6 A REVIEW OF KOREAN MICROLITHIC INDUSTRIES

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INTRODUCTION

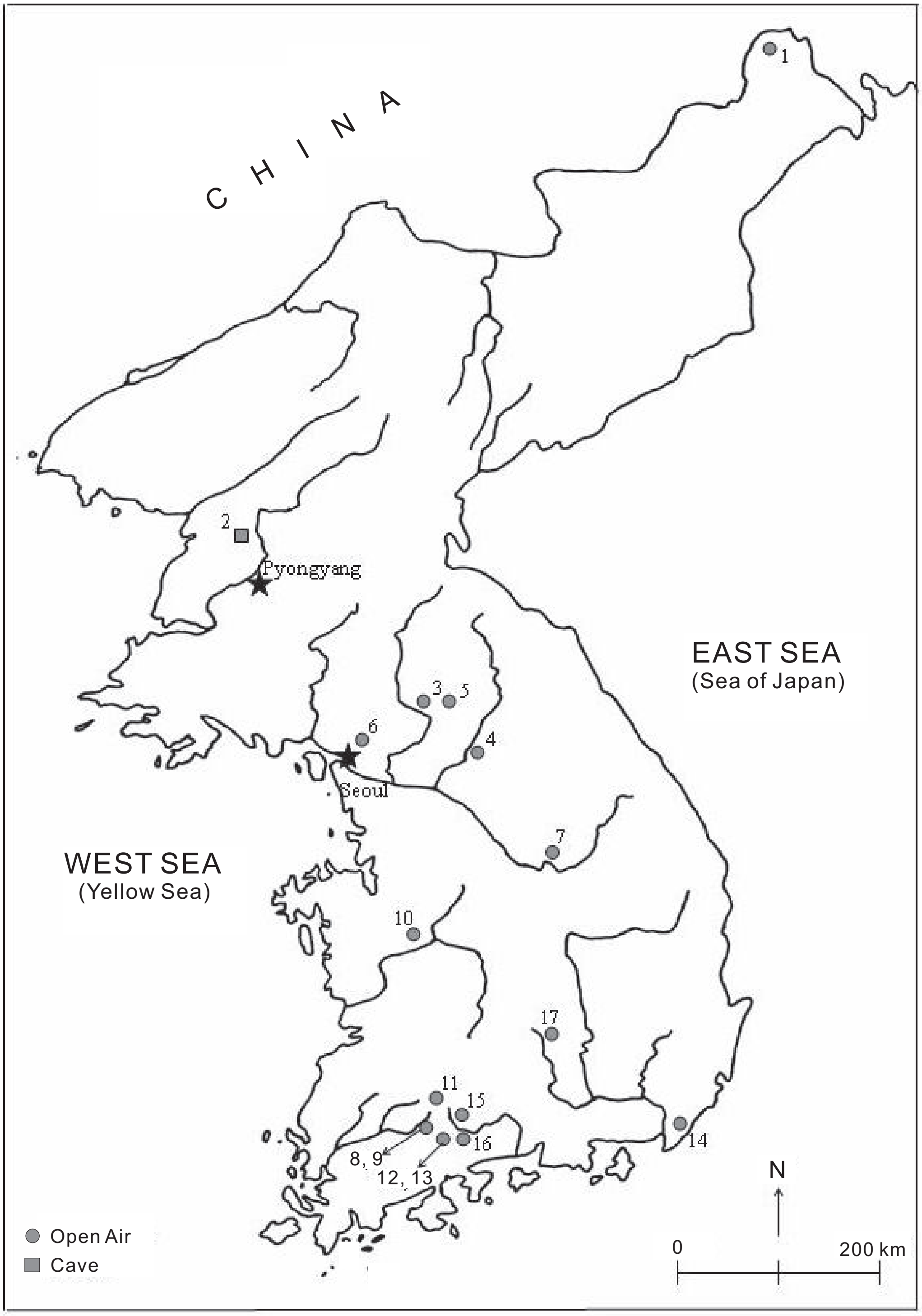
Although Palaeolithic artifacts were initially discovered at the open-air site of Dongkwanjin in the northeastern region of the Korean Peninsula in 1935, the presence of microliths in Korea was only firmly established with their discovery at Kulpori (North Korea) in 1963–1964 and Sokchangni (South Korea) in 1964. Since the 1980s microliths have been recovered from excavations and surveys from at least 17 sites, the majority in South Korea. In this review, the primary Korean microlithic assemblages are discussed, along with the topics of chronology, raw material usage, and artifact typology and technology. Finally, the Korean microliths are evaluated in terms of their position in the broader Northeast Asian picture.

PRIMARY MICROLITHIC ASSEMBLAGES

To date, microliths have been discovered in at least 17 sites in Korea (Figure 6.1; Table 6.1). What follows is a brief description of the primary sites from the northern, central, and southern regions of the Korean Peninsula. Discussion of recent developments in palaeoanthropological studies in modern day North Korea is difficult given the current state of that country's economic and political situation. The severe economic conditions, in addition to a general 'closed door' policy, has resulted in a significant decrease in the number of detailed studies carried out in and disseminated from North Korea in the past two decades. Accordingly, it is extremely difficult for a non-North Korean scholar to estimate how many palaeoanthropological research projects are currently being undertaken or have been carried out over the course of the past decade or so. Fortunately, due to the popularity of archaeology and an economy that is capable of supporting such social scientific research in South Korea, many archaeological surveys and excavations have been carried out south of the Demilitarized Zone (at the 38th parallel separating North and South Korea), particularly over the course of the past two decades. As a result of this interest there has been a significant increase in our overall knowledge of microlithic studies in South Korea (Chang 2002; Norton 2000).

NORTHERN KOREAN PENINSULA

Mandalli is a cave site located 20 km east of Pyongyang, the present day capital city of North Korea. Three stratigraphic levels were determined during excavations, with the most recent one containing Neolithic pottery sherds and bone tools. Mandalli is one of the few Palaeolithic sites on the Korean Peninsula discovered to date that has revealed Upper Palaeolithic artifacts in the same context as *Homo sapiens* remains as well as a large palaeontological assemblage. These Pleistocene deposits were discovered in the middle stratigraphic level. The *H. sapiens* accumulation comprises a calvaria, a mandible, and fragments of another mandible, humerus, femur, and innominate. In addition, the associated faunal assemblage consists of extant animal species, including *Vulpes vulpes*, *Sus* sp., and *Cervus nippon,* and the extinct *Hyaena* sp. Thirteen artifacts were



1. Kulpori; 2. Mandalli; 3. Sangmuryongni; 4. Hahwagyeri; 5. Jangheungni; 6. Millakdong; 7. Suyanggae; 8. Noeundong; 9. Hwasun; 10. Sokchangni; 11. Okkwa; 12. Wolpyeong; 13. Kokcheon; 14. Jungdong and Jwadong; 15. Kumpyung; 16. Juksan; 17. Imbulli.

Figure 6.1: Primary microlithic yielding localities on the Korean Peninsula (see Table 6.1 for site descriptions).

Table 6.1: Primary microlithic localities on the Korean Peninsula.

Location No. on map	*Site Name*	*Open-air/ Cave Site*	*Years Excavated*	*Age Designation*	*Dating Method/ Technique*	*Primary Raw Material*
1	Kulpori	Open-air	1963–1964	Late Pleistocene–Holocene	Artifact assemblage composition	No data
2	Mandalli[1]	Cave	1979–1980	Late Pleistocene/Holocene	Biostratigraphy/ artifact assemblage composition	Obsidian, quartz
3	Sangmuryongni	Open-air	1987–1988	Late Pleistocene	Artifact assemblage composition	Obsidian, quartz
4	Hahwagyeri	Open-air	1991	Terminal Pleistocene	Artifact assemblage composition	Obsidian, crystal quartz
5	Jangheungni	Open-air	1998–2000	24,200 ± 600 BP (SNU00-381)	^{14}C	Obsidian, quartz
6	Millakdong	Open-air	1994–1995	Terminal Pleistocene–Holocene	Artifact assemblage composition	Shale, quartz
7	Suyanggae	Open-air	1983–1985, 1996, 2001	c. 18,630 BP (UCR-2078) c. 16,400 BP (no Lab No. given)	Artifact assemblage composition/^{14}C	Shale
8	Noeundong	Open-air	1998–1999	Late Pleistocene	Artifact assemblage composition	Hornfels, quartz
9	Hwasun	Open-air	1986–1989	c. 15,000 years ago	Artifact assemblage composition	Quartz, hornfels
10	Sokchangni	Open-air	1967, 1990–1992	Late Pleistocene/ 20,830 ± 1880 BP (AERIK-8)	Artifact assemblage composition/^{14}C	Shale, quartz, porphyry
11	Okkwa	Open-air	1990	Late Pleistocene	Artifact assemblage composition	Tuff, porphyry
12	Wolpyeong	Open-air	1995, 1998, 2001	c. 14,000–12,000 years ago	Artifact assemblage composition	Rhyolite
13	Kokcheon	Open-air	1986–1989	Late Pleistocene	Artifact assemblage composition	Quartz, porphyry
14	Jungdong and Jwadong	Open-air	1992–1993	Late Pleistocene	Artifact assemblage composition	Tuff, porphyry, quartz
15	Kumpyung	Open-air	1988	Late Pleistocene	Artifact assemblage composition	Tuff, porphyry
16	Juksan	Open-air	1990	Late Pleistocene	Artifact assemblage composition	Tuff, porphyry
17	Imbulli	Open-air	1989	Late Pleistocene	Artifact assemblage composition	Tuff, porphyry

1. Mandalli is the only microlithic site in Korea that has also fossils, in addition to human remains, in the same context.

recovered during excavations, of which seven were classified as microblade cores. Obsidian was the primary raw material utilized to produce these artifacts. Two pieces of deer antler appear to have been worked as well. In the lowest stratigraphic level only a palaeontological assemblage was recovered during excavations. Even though Mandalli lacks absolute dates, the presence of microblade artifacts in association with modern humans directly underlying Neolithic deposits suggests an Upper Pleistocene–Holocene period of human occupation. The presence of hyaena remains also indicates that human occupation of the cave was probably not continuous even at this late stage of cultural development (Kim *et al.* 1990; Norton 2000; Park 1992; Seo 1990).

CENTRAL KOREAN PENINSULA

In 1964 Sokchangni had the distinction of being the first Palaeolithic site discovered and excavated in South Korea. Between 1964 and 1992 it was excavated 12 times revealing Lower Palaeolithic, Upper Palaeolithic, and Mesolithic residues (Figure 6.2). The Lower Palaeolithic deposits include choppers, chopping tools, cores, and unifacial flakes produced on local quartz and quartzite river cobbles. The Upper Palaeolithic industry is comprised of flakes and blades manufactured on non-local high quality obsidian, quartz crystal, and rhyolite. Evidence of three habitation sites with hearths may also have been discovered in the Upper Palaeolithic stratigraphic level. Two ^{14}C dates exist for the Upper Pleistocene deposits (c. 20,830 BP and c. 30,690 BP). Further support for an Upper Palaeolithic occupation between c. 20,000 BP and c. 17,000 BP is the presence of vertical soil cracks that Korean geologists have traditionally used as representative evidence of the Last Glacial Maximum (LGM) on the Korean Peninsula. In a level situated above the Upper Palaeolithic deposits, microcores, microblades, microburins, and thumbnail scrapers were discovered (Figure 6.3). It has been difficult to obtain solid ^{14}C dates from this level due to disturbance by farmers over the course of the past five centuries, though it is believed to date to the terminal Pleistocene/Holocene transitional period (Lee and Kim 1992; Sohn 1993).

Suyanggae is an open-air Upper Palaeolithic site located about 100 km southeast of Seoul, along the upper South Han River in Chungbuk Province. It was excavated between 1983 and 1985 by Chungbuk National University as part of a salvage archaeology project preceding construction of the Chungju Dam (Figure 6.4). The presence of anvils, used cores, 18 refitted flakes, and debitage, in addition to a concentration of 48 tanged points suggested to the excavators that Suyanggae represents a multi-occupation site that often served as a lithic workshop. Five separate stratigraphic levels were distinguished, with a diversity of typical flake tools, cores, hammerstones, and anvils recovered

Figure 6.2: Overview of the Sokchangni site (photo from Yonsei University Museum 2001:210; reproduced with permission).

Figure 6.3: Microblade core (length 32 mm) from Sokchangni site (photo from Yonsei University Museum 2001:217; reproduced with permission).

Figure 6.4: Overview of the Suyanggae site (photo from Lee and Woo 1998:85; reproduced with permission).

from level 5 and a number of tanged points, microcores and microcore blades exposed directly above it in level 4 (Figure 6.5). ^{14}C dates taken on associated charcoal suggests an occupation age range between c. 18,630 BP and c. 16,400 BP for level 4, which is the layer where the heaviest concentration of lithics was recovered (Lee 1984, 1985; Lee and Woo 1997; Lee and Yun 1994).

Even though most of the 195 microcores from Suyanggae were produced on local siliceous shale (86%), a few were made on non-local obsidian (7%), and porphyry and chert (6.4%). The interesting aspect of the obsidian utilized for the production of microblades at Suyanggae was that neutron activation analysis of the microblade cores indicated three separate sources for the obsidian. This suggests a number of interesting possible scenarios, including a hunter-gatherer group that traveled widely in search of obsidian, traded with other groups, or that different nomadic tribes occupied Suyanggae possibly at different times or even at the same time (Lee 1984, 1985; Lee and Woo 1997; Lee and Yun 1994).

The open-air site of Hahwagyeri is located along the Hongchon River in Kangwon Province. It was excavated in 1990 and 1991 by Kangwon National University Museum. Hahwagyeri is located in an ecotone where several streams meet rolling hills and with mountains as a close backdrop. This would have been an ideal location for hunter-gatherer groups to successfully hunt and fish and thus would have facilitated long-term occupation of the site. As a result of the excavations, 2609 lithic artifacts were recovered including 21 barbs, 36 arrowheads, 27 microblade cores, and 514 microblades (Figures 6.6 and 6.7). The density and wide diversity of stone tools and debitage found at Hahwagyeri suggested to the excavators that this was a long-term encampment where flintknapping took place regularly, which is additional support for the ecotone hypothesis. The microblades were primarily produced on obsidian, crystal, and quartz. It has been suggested that the obsidian used to produce the stone implements at Hahwagyeri originated from Paektusan, the highest mountain on the Korean Peninsula, though sourcing studies have yet to be conducted (Choi 1992, 1994).

SOUTHERN KOREAN PENINSULA

A number of detailed archaeological surveys carried out in the southwestern region of the Korean Peninsula over the past 15 years have revealed 27 Palaeolithic open-air sites, with the heaviest concentration of localities in the Bosung River basin. The largest and most extensively studied locality found in this region is Wolpyeong. Excavations conducted in 1998 and 2001 by Chosun University revealed cultural deposits within a 66,000 m^2 area. Eight separate stratigraphic levels were identified with the heaviest concentration of artifacts in layers 4 (9465 specimens) and 3 (1300 specimens). Among the lithics, 30 conjoinable flakes and cores were discovered. These characteristics at Wolpyeong suggest that this was a place that served as a home base for extended stays and/or was visited fairly frequently. Blades, microblades, microblade cores, hammers, anvils, an assortment of flakes, and debitage were discovered here. The microblade cores were made primarily of rhyolite, while the rest of the stone tools were produced on vein quartz, with a smaller percentage made of tuff and rhyolite (Figure 6.8). Vein quartz was available locally, while rhyolite and tuff sources are located roughly 10 km away. Based on comparative studies with lithic assemblages from other sites (e.g., Suyanggae) and geologic reconstruction, it is thought that Wolpyeong was occupied between c. 14,000 BP and c. 12,000 BP (Lee 1997, 2002a, 2002b).

CHRONOLOGY

Chronological reconstructions of Palaeolithic sites in Korea have traditionally been problematic. For instance, the age of occupation of the Lower Palaeolithic site of Chongokni has led to a spirited debate with dates ranging between 350,000 years ago and c. 30,000 BP (Bae 2002; Danhara *et al.* 2002; Norton 2000; Norton *et al.* 2004; Seong 2004a; Yi 1989, 1996; Yi *et al.* 1998). One of the primary reasons of the difficulty of obtaining absolute dates in Korean archaeological studies is that the acidic soil prohibits preservation of biodegradable materials at just about all open-air sites that date to the Pleistocene, resulting in a paucity of reliable ^{14}C dates for Palaeolithic sites.

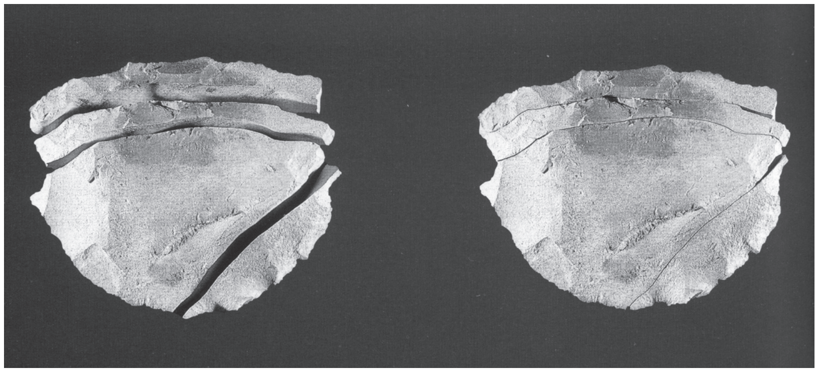


Figure 6.5: Boat-shaped microblade core (length 71 mm) from Suyanggae site (photo from Lee and Woo 1998:124; reproduced with permission).

Figure 6.6: Microblade core (length 25 mm) from Hahwagyeri site (photo from Yonsei University Museum 2001:51; reproduced with permission).

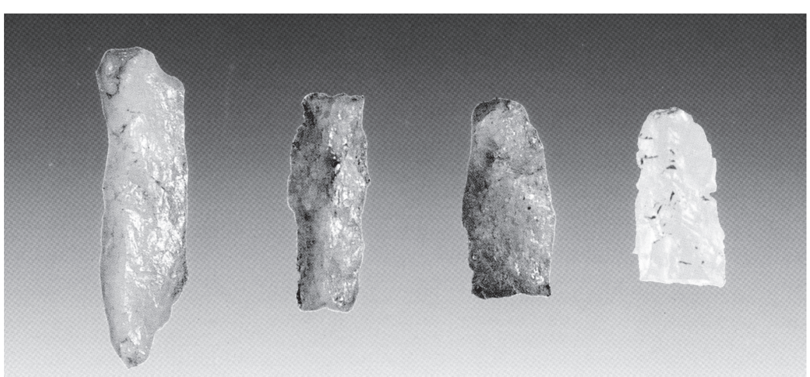


Figure 6.7: Quartz microblades (far left blade – length 21 mm) from Hahwagyeri site (photo from Yonsei University Museum 2001:120; reproduced with permission).

Currently, the earliest dated microliths on the Korean Peninsula are from the Jangheungni site in central Korea with a ^{14}C date of 24,200±600 BP (but see Seong, this volume). Sokchangni and Suyanggae have ^{14}C dates that range between c. 20,000 BP and c. 16,000 BP indicating that microlithic technology was more prevalent at the beginning of the LGM (Chang 2002; Lee and Woo 1998; Lee and Yun 1994).

Instead of utilizing radiocarbon dating, Korean archaeologists have often had to rely on other markers in order to build a general chronological sequence for the transition from blade to microblade technology. For instance, determining presence/absence of AT (Aira-Tanzawa) tephra at archaeological sites in Korea has become more common over the past decade. The AT tephra originates from a volcanic explosion of the Aira caldera that occurred at c. 24,000 BP in Kyushu (Japan), and its presence at archaeological sites as far north as Chongokni and the Shandong Peninsula in northeastern China indicates the extent of the explosion itself. The presence of AT tephra is often used to date many of the Upper Palaeolithic sites in Korea (for example, Koraeri Miryang), though it has sometimes been employed to support chronological reconstructions of Lower Palaeolithic sites as well (such as Chongokni). Even though the AT tephra predates most microlithic sites in Korea, its presence contributes to the reconstruction of chronological sequences of the transition from blade to microblade technologies (Imamura 1996; Norton 2000; Norton *et al.*2004; Seong 1998; Yi *et al.* 1998).

Another useful marker is the presence of vertical soil cracks in stratigraphic profiles (see above). Although there is no conclusive evidence for the formation of these cracks it is believed that they form during cold climates (further studies in Alaska appear to support this hypothesis). Accordingly, the presence of these 'ice wedges' is often thought to represent a chronological period around the LGM. Many of the microcores from the Korean Peninsula are found in stratigraphic levels that either contain these ice wedges or are located directly above them (Lee and Kim 1992; Yi 1989).

Figure 6.8: Microblade core (length 37 mm) from Wolpyeong site (photo from Yonsei University Museum 2001:246; reproduced with permission).

In many cases, site chronologies have been based on lithic typologies. For instance, microcores from Suyanggae, Kokcheon, Taejon, and the lower layer of Sokchangni are characterized as being wedge-shaped with long, single striking platforms. These are considered to be the oldest type of microcore present on the Korean Peninsula. The younger group of microcores display a general decrease in size, a greater diversity in raw material utilized, a simplification of technological processes, evidence of multiple striking platforms on individual cores, and the presence of more exhausted cores. Representative microlithic assemblages are from Wolpyeong, Sangmuryongni, Jungdong, Hahwagyeri, and the upper layer of Sokchangni (Chang 2002).

It is still not well established when microlithic industries disappear from the Korean Peninsula. In general, a diversity of small quartz tools, in addition to pottery sherds and ground stone tools, appear in stratigraphic deposits above microlithic tools. Examples of this are found at Hahwagyeri and Sokchangni. Probably the most representative site of this transition is Kosanni, located on Cheju Island off the southern coast of Korea and dating presumably to c. 10,400–10,200 BP. During the excavations at Kosanni 470 microblades were found in association with 700 projectile points, scrapers, bifaces, burins, and over 1900 Chulmun pottery sherds. This combination of tool types in direct association with pottery is representative of the Upper Palaeolithic/Incipient Neolithic transition in Korea (CNUM 1998; Choi 1994; Norton 2007; Park 1992).

RAW MATERIALS

One possible explanation for the origin of blade and microblade technology in Korea is based on the quality of raw material. It is generally accepted that quartz and quartzite stone tools normally comprise 90–95% of Palaeolithic assemblages in Korea. However, quartz and quartzite are difficult raw materials to work, particularly in the production of uniform tools (Kuhn 1995; Whittaker 1994). With the increased need to produce more standardized stone implements through time it has been suggested that higher quality raw materials were utilized (e.g., obsidian, shale, and tuff), often deriving from non-local sources (Chang 2002; Seong 1998, 2004a). The increased utilization of different raw materials appears to coincide with the transition from the Lower to Upper Palaeolithic in Korea, similar to what occurred in China (Gao and Norton 2002). As evidence from other regions of Northeast Asia (for example, Mongolia: Brantingham *et al.* 2000) suggests, however, raw material constraints cannot completely explain the increased diversity that is associated with the Lower to Upper Palaeolithic transition as it is clear that knappers were capable of getting the most out of the local quartz and quartzite river cobbles in Korea, for example, at the Hahwagyeri site (Figure 6.7).

Regional diversity in raw material utilized in the production of microcores is present in Korea and can be divided into the northern, central, and southern regions. In the north, obsidian believed to have originated from the Paektusan source was the raw material of choice for microcores and microblade production during the terminal Pleistocene (for example, at the Mandalli site). In the central region of the Korean Peninsula, siliceous shale is the most common raw material utilized as evidence from the Suyanggae and Sokchangni lithic assemblages indicates. In the southern region of Korea, microcores were produced on volcanic tuff, with some also produced on siltstone, hornfels, andesite, and obsidian (e.g., at the Wolpyeong, Taejon, and Okkwa sites; Figure 6.9) (Lee 2002a; Seong 1998; Yi *et al.* 1990a). It may be possible that the obsidian found in the southern region originated from the Paektusan source in the north. However, the more parsimonious explanation for the presence of obsidian in the southern region of Korea is that it originated from sources on Kyushu Island in Japan. Only sourcing studies will help to clarify this question.

TYPOLOGY AND TECHNOLOGY

Typological reconstructions of the Korean microcore industries are generally based on the condition of the striking platform, location of microflaking, blank types, and blank preparation. The majority of the Korean microcores belong to the wedge-shaped core category. However, some microcores have been characterized as being conical instead. It is believed that the conical-shaped cores are simply more exhausted forms of wedge-shaped cores. In addition to microcores and microblades, Korean microlithic assemblages are generally comprised of burins, side scrapers, end scrapers, borers, and tanged points, the latter tool type similar to that found in penecontemporaneous Japan (Chang 2002; Lee 2002a; Matsufuji 1987, 1997; Seong 1998).

For typological studies of Korean microlithic industries perhaps the most significant site is Suyanggae. This site is important not only due to the large number of microcores and microblades that were excavated *in situ*, but also because the first attempts of typological and technological analyses of Korean microlithic industries were conducted on the associated artifacts. The Suyanggae microcores can be classified into three types based on the morphology of the striking platform, plain cortex, and flake scar direction. Type I produced microblades that were semi-lunate or boat-shaped through pressure flaking on unprepared platforms. Type II cores had platforms prepared by longitudinal flaking, followed by pressure flaking on the resulting microblades. Type III cores had platforms prepared initially by latitudinal pressure flaking (Lee and Woo 1998; Lee and Yun 1994). These microblade manufacturing techniques are similar to the Yubetsu method in Japan (Aikens and Higuchi 1982), and the Hetao and Sanggan techniques in China (Chen 1984; Gai 1985).

Preliminary comparative studies have been conducted on the Suyanggae (central Korea) and Wolpyeong (southern Korea) microcore assemblages. It has been suggested that variation exists on the striking platforms of the microcores from the two sites. In particular, analyses have indicated that no further retouch was conducted on the Suyanggae microcores once the spall was detached for the modification of the striking platform. In the case of the microcores from the Wolpyeong site, it is believed that additional retouch was

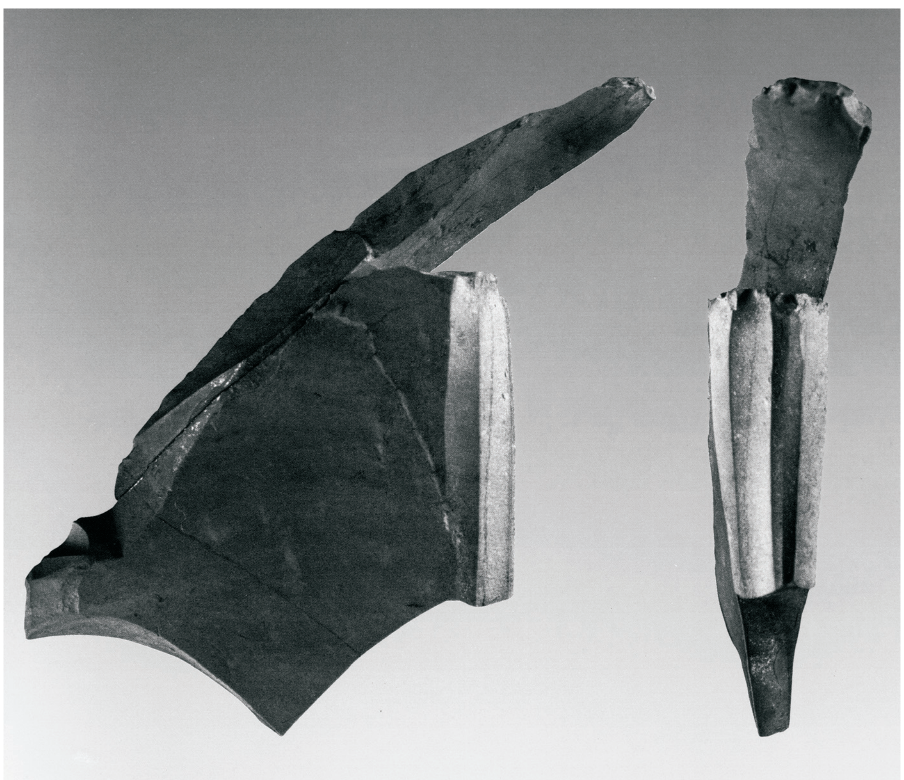


Figure 6.9: Microblade core (length 45 mm) with refits from Okkwa site (photo from Yonsei University Museum 2001:53; reproduced with permission).

carried out which served to further flatten the striking platform. The inter-assemblage variation could be the result of a number of different developments: 1) to some extent different stages of the reduction process; 2) variation in raw materials (Suyanggae: siliceous shale; Wolpyeong: rhyolite and tuff); and/or 3) different functions employed by hunter-gatherers. The additional retouching on the Wolpyeong microcores has led to suggestions that Suyanggae is the older one of the two sites. Also suggestive is that Suyanggae has a ^{14}C date range of c. 18,000–16,000 BP, while artifacts from Wolpyeong have many similarities with the stone toolkit from the Shirataki Hattoridai site in Japan with a ^{14}C date of c. 14,000 BP (Chang 2002; Lee 2002a).

ORIGIN AND DISPERSAL OF KOREAN MICROLITHIC TECHNOLOGY

East Asian microlithic technology is most noted for the presence of wedge-shaped cores that initially appeared in northern China between c. 50,000 years ago and c. 28,000 BP. Korean microliths are considered as one branch of the general East Asian tradition developing sometime after this period. It is relatively easy to build a case for the origin of microlithic technology on the Korean Peninsula to have been a direct result of diffusion from China with some of the technology eventually moving to the Japanese Archipelago through bilateral relations with hunter-gatherer groups from that region. It is not as easy to develop a rationale for the indigenous development of microlithic technology in Korea. Let us first examine the case for diffusion of microlithic knapping technology from China and interaction with hunter-gatherers from Japan.

Up to the early 1970s it was generally believed in China that microliths were only associated with Neolithic and Bronze Age cultural periods. It was not until 1972 that the development of microlithic industries could be pushed back to at least the Upper Palaeolithic. Microcores first began to appear in Chinese Upper Palaeolithic sites between c. 50,000 years ago to c. 28,000 BP. The two primary early sites for the appearance of microliths in China are Salawusu (Uranium-series dates range: c. 50,000–37,000 years ago; ^{14}C date c. 35,340 BP) and Shiyu (^{14}C date c. 28,135 BP). These early dates notwithstanding, microliths do not become common in China until the Upper Palaeolithic/Neolithic transitional stage. It is generally believed that Middle Palaeolithic complexes from Mongolia and/or the Dyuktai culture from Siberia influenced the development of microlithic technology in northern China (Brantingham *et al.* 2000; Chen 1984; Gai 1985; Gao and Norton 2002; Yi and Clark 1985; Zhang 2000).

Jangheungni, with ^{14}C dates of around 24,000 BP, currently represents the earliest appearance of microliths in Korea, followed by Sokchangni and Suyanggae with ^{14}C dates between c. 20,000 BP and c. 16,000 BP. All of these dates postdate the appearance of microliths at Salawusu and Shiyu in China, suggesting that microlithic technology first arose in China and then later spread to other regions of East Asia.

However, the recent discovery of tanged points in stratigraphic levels radiocarbon dated to 38,500 ± 1000 BP (SNU00–261) (Bae and Kim 2003) at the Yonghodong site in central Korea indicates that more advanced lithic technology could have arrived on the Korean Peninsula earlier than generally accepted (Han 2002). Tanged points and microcores are sometimes found in the same stratigraphic levels in Korea [for instance, at Suyanggae (Lee 1984, 1985; Lee and Woo 1998; Lee and Yun 1994)]. Only additional research at the Yonghodong site will reveal whether the ^{14}C date is reliable or the stratigraphic units with two tanged points were subjected to some degree of mixing of younger and older deposits. In addition, microliths have not been found in the same context as the tanged points at Yonghodong. However, if further studies support the Yonghodong findings it could be used as evidence for at least a semi-indigenous development of microlithic technology on the Korean Peninsula that is penecontemporaneous with that from China.

It is clear that microlithic technology discovered on the Korean Peninsula was very similar to what has been found in the Russian Far East around the same time. For instance, tanged points similar to those from Suyanggae are known from the open air site of Ustinovka 1 in the eastern Primorye region of the Russian Far East, indicative of possible cultural contact. Similar backed knives and tanged points appear in archaeological deposits at the Oita site on Kyushu as well suggesting that the technology could have either diffused through Sakhalin Island in the north or from the southern Korean Peninsula. Similar lithic techniques (e.g., Yubetsu, Horoka, and Togeshita) across a very broad region (Korea, Japan, and the Russian Far East) suggest at least minimal cultural contact. The presence of obsidian from Hokkaido in archaeological deposits in Sakhalin and obsidian in southern Korea possibly from nearby Kyushu is further evidence for cultural contact and/or hunter-gatherer migrations throughout the circum-Sea of Japan region (Aikens and Higuchi 1982; Imamura 1996; Kononenko 1997; Kuzmin 2002; Kuzmin *et al.* 2002; Matsufuji 1987, 1997).

FUTURE DIRECTIONS

Although a number of well excavated and studied sites close to 30 have been found, there are still a few limitations that hinder more comprehensive research on the origin and development of microlithic industries on the Korean Peninsula. For instance, probably the most significant problem with the current state of Korean microlithic studies is the dearth of known research in North Korea. Still the two best-known microlithic sites in North Korea are Kulpori and Mandalli, but these were discovered and excavated over a quarter of a century ago. Hopefully, in the future with changes in the political and economic environment on the Korean Peninsula, more collaborative research that involves North Korean scholars will facilitate research geared toward reconstructing the origin and development of microlithic technology across the entire Korean Peninsula.

Three other factors would greatly strengthen the quality of microlithic research in Korean Palaeolithic studies. Firstly, obtaining more absolute dates is critical to reconstructing Upper Palaeolithic lifeways. Due to the paucity of radiocarbon dates it is difficult to develop concrete chronological sequences for site occupation on the Korean Peninsula during the terminal Pleistocene and into the Early Holocene. Secondly, more detailed raw material sourcing analyses are needed to reconstruct general hunter-gatherer mobility patterns and levels of interactions, similar to what has been done in investigating Upper Palaeolithic–Early Neolithic hunter-gatherer movement between Sakhalin and Hokkaido (Kuzmin *et al.* 2002). Thirdly, a paucity of associated faunal remains from Korean sites has resulted in a lack of attempts at reconstructing subsistence patterns of Upper Palaeolithic hunter-gatherers. We are currently planning research specifically designed to address many of these questions.

In the future more advanced typological and technological reconstructions will be conducted on the Korean materials. In addition, with increased studies of these microlithic sites, a stronger chronological model will be developed. It is believed that more detailed analysis of microliths from recently excavated sites (e.g., Wolpyeong) should reveal information regarding the reduction sequences of the microcores. Future research on Korean microlithic industries will lead to a more comprehensive synthesis of hunter-gatherer lifeways and their interaction with other groups in Northeast Asia.

ACKNOWLEDGEMENTS

We would like to thank the editors, Yaroslav Kuzmin, Susan Keates, and Chen Shen for inviting us to contribute this manuscript to the microblade volume and especially for having the patience for our missing every submission deadline by at least several weeks! We thank one anonymous reviewer who helped in tightening up the logic in the manuscript and the following archaeologists in Korea for permission to reproduce figures of their sites and artifacts: Bokkyu Choi, Samyong Choi, Gi Kil Lee, Heonjong Lee, and Yungjo Lee. We take full responsibility for any errors that may be present in this paper.