

# *Chulmun Neolithic Intensification, Complexity, and Emerging Agriculture in Korea*



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## INTRODUCTION

A RECURRING SUBJECT IN ACADEMIC DISCUSSIONS has been the notion of socially complex hunter-gatherers.<sup>1</sup> Scholars have suggested that sociocultural complexity has not been limited to agricultural societies, as was once thought, but was characteristic of some foraging societies where certain socioeconomic factors led to varying degrees of inequality and social and organizational complexity.

The emergence of complex society in prehistoric Korea has long been understood as a socioeconomic corollary of its Bronze Age agriculture. According to the prevailing view, the Bronze Age social complexity that subsequently led to formation of chiefdoms and incipient states was *a consequence of the intensification of sedentism and the rice-based agricultural economy during the Bronze Age* (1300–300 B.C.) (Nelson 1993, 1999; Rhee and Choi 1992). Archaeological data accumulated in recent years, however, suggest the contrary. They include more than 500 new Neolithic sites, including 75 habitation sites and 204 shell middens (Han 2002; KNS & HGRICH 2009). Along with the new data, a number of seminal studies focused on Korean Neolithic settlement patterns have recently appeared (Bae 2009; Im 2006a; Ku 2009). Various subsistence systems have received attention (D.-I. Ahn 2006a, 2006b; Ahn and Lee 2001; Kim 1998, 1999; Kim 2002a, 2002b, 2005; C.-B. Kim 2007; E.-Y. Kim 2007; Lee 2001, 2002), including Neolithic agriculture (S.-M. Ahn 2002, 2005, 2006; Im 2009; G.-A. Lee 2003; Song 2001). These impressive studies provide new perspectives suggesting there was horizontal as well as vertical differentiation and social inequality in Chulmun Neolithic society.

The following discussion is a synthesis of the most recent archaeological data, reports, and studies on the Korean Neolithic, with particular attention to the subsistence, sedentism, and increasingly complex social systems of pottery-using people of the Korean Peninsula. We report on a developmental process that began in late

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Pleistocene/early Holocene times with the appearance of Early Neolithic pottery and associated economic patterns among hunter-fisher-gatherers of the Russian Far East, China, Japan, and Korea. On the Korean Peninsula, socioeconomic growth accelerated markedly after about 4000 B.C., during the time that Chulmun patterns came to dominate Korean Neolithic pottery. The Chulmun Neolithic is therefore the focus of our attention in this article. As a complex society of “the middle ground” (Smith 2001:1), Chulmun was similar to Jomon in sustaining a stable socioeconomic and political system over several millennia (Crawford 2008; Pearson 2007).

We advance the argument that the post-Chulmun florescence of rice-based agriculture seen in the following Mumun period, and the revolutionary societal elaboration that this new productive system fueled during and beyond the Korean Bronze Age, are direct outcomes of socioeconomic patterns developed by indigenous Korean hunter-fisher-gatherers to fit their local landscapes; these traditions reached a critical stage of maturity during the Chulmun Neolithic (S.-C. Shin 2001, 2002*a*, 2002*b*). In the following discussion we use “Early Neolithic” to designate the pottery-making cultures of pre-Chulmun times. “Middle Neolithic” and “Late Neolithic” are both phases of the Chulmun tradition, which is frequently but not invariably noted in the accompanying text.

In addressing the evolution of Korean society over this period, we begin from the view that the relative prosperity of certain environmentally favored Chulmun community settings provided ambitious extended families with opportunities to increase their collective prosperity through cooperative projects. Depending on the individual localities, over time these projects came to include mass harvesting of terrestrial and marine resources as well as cultivation of millets and other cultigens, all of which helped to increase the wealth and social influence of their producers. These processes increased and strengthened individual family traditions. By Late Chulmun Neolithic times, certain local elite family lineages (“houses” in Ames’s 2006 terminology) had become empowered with sufficient resources and social leverage to recruit and direct community labor toward creating the ditches and paddy fields essential to the enormously productive wet-rice agriculture that in succeeding Mumun times fueled the emergence of Korea’s Bronze Age.

The success of these enterprises advanced the fortunes of the community as a whole at the same time as it enhanced the eminence of the “houses” that organized and managed them. Thus, in stepwise fashion, organizational know-how and family in-group traditions established during Chulmun Neolithic times increasingly facilitated the characteristic Bronze Age concentration of wealth and power in the hands of privileged elites. This above all is what made possible the increasingly grander organizations and productions that are the hallmark of civilization.

#### PHYSICAL ENVIRONMENT

A southward extension of the Northeast Asian continental landmass, the Korean Peninsula is surrounded by the sea on three sides (Fig. 1). More than two-thirds of the land comprises rugged mountains intersected by several major river systems: the Dae-dong River system in the northwest; the Han River system in the center; the Geum River and Yeongsan River systems in the southwest; and the Nakdong River system in the southeast. While Korea’s eastern part is mountainous with a steep and narrow coastline, pockets of broad plains and low undulating hills mark its western part. There

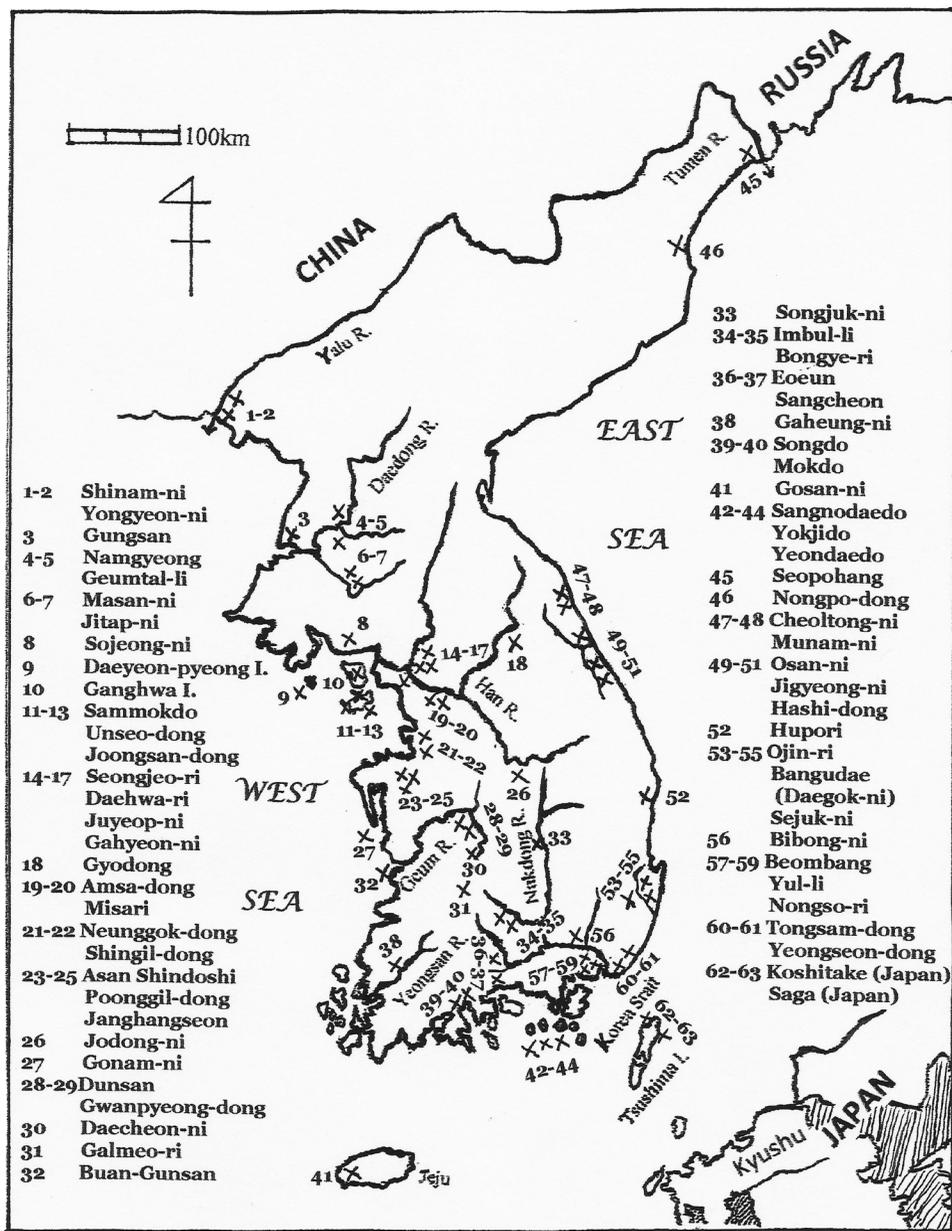


Fig. 1. Rivers of Korea and Neolithic sites cited.

are also hundreds of small and medium-sized offshore islands along the south and the west coasts. As such, the peninsula has four distinct ecozones: terrestrial, riverine, marine, and littoral.

The Korean Peninsula lies in the temperate monsoon climate zone. During the winter it receives north or northwesterly winds from the continental landmass, resulting in dry, cold weather. In the summer, it receives warm, moist southeasterly wind

from the southern Pacific, resulting in high temperatures and abundant rainfall. The peninsula as a whole undergoes four distinct seasons: spring (March–May), summer (June–August), fall (September–November), and winter (December–February), with some north–south variations in seasonal duration.<sup>2</sup>

The entire landscape is covered with thick grass, brush, and trees wherever disturbing by humans has not occurred. Agricultural activities have required extensive land clearing. In prehistoric times, cultivation was mostly carried out on patches that required no land clearing, such as around a river bend or at a confluence of rivers (Song 1998, 2001). Such patches of arable land were limited, however. The vegetation cover would have been even thicker during the Neolithic period than in the present due to a warmer climate.<sup>3</sup>

#### TEMPORAL CONTEXT

Korean Neolithic chronology has been the subject of ongoing debate among researchers (Bae 2009; Ha 2006a; Han 2002; Im 1997a; Im 2007; Kim 1986; Ku 2009; G.-A. Lee 2003; Shin 1994; Yang 2002). While there are differing views on nomenclatures, specific dates, and inter- and intra-regional sequences, there is broad scholarly consensus on the evolutionary trajectory of the Korean Neolithic as a whole. As shown in Table 1, the Korean Neolithic is conventionally divided into Early

TABLE 1. CHRONOLOGICAL DEVELOPMENT OF ANCIENT CHINA, KOREA, AND JAPAN

DATE	CHINA	KOREA	JAPAN
B.C.			
	PALAEOLITHIC	PALAEOLITHIC	PALAEOLITHIC
14,000	Shizitan		
13,000			JOMON
12,000	NEOLITHIC		Incipient
11,000		NEOLITHIC	
10,000		Gosan-ni	Initial
9000		(Early Neolithic)	
8000	Yangshao		
7000			
6000		Yunggimun	Early
5000			
4000		Chulmun	Middle
3000	Longshan	(Middle Neolithic)	Late
2000	SHANG	Late Chulmun	Final
		(Late Neolithic)	
1000	W. ZHOU	MUMUN/BRONZE	
900		AGE	
800		Early	
700	E. ZHOU		
600		Middle	NEOLITHIC
500			YAYOI
400	WARRING STATES		Early
300		Late	
200	QIN, HAN	IRON AGE	Middle
100		GO JOSEON	
		North: LELANG	
0	E. HAN	South: SAMHAN	Late

(Pre-Chulmun) Neolithic, Middle Chulmun Neolithic, and Late Chulmun Neolithic (Bae 2009; Kim 1986; Nelson 1993; Shin 1994).

Korea's Early Neolithic or pre-Chulmun time is defined in its early stage by pottery found on Jeju Island at the tip of the peninsula, which is clearly linked to the Late Pleistocene types found in the Russian Far East, China, and Japan. In its better-known next stage, the Early Neolithic is defined by Yunggimun pottery; this stage lasted until about 4000 B.C. The Middle Neolithic, characterized by surface-manipulated Chulmun pottery, is dated about 4000–2500 B.C. This was a time of dramatic intensification and expansion in subsistence and settlement. The Late Neolithic, marked by deterioration of the Chulmun pottery, began about 2500 B.C. Chulmun pottery was gradually succeeded by plain, coarse Mumun pottery in conjunction with full-blown wet-rice agriculture during the second millennium B.C. Korea had made the momentous transition from Neolithic to Bronze Age culture (Bae 2009; G.-A. Lee 2003; S.-C. Shin 2001, 2002*a*, 2002*b*).

#### EARLY (PRE-CHULMUN) NEOLITHIC SETTLEMENT AND SUBSISTENCE

##### *Before Sedentism*

Discovery in the 1990s of several open sites at Gosan-ni, on Jeju Island off the southern tip of the peninsula, pushed the start of the Korean Neolithic back into terminal Pleistocene times. Cultural remains from Gosan-ni and other nearby sites included microlithic arrowheads, points, scrapers, and awls, along with pottery of a hitherto unknown type. Its temper appeared to have originally contained fibrous materials, making it similar to the Osipovka III pottery of the Amur River region, <sup>14</sup>C dated to 10,098 ± 1507 B.C. Researchers posit that the low sea level at this time exposed the Yellow Sea bed, providing a land connection between Jeju Island and Manchuria. This facilitated people's movement between the Amur region and Jeju Island (Gang 2002; Lee 2004; Lee and Gang 1999; Shin 2007).

The Gosan-ni Neolithic culture (as these finds have become known) seems mostly confined to Jeju Island, but it has also been reported in the far southern peninsula (Ha 2006*a*). It is thought to have continued on Jeju Island until Yunggimun pottery entered from the southern coast of the peninsula at a date that remains unclear.

Gosan-ni Neolithic foragers were heavily dependent on hunting, as indicated by the abundance of microlithic tools including numerous projectiles, arrowheads (70–80% of the total lithic assemblage), and scrapers. Inasmuch as the site was located on the coast, it might be assumed that Gosan-ni Neolithic people exploited marine resources; however, the presence of projectile points and the absence of fishing-related tools and shell middens suggest instead that their subsistence strategy emphasized hunting land mammals such as deer, wild boar, badgers, and pheasants, as well as gathering wild nuts and plants (Gang 2002:25).

##### *Beginning of Sedentism*

“Sedentism” is here used with an emphasis on long-term development representing a gradual shift from mobile to permanently settled life, as suggested by Brown and Vierra (1983:189), Bar-Yosef and Belfer-Cohen (1989:490), and Hitchcock (1987:374). Sedentism is variable and multidimensional and it may be seasonal or year-round. As Kelly (1992:51) has observed, “Not everyone is equally involved in

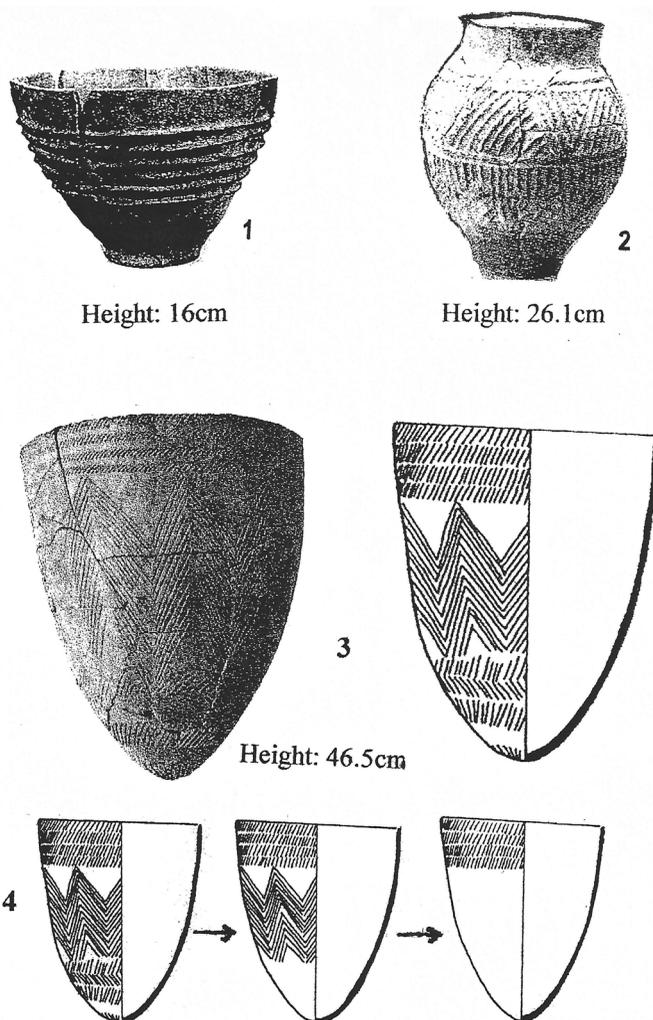


Fig. 2. Korean Neolithic pottery: (1–2) Yunggimun; (3) Chulmun; (4) changes in Chulmun design pattern. (Adapted from Im 2000:66; Im 2004:118; Kim 1986:36; NCHRI 2001:881)

changes in mobility, and the inception of village life entails changes in (but not a cessation of) movement.”

Following this perspective, early sedentism may be discerned on the east coast of the Korean Peninsula at Osan-ni among the societies of pre-Chulmun makers of Yunggimun (appliqué) pottery (Fig. 2: 1–2).<sup>4</sup> Flat-based and decorated with attached thin clay bands, Yunggimun pottery first appeared on the east coast around 6000–5500 B.C., having diffused from the Novopetrovka culture of the middle Amur River basin (D.-J. Lee 2002). It soon spread southward from Osan-ni along Korea’s east coast and from Munam-ni on the central coast to Tongsam-dong, Yeongseon-dong, Ojin-ri, Sejuk-ni, and numerous other sites in the southeast, then around the tip of the peninsula to Songdo Island near Yeosu on the southwest coast. Yunggimun

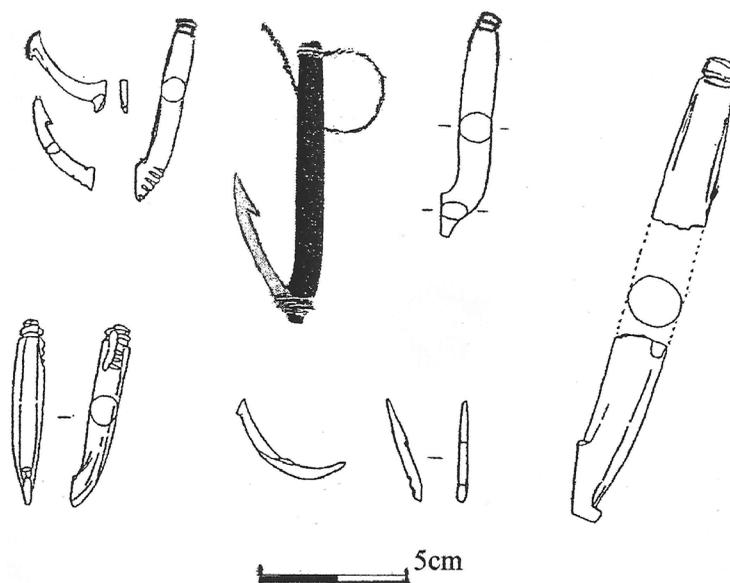


Fig. 3. Compound fishhooks from various Neolithic shell mounds. (Adapted from KAHS 1998: Illustrations; NCHRI 2001: 881)

potsherds are also found at some inland sites (Han 2002) and on Jeju Island at Gosan-ni, Dodudong, the Shinsan-Seongeup area, Aradong, and Eunpyeong-ri (Gang 2002; Lee 2004).

Osan-ni Phase 1, a site located on a coastal sand dune near a lagoon and the mouth of the Namdaecheon River, has 10 circular dwelling floors and pottery kilns dated to around 5500 B.C. (Im 1997*b*, 2000). The houses were constructed on the sandy ground surface, their floors hardened with burned clay. Seven of the ten dwellings were about thirty square meters in size and had one or two square hearths. Other smaller structures are regarded as special purpose buildings (Bae 2009; Im 1997*b*).

The dwelling floors yielded potsherds of a variety of Yunggimun pottery vessels, including large storage jars along with stone axes, stone knives, scrapers, grinding stones, saddle querns, and stone arrowheads. The most common tool, found in nearly every house and in great abundance, was the compound fishing hook (Fig. 3). Only the shanks of these hooks, made of either shale or hornfels, were found. The barbs once fastened to the shanks were most likely made of now-decomposed organic materials such as bone or wood. These hooks were used to catch large fish; they constitute the primary subsistence-related tool at the site (Im 1997*b*).

Faunal remains have not been preserved, but the abundance of fishhooks suggests that the early Neolithic hunter-gatherers of Osan-ni depended heavily on fishing. Since salmon migrations up nearby rivers are known from historical records, investigators have posited that the compound hooks were used to catch migrating salmon in the Namdaecheon River from October to December, and other seasonal big fish in the nearby lagoon. Unlike the south, west, and northeast coasts of Korea, the east-central coast has no natural bays and lacks oyster reefs and eelgrass beds suitable for oyster habitats. Consequently, shellfish harvesting was never a part of Neolithic sub-

sistence along the east-central coast. Though fishing was clearly dominant at Osan-ni, carbonized acorn remains in Dwelling #1, along with mortars and pestles, show that it was supplemented by gathering wild plant products; the finding of stone arrowheads also indicates small game hunting occurred in the extensive forests west of the site (Im 1997*b*; Song 2006).

None of the Osan-ni dwellings were pit houses with sunken floors, unlike the sedentary habitations known to have been used year-round at other Korean sites. Furthermore, they were constructed on a sand dune by the seashore, in a setting affected by strong northerly winds during the winter. It therefore appears that Osan-ni Phase 1 was a seasonal residential base, though it probably had a high annual use redundancy related to the dependable availability of seasonally migrating salmon (Song 2006).

Similar cultural features were present at Munam-ni, another Early Neolithic habitation site 25 km north of Osan-ni. One storage pit contained a cache of 37 compound fishhooks ranging in size from 10.4 to 20.5 cm in length, along with 7 stone adzes having sharply ground edges, and one quartz crystal. A pair of circular slit earrings made of precious stone (Fig. 4: 1), was also found in a pit believed to have been a grave (Park 2003; Shin 2003).

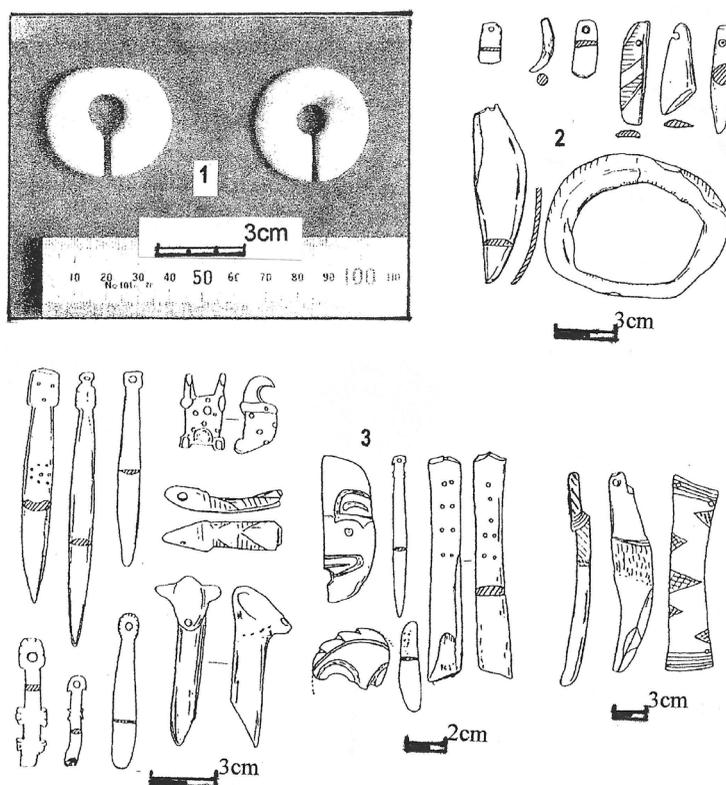


Fig. 4. Ornaments of the Chulmun Neolithic period: (1) jade earrings from Munam-ni; (2) neck pendants and a shell bracelet from Seophang (Late Neolithic); (3) carved objects of ivory and bone from Seophang (Late Neolithic). (Adapted from MGYM 1991:473–477; Park 2003:102)

Farther along the southeast coast an Early Neolithic shell midden at Ulsan Sejuk-ni, <sup>14</sup>C-dated to about 5300 B.C., also gives evidence of intensive harvesting of a wide range of resources (Hwang 2002; Kim et al. 2002). Most obviously, the occupants collected nearshore mussels, oysters, clams, and scallops in great quantity, while fish included large deep-water tuna and shark, as well as gray mullet, sea bream, and flounder. As in the case of Tongsam-dong and other southeast coastal sites, no net sinkers were found in the tool assemblage, but bone tools included harpoon heads made of sharpened eagle wing bone and many compound fishhooks, both types normally used for large fish. Whale bones found at the site surely represent scavenging rather than hunting. Even a single whale carcass fetched up on a nearby beach from time to time would represent a huge windfall. Terrestrial species were attested by deer, boar, fox, and mouse bones, and birds by eagle and pheasant remains.

Sejuk-ni occupants also obtained and stored plant resources in quantity, as shown by the 18 circular storage pits laid out in two parallel rows found at the site. Storage Depots #2 and #3, which were 45 cm wide and 30 cm deep and preserved in their original form, still contained carbonized acorns, as did Storage Depot #1. A storage depot of this scope constitutes substantial evidence for the mass harvesting of woodland plant resources, which would have made an important contribution to the stability and economic security of the community.

Particularly significant is Sejuk-ni Early Neolithic inhabitants' incorporation of wild edible plants and fruits into their diet, including *Chenopodium* sp. and *Rubus* sp. *Chenopodium* constituted the largest percentage (69%) of all weed seeds of anthropogenic taxa collected at the site, suggesting that it was tended as a "protected garden plant" by the inhabitants (Lee 2005).

Near modern Busan on the gently sloping side of an island just off the southeastern coast, and situated near oyster reefs, rock cliffs, and deep sea, the Early Neolithic shell midden site of Tongsam-dong had excellent access to rich marine resources (Sample 1974; Shin 1994: 188–190). The initial Jodo Phase occupants of the site depended heavily on hunting deer, badger, and other land animals, with less attention to marine resources. Deer hunting continued in the succeeding Busan phase, but the numerous compound fishhooks found provide evidence that fishing became increasingly important. Marine resources represented by significant faunal remains included whales, sea lions, dolphins, shark, porgy, bluefin tuna, oysters, mussels, and other mollusks. Large sea mammals such as whales most likely washed ashore dead or wounded, but sea lions could have been killed at night with clubs. It is conceivable that dolphins were taken in bay shore drives, as occurred at the roughly contemporary Early/Middle Jomon Mawaki site across the East Sea in Japan's Toyama Prefecture (Hiraguchi 1992).

#### MIDDLE NEOLITHIC CHULMUN SETTLEMENT AND SUBSISTENCE

##### *Middle Neolithic Sedentism*

Around 4000 B.C. or sometime before, sedentary villages began to appear in west-central Korea that were marked by a ceramic industry of quite different appearance from the Early Neolithic Yunggimun wares seen earlier. This pottery is known as Chulmun ware after a distinctive pattern of surface marking (Fig. 2: 3–5).<sup>5</sup> It soon became the dominant ceramic of the Korean Neolithic (Bae 2009; Han 2002; Im 2006a, 2007; Ku 2009).

Chulmun pots and jars were initially distinguished by a conical body with a pointed or round base and a variety of geometric designs, including short slants and herring-bones, which appeared in three-part sections—upper, middle, and lower—of the vessel surface. As Chulmun pottery spread southward, the design changed, with decreasing emphasis on the tri-part divisional pattern (Fig. 2: 4) (Han 2002; Im 1997a, 2000; Im 2006a, 2006b; Song 2001).

Middle Neolithic villages initially appeared in resource-rich west-central Korea, including: Gungsan and Sojeong-ni in the coastal zone; Unseo-dong and Joongsan-dong on offshore islands; and Jitap-ni, Masan-ni, Amsa-dong, and Misa-ri on alluvial banks of large rivers (KNS & HGRICH 2009:277–359). Within these three eco-zones, Chulmun hunter-gatherers working either independently or cooperatively could access a variety of terrestrial, marine, and aquatic resources including fish, shellfish, small animals, and plant products. In light of the preference for year-round occupation of riverine areas, coastal zones, and islands, fishing was particularly important in Middle Chulmun subsistence. No specific precipitating factors have been identified for the trend toward increasingly sedentary residence, since neither environmental crisis nor resource stress are known to have occurred in the Korean Peninsula at this period (G.-A. Lee 2003:178).

With few exceptions, Middle Neolithic Chulmun village communities typically consisted of 3 to 8 semi-subterranean pit houses, each 4–6 meters across and 30–50 cm deep, with circular or square living floors. Four or five posts supported sloping roofs over the houses. All house floors had a hearth, usually located in the center and protected by an encircling row of stones. Some of the larger houses had two hearths. In addition to pottery vessels, one or more storage pits were also constructed inside or outside the residences (Fig. 5: 1).

Amsa-dong, located on the south bank of the Han River within the urban boundaries of modern Seoul, is considered one of the primary Middle Neolithic Chulmun settlements in west-central Korea and the mother of many other Neolithic villages in southern Korea. It is worthy of detailed attention as it exemplifies prominent characteristics of the culture as a whole.

Amsa-dong contains nearly 30 dwellings, 4 of which have <sup>14</sup>C dates that center around 3800 and 3400 B.C. (Jeong 1994; KNS & HGRICH 2009:63–72). The dwellings at Amsa-dong were square, semi-subterranean structures with rounded corners. Each had a stone-lined central hearth of square or circular shape and four roof-support posts. Floor size ranged from 3.9 × 3.1 m to 7.8 × 6.8 m and floor depth generally ranged from 30 cm to 60 cm, but at least four floors had a depth of one meter. Entrances faced south.

Dwelling #75-2 had a storage pit next to the central hearth, with a large bottomless jar placed in it upside down, a characteristic also seen at the Gungsan I and Jitap-ni Area I sites. Ten additional storage pits were found at Amsa-dong, six of which were located outside of dwelling structures. One large outdoor storage pit was 3.4 m in diameter and 1.74 m deep (Jeong 1994; Natl. Mus. Korea 1995).

Five special-purpose stone-paved features were found outdoors at Amsa-dong. One of them was oblong, about 3 m long and 2 m wide. Some of the paved stones had been subjected to fire. Such structures have been found at other Middle Neolithic village sites and some are thought to have been altars used for community religious rituals (D.-J. Lee 2000:9–10; Natl. Mus. Korea 1995; SGP & NRAE 1998:25).

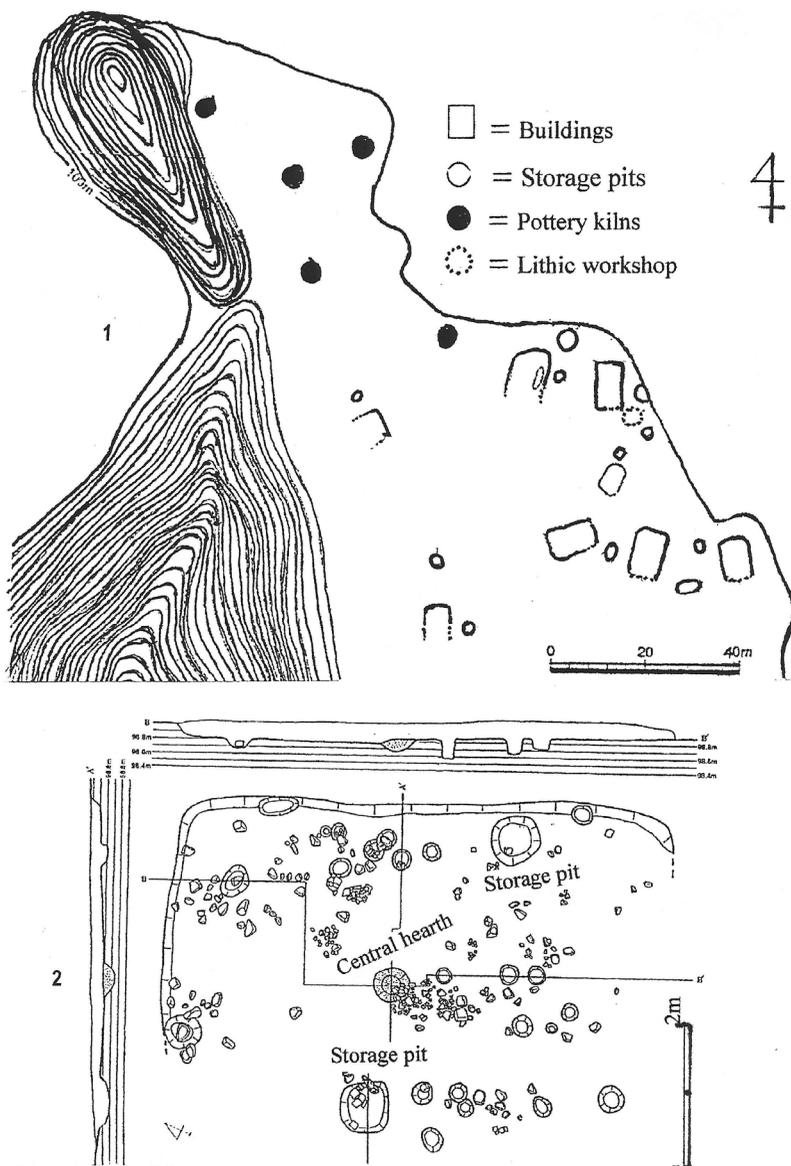


Fig. 5. Songjuk-ni village: (1) village plan; (2) floor plan of House #2. (Adapted from KNS & HGRICH 2009:201)

Pottery was well attested on the dwelling floors at Amsa-dong, which contained numerous broken Chulmun jars, pots, bowls, and dishes. Jars and pots had conical bodies with pointed bases, while bowls and dishes had shallow bodies with flat bases. The ceramic assemblage included large jars and pots with mouth diameters larger than 35 cm and mid-sized ones, 24–34 cm. Small vessels with mouths 17–23 cm in diameter constituted the most numerous type; they were probably used as common food dishes.

Complex decorative motifs and patterns were seen on the ceramics at Amsa-dong. A common pattern involved horizontal bands of impressed slants around the vessel mouth, horizontal herringbone designs around the body, and slants or horizontal herringbone pattern around the bottom. In some cases, wavy, semicircle, concentric, and spiral linear designs were added between the mouth and body of pots and jars (Natl. Mus. Korea 1995).

Stone tools from Amsa-dong include 96 chipped stone axes, 70 knives, and 139 net sinkers along with arrowheads, spear points, shovels, plows, sickles, and numerous mortars and pestles (Fig. 6) (Natl. Mus. Korea 1994, 1995). This eloquent assemblage speaks of hunting, fishing, gathering, and processing plant foods, and probably clearing and construction activities.

In a study of Chulmun settlement pattern, Bae (2007, 2009) noted that hunter-gatherers followed a well-established pattern of village construction during the latter half of Middle Neolithic Chulmun. As typified by Songjuk-ni, a village <sup>14</sup>C-dated to 3000–2500 B.C., the residential zone included a semicircle of individual dwellings built around a central open area (S.-G. Lee 2003) (Fig. 5: 1). Near the residential buildings were outdoor underground storage depots as well as ovens used for food preparation, creating an integrated functional complex of living and sleeping quarters, storage, and a kitchen.

Another salient feature of Middle Neolithic village planning were pottery kilns placed some distance away from the residential area. Excavators of the Songjuk-ni village site suggest this was done to protect the residential zone from the high heat (550–900 °C) during warm seasons and sparks generated by the open-pit firing kilns (Fig. 5: 1). A village of thatched houses would be at risk without adequate planning for protection from fire. This kind of intentional planning has been observed in other Neolithic settlements (Bae 2007, 2009). Other kinds of cooperative planning and execution of policies and tasks critical to the community's common security and well-being are also manifested in various settlements, as will be seen in more examples below.

#### *Middle Neolithic Chulmun Subsistence: A Broad-Spectrum Economy*

Like their immediate predecessors, Middle Neolithic hunters and gatherers characteristically pursued broad-spectrum subsistence strategies across a variety of terrains in their local settings. At Gungsan on the west coast, a shell midden reveals that Chulmun folk harvested resources of many kinds, including deer, antelope, badger, boar, dog, and birds from the land and cod, oyster, clam, gray mullet, and snails from the sea. Stone tools found in the dwellings included many triangular stemmed and leaf-shaped arrowheads, spear points, and harpoon heads (Fig. 6). These are all consistent with the shell midden evidence of local products sought and obtained. Net sinkers began to appear in site assemblages, foreshadowing an expansion into mass harvesting of riverine and marine fishes. Mortars and pestles indicate that processed acorns and other plant products were also increasingly incorporated into the community diet (Han 2002:302–304; KAHS 1998:15–18; MGYM 1991; SGGY 1977:21–30).

Jitap-ni and Amsa-dong are substantial interior valley Chulmun Neolithic sites typical of villages established on the lower reaches of various large rivers flowing from the interior zone out to Korea's western coast. Many net sinkers, mortars and pestles,

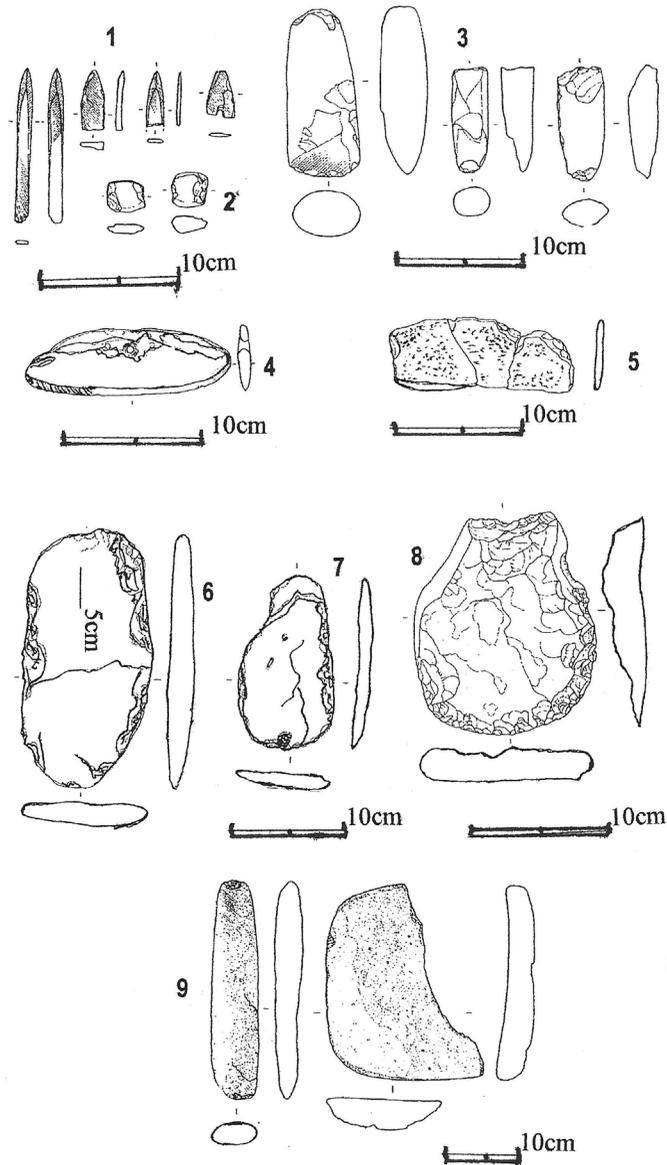


Fig. 6. Chulmun Neolithic stone tools from Amsadong: (1) arrowheads; (2) net sinkers; (3) axes and adzes; (4) crescent-shaped knife; (5) sickle blade; (6) plow (*boseop*); (7) hoe/pick (*gwaengi*); (8) shovel; (9) mortar and grinding stone. (Adapted from Natl. Mus. Korea 1994, 1995)

and other tools show that hunting, intensified harvest collecting, and riverine fishing were all major subsistence strategies in these areas (Natl. Mus. Korea 1994, 1995; SGGY 1977:21–30). Where acorns were available, as they commonly were in the interior valleys, acorn collection quickly grew in importance. This has been shown by a threefold increase in the number of Middle Neolithic Chulmun sites yielding acorn remains, as compared with sites of the preceding period (Ahn 2002: 100).

Sterol analyses from among 53 special-purpose stone-paved features in a Middle Chulmun site at Galmeo-ri, in the southwest inland region, indicate that these features were associated with heavy acorn processing (Ahn and Yu 2002). The harvesting of acorns became increasingly important in Late Neolithic times, with a sevenfold increase in acorn-yielding sites during that period compared to previously documented levels (Ahn 2002:100). In addition to acorns (*Quercus* sp.), Middle Chulmun Neolithic hunter-gatherers collected a variety of flesh fruits (*Vitis* sp. and *Rubus* sp.), nuts (*Juglans* sp.), and roots (*Alium* sp.) (Lee 2008b:391–395). Furthermore, the mass collection of acorns was accompanied by invention of more efficient food preparation tools. Earlier grinding stones found at Osan-ni and other early Neolithic sites were ball-shaped and held in one hand. These were replaced by more efficient club-like pestles operated with both hands during the Middle Neolithic (Song 2001) (Figs. 6: 9, 7: 6).

Thus, within the context of their increasingly broad-spectrum subsistence habits, sedentary Chulmun Neolithic hunter-gatherers improved their technology and infrastructure to support mass harvesting and storage of forest and marine/riverine foods at the same time they began heading toward millet cultivation. Momentous growth in economic productivity was getting under way in Korea (Choi 2001; Song 2001).

#### *Food Production: Broad-Spectrum Economy Plus*

Coinciding with and subsequent to the beginning of sedentism in Middle Neolithic times (c. 4000–3500 B.C.), the first signs of food production in the form of millet cultivation appeared in Korea (S.-M. Ahn 2006; G.-A. Lee 2003). This new subsistence effort was undoubtedly informed by the example of farming in the lower Liao River area of northeastern China, which had started as early as 5000 B.C. (Nelson 1992; Ye 1992:147). The floor fill of Dwelling #2 at the Middle Neolithic Jitap-ni site, in the northern part of west-central Korea, yielded a liter of carbonized grains of *Setaria italica* (foxtail millet) or *Panicum crus-galli* (barnyard grass) (Do and Hwang 1957). At the later Middle Neolithic village of Masan-ni, Dwelling #7 also yielded carbonized millet (KNS & HGRICH 2009:281–286; MGYM 1991:350–353). Another example of millet recovery in the same general area is afforded by the large Middle Neolithic village of Unseo-dong on Yeongjongdo Island, near Incheon.<sup>6</sup> In west-central Korea south of the Han River, carbonized remains of *Setaria italica* have been recovered at the Middle Neolithic site of Asan Shindoshi Area I, dated to about 3500 B.C. (Lee 2008a; Lee et al. 2008). Janghangseon Industrial Site 3, another Middle Neolithic Chulmun site in west-central Korea, also yielded *Setaria italica*, along with *Panicum miliaceum* and *Perilla* (Lee 2008a).

On the south coast, foxtail millet remains AMS-dated to about 3360 B.C. have been found on a Middle Neolithic Chulmun dwelling floor at Tongsam-dong (Crawford and Lee 2003; G.-A. Lee 2003:107). Carbonized remains of broomcorn millet (*Panicum miliaceum*) and edible wild chenopod plants (*Chenopodium* sp.) were also found in significant quantity in the Middle Neolithic strata of the Tongsam-dong shell midden. These data suggest that the Middle Neolithic inhabitants of Tongsam-dong not only cultivated a variety of grains but also effectively incorporated edible wild plants into their diet (Lee 2005).

At Bibong-ni, an inland tidal flat site of the Middle Chulmun, both foxtail and broomcorn millets have been recovered, the former from a shell midden and an

outdoor hearth (Lee 2008*b*). Investigators of the Sangchon B Middle Neolithic village in the southern inland zone reported finding millet from Dwelling #5 and barley from Dwelling #16 (D.-J. Lee 2000). The carbonized grains were found along with stone cultivation tools including plows.

Remains of rice appeared along with millet, barley, wheat, legumes, and hemp in the floor fill of a large house at Daechon-ni in south-central Korea near Daejeon City. Four <sup>14</sup>C dates have placed the age of this impressive mixed agricultural assemblage at 3200 B.C., still within Middle Neolithic times (Han et al. 2002). The social and organizational complexity implied by this site is discussed below.

Beyond the direct evidence of cultivated plant remains, significant numbers of specialized stone tools such as hoes, plows, and sickles found at Amsadong, Nampondong, Tongsam-dong, and other Middle Neolithic sites provide further evidence for cultivation during this period (Ahn and Lee 2004; Choi 2001, 2005; Lee 1998; Song 1998, 2001). Wooden implements could have easily been made using the commonly found polished stone axes, adzes, planes, and chisels, but few have survived. Impressive evidence for sophisticated woodworking at this time is however provided by two wooden boats and a wooden dagger found at Bibong-ni (Natl. Mus. Gimhae 2008).

To sum up this evidence, the presence of millet remains in all parts of the southern Korean peninsula, from Jitap-ni and Masan-ni in the north to Asan in west-central Korea, and Tongsamdong and Sangchon in the south and southeast, demonstrates that millet cultivation was widespread throughout the peninsula in Chulmun villages of Middle Neolithic times. Further, the Sangchon B and Daechon-ni data provide direct evidence for Middle Neolithic mixed crop cultivation that included millets along with rice and barley.<sup>7</sup> This evidence makes it highly likely that future research will show that grains other than millet were widely cultivated in Korea during the later Middle Neolithic, just as they were in adjacent China in the same period (Choi 2005; Crawford and Lee 2003).

During the later Middle Neolithic, new settlements well situated for millet cultivation began to appear in rich alluvial pockets along major river systems, most prominently in the southern interior of the peninsula and along the east and southeastern coasts (Lee 2005; Shin 1994:274–275; Song 1998, 2001, 2009). At this stage, such communities were generally small and may have initially been occupied by shifting cultivators who perhaps retained a measure of mobility in conjunction with continued traditional hunting, fishing, and collecting activities or moved from one arable spot to another in response to other local circumstances (Ahn and Lee 2004; Song 2001).

Dunsan, a Middle Neolithic site in Daejeon City in south-central Korea, appears to have been a millet cultivation site that operated within a broader regime of logistic mobility. Located on a low ridge near a rich alluvial plain at the confluence of two rivers, Dunsan contains 15 large semi-subterranean pits, probably shelters, though none had a hearth. These pits contain pottery vessels and agricultural tools, including many plows, a sickle made of boars' teeth, and stone mortars. Investigators of the site posit that it was a seasonal camp rather than a year-round settlement, a "field house" used as a base for the cultivation and storage of millet (KAHS 1998:43–44).

In light of these observations, it is now thought that sometime before 3600 B.C. the foraging people of west-central Korea incorporated millet into their subsistence (G.-A. Lee 2003:178). With the inception of millet cultivation, Middle Chulmun

Neolithic inhabitants of this region achieved a highly productive subsistence economy that rapidly moved from mixed foraging into increased cultivation (S-T. Im 2006a). The latter achievement led to expansion of Chulmun Middle Neolithic settlements throughout the southern half of the peninsula (Im 2006a, 2009). According to Song (1998, 2001), the Middle Neolithic expansion was essentially an early agricultural expansion.

#### *Intensification in Marine Resource Exploitation*

A second major component of the economic base was also growing in strength and productivity during the same Middle Neolithic period in Korea. On the southern coast at Tongsam-dong, the Middle Neolithic Mokdo phase (about 4000 B.C.) showed dramatic increase in harvesting of marine resources. According to shell midden analysis, whale, sea lion, and shark remains increased more than a hundred-fold over the levels seen in the Early Neolithic. The number of shellfish types collected increased from 13 to 31. New species such as cod were added to the fish being exploited. Further, although the Tongsam-dong site's subsistence strategy emphasized marine resources, deer-hunting productivity also surged, indicated by a fourfold increase of deer remains over the levels of the preceding Busan phase (Sample 1974:102; Shin 1994:189).

During the Tongsam-dong Dudo phase at about 3400–3200 B.C., shellfish exploitation remained essentially at the same high rate as in the preceding Mokdo phase. However, the appearance of foxtail millet (AMS-dated to about 3360 B.C.) along with stone spades and other agricultural tools coincided with a noticeable decrease in the number of land and sea mammals, birds, and large fish consumed at Tongsam-dong (Shin 1994:189–190). The phenomenon suggests that locally, at least, millet cultivation was productive enough to preempt a good deal of the energy that earlier site occupants had put into fishing and hunting.

The high maritime productivity of the Middle Neolithic Chulmun period at Tongsam-dong is also observed on Korea's west coast, including the offshore islands, where more than 90 Middle Neolithic shell middens have been identified between Ganghwado Island and the Geum River (KNS & HGRICH 2009:369–377). At the Gonam-ni shell midden on Anmyeondo Island, the oyster (*Crassostrea gigas*) constituted 80% of all shellfish remains; oyster was also the primary shellfish collected at other sites (KAHS 1998:10–11). The presence of many bones and net sinkers at various shell middens show that marine resources other than shellfish, such as sea bream and stingrays, were being productively sought in Korea's West Sea (Kim 2002a, 2002b; C.-B. Kim 2007; E.-Y. Kim 2007).

Comparative studies of ceramic remains from many Chulmun Middle Neolithic residential sites on both the peninsula and adjacent islands have led Kim (2002a, 2002b) and others (Ahn and Lee 2001; C.-B. Kim 2007) to conclude that most of the 28 island shell middens mark special-purpose resource patches shared by various Middle Neolithic communities. Some investigators have argued that various established settlements on the mainland and large offshore islands such as Dae Yeonpyeongdo approached shellfish exploitation as a logistically organized activity and that the shell middens mark temporary camps repeatedly occupied during shellfish collection and fishing seasons (Kim 2002a, 2002b; E.-Y. Kim 2007).

*Innovation in Production Tools*

The production of polished stone tools marked an advance in lithic technology that coincided with subsistence intensification. The advanced technology enabled Chulmun lithic technicians to produce effective stone tools more or less on demand for various industrial and subsistence purposes. The development of efficient lithic perforation is noteworthy. Drilling holes in stone tools facilitated tying and securing them to wooden handles, which enhanced their effectiveness (Park 2007; SGGY 1977: 32).

For hunting, slender polished stone arrowheads having a special two-winged base and razor-sharp point were invented during the Chulmun Middle Neolithic of Korea. They are not found outside the peninsula. Along with these unique arrowheads, polished stone spear points also appeared (Fig. 7: 1–2) (D.-J. Lee 2003; MGYM 1991: 193, 363–365; SGGY 1977: 32).

Stone net sinkers manufactured from modified stream pebbles also became important (Fig. 7: 9). Net fishing became the dominant subsistence strategy in major rivers

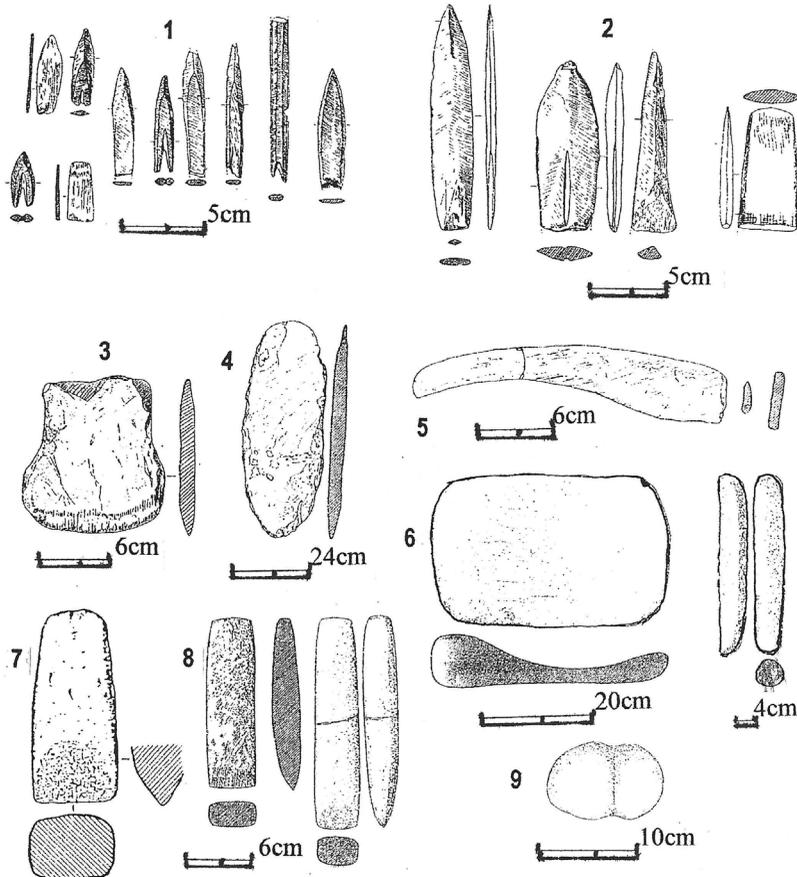


Fig. 7. Chulmun Neolithic tools from Gungsan and Jitap-ni: (1) arrowheads; (2) spear points; (3) hoe/pick (*gwaengi*); (4) plow/shovel (*boseup*); (5) sickle (*nat*); (6) saddle quern and grinding stone; (7) axe; (8) adzes; (9) net sinker. (Adapted from MGYM 1991: 193, 363–365)

because it was far more productive than fishing with hooks (D.-J. Lee 2003). Coastal fishing continued to rely on hooks along with nets (Kim 1998). Obsidian flakes, often retouched as denticulates, were also popular in coastal villages as cutting and scraping tools used in fishing and shellfish-collecting activities (Lee 1998; Park 2007).

Advanced agricultural implements that were made with partially or wholly ground working edges appeared along with advanced hunting tools. They included hoes, plows, and sickles made of stone or bone. The heavy stone plows, operated by two or more people, revolutionized field tilling much as the iron plow would in a later historical period (Choi 2005; MGYM 1991:193, 363–365; SGGY 1977:32; Song 2001). The introduction of club-like pestles and saddle querns is also significant. Unlike the earlier ball-shaped grinding stones held in one hand, the club-like pestles requiring both hands greatly increased efficiency in processing acorns and other dried goods (Figs. 6 and 7) (Song 2001).

Advanced stone tools also included polished stone axes and adzes made for carpentry and woodworking. In light of the relative numbers of such woodworking tools, wooden implements are believed to have been widely used in daily life as well as in agricultural activities. Preserved in the Bibong-ni site, two wooden boats and a wooden dagger of the Middle Neolithic period are evidence of the craftsmanship such stone tools made possible (Natl. Mus. Gimhae 2008). Polished stone tools were also used in manufacturing bone tools and ornaments, an important part of Neolithic culture (Ha 2006b; Lee 2006). Bone tools included needles, awls, spear points, harpoons, sickles, knives, and daggers (Fig. 8). Deer antlers were used as digging tools (Choi 2001:26–28).

#### *Middle Neolithic Chulmun Expansion*

Coinciding with the subsistence intensification that combined long-established hunting-fishing-gathering with the beginning of cereal cultivation, Middle Neolithic settlements grew in number and size (Im 2009). Ten large villages with 10 or more dwellings each have been studied at Amsa-dong, Neunggok-dong, Shingil-dong, Unseo-dong, Sammokdo III, Masan-ni, Jigyeong-ni, Hashi-dong, Songjuk-ni, and Sangcheon B. Four of these sites had more than 20 dwellings; Unseo-dong was an extraordinarily large island village of 50 dwellings. Six of all currently known large Middle Chulmun villages are in west-central Korea, mostly along the coastal zone where their occupants had ready access to rich marine resources in the shallow West Sea (KNS & HGRICH 2009).

The size of certain buildings increased along with village size. At Amsa-dong, for example, Dwelling #71-5 measures 7.8 m × 6.8 m; others range between 3.9 m × 3.1 m and 6.5 m × 5.5 m. The largest house has a two-level subterranean floor with the inner floor sunk 52 cm below the outer one, which itself was 82 cm below the surface. Such large houses with split-level interior floors were also found at Namgyeong and Geumtal-li in the Late Neolithic period; they were generally used as either a storage house or community meeting place (Jeong 1994; KNS & HGRICH 2009; Natl. Mus. Korea 1994).

In addition to Amsa-dong, the Daecheon-ni site in south-central Korea contains a large Neolithic dwelling (9.5 m × 5 m). Rectangular in shape and dated to about 3200 B.C., this was a residential complex internally differentiated into living and working or storage areas (Fig. 9). In addition to numerous Chulmun pottery vessels,

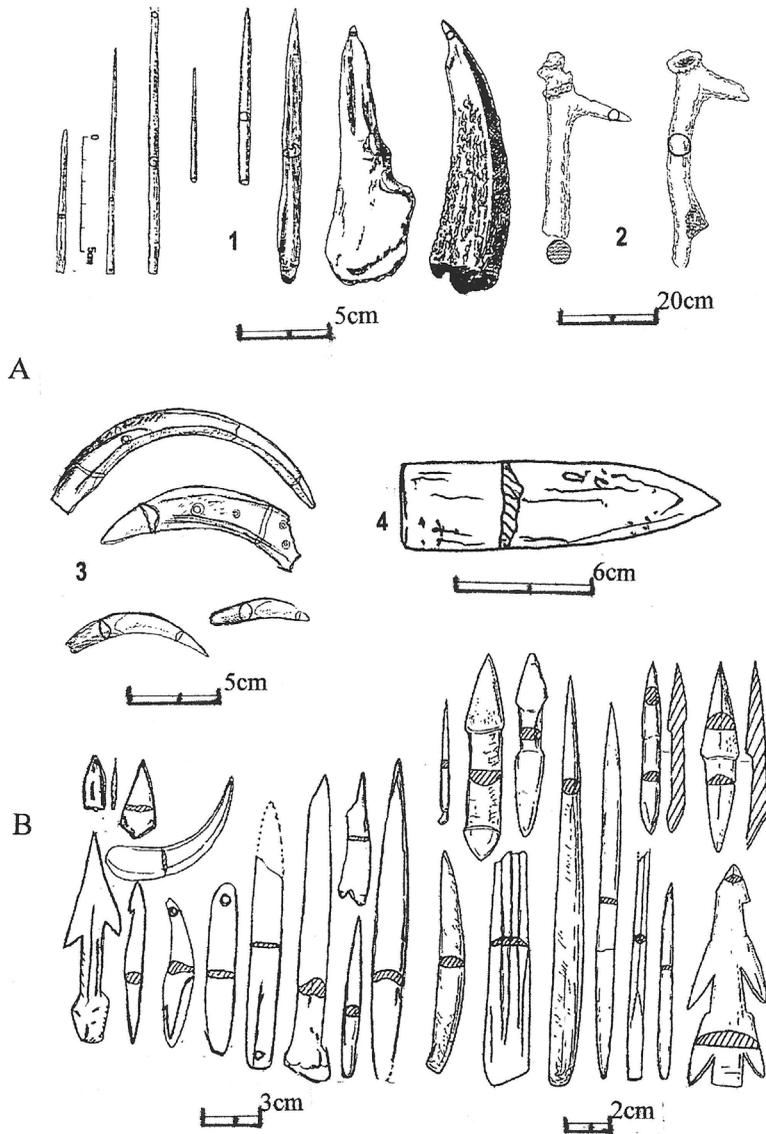


Fig. 8. Chulmun Neolithic bone tools. A: from Middle Neolithic Gungsan—(1) needles and awls; (2) picks; (3) sickles and knives; (4) spear point. B: from Late Neolithic Seopohang—harpoons, lances, and spear points. (Adapted from MGYM 1991:194, 473–477)

its floor fill yielded carbonized remains of millet, rice, barley, wheat, legumes, acorns, and hemp (Han et al. 2002; Ku 2005).

#### *Middle Neolithic Community Segmentation*

Table 2 lists 55 Middle Neolithic Chulmun settlement sites ordered by region, which had fewer than 10 dwellings each. Such sites are found throughout the Korean Pen-

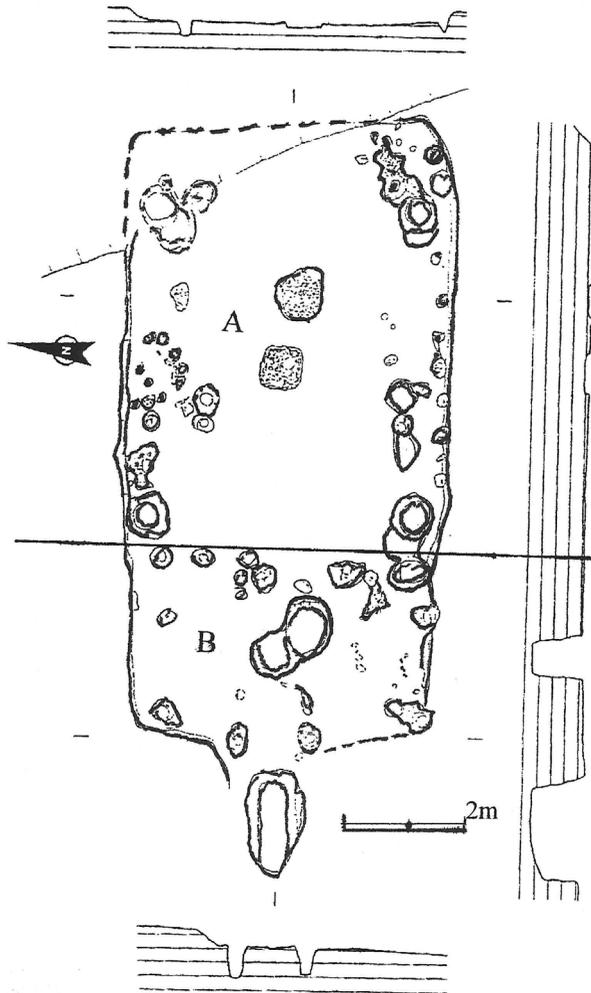


Fig. 9. Daecheon-ni house plan. A: living area. B: special purpose area. (Adapted from Ku 2005:11)

insula in the coastal zones as well as along the interior river systems; they suggest that the Middle Neolithic Chulmun expansion was explosive (Im 2006a, 2009; KNS & HGRICH 2009; Song 1998, 2001). When community growth reached a saturation point, villages began to split off into small hamlets of four to eight families or fewer. These smaller units apparently fanned out to various parts of the peninsula—the east coast, south coast, and inland—relocating at considerable distances from one another (Im 2006a, 2009; Song 1998).

The main problem facing the Middle Neolithic millet cultivators was not the lack of land or open spaces but the lack of patches of land that could be cultivated with little labor input. The tough grass, brush, and trees of the Korean landscape forced early cultivators to search for patches of land that did not require clearing. Though limited, these patches were most often available at river bends or at a confluence of rivers. Find-spots of Chulmun agricultural implements such as hoes, shovels, plows, sickles, and advanced saddle querns suggest that the dispersed villages

TABLE 2. CURRENTLY KNOWN MIDDLE NEOLITHIC CHULMUN SETTLEMENTS IN KOREA, WITH FEWER THAN TEN DWELLINGS (NUMBER OF HOUSES INDICATED IN PARENTHESES).

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<u>Northern part of West-Central Korea:</u> Geumtal-li I (5), Namgyeong (5), Pyodae (5), Jangchon (2), Cheongho-ri (2), Seoktal-li (1).
<u>West-Central Korea:</u> Nongseo-ri (8), Jungsan-dong (8), Samgeo-ri (6), Giji-ri (5), Dangdong-ni (4), Seongnae-ri (4), Gwanchang-ni (4), Hopyung-dong (3), Oido Gaunde Salmak (2), Udu-ri (2), Neundeul (1), Kkachisan (1), Songweol-li (1), Hagam-ri (1), Sasong-dong (1), Pangyo-dong (1), Gajae-ri (1), Misa-ri (1).
<u>East-Central Korea:</u> Yeoknae-ri (3), Auraji (3), Geodu-ri (1), Shinmae-ri (1), Cheonjeon-ri (1), Naepyeong-ni (1).
<u>East Coast:</u> Chodang-dong (7), Gapyeong-ni (2), Songjeon-ni (2).
<u>Southwest Inland Zone:</u> Jangjae-ri (9), Baegam-ri (3), Jingeuneul (3), Galmeo-ri (3), Bongmyung-dong (2), Shinweol-dong (1), Geumseok-ri (1), Gwanpyeong-dong (1), Daecheon-ni (1), Shingwan-dong (1), Ungpo-ri (1), Hyoja-dong (1), Songweol-li (1), Sangjeong-ni (1), Baekseok-dong (1), Ssangcheong-ni.
<u>Southern Inland Zone:</u> Bibong-ni (2).
<u>Southwest Coast:</u> Gado (4), Jangam (2), Noraeseom (1).
<u>South Coast:</u> Tongsam-dong (3), Mokdo (2).

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Source: KNS & HGRICH 2009:292–359.

first settled on fertile alluvial banks in the lower reaches of major rivers and from there gradually moved upstream into the upper reaches of the river systems, occupying arable lands at the confluences of rivers along the way. The trend continued into the Late Neolithic period (Song 1998, 2001, 2009). This settlement dispersal was an important outcome of the emerging new subsistence economy incorporating millet cultivation.

#### LATE NEOLITHIC CHULMUN SETTLEMENT AND SUBSISTENCE 2500–1300 B.C.

In west-central Korea, the dispersal that began during the latter part of the Middle Neolithic Chulmun period accelerated in Late Neolithic times. It is thought that the village communities initially involved were quite small. They probably divided their time and energy between long-established hunting-gathering and newer millet cultivation pursuits, perhaps exercising considerable mobility in the process (Im 2006a). With a few exceptions such as Poonggi-dong (Ku 2004), people maintained few substantial residential structures and left relatively little habitation remains. Often stone tools used for horticultural activities are the only evidence of their activities at these short-term residential camps (Song 1998, 2001).

In other parts of the Korean Peninsula, however, villages thrived during Late Neolithic times. Substantial Late Chulmun settlements include, among others, Seopohang on the northeast coast; Shinam-ni and Yongyeon-ni in the northwest; Geumtal-li and Namgyeong in the northern reaches of west-central Korea; Cheoltong-ri on the central east coast; Sangcheong-ni in east central Korea; Yulli on the southeast coast; and Sangchon B and Bonggye-ri in the southern inland zone (Bae, 2009; Lee 1998; D.-J. Lee 2000; SGGY 1977). Recent investigations indicate that Late Neolithic villages also flourished in the Asan area of the west-central region (Ku 2004).

Extraordinarily large buildings appear in some of these Late Neolithic villages. Dwelling #31 at Namgyeong measures an impressive 13.5 m × 8.4 m. More than 3000 net sinkers were found in this storage house (Kim and Seok 1984). At Seopohang, Dwelling #9 was a similarly large building measuring 12 m × 6 m that has been recently reassessed and assigned to the Late Neolithic; it apparently served as a community center (Kim 2009).

Aside from increased size, the shape of residential buildings also changed. Excavated evidence reveals a tendency for the circular and square residential structures of earlier Chulmun settlements to become longer, more narrow, and rectangular by the time of the early Mumun period, which marks the beginning of Bronze Age times (CRICH 2008; Ku 2005).

#### *Late Neolithic Subsistence: Horticultural Expansion*

Increasing agricultural activity in the interior regions shows that millet-based food production became a significant component of the mainland economy during Middle Neolithic times and that the trend continued through the Late Neolithic (Kim 1986:52–57; Lee 2005:39–40; Shin 1994:275–276). At the same time, a gradual decrease in marine resource exploitation at mainland coastal sites accompanied a shift to increased use of terrestrial resources, as at Buan-Gunsan on the west coast (Lee 2001:311), and along the southern coast (Shin 1994:275). On a few islands such as Sangnodaedo off the southern coast, where the island inhabitants had long depended on marine resources, the old patterns continued with little change (Shin 1994:179–187, 273–276).

A steadily growing emphasis on grain cultivation by later Chulmun people is attested by several techno-economic social phenomena. First, during the Late Chulmun, foxtail and broomcorn millet species overwhelmingly outnumbered chenopods and other wild plants among cultivated and protected plants, suggesting that millet was becoming the most manageable and productive food source (G.-A. Lee 2003:107, 169–170; 2005). Second, new sites of millet cultivation continued to appear over a broad area, as at Namgyeong and Sojeong-ni Area 2 in the north and Oun 1 in the south (Ahn 2002; Choi 2005; Crawford and Lee 2003; Kim and Seok 1984; G.-A. Lee 2003).

A number of Late Neolithic Chulmun sites also provide archaeological evidence of rice, another cultigen essential to highly productive subsistence intensification. The finds include carbonized rice from Seongjeo-ri (a peat bog), Daehwa-ri, and Gahyeon-ni (also a peat bog); rice plant opal from Juyeop-ni, Jodong-ni, and Nongso-ri (a shell midden); rice pollen from Gaheung-ni; and rice grain impressions in pottery vessels from Udo (Ahn 2002:99; Choi 2005).

Carbonized remains of barley in the Middle Neolithic phase of Sangchon B in the southern inland zone, as well as at Daecheon-ni in south-central Korea, indicate that mixed crop cultivation had already begun during the Middle Chulmun period. Barley remains also appear in the Late Neolithic phase of Sangchon B (D.-J. Lee 2000). That along with the evidence of rice at various Late Neolithic sites mentioned above shows that mixed crop cultivation continued after the Middle Neolithic.

The increase in food production activities coincided with a steady increase in number and variety of agricultural tools found throughout the peninsula from Middle Neolithic times onward. These include picks, hoes, and plows used for cultivation;

bone and stone sickles for reaping; and mortars and pestles for plant food processing. Inside House #31 at Namgyeong 10 sets of large saddle querns and pestles were found, five of which were lined up in a row against a wall (Choi 2001, 2005; Lee 1998; D.-J. Lee 2000; Kim and Seok 1984; Song 1998, 2001). A particularly significant technology in the Late Neolithic period was a versatile cultivation tool known as a *gombae gwaeng-i* (Fig. 10: 1). With an ovate blade and a narrowed, parallel-sided shank, it could be hafted as either a shovel/plowshare or a hoe, depending on whether the shank was lashed parallel to a straight wooden handle or to an angled handle made by appropriately trimming a forked tree branch.<sup>8</sup> As a heavy-duty hoe, it was used to break up large lumps of earth into fine soil and create rows of mounds for seed planting. Appearing first in the northern part of the peninsula during the Late Neolithic,

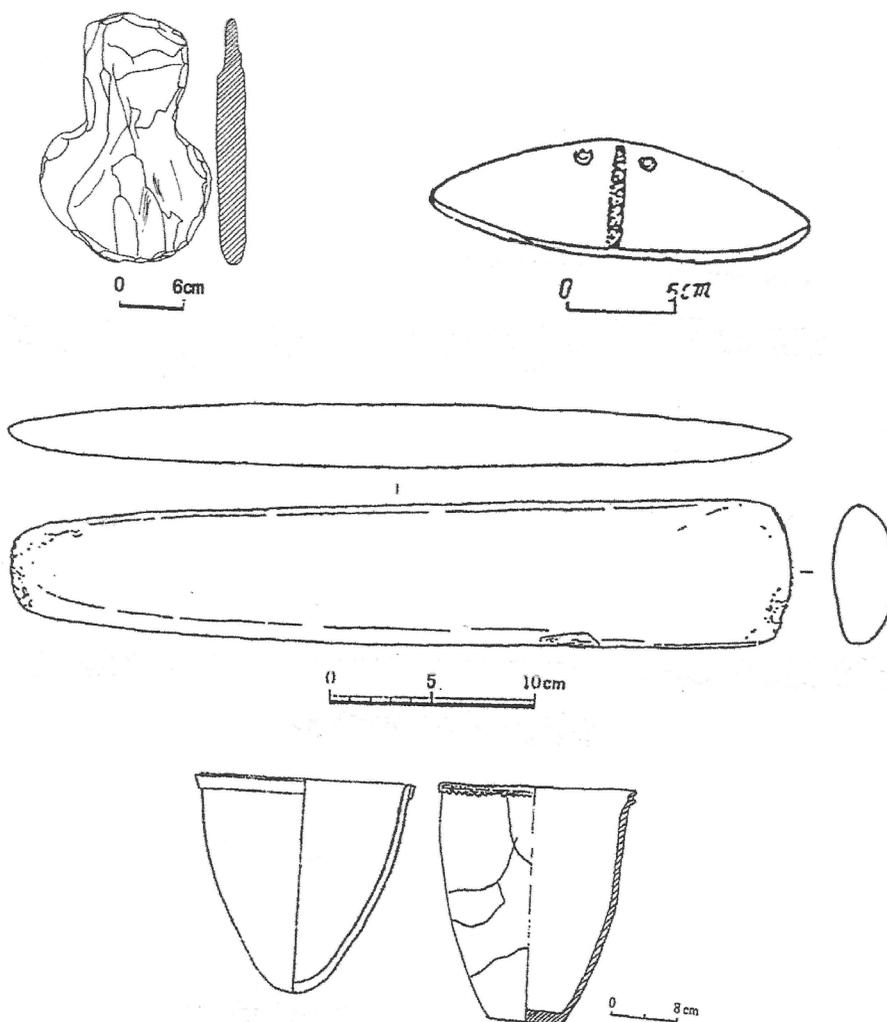


Fig. 10. Late Neolithic tools and pottery: (1) *Gombae Gwaengi*; (2) crescent-shaped stone knife; (3) elongated stone axe from Hupori; (4–5) jars with a double lip (4: from Yulli; 5: from Seopohang). (Adapted from Ha 2006a: 168; KAHS 1998: Illustrations; MGYM 1991: 253, 460, 476–478)

this intelligently conceived stone head spread southward, becoming a standard cultivation tool used for intensive agriculture in the following Mumun period. Along with the *gombae gwaeng-i* came lunar-shaped polished stone knives (Fig. 10: 2). These also first appeared in the north, at Shinam-ni adjacent to northeast China, then gradually spread southward; by the Bronze Age they were a standard grain-reaping sickle (NCHRI 2001: 79, 447–448).

As in earlier Chulmun times, local ecological conditions affected regional behavior in subsistence patterns during the Late Chulmun Neolithic (Shin 1994). Even so, toward the end of the Late Neolithic, the earlier foraging economy of hunting, fishing, and gathering supplemented by millet cultivation was giving way to an increasingly intensive mixed crop agriculture that was beginning to include rice, barley, and legumes (Ahn 2000, 2005; Kim and Seok 1984; Lee 2001; D.-J. Lee 2000; G.-A. Lee 2003; SGGY 1977; Shin 2001, 2002b).

### *Mass-Capture Technology*

Along with the expansion in volume and variety of cultivated grains, the Late Neolithic period witnessed a florescence in the deployment of mass-capture technology. As previously noted, Building #31 at Namgyeong (a Late Neolithic village on the northern bank of the Daedong River within the present boundary of Pyeongyang city) contained nearly 3000 stone net sinkers (2000 in one spot and 600 in another spot inside the building) and 120 storage vessels, some of which were considerable in size. At Geumtal-li, another late Neolithic village nearby, excavators found another group of 600 stone net sinkers inside Building #9.

As at most prehistoric sites, no nets have been preserved (Rowley-Conwy and Zvelebil 1989). However, since 600 net sinkers were found in two separate spots, it is reasonable to assume that large nets each requiring about 600 stone sinkers were being used. If so, Building #31 at Namgyeong once stored five substantial nets. These nets would have been used for mass-capture of abundant freshwater fish in the Daedong River. The fifth longest river in Korea, Daedong is 438 km long and has been reported home to 68 freshwater fish species, including gray mullet, carp, bass, perch, eel, and catfish. The numerous pottery vessels found associated with the net sinkers would have served to store large quantities of fish.

In addition to large nets used in mass river-fish capturing, a tidal weir system appears to have been employed in the West Sea. The investigators of the Gonam-ni B-3 Shell Midden on Anmyeondo Island off the west coast speculate that the large quantities of sea bream, shark, sea bass, perch, and flounder attested by the shell midden were caught using a tidal weir system.<sup>9</sup> This hypothesis is entertained on the basis that normal fishing tools such as hooks, harpoons, and net sinkers are missing from the shell midden and the fact that the powerful, ruling families of Korea's Joseon Kingdom (A.D. 1398–1910) monopolistically controlled extensive weir systems for mass-capture of marine resources in the West Sea (So 2002).

Also relevant to the discussion of Late Neolithic mass-capture of marine resources are the famous Bangudae petroglyphs known from Daegok-ni in southeast Korea (Fig. 11). Found on a broad rock ledge alongside the lower Taehwa River, which flows into the East Sea some distance north of Busan, some of these petroglyphs depict whales being hunted from boats. In one substantial boat rowed by about 20 men stands a hunter throwing a spear or harpoon at a whale. A number of beautifully

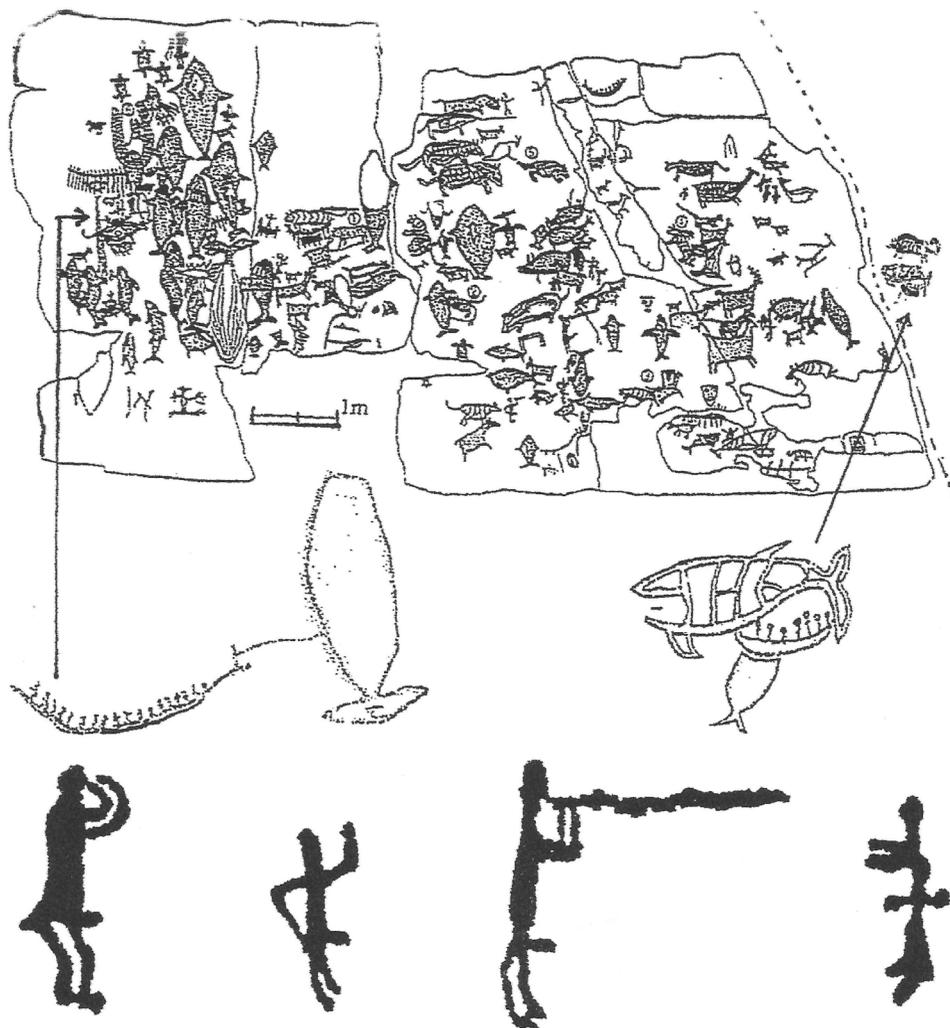


Fig. 11. Bangudae petroglyphs. (Adapted from Han 2002:648; Jeon 1996:78; Moon 1984:199, 239)

executed petroglyphic images depict whales in good anatomical detail. The whaling enterprise recorded at Bangudae could only have been undertaken by well-organized and skilled teams working under an effective elite leader, as we know from the ethnographic example of Eskimo whalers. Among the Bering Sea Eskimo, the rich harvests obtained from successful whaling expeditions established and sustained a whaling captain's wealth, prestige, and social preeminence while enriching his community (Spencer 1959).

The precise chronology of the Bangudae petroglyphs has been much debated, although they are clearly ancient (Hwang and Yun 2000; Jang 1996). The absence of recognizable whale hunting tools in local Neolithic shell middens and the assumption that only barges and hollowed-out log canoes existed during the Neolithic period have led a number of scholars to advocate a Bronze Age origin for the petroglyphs

(Im 1991; Im 1999; Jang 1996). Other scholars, noting that the Bangudae petroglyphs depict only fishing and hunting scenes, argue that they reflect the economic life of Neolithic hunter-fisher-gatherers and were first created during the Late Neolithic as part of a fertility ritual (Jeong 1988; Lee 1986; Moon 1984). Hwang and Yun (2000) recently strengthened the argument for Neolithic origins of Bangudae whale hunting on the basis of careful analyses of the physical environment of the Taehwa River in the Holocene. They posit that the sea level rise during the Chulmun Neolithic period made the river valley near Bangudae part of the East Sea. Already skilled in river fishing, Neolithic hunter-fishers then corralled the sea mammals into a killing area using several small boats. The precise dating of whale hunting at Bangudae cannot be resolved here, but the history of sea-mammal hunting is documented well back into Middle Holocene times in the northern Pacific and all around the East Sea, so it is reasonable to entertain the possibility of whaling at Bangudae by Late Neolithic times, if not earlier (Ackerman 1984; Aikens and Akazawa 1992; Dikov 2004).

Having broadly characterized the developing economic trajectory of the Korean Neolithic, it is important to return at this point to a matter of definition. As noted earlier, the Chulmun complex of geometric ceramic decoration gave its name to Korea's Middle and Late Neolithic periods. But in Late Neolithic times, Korea's Chulmun pottery tradition steadily shed those designs, becoming increasingly Mumun, a plain pottery with few or no decorations (Fig. 2: 4). Concurrently, a new type of pottery vessel with doubled lips began to appear in the assemblages of various Late Neolithic sites and continued through the Early Mumun period (Fig. 10: 4). This attests to cultural continuation between Late Chulmun and Early Mumun pottery manufactures (Bae 2003; Ha 2006a; Shin 1994, 2002a). By the time mixed-crop agriculture that included rice cultivation was supplanting the older mainly foraging economy, surface-marked Chulmun pottery had all but disappeared. The prevailing pottery was now the Mumun type; hence the term "Mumun agriculture" is applied to the diverse new crop complexes that included rice.

#### NEOLITHIC GRAVES AND PRESTIGE GOODS, SPECIAL FEATURES, AND TRADE/EXCHANGE

##### *Graves and Prestige Goods*

Virtually all intact Korean Neolithic graves identified thus far come from Chulmun shell middens along the coast or on offshore islands because lime-rich seashells provide a chemistry conducive to the preservation of bone. Conversely, intact graves are extremely rare in mainland sites because the high acidity of Korean soil quickly decomposes bone and any other organic materials contained in a grave. Non-shell midden sites nevertheless occasionally contain imperishable artifacts that provide information on the status or activities of the people buried in them (Fig. 4).

Fifteen earthen pit graves were found associated with a shell midden on Yeon-daedo Island off the south coast; 13 of them contained human skeletal remains. Each grave was a single burial except for Grave #2, which appeared to be a family burial with three skeletons. All graves contained burial goods, but the materials in Graves #7, #11, and #14 were distinguished from those of the others in both quantity and quality, suggesting social inequality existed in the associated settlement. Grave #7 contained shell ankle and arm bracelets, a hairpin, and neck pendants, while Grave

#14 held two tubular beads, one made of jade and one of agate (Natl. Mus. Jinjoo 1994).

At the Beombang Shell Midden site, an earthen pit grave was found along with outdoor cooking facilities. The grave contained skeletal remains of a female child and a jade ornament (Busan City Museum 1996). The Sangnodaedo Sandeung site revealed an earthen pit grave containing skeletal remains of a female, 13 to 15 years old, with three shell bracelets on her left wrist (Busan College 1989).

On Yokjido Island, skeletal remains of three people were recovered from under a pile of stones. An earthen pit of irregular shape at the same spot contained remains of a female, about 20 years old, and a male. The latter was an adult who displayed an external auditory canal exostosis, which is a distinguishing acquired anatomical trait of longtime swimmers and divers; this suggests the man was a specialist in underwater harvesting (Natl. Mus. Jinjoo 1989).

Two complete jar coffins at Sangchon B in Korea's southern inland zone contained cremated bones. The jar burials were found inside Dwelling #14; they contained a red-burnished bowl and a variety of stone tools made for industrial and subsistence activities, including projectiles, polishing stones, net sinkers, and a fire ignition stone (D.-J. Lee 2000).

Known Late Neolithic Chulmun graves include the Gyo-dong Cave and Hupo-ri burials. Gyo-dong Cave, located in Chuncheon City in east-central Korea's mountainous region, contained the remains of three skeletons and numerous stone tools including a 40.8 cm long stone axe, five smaller stone axes, knives, arrowheads, net sinkers, a compound fishhook, and awls, along with an 11-cm-long tubular bead and a piece of quartz crystal (Kim 1963).

Hupo-ri on the southeast coast includes a large earthen pit grave (4.5 m × 3.5 m) on the top of a 45 m high hill. It contained the cremated skeletal remains of at least 40 young males and females, evidently placed there over time. The skeletal remains were ritually covered with more than 180 fragments of long slender axes made of gneiss and smaller axes made of hornfels (Fig. 10: 3). Other burial goods included small ornamental axes of precious ground and polished stone and two tubular beads (Natl. Mus. Gyeongju 1991).

### *Special-Purpose Features*

Numerous special-purpose features in the form of oval or square stone-paved structures have been found at various Neolithic habitation sites, ranging in number from 5 at Amsa-dong (Natl. Mus. Korea 1995: 227–228) to more than 50 at Galmeo-ri (Ahn and Yu 2002). One of the special features at Amsadong is 194 cm × 392 cm in width and length while most of the features at Galmeo-ri are 80 cm × 100 cm. Their functions are generally unknown, but chemical analyses of the associated soil at Galmeo-ri indicate that some of these features were used for processing acorns (Ahn and Yu 2002).

Two stone pavement features at Sangchon B were apparently constructed for mortuary rituals. Located nearly side by side, one was 8.70 m long and 5.50 m wide, the other 30 m long, 2.50 m wide, and 1 m high. Burned skeletal remains inside the smaller feature and numerous charcoal remains nearby have led investigators to posit that it was used as a cremation platform; the larger feature was perhaps used for a community mortuary ritual (D.-J. Lee 2000).

*Trade and Exchange*

Nonlocal items found at Neolithic sites indicate that long-distance trade and exchange began during the Early Neolithic and continued through the Late Neolithic, with a florescence during Middle Neolithic Chulmun times. Trade items included jade, pottery vessels, shell ornaments, production tools, and obsidian raw material. Raw materials for white jade ornaments came from northeastern Manchuria and eastern Siberia via Korea's Tumen River into central Korea, where the stone was locally turned into tubular beads such as those found in the Gyo-dong Cave grave in Chuncheon (Han 2002:240–241).

The most voluminous long-distance exchange conducted during the Neolithic period took place between Korea's southern coast and the northwest coast of Kyushu across the Korea Strait, which served as a common maritime economic zone for the two regions. Chulmun pottery types found at 27 sites in Kyushu and Jomon pottery types found at 24 sites on Korea's southern coast, representing the entire span of the Korean Neolithic, suggest that the two regions maintained a long-term trading relationship over some 3000 years (Ha 2006c; Hirose 2005).

The primary objective of trade for Neolithic inhabitants of the Korean coast was obtaining raw obsidian from Kyushu; this is suggested by the abundance of Kyushu obsidian at various southern coastal sites in Korea. The imported raw obsidian was used to manufacture a variety of hunting and fishing tools according to local needs and specifications, including arrowheads, harpoon points, scrapers, and awls. Demand for the Japanese obsidian was great because the Korean Peninsula lacks obsidian sources except in the extreme north.

Because of the importance of obsidian tools in Korean subsistence strategies, and the difficulty of sailing long distance across the hazardous Korea Strait, the obsidian trade was evidently carried out from early on as an organized economic activity. The presence of over 2600 Korean Yunggimun Early Neolithic pottery pieces at Koshitaka on Tsushima Island, midway between Korea's southern coast and northern Kyushu, has led investigators to posit that one part of the organized activity was maintaining a base for raw material acquisition.<sup>10</sup> Chulmun traders acquired Kyushu obsidian on Tsushima Island for subsequent delivery to their proprietors or customers at Tongsam-dong. The latter then redistributed the raw material as well as manufactured goods to other Neolithic villages along the Korean coast and offshore islands (Ha 2006c).

In exchange for the obsidian, Chulmun traders exported compound fishhooks and clamshell arm bracelets to Jomon Kyushu. Most of the numerous shell arm bracelets (84%) found at the Saga shell mound on Tsushima Island are made of *Glycimeris albolineata* shells unique to Korea's southern coast. The recent recovery at Tongsam-dong of more than 1500 *Glycimeris albolineata* shells, including many half-worked ones, along with a large quantity of obsidian materials, suggests that Tongsam-dong was a shell-bracelet manufacturing and redistribution center (Ha 2006c).

DISCUSSION: COMPLEX ADAPTIVE BEHAVIOR, LOGISTICAL ORGANIZATION,  
STORAGE, AND THE MERGING OF FORAGING AND FARMING  
IN NEOLITHIC KOREA

Fitzhugh observes that “social evolution [is] the consequence of a dynamic interplay between individual adaptive behaviors and the socio-ecological contexts they help

to shape” (2003:8). A simple society becomes more complex when its members engage in innovative, dynamic, and complex adaptive behaviors in their settlement-subsistence strategies. Chulmun complexity in subsistence strategies began with the trend toward sedentism that emerged around 4000 B.C. in west-central Korea. For Chulmun Neolithic hunter-gatherers, the switch was a momentous event that brought new challenges as well as new opportunities in their quest for sociopolitical and economic security.

Even as they were pursuing a broad-spectrum economy, they embarked on new behaviors. A seminal new behavior was their adoption of millet cultivation to increase their food supply. As a food-procurement technique, millet cultivation is one of the less time-consuming and labor-intensive production strategies, and therefore is a relatively practical way for hunter-gatherers busy with other subsistence activities to provide themselves with more “groceries” and greater economic security. The millet harvest can be gathered, transported, and stored for the winter season and processed for eating using technologies and practices already long established in the cultural repertoire of hunting and gathering.

It is noteworthy that the first Chulmun Neolithic experiments with agriculture apparently took place in the Daedong River basin (SGGY 1977). This area has good access to terrestrial, riverine, and marine resources. The richness of these resources meant that failure in the experiment would be less risky (Gebauer and Price 1992). The experiment succeeded, however, and millet cultivation spread to all parts of the peninsula south of the Han River, reaching the Asan area on the west coast by 3500 B.C. and the south coast by 3360 B.C.

Chulmun millet cultivation, however, did not replace the pre-existing broad-spectrum subsistence system. It simply became an integral part of the Chulmun subsistence strategy, resulting in “broad-spectrum economy plus,” a term adopted in this article for subsistence intensification during the Middle Neolithic. In fact, the exploitation of marine resources continued to intensify during the Middle Neolithic. According to a shell midden analysis at Tongsam-dong on the south coast, during its Mokdo phase ( $^{14}\text{C}$ -dated to  $3940 \pm 140$  B.C.), whale, sea lion, and shark remains increased more than a hundred-fold over their presence in the Early Neolithic, as shown in the Tongsamdong remains.

A similar picture is seen in archaeological data from the west coast, where more than 90 Middle Neolithic shell middens have been identified on the islands between Ganghwado Island and the Geum River (KNS & HGRICH 2009:369–372). The presence of many net sinkers at various shell middens suggest that marine resources other than shellfish, such as sea bream and stingrays, were also exploited in the West Sea (Kim 2002a, 2002b; C.-B. Kim 2007; E.-Y. Kim 2007).

Communities did not carry out the newly intensified marine resource exploitation haphazardly. Several studies of West Sea shell middens have led investigators to four significant conclusions: (1) the multitudinous shell middens were nonresidential, specialized activity sites used for shellfish collection and processing; (2) shellfish collection was carried out logistically by social units resident on the mainland or nearby large islands; (3) exploitation of shellfish beds entailed a year-to-year redundancy; and (4) resource patches were not exclusively owned by any particular unit but shared cooperatively by several residential groups, which minimized intracommunity conflicts (Kim 2002a, 2002b; E.-Y. Kim 2007).

Logistic organization as a subsistence strategy involves a high degree of planning, for it requires gathering information about resource patches and their seasonal variability and distances to and from residential bases through neighboring territories; scheduling field travel, provisioning, maintaining tools, and organizing, assigning, and managing specific task groups; and managing on-site conflict with collectors from other villages, and so on. Thus, logistically oriented societies create vertical as well as horizontal functional differentiation. The system requires that specific tasks be executed in a timely fashion and that there is a division of labor among managers, planners, tool makers, transporters, collectors, processors, watchmen, cooks at the work site, and so on.

The logistic strategy can be also observed in Middle Neolithic terrestrial resource exploitation. A Chulmun site at Galmeo-ri in Korea's southwestern interior zone, located among wooded hills, has revealed 53 stone-paved special-purpose features. Sterol analysis of organic residues from the features indicates that they were largely used for acorn processing (Ahn and Yu 2002). In the absence of any substantial habitation remains, the Galmeo-ri site appears to have been a nonresidential special-purpose locus analogous to the many shell middens in the West Sea region.<sup>11</sup> A massive number of food-processing features at the site suggest that food production there was also carried out under logistical planning and organization. The Dunsan site in central southern Korea is another example of the logistical strategy vis-à-vis terrestrial resource exploitation. The archaeological features uncovered at the site fit Binford's (1980: 12) concept of "field storage," a type of site "generated by a logistically organized system."

Logistical strategies were also employed in trade and acquisition of special goods, especially obsidian from Kyushu. Because of obsidian's value to effective maritime subsistence strategies, Chulmun communities on Korea's south coast engaged in co-operative acquisition enterprises through a logistically organized overseas trade base at Koshitaka on Tsushima Island in the Korea Strait.

Storage was an integral part of Chulmun subsistence strategies; its importance as a condition as well as a mark of a complex society is addressed by several researchers (Fitzhugh 2003; Rowley-Conwy and Zvelebil 1989; Testart 1982). Storage contributes to sedentism, which in turn enhances agriculture (Binford 1980: 18). For Korean Chulmun Neolithic society, the most ubiquitous storage behaviors involved ceramic containers, which are found in the cultural remains of all Neolithic settlements. Particularly significant were medium-sized pots (35–45 cm in diameter) and large pots (50–70 cm), conical or round-based, found at many sites of the Middle and Late Neolithic periods; these pots contained various materials including carbonized grains and acorns (Ku 2006; Nelson 1993).<sup>12</sup>

As a sign of the increasing use of logistical storage strategies during the Middle Neolithic, there appeared indoor and outdoor underground pits of varying widths and depths, generally of circular or oval shapes. As in the case of Amsadong and Songjuk-ni, outdoor storage pits were placed near dwelling structures, while indoor storage was usually located next to the earthen wall of a semi-subterranean living floor (Ku 2006, 2009). At Gungsan, Jitap-ni, and Masan-ni, jars with their bases removed were placed upside down inside some of the indoor storage pits; they functioned to smooth and seal the interior walls of the storage pits (Jeong 1994; KAHS 1998; Ku 2006). Some of the underground storage pits have yielded substantial amounts of

carbonized acorns, an eminently collectible staple widely available in the Korean woodlands (Ku 2006; D.-J. Lee 2000).

Toward the end of the Middle Chulmun Neolithic, storage pits increased dramatically in number as well as size. For example, at Songjuk-ni, three houses had three pits each (two indoor and one outdoor in each case), and four more houses had two storage pits each (one indoor and one outdoor) (KNS & HGRICH 2009). At Bibong-ni, 19 outdoor storage pits were found in a small village that had only two houses (Bae 2009:346). More than 100 storage pits were constructed within the late Neolithic settlement at Sangchon B (SGP & NRAE 1998:23).

Another type of storage with clear implications for growing societal complexity was the so-called “storehouses,” two-level structures that resembled dwellings. Examples already mentioned include Amsadong House #6, Geumtal-li House #11, and Namgyeong House #31 (KAHS 1998). Such storehouses are usually found associated with more material remains such as tools and pottery than are normally present in family dwelling structures; they were clearly focal points of collective labor and productive activities. A more explicit interpretation would be that they were the “great houses” of dominant lineages at the nexus of social control in their communities. Among other items, the Chulmun Neolithic “storehouse” at Namgyeong (#31) contained more than 3000 net sinkers, implying one or more nets of very impressive size and productive potential. Such items would have been at the heart of the highly organized and large-scale mass-capture harvesting activities discussed above; we will return to this in our concluding remarks.

Ethnographically and in prehistoric archaeological data, the relationship of social storage, resource abundance, and mass-capture to prestige or rank enhancement is well documented. Mass-capture technology was often used to increase the wealth, prestige, rank, and political power of leading individuals or households (Rowley-Conwy and Zvebil 1989). In Korea’s Late Neolithic period, some leading “houses” were evidently accumulating wealth and advancing their social ranking and prestige by such means, demonstrated by the large storage houses, abundant storage vessels, and mass-capture fishing technology (i.e., large nets, weir systems), perhaps in addition to harpooning whales from boats on the open sea.

Finally, the broad distribution of Chulmun sites shown in Table 2 suggests that when Middle Neolithic settlement expansion reached a saturation point, Chulmun hunter-gatherer-cultivators decided to break into smaller units and disperse, relocating at increasing distances from one another. This dispersal served to minimize intra-settlement conflicts and maximized food production potential by relocating to new arable lands (Im 2006*a*). As millet-based food production evolved into more complex mixed-crop agriculture, the Chulmun Neolithic culture gradually disappeared. It was supplanted by the full-fledged agricultural villages of the Mumun period, which mark the inception of the Korean Bronze Age (S.-C. Shin 2001, 2002*a*, 2002*b*).

What effects did subsistence intensification and complex adaptive behavior have on the society of the Chulmun people? Did it remain simple and egalitarian or achieve a certain level of social complexity? Social complexity has been characterized as horizontal or vertical “functional differentiation among societal units” (Blanton 1981:21). Horizontal “functional differentiation [is] among parts of equivalent rank,” while vertical “rank differences . . . [is] among functionally diverse parts” (Blanton 1981:21).<sup>13</sup>

Only a decade ago, when fully excavated Chulmun villages were still rare, it was still assumed that hierarchically arranged settlements appeared only during the Bronze

Age (Rhee and Choi 1992). Chulmun villages were regarded as egalitarian bounded tribal units.<sup>14</sup> Chulmun settlements excavated in recent years have revealed, however, that social differentiation actually increased during the Middle Neolithic. Prior to about 3600 B.C., settlements consisted of two or three houses of similar size. Such settlements most likely functioned as independent or segregated economic units. However, after 3600 B.C., some Chulmun villages increased considerably in size. Hamlets including 5–8 families became more common and some much larger communities also developed. Unseo-dong apparently housed 50 families, Amsa-dong 30, Neunggok-dong 26, Shingil-dong 23, Sammokdo 17, Hashi-dong 15, and Sangcheon B 13. We posit that the larger villages were the “mothers” of and served as social centers for smaller villages nearby.

In parallel with intravillage differentiation, inequality emerged intramurally, as shown in the Sangchon B, Jigyeong-dong, and Namgyeong settlements. In each case, one or two large buildings stood among several small ones. In other cases, as with Gwanpyeong-dong and Daecheon-ni, a single large building constituted a settlement in itself, akin to a manorial estate. Increase in building size was also accompanied by functional differentiation inside the buildings, as indicated by spatial divisions inside the large Daecheon-ni building (Han et al. 2002; Im 2006a; Ku 2005, 2009).

More evidence for social inequality is apparent in the Late Neolithic phase, especially in the differential concentrations of tools critical to the production economy. In the village of Namgyeong, believed to have been a substantial Neolithic community, House #31 was not only the largest and most impressive building but also contained the largest number of net sinkers: 3000 compared to 10 at most found in other residences (Kim and Seok 1984). A similar inequality was present in the village of Geumtal-li nearby, with 600 net sinkers concentrated in one residence. In the Late Neolithic phase of Seopohang, Houses #8 and #9 (the largest building in the community) had concentrations of harpoons, knives, and lance heads made of ivory and bone; these tools were critical to hunting mammals and large fish in the open sea (MGMY 1991: 473–475).

Social inequality in the Chulmun Neolithic is also revealed by the existence of differentiated burials including prestige goods such as arm and ankle bracelets, neck pendants, tubular beads of precious stones, jade ornaments, and other valued artifacts (Ahn 2005; S.-G. Lee 2000). Concentrations of luxury goods (including beautifully carved ivory and bone objects) in a limited number of houses at Late Neolithic Seopohang also indicate social inequality (MGMY 1991: 474–477). It is not possible to state whether social status was acquired or ascribed in Chulmun society, but a differentiated infant burial at Beombang suggests that in certain cases ascribed statuses did exist.

Logistic organization and mass-capture activities imply functional differentiation in Chulmun economic activities, as evident in whale hunting by boat (Fig. 11). Also, a number of Middle Neolithic Chulmun sites have revealed evidence of craft specialization and division of labor. On Yokjido Island, for example, skeletal remains of a male show signs of an external auditory canal exostosis. This distinguishing anatomical trait, caused by repeated and sustained cold-water diving, suggests that diving for mollusks was performed by specialists (Natl. Mus. Jinjoo 1989).

Discovery of more than 1500 valued *Glycymeris abolineata* clam shells found at Tongsam-dong, along with half-finished bracelets and numerous obsidian flakes, has led Ha (2006c) to suggest that specialized shell-bracelet workshops were maintained

on site as part of a bracelets-for-obsidian exchange system. The clamshell bracelets produced in the Tongsam-dong workshops were exchanged for Kyushu obsidian. The obsidian was then made into a variety of subsistence-related tools for distribution to fishing villages along the southern Korean coast. The presence of beautifully carved art objects of ivory and bone in residential remains at the prosperous coastal Late Neolithic village of Seopohang also reveal specialists at work (Go 2004; MGYM 1991).

Craft specialization was evident in tool production as well, as shown by the special lithic workshop found in a building at Chodang-dong on Korea's east coast, dated to 3000 B.C. Beginning in the Middle Neolithic period, polished stone tools more advanced than those of earlier times appeared. Polished axes, adzes, planes, and chisels made by skilled lithic craftsmen supported carpenters' and woodworkers' production of wooden implements for agriculture and other aspects of daily life. Thus, as commonly happens in the realm of technology, one innovation led to another in a continuum of development.

The Neolithic Chulmun may also have had social specialists such as shamans who mediated between the human and spirit worlds. An ancient social practice, shamanism is implied by unusual human figures in the Bangudae petroglyphs. Researchers have interpreted some of the petroglyphs as depicting shamans conducting fertility ceremonies (Fig. 11) (Im 1999:55-56). Special stone platforms, often associated with fire, found at Sangchon B, Amsa-dong, Songjuk-ni, and Bongye-ri, are viewed as public religious centers where shamans might have conducted rituals on behalf of the community (D.-J. Lee 2000).

#### CONCLUSION: RETROSPECT AND PROSPECT

Like the Jomon in the Japanese archipelago (Crawford 2008; Pearson 2005), by around 3500 B.C. Korea's Chulmun Neolithic society had gone beyond foraging and collecting and become a society of "the middle ground" (Smith 2001:1). The Neolithic Chulmun became increasingly sedentary and began food production at a low level as they sought to secure critical marine and terrestrial resources through logistic strategies. They increasingly used storage as a mechanism of risk and wealth management. Gradually intensifying subsistence strategies that combined hunting, fishing, gathering, and mobile horticulture, along with storage capability, enabled Korea's Chulmun Neolithic society to maintain sociopolitical and economic stability over a period of several thousand years. The similarity with Jomon society came to an end when the Late Chulmun society began to expand the agricultural endeavor by adopting rice as part of mixed-crop farming. The dissimilarity was undoubtedly due to Korea's proximity to China, where rice had long before become an important component of mixed-crop agriculture (Nelson 1999:150).

The logistic strategies of this varied socioeconomic system generated functional differentiation among residential units and social inequality between managers and those they managed, or between the rich and the poor. Chulmun Neolithic society did not engage in monumental construction nor in the establishment of ruling dynasties, but it created social, economic, and technological mechanisms that moved Korea into the Mumun period of megalith builders and bronze weaponry.

Neither at the beginning nor end of the Chulmun Neolithic did external factors, such as an environmental crisis, population pressure, resource stress, or invasion, cause

the sociocultural changes entailed in the adoption, intensification, and spread of agriculture in the Korean Peninsula (Ahn 2005; G.-A. Lee 2003; S.-C. Shin 2001, 2002*b*). Rather, the evidence gathered above makes it clear that the growing social complexity and productive intensification of the Chulmun Middle and Late Neolithic emanated from the increasingly organized, innovative, and dynamic behaviors of indigenous hunter-gatherers responding rationally, socially and economically, to the ecological contexts in which they lived over a long period of time.

The leading “houses” of Chulmun society increasingly (and with attention to their own self-interest) organized and managed labor-intensive productive activities, especially mass harvesting and storage of marine and forest resources, cultivation of millet, and eventually mixed-crop agriculture that included rice. This developmental process prepared the way for a new socioeconomic infrastructure. The Chulmun tradition gradually gave way to the Mumun as the same people, using the organizational and technological skills they had developed over time, moved into large-scale Mumun mixed-crop agriculture, metallurgical production, and other industries. The leading “houses” engaged in this process undoubtedly emerged as the sociopolitical elites of the Mumun period, the wielders of bronze weapons and builders of rice paddies and impressive megalithic tombs.

Thanks to massive public works projects presently under way in Korea, intensive archaeological surveys and large-scale excavations continue to reveal prehistoric settlement sites across Korea’s landscape. With increasing use of the water flotation technique, paleobotanical data are also increasing dramatically, shedding further light on agricultural expansion during the Late Neolithic. This accumulating archaeological data will surely continue to clarify and sharpen our understanding of the processes by which Late Chulmun society transitioned into Mumun Bronze Age society.

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#### NOTES

1. For discussion on socially complex hunter-gatherers, see: Aikens 1981; Aikens and Akazawa 1996; Aikens, Ames, and Sanger 1986; Arnold 1992; Bar-Yosef 2002; Fitzhugh 2003; Harris 1989; Hayden 1990, 1995, 2001; Jochim 1998; Kelly 1992, 2007; Kuijt and Goring-Morris 2002; Matson 1985; Pearson 2007; Price 1995; Price and Brown 1985; Price and Gebauer 1995; Rowley-Conwy and Zvelebil 1989; Savelle 2002; Sassaman 2004; Thomas 1981.
2. For further information on Korea’s physical environment, see G.-A. Lee 2003:51–55; Nelson 1993:12–22.
3. Regarding Korea’s paleoenvironment, see G.-A. Lee 2003:55–68; Nelson 1993:22–25.
4. For a full description, see Nelson 1993:61–70.
5. For a full description, see Nelson 1993.
6. Information provided through personal communications with the Joong-Ang Institute of Cultural Heritage.
7. Thanks to the flotation techniques increasingly employed at excavation sites in recent years, there has been a marked increase in the number of Korean Neolithic sites yielding millet and other crop remains; the trend will surely continue (Ahn 2005; G.-A. Lee 2003).
8. Wooden cultivation tools have rarely survived, but are believed to have been widely used based on analogies with tools from more recent times.
9. In prehistoric times, the island was a peninsula connected to the mainland.

10. Only seven Jomon pottery pieces were found at the same site.
11. This is typical of many other small Chulmun sites in interior wooded zones (Song 1998).
12. The pots were usually secured in slight dips in the floors of dwellings (Jeong 1994).
13. Chapman (1990: 169) further observes that “functional differentiation may be political or economic, and sometimes both, and what begins as horizontal specialization may be elevated to vertical specialization (e.g., where craft specialists are given higher status).”
14. “Local disasters could have been mitigated by a loose arrangement of relationships rather than by any ‘tribal’ leaders” (Nelson 1992: 182).

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#### ABSTRACT

Emergence of complex society in prehistoric Korea has long been understood as a socioeconomic corollary of its Bronze Age agriculture (1300–300 B.C.). Archaeological data accumulated in recent years, however, point to the contrary. By around 3500 B.C. Korea's Neolithic society had gone beyond foraging and collecting and become a society of the middle ground. It became increasingly sedentary and began food production, initially at a low level, as it sought to secure critical resources through logistic strategies. It also increasingly utilized storage as a mechanism of risk and wealth management. Gradually intensifying subsistence strategies that combined hunting, fishing, gathering, mobile horticulture, and storage mechanism, enabled Korea's Chulmun Neolithic society to maintain its sociopolitical and economic stability over a period of several millennia. The intensification increased during the Late Neolithic with emerging mixed crop farming and mass-capture of marine resources. Post-Neolithic florescence of rice-based agriculture and the revolutionary societal elaboration during and beyond the Bronze Age were direct outcomes of socioeconomic foundations laid by the indigenous Korean hunter-fisher-gatherer-cultivators during the Chulmun Neolithic. **KEYWORDS:** Korea, Chulmun Neolithic, subsistence intensification, managerial leadership, logistic strategies, food production, storage depots, social inequality.