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The current state of Korean paleoanthropology

The hominid fossil and Paleolithic archaeology records from the Korean Peninsula are extensive, but relatively little is known about the Korean human evolutionary record outside this region. The Korean paleoanthropological record is reviewed here in light of major research issues, including the hominid fossil record, relative and chronometric dating, lithic analysis, hominid subsistence, and the presence of bone tools, art and symbolism. Some of the major conclusions drawn from this review include: (1) hominid fossils have been found in nine separate sites on the Korean Peninsula; (2) possible *Homo erectus* fossils are present in North Korea; (3) Ryonggok Cave, in North Korea, has exposed the remains of at least five archaic *Homo sapiens* individuals; (4) a possible burial of an anatomically modern *Homo sapiens* child, discovered in Hungsu Cave in South Korea, has been tentatively dated to roughly 40,000 years ago; (5) handaxes and cleavers have been found at a number of sites near Chongokni and they appear to date to at least 100,000 years ago; and (6) taphonomic studies are necessary for addressing issues related to determining the nature of hominid-carnivore interaction over similar resources (e.g. carcasses and shelter); and the presence/absence of Early Paleolithic bone tools, art, and symbolism in Korea.

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Introduction

A great deal of attention has been paid to the biological and behavioral transition between archaic and modern humans (Smith & Spencer, 1984; Mellars, 1989; Trinkaus, 1989; Mellars & Stringer, 1989, 1992; Akazawa *et al.*, 1992; Bräuer & Smith, 1992; Aitken *et al.*, 1993; Nitecki & Nitecki, 1994; Klein, 1995; Clark & Willermet, 1997). Even though much research has been done dealing with the origins of anatomically modern humans in East Asia, the vast majority of it has concentrated on the hominid fossil records of China and Southeast Asia (Thorne & Wolpoff, 1981, 1992; Wolpoff *et al.*, 1984; Stringer, 1990; Pope, 1992; Lahr, 1995; Wu & Poirier, 1995; Etler, 1996). Despite extensive Pleistocene hominid and Paleolithic[1] archaeological records, one region of East Asia that has been largely neglected is the Korean Peninsula (encompassing modern day North and South Korea) (Figure 1, Table 1). The main difficulty for western scientists is that the majority of the literature has been published in Korean. The major articles in English dealing with the Korean paleoanthropological record are the results

1. Due to the absence of a clearly definable Middle Paleolithic in East Asia (Gao, 1999; Gao & Norton, n.d.), in this paper the Paleolithic sequence is divided into Early and Late Paleolithic, rather than the more traditional Lower, Middle, and Upper Paleolithic. Archaeological sites not associated with identifiable Late Paleolithic stone tools (i.e., blades) or with any other characteristically modern archaeological traces (e.g., presence of art and symbolism) are referred to as Early Paleolithic (see Table 1).

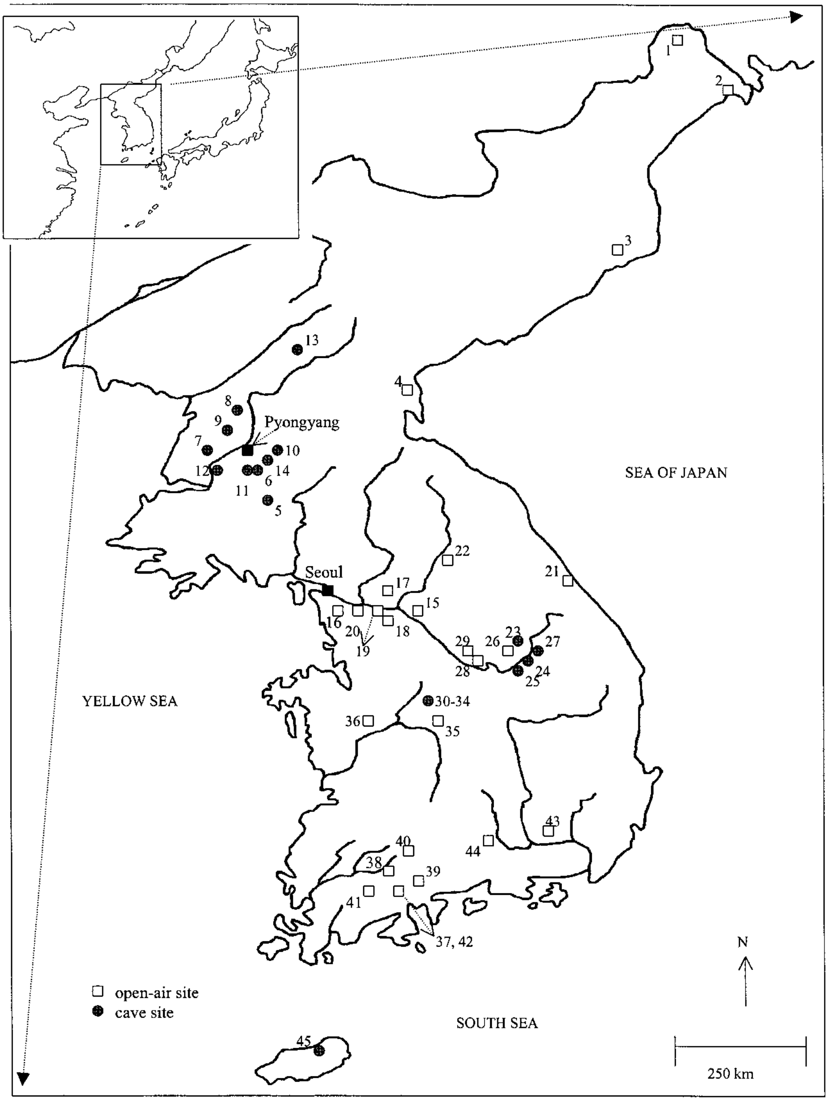

Figure 1. Locations of major Paleolithic and Pleistocene paleontological sites on Korean Peninsula. See Table 1 for site descriptions.

of doctoral dissertation work conducted in Korea by Korean nationals (e.g., Yi & Clark, 1983; Bae, 1992*a*). The main goal of this paper is to present a review of the paleoanthropological record of Korea based predominantly on literature available only in Korean. It is clear that there is sufficient material in this region to address current issues in East Asian paleoanthropology; in particular, the biological and behavioral transitions between archaic and modern humans in East Asia, and from a broader perspective, the Old World.

The earliest hominid occurrences in the Korean Peninsula date to between 400,000 and 600,000 years ago (Y. C. Park, 1992). Accordingly, this paper examines the Middle and Upper Pleistocene human evolutionary records of Korea. It provides a brief synthesis of the evidence on paleoenvironmental reconstruction, dating (both absolute and relative), lithic analysis, the hominid fossil record, hominid subsistence strategies, and the presence/absence of Early Paleolithic bone tools, art, and symbolism.

This review deals predominantly with current issues in human evolutionary research found south of the 38th parallel (i.e., division between modern day North and South Korea). Due to access constraints to paleoanthropological material, relatively little is known about the present state of North Korean human evolutionary research *vis-à-vis* South Korea. Accordingly, it is difficult to synthesize research being done in the northern part of the Korean Peninsula (e.g., see Lee, 1982; Han, 1990; Park, 1992; Yi, 1992; Chung, 1995, 1996).

Present and past environment of Korea

The Korean Peninsula is located between 33′06′–43′01′N and 124′11′–131′53′E and is roughly 1000 km long and 300 km wide. It is surrounded by the West Sea/Yellow Sea to the west, East Sea/Sea of Japan to the east and the South Sea to the south (Figure 1). Manchuria and Siberia are situated to the north. Approximately 70% of the Korean Peninsula is mountainous. The Taebaek mountain range forms the backbone of the Korean Peninsula, running north and south along the eastern coast (Kim, 1983; Bae, 1988; Yi, 1989; Nelson, 1993).

There are three main woodland types on the Korean Peninsula (warm temperate, temperate, and cold temperate woodlands) with substantial overlap along the boundaries. The warm temperate vegetation area includes the southern coast and Cheju Island and is characterized by broad-leaved evergreen woodland. The majority of the Korean Peninsula is covered by temperate deciduous broadleaf woodland. The third vegetation type, cold temperate, is found predominantly in the northern areas of the Peninsula, and is characterized by evergreen coniferous woodland (Bae, 1988; Yi, 1989).

Kong (1991) divides the different plant types found on the Korean Peninsula into arctic-alpine, alpine, and endemic alpine. Of the 419 plant species identified, Kong (1989, 1991) determined 239 to be alpine, and of these, 139 species were found exclusively in the northern part of the Korean Peninsula. Kong (1991) suggests that the reason why alpine species are found in the southern part of the region is that the lowlands may have served as a refugium during periods of Pleistocene glacial advances. The Pleistocene vegetation boundaries of Korea were similar to the present day in that they were characterized by mixed woodland of coniferous and deciduous broad-leaved trees which moved north and south with fluctuating temperatures (Kong, 1991; Bae, 1992*a*).

Many Pleistocene sites in Korea, particularly in the northern region, have yielded animal bones, facilitating paleoenvironmental reconstruction and faunal correlation. The sites of Komunmoru, Daehyundong, Soongnisan, Turubong Cave No. 2, and Chommal Cave contain faunas that have been correlated to the Middle, Middle–Upper, and Upper Pleistocene (Table 2). Komunmoru, located in North Korea, is the oldest site on the Peninsula, biostratigraphically correlated between 400 ka and 600 ka years ago. The fauna is similar to Zhoukoudian Locality 1 lower levels. The presence of *Megaloceros*, *Dicerorhinus*, *Macaca*, and *Bubalus* in this assemblage suggests a warm and humid forested environment during the Middle Pleistocene (Bae, 1992*a*).

Among the taxa that appear in the late Middle–early Late Pleistocene assemblages of Daehyundong and Soongnisan, are *Crocuta*, *Hyaena*, *Capreolus*, *Ovis*, and *Bison* (Table 2). Daehyundong, with a higher percentage of extinct taxa is considered the

Table 1 Major Paleolithic sites and paleontological localities in Korea[1]

Location no. on Figure 1	Site name	Open air/cave	Chronological age	Dating technique[2]	Cultural assignment[3]	Hominid fossils	Archaeological remains	Faunal remains
1	Kulpori	Open air	30–100 ka	Lithic typologies	Early Paleolithic		*	
2	Dongkwanjin	Open air	Upper Pleistocene	Biostratigraphy	Early Paleolithic		*	*
3	Jangdokni	Open air	Upper Pleistocene	Palynology				*
4	Kulchaedok	Open air	Upper Pleistocene	Biostratigraphy				*
5	Haesang	Cave	Middle Pleistocene	Biostratigraphy				*
6	Kommunmoru	Cave	400–600 ka	Biostratigraphy	Early Paleolithic		*	*
7	Yokpori, Daehyundong	Cave	Middle/Upper Pleistocene	Biostratigraphy		*		*
8	Mandalli	Cave	Upper Pleistocene	Biostratigraphy	Early/Late Paleolithic	*	*	*
9	Ryonggok	Cave	400–500 ka/46–48 ka	TL, biostratigraphy	Early Paleolithic	*	*	*
10	Hwachondong	Cave	Upper Pleistocene	Biostratigraphy				*
11	Dokchaegul	Cave	Upper Pleistocene	Biostratigraphy				*
12	Chonchongam	Cave	Middle Pleistocene	Biostratigraphy				*
13	Dokchon, Soongnisan	Cave	Middle/Upper Pleistocene	Biostratigraphy		*		*
14	Kumchon	Cave	Upper Pleistocene	Biostratigraphy		*		
15	Chongokni	Open air	30–270 ka[4]	TL, K/Ar, OSL, IRSL, tephrochronology	Early Paleolithic		*	
16	Kumpari	Open air	30–270 ka	Lithic typologies (similar to Chongokni)	Early Paleolithic		*	
17	Namkaeri	Open air	30–270 ka	Lithic typologies (similar to Chongokni)	Early/Late Paleolithic		*	

Table 1 ***(Continued)***

Location no. on Figure 1	Site name	Open air/cave	Chronological age	Dating technique[2]	Cultural assignment[3]	Hominid fossils	Archaeological remains	Faunal remains
18	Dayulli	Open air	30–270 ka	Lithic typologies (similar to Chongokni)	Early Paleolithic		*	
19	Kawoli	Open air	30–270 ka	OSL, IRSL, lithic typologies (similar to Chongokni)	Early Paleolithic		*	
20	Chuwoli	Open air	30–270 ka	OSL, IRSL, lithic typologies (similar to Chongokni)	Early Paleolithic		*	
21	Shimgokni	Open air	Middle/Upper Pleistocene	Lithic typologies	Early Paleolithic		*	
22	Sangmooryongni	Open air	Upper Pleistocene	Lithic typologies	Early/Late Paleolithic		*	
23	Chommal Cave	Cave	13 ka; 40–66, +30/ − 18 ka	C-14, uranium-series	Early/Late Paleolithic	*	*	*
24	Kumgul	Cave	70–180 ka (600–700 ka?)[5]	ESR, biostratigraphy	Early Paleolithic		*	*
25	Sangsi Rockshelter	Cave	30 ka	Uranium-series	Late Paleolithic	*	*	*
26	Suyanggae	Open air	Late Upper Pleistocene	Lithic typologies	Late Paleolithic		*	*
27	Kunanggul	Cave	Upper Pleistocene	Biostratigraphy	Early Paleolithic	*	*	*
28	Changnae	Open air	17–19 ka	Lithic typologies	Late Paleolithic		*	
29	Myungori	Open air	40–50 ka	Lithic typologies	Early Paleolithic		*	
30	Turubong Cave No. 9	Cave	Upper Pleistocene	Biostratigraphy	Early Paleolithic		*	*
31	Turubong Cave No. 2	Cave	Upper Pleistocene, 32 ka	Biostratigraphy; mass spectrometry	Early Paleolithic		*	*

Table 1 (***Continued***)

Location no. on Figure 1	Site name	Open air/cave	Chronological age	Dating technique[2]	Cultural assignment[3]	Hominid fossils	Archaeological remains	Faunal remains
32	Turubong Saegul	Cave	Upper Pleistocene	Biostratigraphy				*
33	Turubong Hungsugul	Cave	40–50 ka	Biostratigraphy	Early Paleolithic	*	*	
34	Turubong Chonyogul	Cave	Upper Pleistocene	Biostratigraphy				*
35	Saemgol	Open air	Upper Pleistocene	Lithic typologies	Late Paleolithic		*	
36	Sokchangni	Open air	10–300 ka (?)[6]	C-14	Early/Late Paleolithic		*	
37	Kokchon	Open air	Late Upper Pleistocene	Lithic typologies	Late Paleolithic, Mesolithic		*	
38	Okkwa	Open air	10–20 ka	Lithic typologies	Late Paleolithic		*	
39	Kumpyung	Open air	13–15 ka	Lithic typologies	Late Paleolithic		*	
40	Jaewolli	Open air	Upper Pleistocene	Lithic typologies	Late Paleolithic		*	
41	Daechonni	Open air	Upper Pleistocene	Lithic typologies	Early/Late Paleolithic		*	
42	Juksanni	Open air	Upper Pleistocene	Lithic typologies	Early Paleolithic		*	
43	Miryang Kokaeri	Open air	Late Upper Pleistocene	Tephrochronology, lithic typologies	Late Paleolithic		*	
44	Jinju Naechon	Open air	Upper Pleistocene	Lithic typologies	Early Paleolithic		*	
45	Billemot Cave	Cave	Upper Pleistocene	Biostratigraphy				*

Notes: [1]In terms hominid fossils, archaeological material, and faunal remains, a blank space indicates that material is absent or not reported from the site.
[2]Many of the Paleolithic sites from North Korea do not have absolute dates. In addition, many of the cave localities only have faunal remains; accordingly relative dating based on faunal correlations is predominant in this region.
[3]Due to a lack of a clear Middle Paleolithic culture in East Asia (Gao, 1999; Gao & Norton, n.d.) and specifically in Korea, a two stage Paleolithic cultural sequence is employed here (Early/Late Paleolithic).
[4]See text for issues related to chronometric age of Chongokni and nearby sites.
[5]Sohn (1990) postulates a relative date of 600–700 ka based on presence/absence of certain species for the lower stratigraphic layers.
[6]Sokchangni C-14 dates apply only to upper levels. The older dates are estimates based on the stratigraphy and radiocarbon dates derived from the upper layers.

Table 2 Representative terrestrial macromammal fauna from Middle, Middle–Upper, and Upper Pleistocene Korea (after Bae, 1992*a*; Sohn, 1990, 1992)

Family	Genus/species	Common name	Middle Pleistocene (after Komunmoru)	Middle–Upper Pleistocene (after Daehyundong and Soongnisan)	Upper Pleistocene (after Chommal Cave and Turubong Cave 2)
Primates	*Homo* sp.	Hominid		*	*
	Macaca sp.	Macaca	*		*
Carnivora	*Nyctereutes procynoides*	Racoon dog		*	*
	Vulpes vulpes	Fox		*	*
	Ursus spelaeus	Cave bear	*	*	*
	Ursus arctos	Brown bear	*	*	*
	Lutra lutra	Otter		*	*
	Meles meles	Badger	*		*
	Mustela sibricus	Polecat		*	
	Hyaena sp.	Hyaena		*	*
	Crocuta ultima	Spotted hyaena		*	*
	Panthera tigris	Tiger	*	*	*
	Panthera pardus	Snow leopard		*	*
	Panthera spelaea	Cave lion		*	
Proboscidea	Elephantidae sp.	Elephant	*	*	
Perissodactyla	*Dicerorhinus kirchbergensis*	Woolly rhinocerus	*	*	
	Coelodonta antiquitatis	Woolly rhinocerus		*	*
	Equus sp.	Horse		*	*
	Equus sangwonensis	Sangwon horse	*		
	Equus caballus	Dokchon horse		*	*
Artiodactyla	*Sus scrofa*	Pig	*	*	
	Megaloceros sp.	Giant deer		*	
	Megaloceros sangwonensis	Sangwon deer	*		
	Pseudaxis grayi	Sika deer	*		*
	Cervus sp.	Deer			*
	Cervus elaphus	Red deer	*	*	*
	Cervus nippon	Japanese deer		*	
	Capreolus capreolus	Roe deer		*	*
	Ovis cf. *ammon*	Mt. sheep		*	*
	Bos primigenius	Aurochs	*	*	*
	Bison priscus	Bison		*	*
	Bubalus sp.	Water buffalo	*	*	

older of the two sites (Sohn, 1990; Bae, 1992*a*). The co-occurrence of forest dwelling animals (e.g., *Cervus*, *Megaloceros*) with more open-dwelling taxa (e.g., *Capreolus*, *Ovis*, *Hyaena*, *Crocuta*) indicates a period of environmental change. The region was either in the process of changing from warm and heavily forested to a cooler, still moist climate (the environment was still warm and wet enough to support *Bubalus*) or the habitat was subjected to a series of warm–cold fluctuations.

Absence of *Bubalus* and *Dicerorhinus* in the Late Pleistocene faunal assemblages of Chommal Cave, and Turubong Cave No. 2 indicates that the environment became drier and cooler. In addition, the appearance of *Coelodonta* suggests that the cooler climate on the Korean Peninsula was able to support a southward migration of this taxa. This correlates with Kong's (1991) study of the movement of alpine plant species down the Korean Peninsula in light of increasing glaciers. Continued presence of *Capreolus* and *Ovis* from the Middle-Upper Pleistocene to the Upper Pleistocene argues for more open conditions (Table 2).

History of paleoanthropological research in Korea

Paleoanthropological research in Korea began over 60 years ago, with excavations of the Paleolithic open-air sites of Dongkwanjin and Yondaebong in the northern region of the Korean Peninsula in the mid-1930s (Bae, 1992*b*; Lee, 1994; Lee *et al*., 1994; Chung, 1995). Due to political instability in Korea following World War II and the Korean Conflict, few human evolutionary studies were conducted. However, starting in the early 1960s an increase in paleoanthropological research occurred.

The majority of Pleistocene sites in North Korea are limestone cave localities, and of these, most are located around the present-day capital of Pyongyang (Figure 1). Paleolithic excavations in North Korea began in the 1960s with the discovery and subsequent work at Kulpori, Komunmoru, Chongchongam, and Haesangdong. Five more sites were found and excavated in the 1970s and fieldwork was carried out on an additional five during the 1980s. However, few excavation reports and analyses have been published (Chung, 1996).

Since the discovery and excavation of the Sokchangni open-air site in 1964, a number of South Korean Paleolithic sites have been surveyed and excavated, and the results are well published. This is due mainly to a keen public interest in reconstructing the history (and prehistory) of the Korean people; which, in turn, has resulted in funds becoming available for paleoanthropological research. Following fieldwork at Sokchangni, excavations during the 1970s were undertaken at Chommal Cave, Turubong Cave Complex, Billemot Cave, and Chongokni (Sohn, 1990; Park, 1992). As of 1998, over one hundred Paleolithic archaeological sites have been discovered and surveyed in South Korea, with excavations carried out at many of them (Figure 1).

Issues in Korean human evolutionary studies

Paleoanthropological research in Korea has produced a good number of hominid fossils, lithic artefacts, and Pleistocene faunal remains. Due to acidic soils in the southern region of the Peninsula, bone preservation is poor. Accordingly, the majority of hominid fossils and Pleistocene faunal assemblages have been recovered in the north, where the preponderance of sites are cave localities. Review of the human evolutionary record indicates that there are a number of debates related to the interpretation of these materials.

Table 3 Hominid fossil record from Korean Peninsula

Site	Age	Specimens	Attribution
Yokpori, Daehyundong	Middle/Upper Pleistocene	Frontal, occipital, parietal	*Homo* cf. *erectus*
Dokchon, Soongnisan	Middle/Upper Pleistocene	2 molars, scapula, mandible	Archaic *Homo sapiens*
Ryonggok	Upper Pleistocene		
	Layer 9 (46–48 Ka)	Cranium no. 7, mandibles nos 1, 2, 6	Archaic *Homo* cf. *sapiens*
	Layer 10	Cranium no. 3, mandible nos 4, 6, femur	Archaic *Homo* cf. *sapiens*
	Layer 11	Temporal, frontal, mandible fragments, 3 humerus fragments, 8 vertebrae (2 each: cervical, thoracic, lumbar, sacrum), 3 innominate and 2 femur fragments	Archaic *Homo* cf. *sapiens*
	Layer 12	Maxilla no. 8	Archaic *Homo* cf. *sapiens*
Mandalli	Upper Pleistocene	Calvaria, mandible, fragmentary mandible, humerus, femur, and innominate	Modern *Homo sapiens*
Kumchon	30 Ka	Mandible, teeth, and part of the axial skeleton	Modern *Homo sapiens*
Chommal Cave	40–60 Ka	Phalanx, metatarsals	Modern *Homo sapiens*
Sangsi Rockshelter	30 Ka	Left parietal and occipital fragments, left radius, right scapula, right humerus, assorted teeth	Modern *Homo sapiens*
Kunanggul	Upper Pleistocene	Talus, metatarsal, phalanx	Modern *Homo sapiens*
Turubong Hungsugul	40–50 Ka	Almost complete cranium and postcrania	Modern *Homo sapiens*

Hominid fossil record

Archaic and modern *Homo sapiens* remains have been recovered from eight cave sites and one rockshelter on the Korean Peninsula (Table 3). Frontal, occipital, and parietal fragments were found at Yokpori, Daehyundong (Middle–Late Pleistocene age). The age at death of the Daehyundong hominid is estimated to be about 7–8 years, and it has been assigned to *H. sapiens neanderthalensis* (Kim *et al.*, 1985:185). In the Dokchon Soongnisan excavations, two hominid molars (M_1 and M^2) and a scapula, found in the lower stratigraphic level, and a fragmentary mandible from the upper layer, are argued to represent *H. sapiens neanderthalensis*. A hominid mandible was also found in the same context as a cave hyaena mandible in the upper layer of the Dokchon Soongnisan cave (Middle–Late Pleistocene) (Archaeology Research Laboratory, 1978).

The most important site is Ryonggok Cave located near Pyongyang, the capital

(a)

(b)

Figure 2. (a) Frontal view of reconstructed Ryonggok archaic *Homo* cf. *sapiens* cranium no. 7. (b) Lateral view of reconstructed Ryonggok archaic *Homo* cf. *sapiens* cranium no. 7 [from Sohn, 1992:12 (Figure 17)].

city of North Korea (Figure 1), which has yielded the remains of at least five archaic *H. sapiens* individuals (Jun *et al.*, 1986). Hominid fossils were found in the four cultural layers identified (Table 3; Figure 2). Morphological variation between the hominid remains from the different strata is not significant (Jun *et al.*, 1986). An initial thermoluminescence date suggested an age of 400–500 ka years for the earliest occupations, but this does not agree with the chronology based on the associated archaeological and faunal remains (Chung, 1996). A more recent uranium-series date from the upper layer suggests an age of 46–48 ka, which correlates more closely with the paleoanthropological material.

Modern human remains from Kumchon Cave (North Korea) include one mandible, one tooth, and five vertebrae (ca. 30 ka). The

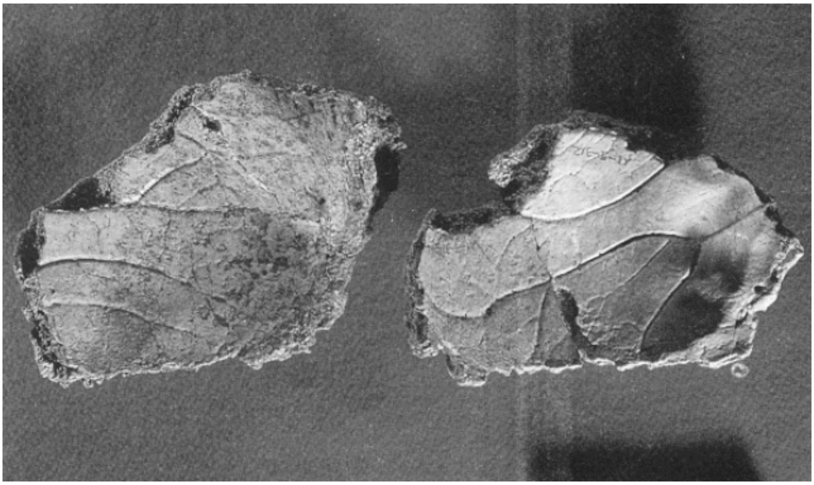

Figure 3. Endocranial view of parietal fragments from Sangsi Rockshelter modern *Homo sapiens* [from Sohn, 1992:11 (Figure 14)].

approximate age of the hominid is 30–35 years and it has been determined to be a male (Jang & Kang, 1988). The Kumchon hominid remains were dated based on faunal correlations. Excavations at Mandalli exposed a number of modern *H. sapiens* remains, including part of a cranium, an intact mandible, a fragmentary mandible, and a partial humerus (Late Pleistocene age) (Kim *et al.*, 1985; Park, 1992; Chung, 1996). The Mandalli fossils were found in association with Late Paleolithic stone implements and a faunal assemblage that included few extinct species (Kim *et al.*, 1985).

Access constraints to the original fossil material currently limits carrying out a detailed comparative study of these important North Korean hominid fossil remains. Many of the analyses of North Korean hominid material are from casts made from secondary and tertiary sources and/or published excavation reports.

Excavations at the Sangsi Rockshelter in the central part of present day South Korea yielded modern *H. sapiens* remains, including four parietal and occipital fragments, one scapula, one radius, one humerus, and several teeth (Figures 3 and 4). The fossils were dated to about 30 ka by the uranium-series method (Sohn, 1990; Park, 1992). In addition, the remains of a modern *H. sapiens* child were discovered in Hungsu Cave, part of the Turubong Cave Complex, including a nearly complete skull and postcranial skeleton (Figure 5). At the time of death, the child is estimated to have been about 5–6 years old and the context in which the fossil remains were unearthed suggests a burial (Park & Lee, 1990; Lee *et al.*, 1991; Park, 1992). If the date of 40 ka is accepted, the Hungsu find would be one of the oldest modern *H. sapiens* interments in East Asia. Nevertheless the context of the hominid burial and the date of the site have been the subject of some debate (Bae, personal communication, 1999).

One of the major issues with the Korean hominid fossil record involves systematics. North Korean paleoanthropologists have continually asserted that *H. sapiens neanderthalensis* lived in many of these Pleistocene caves (e.g. Kim, 1985). However, metric and non-metric analyses of many of these ‘‘Neanderthal’’ fossils indicate that they fall in the range of either archaic or modern *H. sapiens* (Park, 1992). Chronologically

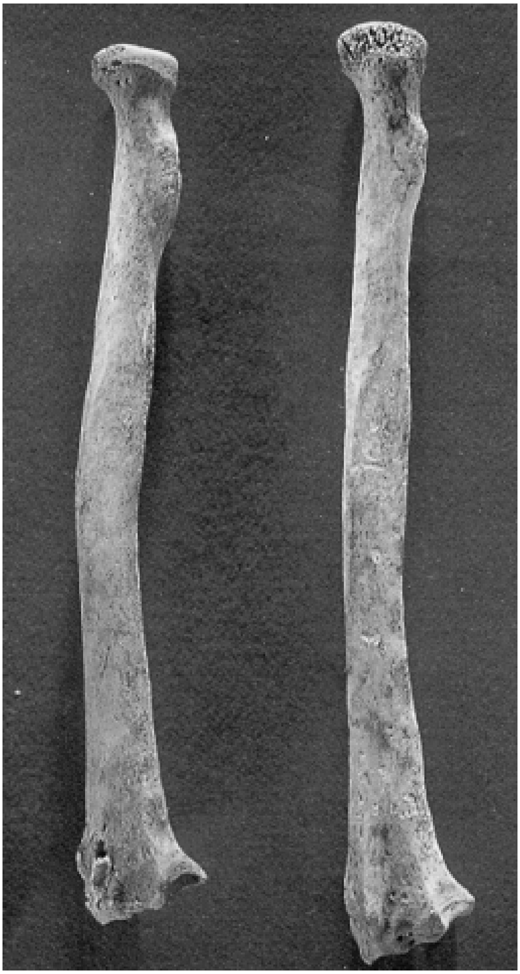

Figure 4. Left: modern *Homo sapiens* radius from Sangsi Rockshelter (Paleolithic); Right: modern *Homo sapiens* radius from Sangsi Rockshelter (Neolithic) for comparison [from Sohn, 1992:16 (Figure 16)].

and morphologically similar hominid fossils from northern China (e.g., Jinniushan, Xujiayao) have been referred to as archaic *H. sapiens* (Pope, 1992; Wu & Poirier, 1995). Accordingly, what North Korean paleoanthropologists have been referring to as *H. sapiens neanderthalensis* should actually be considered archaic or modern *H. sapiens*.

In addition, the Ryonggok hominids have been assigned to the archaic *H. sapiens* subgroup (Jun *et al.*, 1986; Park, 1992). However, a number of features of the cranium and mandible of the Ryonggok hominids appear to more closely align them with modern humans, including a rounded cranial vault, weak supraorbital tori, short face, steeply inclined forehead, absence of an occipital torus (Figure 2), and presence of a chin. Until the Ryonggok hominid fossils are better studied, an archaic *H.* cf. *sapiens* designation is more applicable.

Nevertheless, the reconstructed cranium from Yokpori, Daehyundong does not fall neatly in the range of either archaic or modern *Homo sapiens*. The cranium, though referred to as *H. sapiens neanderthalensis* (Kim *et al.*, 1985), more closely resembles *H. erectus* fossils from Zhoukoudian with cranial features including a well-developed occipital torus, pronounced supraorbital torus, and alveolar prognathism. Until this material is better described and published, attribution to *H. erectus* may be more appropriate.

Lithic technology

Beginning in the 1940s, Movius (1944, 1949, 1969) argued that East Asia was a "cultural backwater" because the region lacked the Acheulian stone toolkit (i.e., handaxes and cleavers). Even though Yi & Clark (1983) argued that the "Movius Line" be discarded, it is still accepted by many Old World Paleolithic archaeologists (e.g., Schick & Dong, 1993; Clark, 1994; Pope & Keates, 1994; Schick, 1994). Nonetheless, a number of Korean Paleolithic stone tool assemblages contain handaxes, cleavers, and picks, in association with the more traditional chopper-chopping tools. The best known of these localities is the Paleolithic site of Chongokni, located just northeast of Seoul (Yi, 1989; Bae, 1992*b*; Bae & Ko, 1992; Bae & Choi, 1994; Bae *et al.*, 1995). The discovery of Paleolithic artefacts in this area in 1978 led Kim Won-yong (Seoul National University), Chung Young-hwa (Youngnam University), and a number of other scholars to begin excavations the

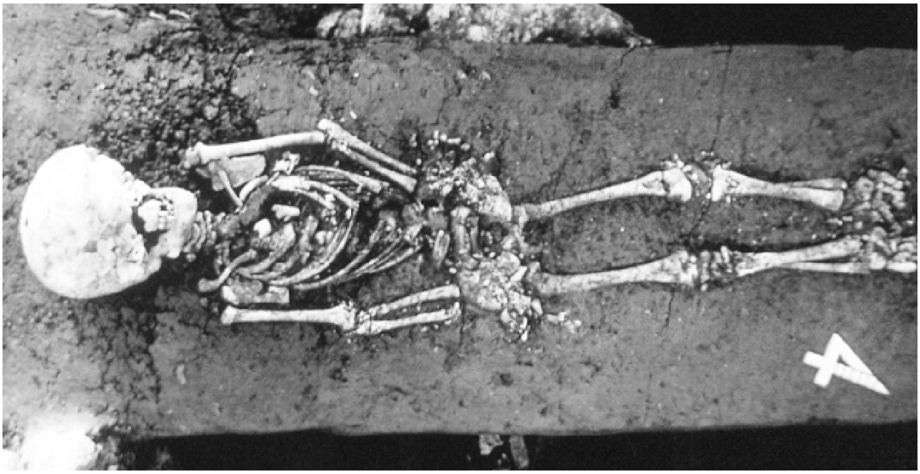

Figure 5. Turubong Hungsu modern *Homo sapiens* skeleton [from Sohn, 1992:13 (Figure 19)].

following year (Chung, 1994). As of 1998, a total of ten excavations have been conducted in and around Chongokni exposing numerous Early Paleolithic heavy duty tools (e.g., handaxes, picks, cleavers, choppers), flakes, and debitage produced on quartz, quartzite, and poor quality basalt raw materials (Bae *et al*., 1995; Bae, 1997) (Figures 6 and 7).

Additional surveys and excavations of other localities near Chongokni, along the Hantan and Imjin Rivers, have resulted in the discovery of penecontemporaneous Paleolithic sites (e.g., Chuwoli, Dayulli, Kawoli, Kumpari, and Namkaeri; see Yi, 1989, 1996; Sohn, 1990; Park, 1992; Yi & Lee, 1993; Choi, 1994) yielding similar lithic assemblages (Figure 8). These finds and others in East Asia (e.g., Dingcun, Bose; see Qiu, 1985; Huang, 1987, 1989, 1993) provide clear evidence of a heavy duty lithic industry that includes bifaces, picks, and cleavers east of the Movius Line.

Chronometric dates obtained from these sites have resulted in controversial ages (Yi, 1986, 1989, 1996; Bae, 1988, 1997). Bae (1988), employing K/Ar dating, argued that Chongokni dates anywhere from 100,000 to 270,000 years ago, but Yi (1986, 1989, 1996) utilizing thermoluminescence (TL) and optically stimulated luminescence dating (OSL), asserts that the site is younger, possibly as recent as 30,000 to 40,000 years ago. However, the recent discovery of AT tephra[2] at Chongokni in the upper stratigraphic layers (Yi, 1996; Bae, 1997; Yi *et al*., 1998), suggests that the typical Early Paleolithic stone tools found predominantly in the lower stratigraphic levels are much older than 30–40 ka, possibly as old as 100 ka.

Dating

One of the main problems with Korean Paleolithic sites, particularly those in the north, is that they lack chronometric dates (Bae, 1992*a*; Chung, 1995). The main reason for this is that little tectonic activity occurred on the Korean Peninsula during the Pleistocene (the presence of AT tephra

2. AT tephra represents Aira-Tanzawa pumice which erupted from the Aira Caldera in southern Kyushu (Japan) between 21,000 and 22,000 years ago (Imamura, 1996). The distribution of the volcanic ash was once thought to have only reached the southern part of the Korean Peninsula, but recent fieldwork around Chongokni by Tsutomu Soda (personal communication, 1998; see also Yi, 1996; Bae, 1997; Yi *et al*., 1998), has resulted in the discovery of AT tephra as far north as Chongokni.

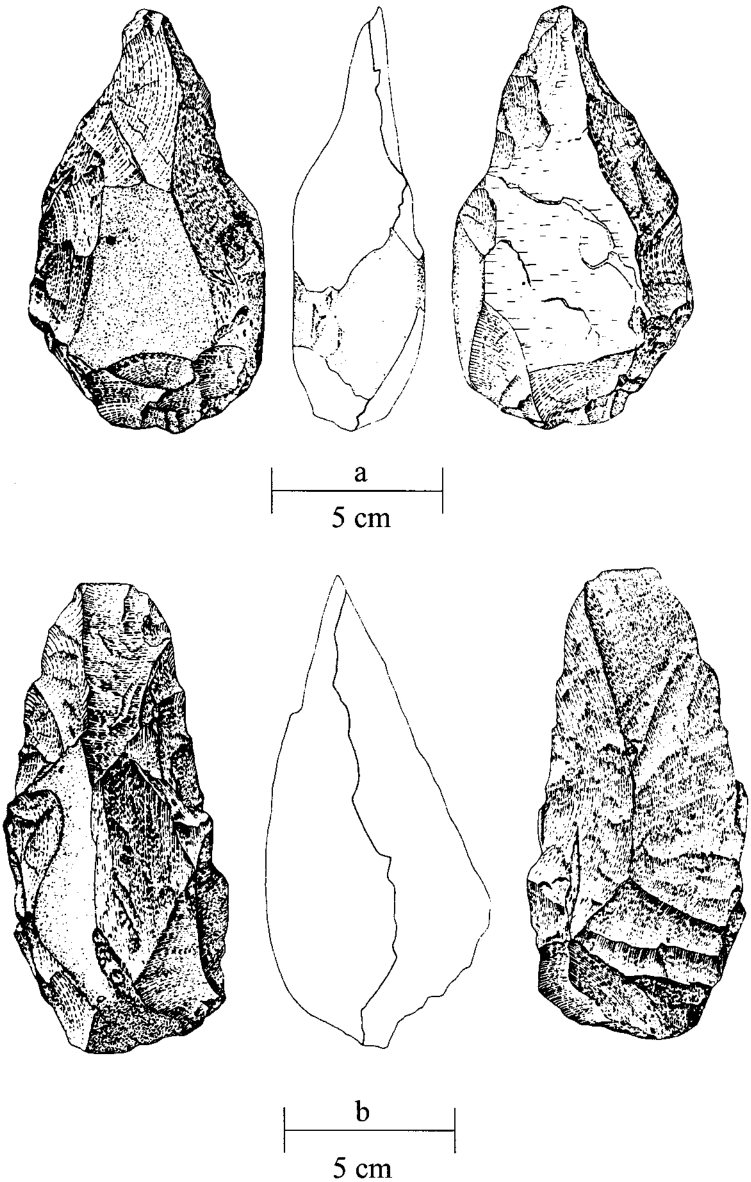

Figure 6. Bifacial implements from Chongokni [after Chung, 1994:27, 29 (Figures 2, 4)].

from Japan notwithstanding). As a result, cultural material has a tendency to be defined typologically, while sites are biostratigraphically dated, based on the number of extinct species (see Table 1).

Nevertheless, the number of chronometric dates are on the rise, particularly in the southern part of the Peninsula. For instance, AT tephra was discovered at the Late Paleolithic site of Miryang Koraeri in

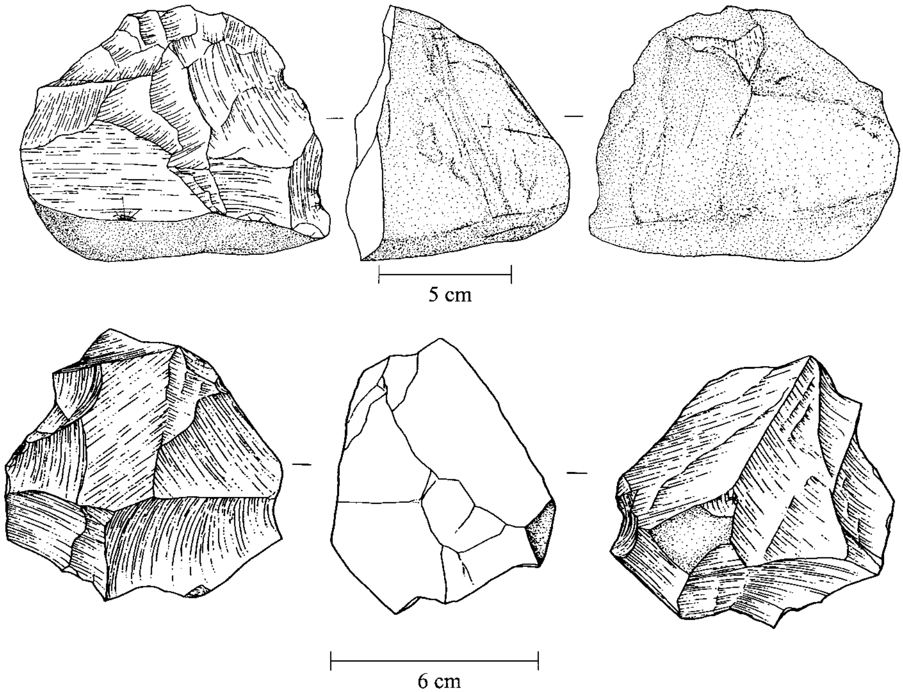

Figure 7. Chopper and core from Chongokni [after Bae *et al.*, 1995:147, 149 (Figures 100, 103)].

the south, suggesting an age somewhere between 20–25 ka (Y. C. Park, personal communication, 1998). In addition, radiocarbon, Electron Spin Resonance, and uranium-series dates have been derived from the important sites of Sokchangni, Chommal Cave, and Sangsi Rockshelter (Table 1).

Faunal analysis

Traditionally in Korea, faunal remains from Pleistocene sites have been employed to reconstruct paleoenvironments and determine relative ages. Analysis of animal remains from Paleolithic sites to address the issues of hominid subsistence patterns, presence/absence of bone tools, art, and symbolism has received relatively little attention. Turubong Cave No. 2 and Chommal Cave are two of the best documented bone-bearing Pleistocene localities on the Korean Peninsula that have been utilized to try to deal with these issues (Sohn, 1980, 1990, 1992, 1996; Sohn *et al.*, 1980; Lee, 1983, 1984, 1994, 1996; Lee *et al.*, 1991).

The Turubong Cave Complex consists of Turubong Cave No. 2, Cave No. 9, Saegul, Chonyogul, and Hungsu Cave (Figure 1, Table 1). These caves were discovered during mining for limestone on Turubong Hill in central Korea during the 1970s (Lee, 1984, 1994). Cave No. 2 was found in 1976 and excavated until 1978 (Lee, 1984). Excavations revealed 4 m of deposits and 36 stratigraphic levels (Lee, 1994). Cave No. 2 has produced the greatest species diversity of all the cave sites on the Korean Peninsula: 46 mammalian species are identified, along with one reptile and two amphibians (Table 2). Cervidae dominate the assemblage, with *Pseudaxis grayi* accounting for 75% of the approximately 20,000 bones recovered.

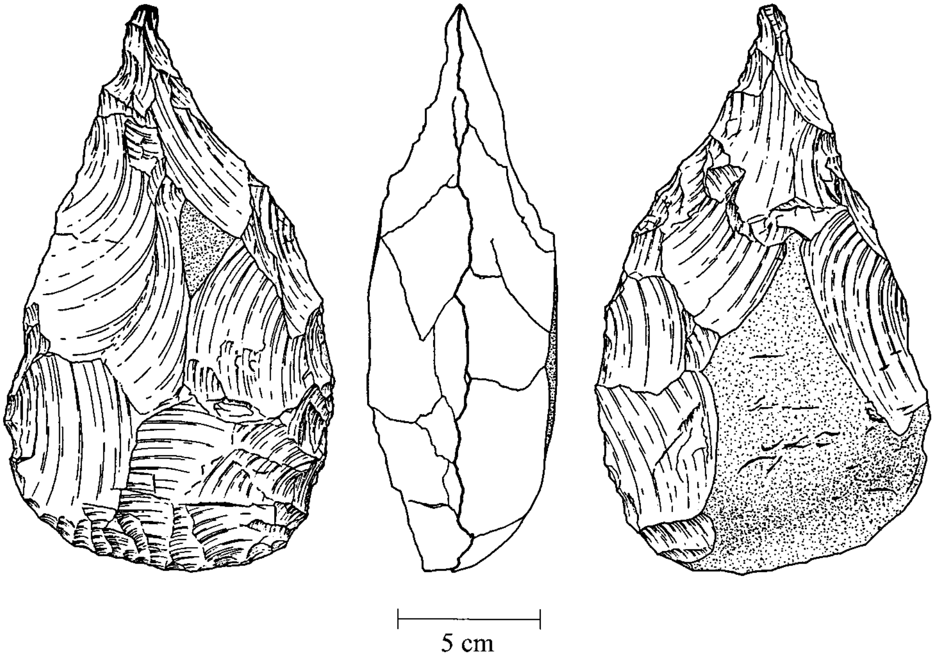

Figure 8. Bifacial implement from Kawoli [after Yi & Lee, 1993:25 (Figure 6)].

In Turubong Cave No. 2, pollen was recovered from 22 of the 36 stratigraphic layers, including *Pinus*, *Alnus*, Ericaceae, *Betula*, and *Quercus* (Lee, 1984, 1994). Analysis of pollen from the middle series of layers suggests a warm climate, while the more recent levels indicate a cooler environment. Traces of a hearth were found near the entrance of Cave No. 2 (Lee, 1996). Among the ashes were remains of oak and pine and scattered around the hearth were hammerstones and osseus artefacts.

Chommal Cave was discovered and first excavated in 1973, and fieldwork continued up through 1980 (Sohn, 1980, 1990; Sohn *et al.*, 1980; Sohn & Han, 1996). The site is located on Youngdu Mountain in the central part of the Korean Peninsula (Figure 1). Six stratigraphic layers were mapped at this site with uranium-series dates ranging from 40,000 to 66,000 years ago for the middle levels (Sohn, 1990). However, the dates are equivocal (Table 4), with the older date being derived from a layer stratigraphically above the younger date. The error range for the younger uranium-series date is unpublished (Sohn, 1990; Bae, 1992*a*). As postdepositional disturbance appears to have modified the site, only additional absolute dates will help clarify the actual age of the Chommal Cave occupation periods. Among the Chommal Cave fauna, 45 mammalian species were identified, with 35·5% of them extinct. Cervidae were most abundant, represented by over 4600 specimens of the roughly 10,000 total bones in the assemblage.

Hominid subsistence, bone tools, art and symbolism

The presence of modern *H. sapiens* skeletal remains has led the excavators to argue that hominids were the main agents involved with the accumulation of the Chommal Cave faunal assemblage (Sohn, 1980; Sohn & Han, 1996). Even though hominids are

Table 4 **Stratigraphy from Chommal Cave site**

Level	Deposit thickness	Cultural and/or absolute age	Dating sample
VII		Neolithic	
VI	60 cm	13,700 ± 700 BP (C-14)	Carbon
V	85 cm	66,000+30,000/ − 18,000 BP (U/Th)	Felid canine
IV	50 cm	40,000 (U/Th)	*Ursus* mandible
III	90 cm	Sterile	
II	15 cm	Sterile	
I	100 cm	Sterile	

Note: Deposit thickness for Neolithic level (VII) and error ranges for level IV were not published.

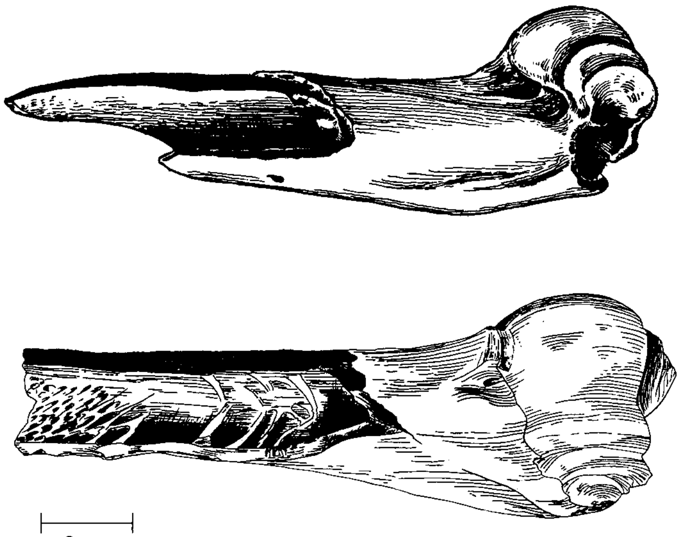

Figure 9. Purported Paleolithic bone tools (point and scraper) from Turubong Cave No. 2 [after Lee, 1984:343 (Figure 49)].

absent from the Turubong Cave No. 2 site, the role carnivores played in the formation of the archaeofaunal assemblage has been downplayed (e.g., Lee, 1983, 1984, 1994, 1996). Hominid subsistence patterns were reconstructed under the supposition that they were responsible for the accumulation of just about all of the faunal remains recovered from these two sites.

One of the more controversial topics in Korean paleoanthropology is the subject of bone tools (e.g., see Sohn, 1980, 1983, 1984, 1988, 1990, 1992; Lee, 1983, 1984; Jo, 1986; Bae, 1988, 1992*a*,*b*; Lee *et al.*, 1991; Sohn & Han, 1996 for opposing views). For instance, of the 2000 "artefacts" found in the Turubong Cave No. 2 site, the majority have been argued to be osseous implements (Lee, 1984) (Figure 9). The few stone artefacts found in association with the faunal material fail to show any definitive signs of extensive artificial modification. Accordingly, it has been argued that bone implements were the preferred tools (Sohn,

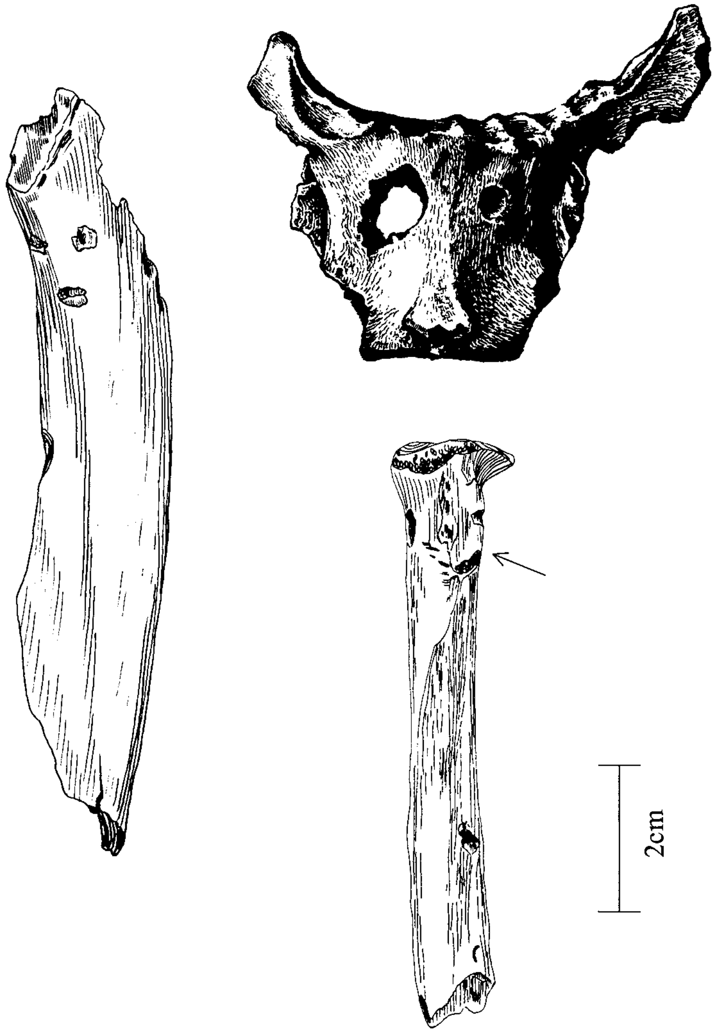

Figure 10. Purported Paleolithic “face sculptures” on bones from Turubong Cave No. 2 [after Lee, 1984:350–351 (Figures 56, 57)].

1980, 1988, 1990; Lee, 1983, 1984, 1994, 1996).

The evidence for Paleolithic art and symbolism has also been contentious. For instance, presence of Ericaceae remains in Turubong Cave No. 2 led the excavators to assert that it was transported in by hominids. This is used as evidence that the Turubong hominids should be considered the “first flower people” (Lee, 1984, 1994), contrary to claims about Neandertals from Shanidar Cave (Solecki, 1971). Moreover, the Turubong excavators asserted that deer phalanges with holes in them are evidence of Paleolithic art (Lee, 1984, 1994, 1996) and that human faces have been incised in certain long bones and innominate fossils (Figure 10).

Potential contributions of Korean paleoanthropology

The Korean paleontological and archaeological records provides sufficient data for addressing certain issues related to the origins of modern humans in East Asia. For instance, what is the nature of the transition between archaic and modern humans in this region? Does evidence exist for a slow, uniform transition between archaic and modern humans or is there a sharp change between the two hominid groups? In addition, when do these shifts take place, and are they coeval with morphological changes occurring in hominids from northern China (e.g., Zhoukoudian Locality 1, Dali, Upper Cave)? Furthermore, what is the relation of the Korean hominids to the nearby Chinese archaic *H. sapiens*-bearing sites of Xujiayao and Jinniushan?

Importantly, most of the Korean sites date to the late Middle or Late Pleistocene; the period when the biological and behavioral transition between archaic and modern humans is argued to have occurred. However, there are limitations in incorporating this evidence into broader issues of Old World prehistory. The following suggestions are offered to facilitate the synthesis of this record.

Hominid fossil record

The hominid material needs to be systematically described and illustrated. In many cases, basic descriptions of the fossils are published, rather than including the measurements of the skeletal remains. Furthermore, reliable dates need to be obtained from the stratigraphic layers containing the hominid fossils. Absolute dates derived from the hominid fossils themselves would also clarify the age of the deposits.

In addition to increasing the Northeast Asian paleoanthropological dataset *vis-à-vis* the western Old World, the Korean material may be employed to study intraspecific regional variation between penecontemporaneous hominid fossils from northern China (e.g., Zhoukoudian, Dali, Jinniushan, Xujiayao) and Japan (e.g., Minatogawa, Yamashita-cho).

Lithic analysis

In the majority of Korean Paleolithic excavations stone artefacts are the only material recovered and accordingly, a great deal of attention has been given to their interpretation. However, the lithics are usually categorized according to a typological scheme (e.g., Bordes' 63 stone tool types) and described. Little attention has been given to morphological-functional studies (but see Yoo, 1997), raw material sourcing, or microwear analysis.

Hominid subsistence, bone tools, art and symbolism

A paucity of taphonomic research currently hinders reconstruction of the nature of hominid–carnivore interaction over large carcass resources in this region (Bae, 1988, 1992*a*,*b*; Kwon, 1996, 1998; Park, 1996). Experimental and comparative taphonomic studies would also be able to address the issues of presence/absence of Paleolithic bone tools and art and symbolism, particularly because a number of osseus implements and bone art appear to have been simply the result of carnivore, rather than hominid, modification (Norton, personal observation, 1998). A detailed taphonomic analysis of the Chommal Cave faunal assemblage is currently underway, which will hopefully shed some light on the degree of hominid–carnivore competition over similar resources in this region (Norton, n.d.).

Summary and conclusions

Modern Korean paleoanthropological research began only in the 1960s and, as a consequence, lags behind similar studies in

China. Nevertheless, after four decades of intensive research the Korean paleontological and archaeological records have much to offer paleoanthropology in terms of increasing the sparse dataset in East Asia and addressing current issues in Old World human evolutionary studies. The main points introduced in this review include: (1) the Korean Pleistocene environment, based on faunal remains, did not differ much from that in northern China; (2) hominid fossils are known from nine sites on the Korean Peninsula, but these have not been fully described; (3) *H. erectus* remains may be present east of Zhoukoudian at Yokpori, Daehyundong in North Korea; (4) the recovery of handaxes at a number of sites near Chongokni provides clear evidence for the occurrence of bifacial implements in early Upper Pleistocene Korea, and from broader East Asia, demonstrating that their presence was not a singular occurrence during the Early Paleolithic in this region; (5) Chongokni and these other handaxe-bearing sites appear to be at least 100,000 years old; and (6) taphonomic studies are critical if debates over hominid subsistence, bone tools, art and symbolism in Korea are to be resolved.

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