Sagamino, Musashino, and Shimofusa); this is supply zone W (Figure 4.16). Examples of distant utilization

No.	Microblade Industry	Shinshu Sources				Izu-Hakone Sources		Kozu source	Total
		Wada	Omegura	Kirigamine	Tateshina	Hatajuku	Kashiwatoge	Kozu	
1	Kamisoyagi Loc.1					52	18	260	330
2	Kamisoyagi Loc.3-C	138							138
3	Kamisoyagi Loc.3-E	2							2
4	Kamisoyagi Loc.4							2	2
5	Fukuda-Fudanotsuji							1	1
6	Nagahori-minami Ⅱ	2							2
7	Daiyama Ⅱ	239	1	98	29		380	1	748
8	Kashiwagaya-nagawosa Ⅳ							349	349
9	Kamiwada-joyama Ⅱ	74		56					130
10	Soyagi-nakamura Ⅱ	1		19	58	1		1	80
11	Kashiwadai-ekimae Ⅰ						7	273	280
12	Kashiwadai-ekimae Ⅱ							97	97
13	Hoonji				1	12		185	198
Total		456	1	173	88	65	405	1169	2357

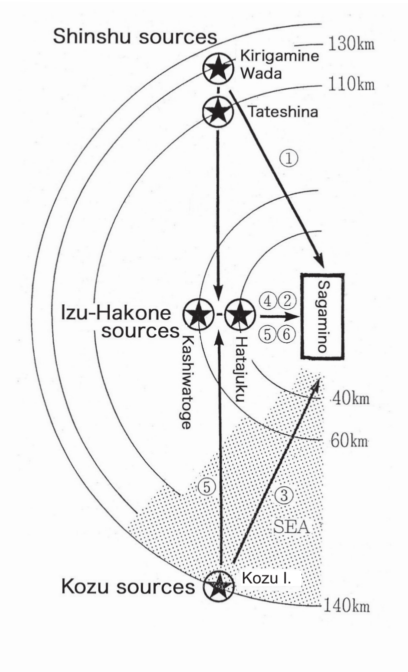


Table 4.3: Sources of obsidian artifacts used in microblade industries of the Sagamino Plateau (after Mochizuki and Tsutsumi 1997).

include the Taruguchi site, Niigata Prefecture, almost 300 km away from the sources, though this may have been an exceptional case.

Major sources are also located on Kozu Island, with obsidian from these sources transported within a 150 km range along the coast of Honshu, including the Sagamino Plateau; this is supply zone K (Figure 4.16). Examples of inland wide range transportation include the Yadegawa site, Nagano Prefecture, in the mountainous highland area 200 km away. Since Kozu Island was not connected to Honshu even during the LGM, obsidian must have been transported by sea. The supply of obsidian from Kozu Island to Honshu was very active at the Microblade Industry stage, though its utilization started in the early Upper Palaeolithic. It may be assumed that, at the Microblade Industry stage, arrangements were made to manage the organization and scheduling of lithic procuring groups to Kozu Island.

Obsidian from the Yatsugatake sources was mainly transported to the Nobeyama area, in contrast to the long distance movement of obsidian from the Wada-toge and Kozu Island sources (Figure 4.16). Obsidian from the Izu Kashiwa-toge and Hakone Hatajuku sources was also brought to sites within a 100 km range, that is, in the Sagamino and Musashino regions, and the base of Ashitaka Mountain. Obsidian from these sources had a limited distribution and amount, since it was inferior in terms of quantity and quality compared to obsidian from the Wada-toge or Kozu Island sources. The Izu Kashiwa-toge and Hakone Hatajuku sources were sometimes used to supplement obsidian from Wada-toge or Kozu Island. The supply system of obsidian from the Takaharayama sources in Tochigi Prefecture is still unclear, since we do not have sufficient results of source analysis. In the preceding Backed Knife Industry period, however, obsidian from Takaharayama was widely utilized on the Shimofusa Plateau in Chiba Prefecture. Thus, it is quite probable that utilization of Takaharayama obsidian continued in the Microblade Industry period on the Shimofusa Plateau, which is more than 100 km distant from the sources.

It has been historically controversial how obsidian was transported: direct procurement or exchange. In recent years, supply based on embedded strategy, proposed by Binford (1980) with respect to Nunamiut ethnography, has also been taken into account in Japanese research. It may further be assumed that risk reducing strategy played a role in lithic procurement (Wiessner 1982).

Taking these models into account, how can we explain the lithic procurement strategy of the Japanese microblade industry? There is no doubt that intensive direct procurement, entailing overseas journeys between Honshu and the small islands, was necessary for the procurement of obsidian from Kozu Island. On the other hand, the transport range of obsidian sometimes reached 250–400 km. At this distance, it can hardly be assumed that obsidian was obtained by direct procurement or embedded strategy, and instead, we may postulate an exchange system based on a communication network between local areas. It is highly probable that an exchange system was arranged in the second half of the Upper Palaeolithic in order to obtain specific material such as obsidian. At the beginning of the Upper Palaeolithic, lithic procurement strategy may be explained by a relatively simple model, such as direct procurement, since the exploitation system of specific materials, including obsidian, had only emerged at that time. In the second half of the Upper Palaeolithic, when local characteristics can be traced in the archaeological records and social systems developed, it seems to be unreasonable to choose one strategy from representative procurement models such as direct procurement, embedded strategy, or exchange. It may be assumed that the procurement strategy was selected with respect to individual raw materials, affected by the following conditions: (1) geographical relationship between the nomadic subsistence territory and the lithic sources, (2) difficulty of resource procurement, which is subject to the resource structure, (3) resource value, that is, lithic quality, and (4) social relationships of the human groups.

Recent archaeometric lithic source analyses have shown that the supply zones of the raw material are different from the traditionally assumed archaeological units, based on the distribution of stone tool types or manufacturing techniques, making it possible to have a new understanding of what a territory is. In the background of this new understanding of territory, we can reconstruct settlement systems, communication networks, and social systems of mobility.

CONCLUSION: THE END OF THE MICROBLADE INDUSTRY AND THE TRANSITION TO THE JOMON PERIOD

The developmental scenario of the microblade industry on Honshu may be described as follows: the spread of the uniform and homogeneous Yadegawa method was followed by the introduction and spread of the Yubetsu method from north (southern Siberia and Inner Mongolia) and south (southern part of the Korean Peninsula) of the Japanese Archipelago. The Upper Palaeolithic culture of Japan, which corresponds to a time of climatic fluctuations at the end of the Pleistocene, is characterized by a reduction of territories and the break-up of large human groups and an increase of smaller local groups. The microblade industry was brought to the Japanese Archipelago against this background of social evolutionary processes.

Since each local group on the Japanese Archipelago attempted to adapt to their local environment, diversified aspects can be observed in the transition process to the Jomon culture, which is defined as a forest-adapted hunting-fishing-gathering complex. Closely related to this, the end of the microblade industry was a complicated and diversified process in each region (Sato 1993). The sedentary hunting-fishing-gathering strategy of the Jomon culture was first adopted in southern Kyushu, where a warm and equable climate preceded that of other regions, and then spread northward. While in southern Kyushu microblade technology was adopted by the primary Jomon, it was rapidly replaced in Honshu by the Incipient Jomon culture (c. 13,000–10,000 BP) with its large-sized point industry and pottery. As the Palaeolithic-like mobile strategy continued on Hokkaido, microblade technology was predominant in this region before the Initial Jomon period (c. 10,000–7000 BP).