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Han River Chulmuntogi: A Study of Early Neolithic Korea

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PREFACE

This volume, a revised version of my dissertation, is based on field work conducted between June 1970 and July 1971. It grew out of a combination of dogged determination and sheer luck. The determination was responsible for getting me to Korea; the luck led me to the friendship and aid of extraordinarily well-informed and generous people who smoothed my path in countless ways.

In the beginning, when I was just groping (and not yet coping) with the language, Pak Dong-Won, of the geography department at Seoul National University not only helped me isolate and learn the Chinese characters most useful in reading archaeological papers, but also accompanied me on my first field explorations and gave freely of his expertise in hydrology.

Dr. Kim Won-Yong, director of the National Museum in Seoul, graciously gave me his time and knowledge, discussing Korean prehistory, showing me artifacts, and making the archives of the museum available to me. Dr. Sohn Pow-Key of Yonsei University also allowed me to see his collections and discussed with me his continuing excavations at Sokchangni.

By this time, some possibilities for research were coming into focus. I had become interested in the sites with decorated pottery called Chulmuntogi ("Comb-pattern pottery"). Sites with this ceramic are found in clusters along the coasts and major rivers of Korea. I found that this was one of the least studied periods in Korean prehistory, and that no attempt had yet been made to understand the sites and their contents as the material remains of a working social system. Subsistence and settlement, as the most

tangible subsystems, seemed to be a useful place to begin.

For practical reasons I did not plan any excavations, as I had been told that excavations by foreigners, even joint projects with Korean archaeologists, were against the policy of the Korean government. My project, therefore, was structured as an intensive survey of an area on the Han River which was known to have several sites close together. These offered the best chance of success, since more environmental data had been gathered from this region than elsewhere in Korea. My project also carried out surveys of other parts of the Han River and analyzed previously excavated artifacts from the Han River sites.

Members of my survey crew were recruited from the international community in Seoul, and they brought diverse useful talents and training. Jean Cronk, ceramicist, Casper Cronk, geologist, and their intrepid driver, Mr. Oh, were among the first of these. Martha Sloan was invaluable as translator and cross-cultural interpreter. Others who helped with the surveys include Jean Wilds, historian; M. E. Wilds, photographer; Jacqueline Giddens, nutritionist; and Ann Hunter, Erika Garcia, and Herbert Garcia, amateur archaeologists.

Concurrent with the beginning of the survey program, I was introduced to Im Hyo-Jai of the archaeology department at Seoul National University whose major interest was also the Chulmun Period. We found it to be to our mutual interest to join forces, and he and some of his students frequently joined the surveying expeditions. He also extended a great many courtesies to me, for which I am deeply grateful, including locating for me pertinent papers in Korean journals, lending me unpublished site reports, and introducing me to other archaeologists.

Artifacts from the Seoul National University Museum were used for the bulk of the analysis. In addition, Lim Byung-Tae, of the

Soong Sil College Museum, allowed me to study his pottery collections from Amsari and to make copies of his detailed unpublished site plans. Later on, I was able to borrow David Chase's collections from Misari and elsewhere, from the Archaeological Research Laboratory of the University of Texas at Austin. I am grateful for these courtesies.

After the completion of the field season, herbarium specimens which had been collected near the Han River were identified by Professor Lee Il-Koo of Kon Kuk University, and wood samples were identified by R. C. Koeppen of the U.S. Forest Service. I would like to thank both of them for their contributions to this study.

I would also like to thank the members of my doctoral committee Dr. James B. Griffin, Prof. Kamer Aga-Oglu, Dr. Richard Beardsley, and Dr. Henry T. Wright for their painstaking comments on early drafts of my dissertation, and Robert Whallon, Jr. for going over the statistics. They are of course absolved of all responsibility for any errors that may remain and for the interpretations and inferences which are wholly my own.

I am grateful to the University of Denver and the University of Michigan for the use of computer time, and to Martha Caldwell, programmer at the University of Denver Computer Center, for her aid.

Finally, a word of appreciation for the help of my sons on minor but time-consuming chores and for my husband's advice and support of my research without which the project would have been impossible.

I have used the McCune-Reischauer system of romanization, omitting diacritical marks, for all Korean words except for certain proper names where different transliterations have become standard.

TABLE OF CONTENTS

TABLE OF ILLUSTRATIONS

Chapter 1

INTRODUCTION

Scattered throughout the Korean peninsula are about 100 known sites which contain handmade pottery decorated with parallel incised lines. First described by Japanese archaeologists in the early part of this century, the pottery was thought to resemble Central European ceramics decorated with a multiple toothed tool, and so was designated in Japanese Kushimemon Doki, a translation of Kammkeramik (comb-pattern pottery). Translated into Korean, the same characters are pronounced Chulmuntogi, and sites with such pottery are known collectively in Korea as the Chulmuntogi Munhwa, the "comb-pattern pottery culture." Although not descriptive of a majority of the pottery called Chulmun, this term will nevertheless be retained here since it has become established in Korea. It is well understood to cover a variety of other decorative techniques as well as possible comb markings on prehistory pottery in Korea.

Other prehistoric handmade pottery is also found in Korea that differs from Chulmun chiefly in having no surface treatment other than smoothing. It is called in Korean Mumuntogi, "undecorated pottery," often translated into English as "plain coarse ware." Most prehistoric pottery has been placed into one of these two categories, and much ink has been spilled over which is earlier, or whether they represent co-existing ethnic groups and/or ecological adaptations. The debate is still unresolved, since locational strategies for the two kinds of sites differ, making stratified sites rare.

Although this volume will pay some attention to Mumuntogi, its principal interest is in the Chulmun Period, in particular a group of sites on the Han River in central Korea. My project concentrated on an analysis of the Han River sites in the hope that subsistence and settlement strategies of the Chulmun Period could be better understood.

This volume is addressed not only to the professional archeologist but also the interested layman who is uninformed with both archeology and with Korea. Therefore, I have provided in the next three chapters some background information on Korean geography, Korean prehistory, and prehistoric pottery types in East Asia and their relationship to Chulmun. The remaining chapters contain the specific data pertaining to the Chulmun Period and attempt to define the subsistence and settlement subsystems on the basis of these data.

Right now, however, we must first address ourselves to the central issue before us: do Chulmun Period sites represent lifestyles of subsistence or settlement? I will discuss some prevailing interpretations while reserving my own conclusions for the final chapter.

The distribution of Chulmun Period sites is not random. They are found predominantly on the coasts and major rivers, with many more sites on the west coast than on the east coast (Figure 1). The sites tend to cluster, especially along rivers and near river mouths, rather than being evenly distributed along the coasts and rivers.

Because of the coastal and riverine location of these sites, because many of the sites consist of shell mounds, and because net sinkers and/or fishhooks are frequently found in the sites, the subsistence base of the Chulmun Period has traditionally been assumed to have consisted of fish and shellfish. Additional subsistence activities are of course not denied by the traditional

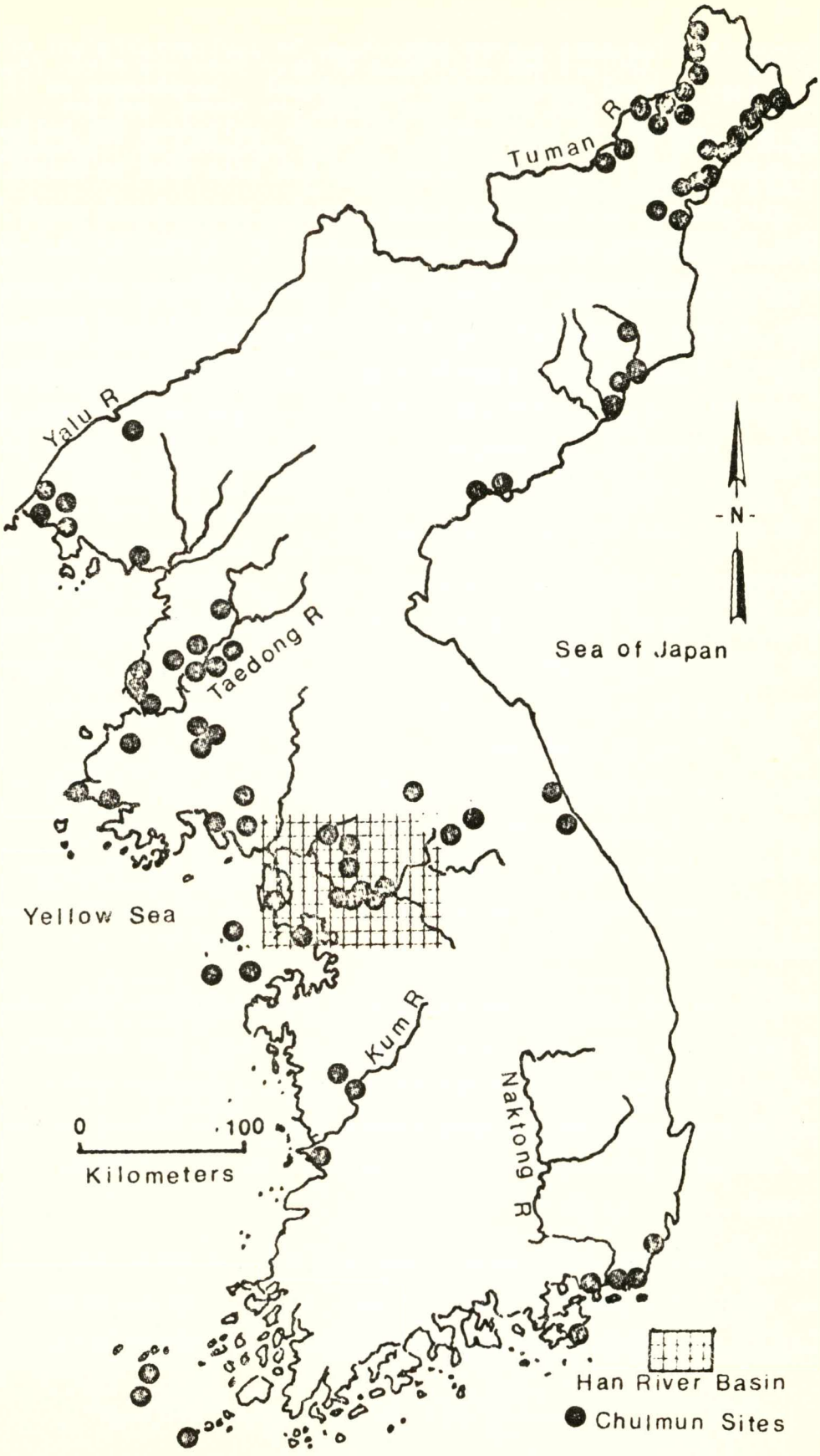


Fig. 1. Distribution of Chulmun Sites in Korea. Redrawn from Arimitsu 1962.

interpretation. Antlers and artifacts of deer bone are often found in the shell mounds, less often boar tusks are found, and occasionally small slate points appear in the assemblages, indicating that there was also some hunting.

The traditional interpretation of an essentially fishing economy for the Chulmun Period, however, seems inadequate for two reasons. First, it fails to explain the large quantity of potsherds found in each site. Did the pottery serve as cookware for the fish/shellfish, to store such resources, or for some other subsistence resource? If some other resource was being cooked or stored, then perhaps the large quantity of pottery indicates its equal or even more intensive utilization.

Second, the traditional interpretation explains only partly the distribution of sites. Such a distribution could result from several different settlement systems. For instance, this pattern of sites might be a result of seasonal migrations, with groups using river sites in some seasons and coastal sites in other seasons. Alternatively, the sites might represent the filling of a new niche by fissioning as the population grew, or such a pattern might be a result of depletion of resources and the movement of the same group to another nearby location as new resources were required.

Since the two unexplained aspects of the Chulmun Period, the use of many large pots and the clustering of sites, are probably related to the subsistence resources utilized, a project which focused on understanding the subsistence system was framed in the hope of at least providing tentative answers to some of these questions.

Subsistence and settlement, then, are the two basic subsystems to be considered in this volume. Although it would be possible to subdivide thses categories, for our purposes here,

only the alternatives of year-round versus seasonal settlements will be considered. Subsistence alternatives include generalized hunting and gathering, essential dependence on fishing, and utilization of both wild and cultivated resources. The combinations of these subsistence and settlement alternatives produce six possible patterns: (1) seasonal use of the middle Han sites for hunting and gathering, (2) settled hunting and gathering, (3) seasonal use of the sites for fishing, (4) settled fishing, (5) seasonal planting at the sites with return for harvesting, and (6) settled planting.

Chapter II

GEOGRAPHY OF KOREA*

The peninsula of Korea extends slightly east of south from the Asian continent, from north latitude 40^{o} to almost 34^{o}. Between the west coast and the mainland lies the shallow Yellow Sea. The Liaotung and Shantung peninsulas jut into the north and east of the Yellow Sea respectively, making the shortest distance between Korea and China less than 200 km.

The islands of Japan enclose the Sea of Japan on the east, and the southernmost of these islands, Kyushu, is also within 200 km. of Korea. From one small island to another the greatest distance is 50 km., so that on a clear day it is possible to navigate across without losing sight of land. The Ryukyu chain is a continuation of the arc of Japanese islands toward the southwest, again with no great distance between islands all the way to Taiwan and the southern coast of China.

Korea thus forms an east-west link between Japan and China, and a north-south link from Manchuria through the Ryukyus to south China by way of Taiwan. While the seas on three sides and mountains in the north provided barriers to movements of people and cultural exchange, they were by no means impenetrable, but served instead as natural boundaries for the unusually homogeneous Korean language and culture (Figure 2).

*The information in this chapter is derived from Bartz (1972) and McCune (1956).

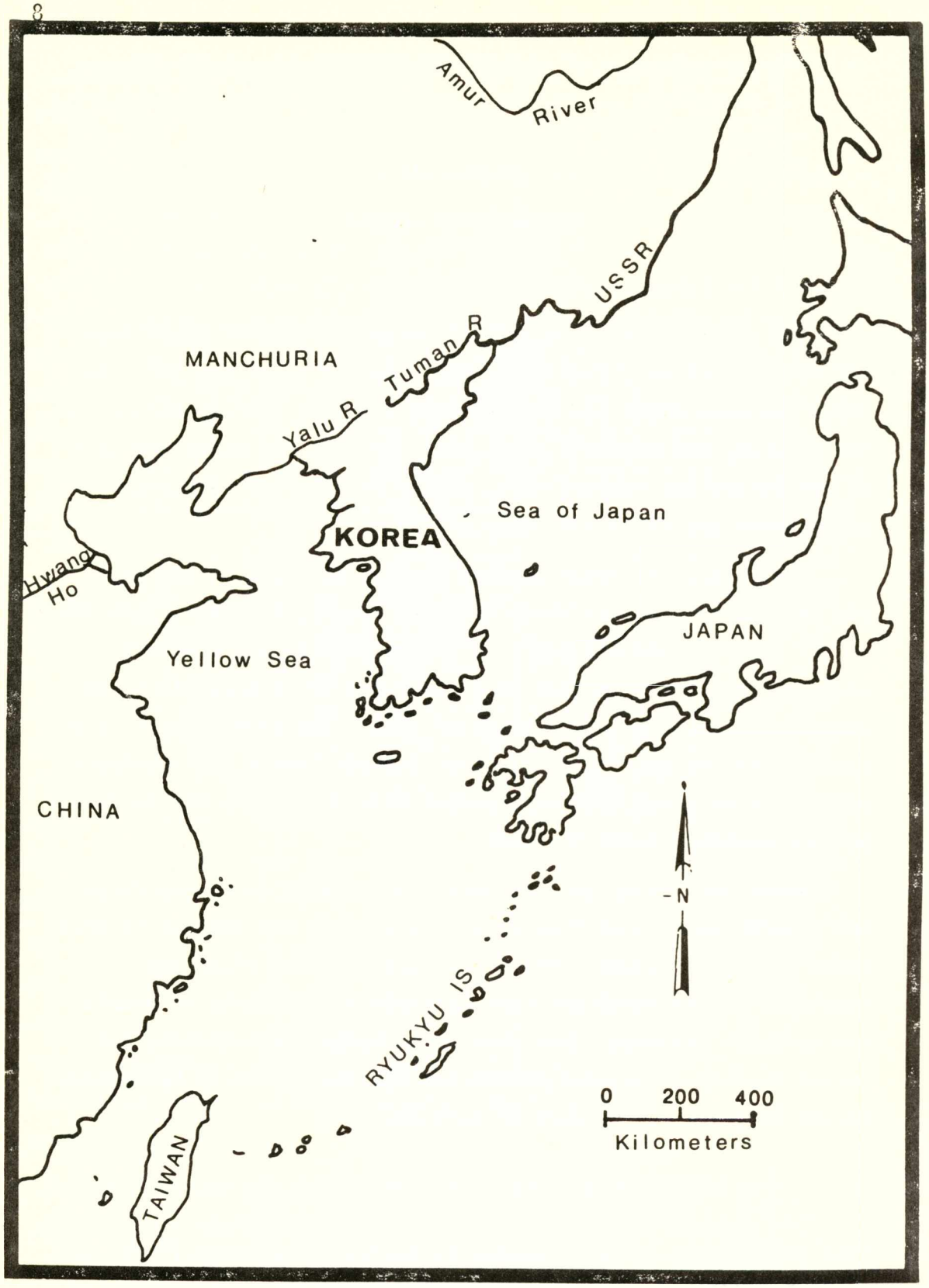


Fig. 2. Korea in its East Asian Setting

Geology

Geologically, Korea consists of the outermost edge of the ancient bedrock of the Asian continent. Because there has been more erosion than deposition, the exposed rocks are principally the granite-gneiss and mica-schist of the ancient pre-Cambrian block. Volcanic activity has largely been confined to the extreme northeast corner of the peninsula and Cheju Island, 100 km. off the southern coast. Therefore igneous rocks are rare. Conglomerates, sandstones, and shales occur sporadically, in thick layers only in the southwestern provinces of Kyongsang Puk Do and Kyongsang Nam Do. There are limestone beds in the southeast and in the far northeast. However, stone that produces a conchoidal fracture when chipped is rare. There is no flint or chert, and obsidian is found only at the north and south borders of Korea.

Topography

The whole block of the peninsula is uplifted on the eastern side and tilted down on the west and south, giving the east and west coast lines strikingly different characters. The east coast drops sharply from the mountains to the sea, with neither islands nor bays to disturb its clean lines for most of the coast. The continental shelf is narrow here, and the Sea of Japan plunges to a depth of 1000 m. less than 50 km. off shore. Many islands and bays mark the ragged submerged coasts of the west and south. The Yellow Sea is quite shallow, and this fact combined with the narrow outlet causes enormous tides, the range of which is exceeded nowhere in the world except in Nova Scotia. At Inchon, for example, the difference between high tide and low tide can be more than 10 m., exposing at low tide 2750 square km. of mud flats. As the tide comes in, conflicting currents are set in motion making boating hazardous, although skillful fishermen take advantage of the currents to drive fish into their nets.

The topography of the entire Korean peninsula is rugged and dissected. Seventy per cent of the land is mountainous, about 40 per cent with steep slopes of 40° or more. Although the mountains are not high (less than 5 per cent of the land is over 1000 m.), they form formidable barriers to transport, with their steep sides and narrow river valleys (Figure 3).

The mountains are faulted in two directions, so that even major rivers abruptly veer many times in their courses, and their valleys tend to be useless as major traffic arteries. Even modern highways rarely follow a river for any distance.

Weather and Climate

Because of the shifting Polar Front, the weather of Korea resembles that of Siberia in the winter and the South Pacific in the summer. The actual winter temperatures are not spectacularly low, with a mean January temperature of -5°C (24°F), but the discomfort caused by the strong, dry winds can be severe. These winds are mitigated, however, by the position of Korea at the edge of the continent. As the cold air arrives over the ocean it begins to warm, and this warm air sets up a circular system which brings warm air back to Korea for a few days, until it is so warm that a new high pressure cold wave may move in from the north. This is reflected in the Korean proverb, "three days cold, four days warm." In spite of the warming effect of the sea, however, Seoul, approximately in the center, has three months of mean temperatures below freezing.

Winters are dry and there is little snow. Seoul averages only two days per month of snowfall in winter. The first snow occurs toward the end of November and the last is usually in late February, although spring snowstorms do occur. The rivers freeze over. For example, at Seoul the Han River is frozen for about 3-1/2 months each year.

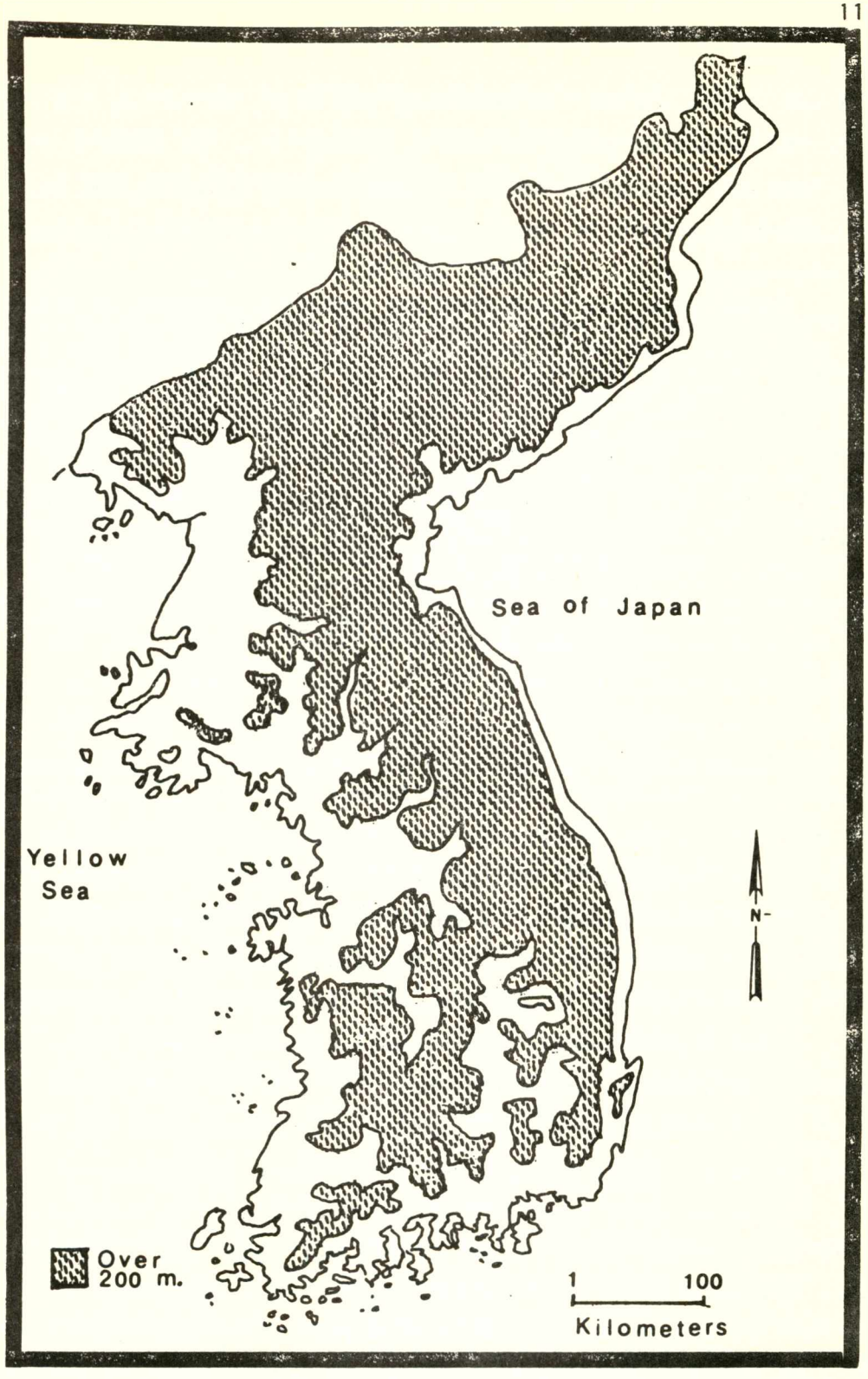


Fig. 3. Topography of Korea

Summer temperatures, in contrast, are high, as in the humidity. The growing season at Seoul is short, having only 170 frost-free days. Thus only one grain crop per year can be grown in the Han River Valley, although in the southern provinces double cropping is practiced.

In summer when the Polar Front shifts far to the north, drenching monsoon rains arrive with the warm air from the south. Average precipitation, almost entirely in rainfall, is 1203 mm. per annum at Seoul. Sixty-four per cent of the rainfall occurs from June to September. The amount of precipitation, however, is quite variable from one year to another, diverging as much as 40 per cent from the mean. Several dry years can occur in a row. On the other hand deluges are known: Seoul once had 1357 mm. of rainfall in the month of June alone.

River Regime

These patterns of precipitation have a profound effect on the rivers and their flow patterns. Since there is little snow, snow melt in the spring does not raise the rivers significantly above their very low winter levels. Greatly increased volume does occur with the rain, however, accentuated by rapid runoff due to the granitic bedrock covered by shallow soil and the steepness of the slopes. These higher summer river levels occur regularly, not just in years of exceptional precipitation. The average flow of the Han River at Seoul in January or February is one-twentieth of the average flow in July. These rapid flows carry great quantities of debris, including large stones. Korean rivers carry an estimated total of 400,000 tons of silt out to sea each year, and the quantity of water markedly diminishes the salinity of the Yellow Sea.

These large seasonal flows cause broad river beds but fail to form deltas. Silt is carried out to the mud flats, leaving sand,

gravel, and large cobbles differentially deposited in the river beds. The lower stream beds, therefore, tend to build up rather than cut down, and some are elevated above the valley floor.

The Paleoclimate

There is general, although not complete, agreement among scholars from various disciplines relating to paleoclimates that the worldwide climate change which marked the end of the Pleistocene culminated in a period which was warmer than the present (Wissman et al., 1956:281). There is some evidence of such a warmer period in East Asia. Tsukada (1966:546) reports warmer plant species in Taiwan in approximately 8000-4000 B. C. on the evidence of pollen cores. Some data from Japan also have been interpreted as evidence of a warmer climate, for there is an early shift from warm water molluscs to cold water molluscs in the Jomon sites near Tokyo Bay (Kidder 1955:40). Chard (1974:57) cites pollen studies in Siberia as evidence for a warmer period in that region, around 8000-4500 B.P.

Only one pollen analysis has been published from Korea (Oh CY 1971). This study indicates that at about 3000 B.C. Korea had a cool moist climate, with deciduous forests. Therefore, until evidence appears to the contrary, it is most reasonable to assume for 3000 B.C. and later a climate roughly similar to that of the present in Korea. In other words, we are probably looking at a period at the end, or toward the end, of a climatic optimum.

Coastal Submergence

Although it is sometimes stated that the west coast of Korea is still sinking, the placement of prehistoric shell mounds on western islands just above the high tide mark would seem to indicate a lack of major change since their deposition. During part of the Pleistocene the Yellow Sea was dry land and a land bridge to

Japan existed, but the seas may have reached their present level by 3000 B.C. or earlier.

During the previous millennia in Japan the land emerged. Japan's geology, however, is significantly different from that of Korea. Volcanic activity accounts for many phenomena of Japan, while Korea has little evidence of volcanic action even in the remote past. The coastal emergence in Japan, therefore, is not pertinent to events in Korea. Chard (1974:56) suggests that in the Amur basin by 8000 years ago, the "modern environment, modern fauna, and present sea levels and geography" pertained. Pending further study by geologists, it may be assumed on the basis of shell mound locations that the submergence of the western coast had occurred prior to the settlement of the islands in the Chulmun Period.

We may, therefore, further assume that both sea level and climate have remained reasonably constant since the Chulmun Period and that the present climate can be considered an indicator of the climate of 5000 years ago. Ancient flora and fauna, partly dependent as they are upon climate, can then be inferred from present remnants and early historic records.

Chapter III

KOREAN PREHISTORY

Outside of Korea and Japan, very little attention has been paid to Korean prehistory. The reasons for this are to be found in the difficulty for non-Asians of reading primary sources in Korean and Japanese, the inaccessibility of many publications, and the lack of a synthesis of Korean prehistory in any European language. In addition to these factors, interest in the prehistoric periods in Korea itself is a rather recent phenomenon, and there has not been anything like the archaeological activity that has taken place in Japan and China.

It is not my purpose here to review the history of Korean archaeology; such a review may be found in Sample (1967:4-32, 1974:2-7). It is worth repeating here, however, that well-organized excavations of prehistoric sites have been rare, that publication, if any, is frequently in small Korean journals only rarely with English summaries, and that the information is therefore not readily available.

Given the handicaps imposed on Korean archaeologists, including lack of specific training in anthropological archaeology, there has been surprising progress in prehistoric archaeology in Korea, but much remains to be done. It has been scarcely fifteen years since the first excavations of prehistoric sites by Koreans. A few Korean archaeologists have begun to read widely in Western publications and to apply new method and theory to Korean prehistory. Nevertheless, the tradition of Confucian education combined with a heritage of interpretation by Japanese archaeologists from a less

scientific era have produced opinions which are less critical than they might have been.

Not enough recent research has been accomplished to make a synthesis of Korean prehistory possible at this time. The tragic split of Korea into two separate and non-communicating sovereignties adds to the difficulties. Nevertheless, to put the Chulmun Period in its proper perspective, a brief review of the archaeological sequences in Korea will follow. The sequence is not yet definitive, but it is a trial ordering of the data which future research will refine and possibly rearrange. The Han River sequence is based on published and unpublished site reports, discussions with Korean archaeologists, re-analysis of previously excavated artifacts, as well as my own fieldwork.

Archaeological Sequences

As just mentioned, the sequence of prehistoric periods is not yet firmly established, especially the relationship of Chulmuntogi and Mumuntogi. Although in the Han River valley Mumuntogi is found above Chulmuntogi in the few sites where both occur, the reverse is reported from Tongsamdong near Pusan (Sample 1967, 1974). Part of the difficulty lies in the lumping together of unassociated undecorated pottery types into one category, as Sample's work demonstrates. The concept of Chulmuntogi should also be refined. As this problem is unresolved, the sequence as given can be understood to apply to the Han River valley, but not necessarily to the rest of Korea.

Preceramic Sites

No preceramic sites are known in the Han River valley. The nearest preceramic site is that of Sokchangni, some 100 km. south of Seoul, on an upper terrace of the Kum River. Pebble chopping tools are characteristic of the lower layer of this site, with

retouched blades in the upper layers. Radiocarbon dates generally fall between 30,000 and 20,000 BP (Sohn 1967, Sohn et al., 1971: 12). Two later dates have also been obtained: 6590±220 BP (Valastro and Davis 1970:278) and 2990±120 BP (Yang 1970:351), but Sohn believes that the samples must have been contaminated by repeated flooding of the river. Other preceramic sites have been found on the Tuman River in North Korea, and in a few other locations in the south (Sample and Mohr 1964).

Chulmuntogi Sites

In general, all prehistoric handmade decorated pottery in Korea is designated Chulmuntogi and is thought to belong to the same widespread horizon that includes comb-impressed pottery from Siberia and Eastern Europe. The Korean pottery is usually decorated with parallel incised lines, although other techniques of marking the unfired clay are also used in various regions. Stone artifacts include ovate "hoe-axes" (Figure 4), net sinkers (Figure 5), grinding stones, and polished slate points.

The Chulmuntogi found in central Korea, both in the Han River sites and farther north in Hwanghae Do (province on the Yellow Sea, immediately north of Kyonggi Do), is considered to be classic Chulmun (Figures 6-9). Other Chulmun pottery differs in some respects. Kim divides Chulmun into four groups: west coast, southeast coast, northwest and northeast (Kim WY 1967:101). The west coast group contains the classic Chulmuntogi, with conical bases, sand and mica tempering, and incised decorations. Southeast coast Chulmun includes rows of raised bosses and fillets, and the entire pot is not necessarily decorated. Some of the pots have flat bottoms. The northeast Chulmun is tempered with grit and made of a sticky clay which fires to a dark color. The pots in the northeast always have flat bases and are often decorated with concentric semi-circular rows of punctates. Northwest pottery also

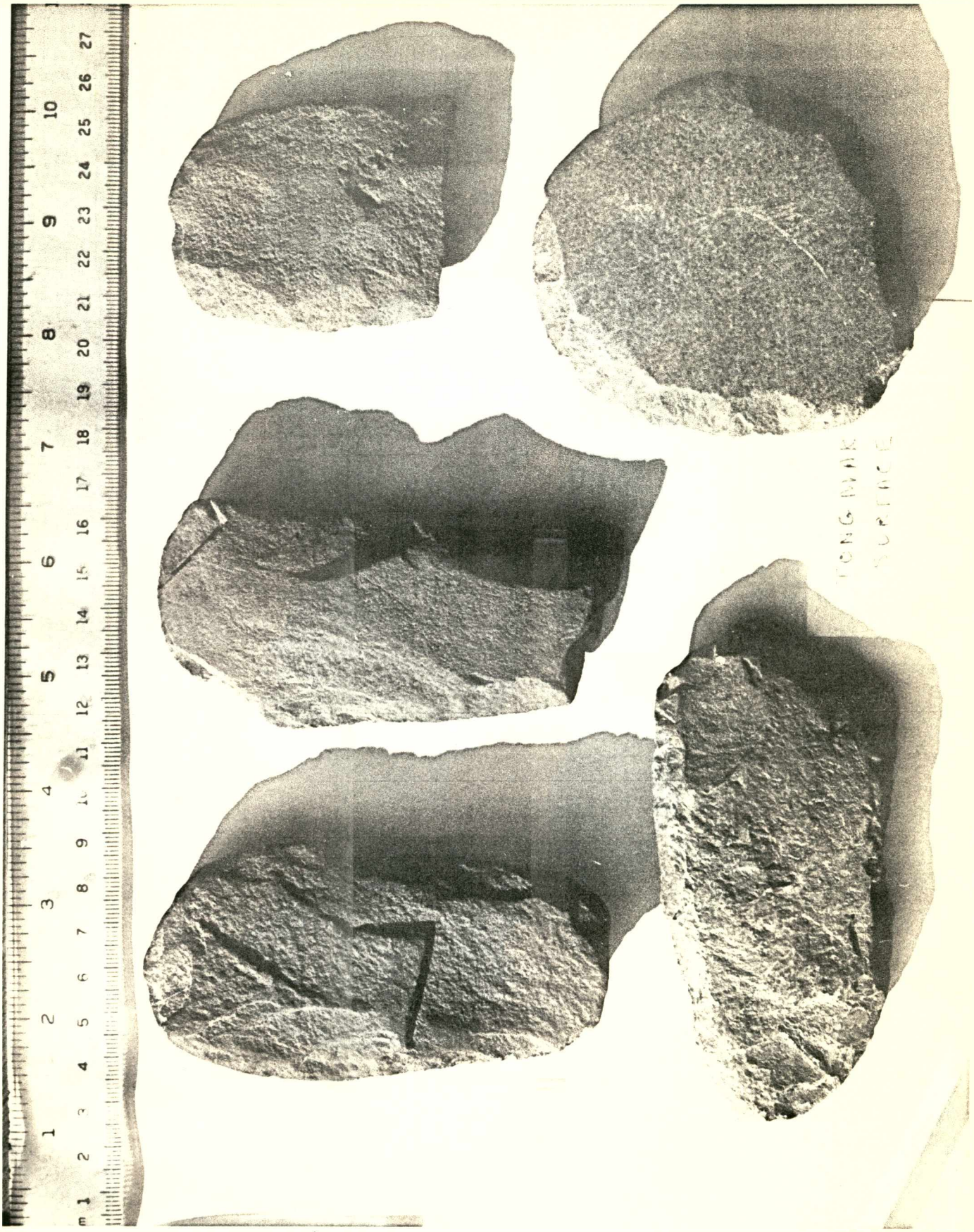


Fig. 4. Stone "hoe-axes," Tongmak

Fig. 5. Stone Pebble Sinkers, Tonmak

Fig. 6. Sherds, Tongmak Surface

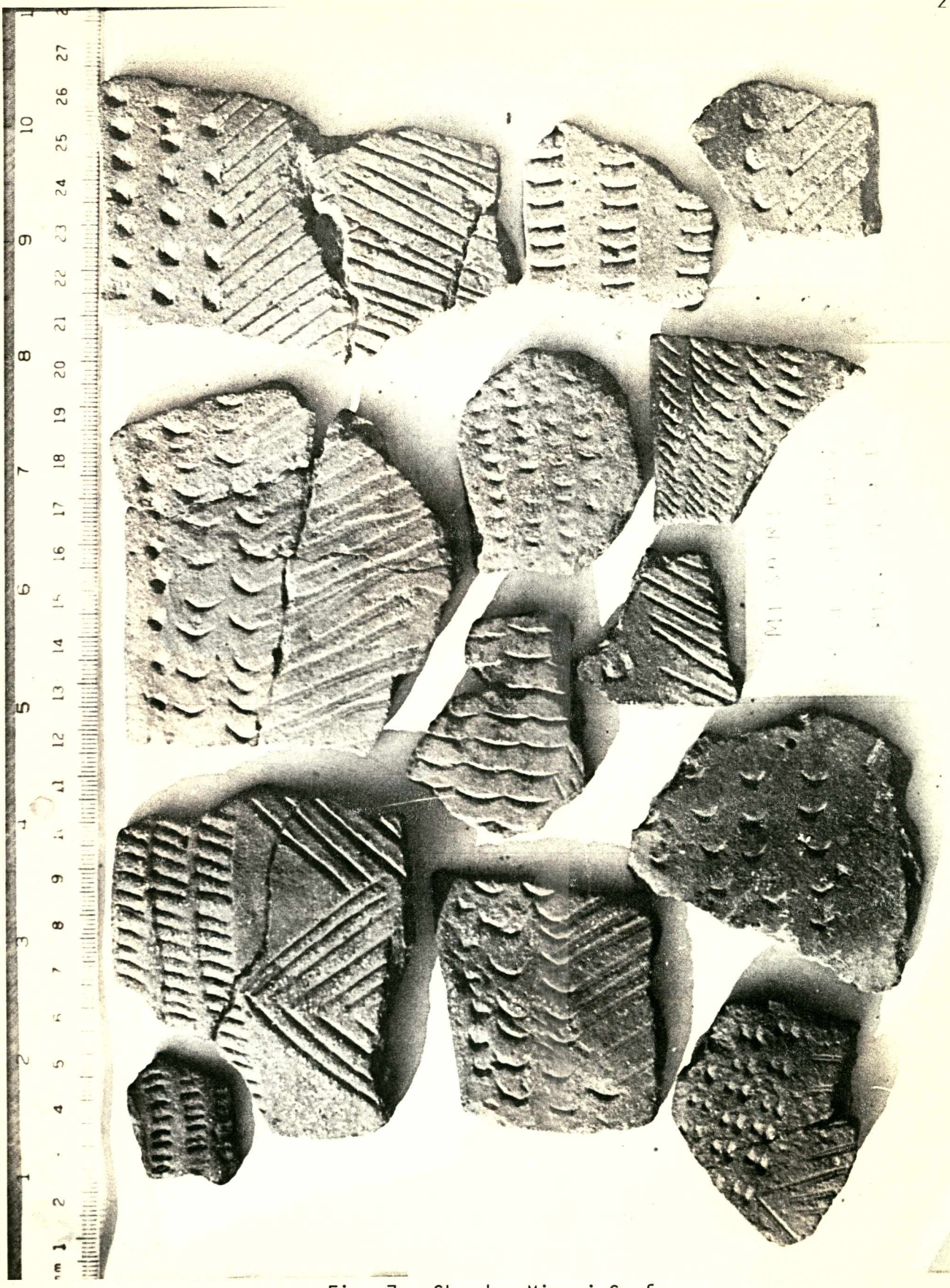


Fig. 7. Sherds, Misari Surface

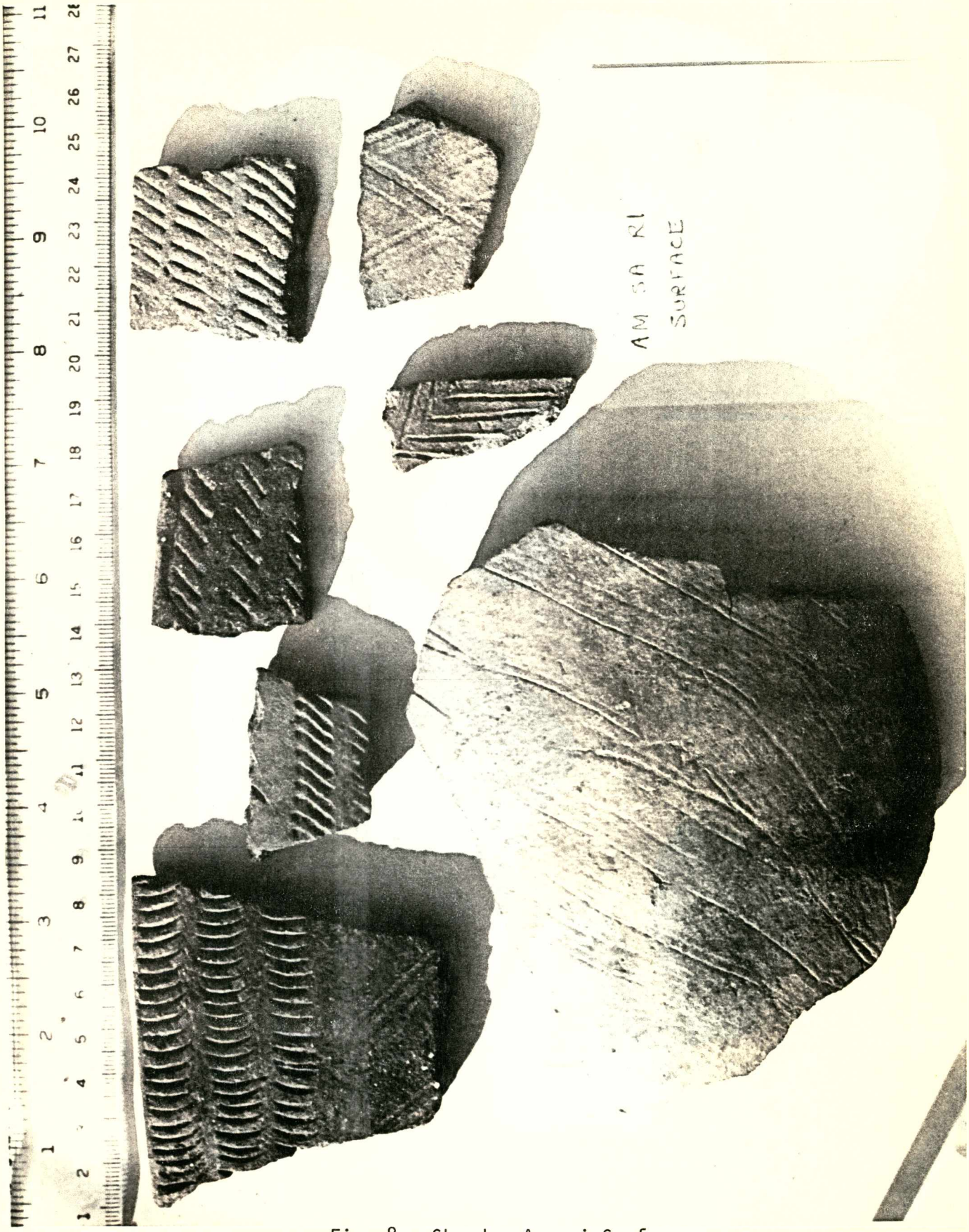


Fig. 8. Sherds, Amsari Surface

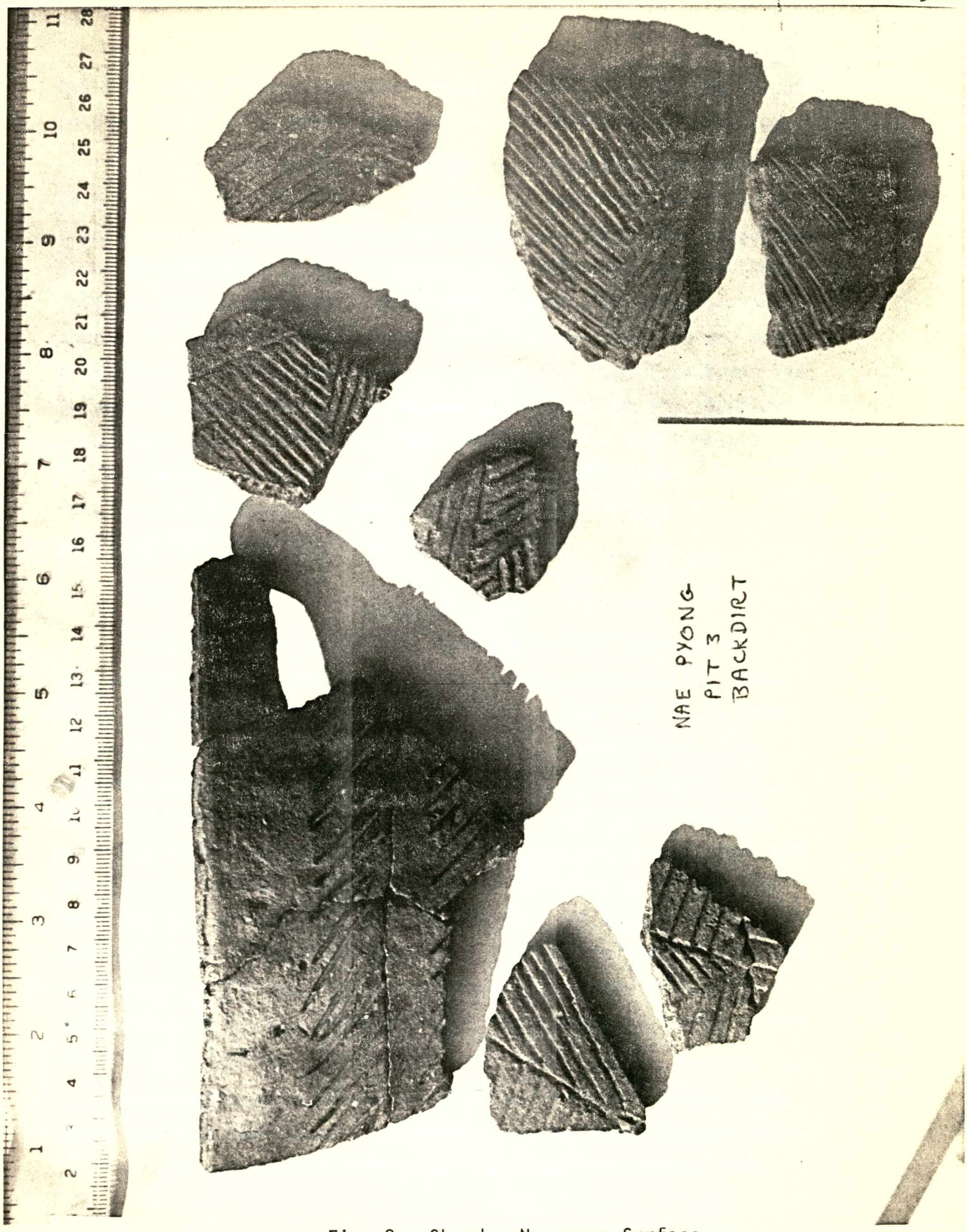


Fig. 9. Sherds, Naepyung Surface

has flat bases. Other variants are also found, such as the thicker pottery with evenly spaced grooved lines on the central east coast.

The house pits which have so far been excavated are small, each with a single hearth. Sites are also small and are found on coasts or river banks. Radiocarbon dates are rare; they range from about 6000 BP (Sohn et al., 1971:15) to 2340±120 BP (Kim WY 1969b:6). This latter date, however, comes from a layer with a few incised sherds which are not the same as other Han River Chulmun and may be transitional. Dates from Amsari: about 3000 B.C. (Lim Byung Tae, personal communication), and Tongsamdong: 4020±100 BP, 3980±100 BP, 3930±100 BP, and 3830±100 BP (Yang 1970) are more consistent. Chulmun dates from Shido (one of the islands off the west coast near Seoul), however, are about 1000 years later (Yang 1972). Certainly many more determinations are needed.

Mumuntogi Sites

In the Han River valley the Mumuntogi is different in all characteristics from Chulmuntogi. It is very thick-walled (about 12 mm.), tempered with coarse grit, light yellow to buff in color, and made in a variety of shapes, often with a small foot. Appendages such as spouts and lugs are common. Sites with this ceramic are more frequently located on protected hillsides near the river than on river terraces. House pits are usually long and narrow, with several hearths spaced along the center of the long axis (Kim and Lim 1968:25; Kim CG 1968:47). At some of these sites polished slate arrowpoints appear. A typical implement is the semi-lunar stone knife, very similar to those associated with grain cultivation in China. Large polished adzes are also found, as are grooved net sinkers.

Mumuntogi appears elsewhere in Korea in various assemblages. There are also some sites with pottery bearing some characteristics of Mumuntogi and some of Chulmuntogi, such as that from a cave

burial site in Chunchon (Anonymous 1970:24) which has incised or impressed bands, no decoration on the body, and flat bases. A few sherds from the bottom layer at Susongni on the Han River may also be transitional.

At Tongsamdong a pottery unlike any Han River ceramic was found on the lowest level by Sample (1967:299), and the classic Chulmun, called by Sample "Tudo Bold," lay above it. Many sherds from Sample's "Pusan" type also resemble Han River Chulmun. The radiocarbon dates from excavations by Seoul National University show a curious progression of younger dates from deeper levels (Yang 1972: 274-278), although their excavations have confirmed Sample's sequence.

In many sites throughout Korea Mumun is found above Chulmun, and except for Tongsamdong the reverse has not been reported. (See, for example, Henthorn 1968 on the Misongni site, Kim Wy 1967b on the Kungsan site, and Kim Wy 1962b:44 on Shang-ma-shih Island.)

The Dolmen Period

Korea has two types of megalithic monuments, both called dolmens. One is made of a rectangle of upright stones topped by a large slab which tends to be found in the north; the other consists of a large slab at ground level covering smaller stones which is more commonly found in the south. Both kinds of dolmens seem to have been burial markers, although few have any human remains. Artifacts associated with these monuments include bronze weapons, polished stone, Mumuntogi, and rarely a red polished pottery. In the extreme south of Korea and a few southern islands of Japan, flat dolmens cover jar burials. The jars are of the grey check-stamped ware that belongs to the proto-historic period (Kaneko 1966: 12, Kim Wy 1964), but other associated pottery is often plain and coarse. The dolmen period is therefore placed in the bronze age, perhaps beginning about 700 B.C. (Kim Wy 1962c).

In the middle Han valley and its immediate vicinity there are no dolmens, but there are some flat dolmens on the North Han, about 20 km. upriver from the confluence with the South Han, large upright dolmens on Kanghwa island, and a group of plundered dolmens near Naepyung.

The Kimhae Period

Kimhae is the name of a large shell mound near Pusan which has given its name to a hard grey pottery also called proto-Silla. Iron knives hafted in deer antler were also found at the type-site, along with carbonized grains of rice (the earliest positive evidence of rice cultivation in Korea) and a Chinese Han 漢 dynasty coin of the first century A.D. (Kim Wy 1967c). Presumably this belongs to the time of the "Three Hans" 三韓, a proto-historic period when the small tribes of Korea were beginning to consolidate. Hatada (1967:11) refers to a Chinese document which records that the Korean Han tribes grew hemp, millet, rice, wheat, and pulse, and kept cows and pigs.

The Three Kingdoms

One of the earliest local historical documents is the Sam Guk Sagi, the history of the Three Kingdoms. Each "kingdom" was at first little more than a loose alliance of tribes. In the south-east was old Silla (a union of the Hans tribes) (57 B.C.-A.D.663), in the north Koguryo (37 B.C.-A.D. 668) and in the west, including the region of the Han River, was Paekche (18 B.C.-A.D. 663).

Koguryo was built partly upon the ruins of the Chinese colony of Lolang (Nangnang in Korean) whose rich tumuli have revealed objects of Chinese civilization not elsewhere preserved. Old Silla, too, is known for its large grave mounds and for a thin-walled grey pottery thrown on a wheel. Pedestal bases with excised rectangles

and triangles, wavy parallel incised lines, and dangling leaf-shaped decorations are characteristic of the pottery. Elaborate gold crowns and jewelry are found in the tombs.

The Han River region was inhabited by the kingdom of Paekche ("100 tribes"). The first of Paekche's capitals was on the Han River near Seoul (Kim Wy 1967b). Paekche pottery is hard, grey, unglazed and thin, much like early Silla. It is frequently check-stamped or mat-impressed.

Historic Periods

The Three Kingdoms period came to an end when Silla unified the peninsula under its rule, ushering in the period known as Unified Silla (A.D. 668-935), dominated by a political center in south-central Korea. Ultimately, the decline of Silla was offset by new strength in the north, and the Koryo dynasty took power until A.D. 1392. Following Koryo, the Yi Dynasty began, the longest in Korean history. It was brought to an end by the Japanese annexation in 1910.

Chapter IV

PREHISTORIC POTTERY TYPES OF EAST ASIA: THEIR RELATIONSHIP TO CHULMUN

As explained earlier, the very name of Chulmuntogi ("Comb-pattern pottery") was created by early Japanese archaeologists to express their opinion not only with regard to the similarities between Korean decorated pottery and East European Kammkeramik but also to suggest a derivation therefrom. This suggestion was first made by Fujita in the early thirties (Fujita, 1948:13), and has rarely been challenged since. However, it has never been suggested, even by Fujita, that all "comb-pattern" pottery is in fact decorated with a comb-like implement. All prehistoric decorated pottery in Korea falls under this rubric, whether the decorations were made by incising, stamping, punching, grooving, or even pinching or filleting. Kim Jon-Hak (1968:5-7) makes a very good case for the appropriateness of the more general term "geometric" for this group of pottery, but this has not been accepted by other workers in the field. Lumping all the decorated pottery together may obscure important regional differences, but if it is to be given a collective term, "comb-pattern pottery" fails to describe the majority of it.

There can be no question about certain superficial similarities between some East Baltic and Siberian pottery types and certain selected sherds of Chulmuntogi. Kim Won-yong illustrates some of these in a review article (1962b:48-49). Especially the pottery from Amsari, which is considered to be "classic Chulmuntogi," bears considerable likeness in a few atypical decorative motifs. Kim also reiterates, in the same paper, the theory that

the idea of pottery making, or the potters themselves, came from the north and went to Japan producing the Jomon pottery which also bears some striking resemblances to Chulmuntogi. It has been widely thought in Korea that the radiocarbon dates for Jomon must be in error since they fail to fit this sequence. Even Kim Jon-Hak (1966) joins those who believe that the "geometric" pottery came from Siberia.

It has alternatively been suggested by a Soviet archaeologist that the type of pottery represented by Chulmuntogi is ancestral to that in the Soviet Maritime Region and in the Amur River basin, and that it is ultimately patterned after unspecified basketry from Southeast Asia (Okladnikov 1964:38). Some round-based pottery in the Ryukyus has been suggested as a possible step on its journey northward.

Daifuku (1949), reflecting a point of view common in Jomon studies before the era of radiocarbon dates, suggests four possible routes by which the Jomon culture might have been introduced to Japan. Two of these are through Korea, but in his sketch map (1949: 268) he does not extend the origin of the arrows in his diagram back toward Siberia.

When considering relationships between Chulmun and other kinds of prehistoric pottery, a caveat is in order on the quality of the evidence. Even the most cursory examination of relationships within East Asia is beset by great difficulties. Not the least of these is the number of unrelated languages in which site reports are published from the areas bordering on Korea or believed to be forerunners of Chulmuntogi. Reports tend to be published, if at all, in small journals rarely obtainable outside their country of origin. For this reason the following relies largely on summaries in English or translations for each area and refers, where possible, to original site reports for illustrations, photographs, and maps.

No reason has been found to doubt the reliability of any of the major sources; nevertheless they are summaries and secondary sources and, therefore, the full range of the underlying data is not available.

A second kind of difficulty lies in the nature of the data. The only large series of radiocarbon dates in the area is from Japan, with one pertinent date from the Ryukyus and a few from Siberia and China. Relative chronologies, local sequences, and guess dates based variously on geologic strata or level of development are less than satisfactory for comparisons between regions. The time dimension, which is crucial to the solution of the problem, is thus uncertain at best.

It is not the purpose here to compare entire assemblages. Since it is on the basis of resemblances between pottery styles that relationships between areas have been postulated, the discussions will be region by region, but they cannot be exactly parallel, since all pertinent information is not available for all regions.

In order to be a possible forerunner of Chulmun, a ceramic ware must be antecedent in time, belong to a contiguous area or at least show continuous style similarities through the intervening distances, and be similar in form and/or style. However, because theories of the origin of Chulmun have been based on stylistic likenesses alone, the following discussion will have the same emphasis.

Eastern Europe and Siberia

Korean and Japanese archaeologists generally believe that Chulmun is principally related to Kammkeramik from the East Baltic area by way of Siberia (Fujita 1948:13, Kim WY 1962b:43). East Baltic "classical comb and pit-marked pottery," however, actually

bears no close resemblance to Chulmuntogi. The so-called comb-markings on classic Chulmun are a series of short incised lines, drawn either one at a time or, according to Kim Won-Yong (1962a) and Chase (1964:145), sometimes with a comb. In either event, the comb markings are not the same as those of the Baltic area where the marks are made by impressions of the end of a multiple-toothed implement. Thus the comb-markings of Chulmuntogi do not parallel those of the East Baltic at all. The pit markings are also essentially different; in the Baltic pottery there are deeply indented pits but Chulmun contains shallowly impressed punctates. Arrangement of design elements also differs; rows of punctates may occur on Chulmun pottery between the band design and the body design or they form the band design itself, but on Kammkeramik pits usually alternate with other designs or form part of a more complex design (Gimbutas 1956:205). Thus the only characteristics actually shared by Chulmuntogi and Kammkeramik are general similarity of shape (pointed bases) and the fact that both kinds of pottery are decorated with lines and dots created by roughening the surface. As many North American Woodland pottery types also share these similarities, the postulated relationship seems extremely tenuous.

If, however, such a relationship existed, one would expect to find linking pottery types in the intermediate land area within the deciduous forest zone. Such, however, is not the case. For instance, Siberia, especially the region around Lake Baikal, which is cited by the proponents of the theory as providing such a link, contains prehistoric pottery with similarities to Chulmun, but the similarities are not the same as those shared with Kammkeramik, except for the conical shape.

The earliest pottery type from the Baikal region, Isakovo, shares with Chulmun certain design motifs, in particular the row of punctates around the rim and a row of curved line impressions. However, in Chulmun these designs are used in multiple rows and

the rest of the pot is decorated with a contrasting pattern. Isakovo is decorated only by a single row of punctates or curved lines, which may also be on the inside or on the lip edge (Michael 1958:39, Chard 1958:9). Neither of the latter placements have been reported on Chulmuntogi.

Placement of motif, however, is less important than differences in manufacture which would seem to be basic. In contrast to Chulmun which was built up by the coil method, the Baikal pottery, according to Okladnikov, was made by pressing wet clay into nets. Even if this was not the method of manufacture, the net markings, which are conspicuous on Isakovo, are absent on Chulmun.

According to Michael (1958:40), some have speculated that Baikal pottery was derived from Kammkeramik, others think that it came from Southeast Asia. Okladnikov, however, who has studied the area personally, believes the pottery to be autochthonous. It might be added here that the comb impressions which have been adduced as evidence of a relationship with Kammkeramik belong to the pottery of the next stage, Serovo, which has a completely different shape. And again the comb markings are impressions of the points of the comb rather than lines incised with a comb.

The earliest radiocarbon-dated pottery in this region is from Bel'kachi I, about 4920 B.C. (Chard 1974:65). This pottery is similar to Isakovo pottery in shape decoration and, apparently, method of manufacture. The associated stone tools are "virtually unchanged" from the preceding era (Chard 1974:65), lending support to Okladnikov's suggestion of local development of the pottery.

In sum, then, the Chulmun pottery of Korea shares no characteristics with Serovo, the comb-impressed ware of Siberia. It is the same in general shape as the earliest ceramic stage in the Baikal region, Isakovo, and shares two decorative motifs and the placement of these motifs in a band around the rim. It differs

fundamentally, however, in method of manufacture. Therefore, the Baikal pottery cannot be seen as an intermediary between Kammkeramik and Chulmun, and it may not indeed be related to either.

China

Ceramic stages antedating the Yangshao horizon in China are still speculative. Chang (1968:88) postulates a pre-Yangshao horizon which he calls Sheng-wen ("cord-marked") and for which he assumes a level of primary village-farming efficiency. The term Sheng-wen is applied to all cord-marked pottery found widely throughout China and remaining on the fringes after the nuclear area had developed painted (Yangshao) and polished (Lungshan) pottery. Sometimes cord-marked pottery is found in the same levels as the more developed Yangshao or Lungshan ceramics.

Although Chang postulates that a Sheng-wen horizon will be widely found, there is still little evidence. A cave site in central China has recently disclosed an early Sheng-wen site (Chang 1972:436). Except for being handmade, the pottery seems to be utterly unlike Chulmun. For other Sheng-wen sites, settlement and subsistence are unreported, and the accompanying assemblages are quite variable, as are other attributes, such as color, temper, and shape of the pottery itself. Sheng-wen is thus not a useful category for the purpose of comparison with Chulmun.

Nevertheless, some tantalizing similarities do appear. Cheng (1967:213, Plate 15, no. 11) illustrates a sherd from Hsien-jen-chiao in Szechwan which seems to be identical to some Amsari pottery. In the written description (pp. 118-119), however, Cheng suggests that some vessels of this type were wheel-made, which would be a basic difference.

Chang (paraphrased in Pearson 1972:228-29) has pointed out similarities between Chulmun and pottery "all along the northern

fringes of China, from Manchuria to the Great Wall areas of Sinkiang." This area, however, is not China proper and will thus be treated separately in the next section. The developments in China's nuclear areas seem to have influenced Korea only later, at the time of the Lungshanoid expansion.

Manchuria

The region usually known in English as Manchuria and called by the Chinese the Northeast is one of the areas of East Asia least known archaeologically. This is regrettable since it borders on Korea to the north, belongs to the same ecological zone, and presumably would have been a natural area for cultural contacts.

A few sites, however, have been excavated and published. One such series of sites, which are thought to contain the earliest pottery in the region, are near Ang-ang-hsi (Cheng 1959:137-141, Larichev 1964:181-231, Chang 1961:58-59). The sites are dated by means of their geological stratum to about 5000-4000 B.C. (Cheng 1959:141) and therefore could antecede Chulmun. On the other hand, Larichev (1964:228) would place the sites between 2500-1800 B.C. No radiocarbon dates are yet available.

The description of the pottery from Ang-ang-hsi sounds similar to Chulmun: predominantly brown in color, handmade by coiling, simple shapes with straight rims and flat or rounded bases, no handles, decorative designs in bands, incised and applique patterns (Cheng 1959:139). The drawings (p. 140), however, do not resemble Chulmun at all. The shapes, for instance, are globular, with rudimentary necks, and some vessels have spouts. The only illustrated band is in the middle of the jar, and it is composed of zoned areas rather than rows. The similarities are rather general. Larichev (1964:226) notes that the cultural affinities of the pottery are with the Soviet Maritime Region, northern Korea, and the Late Jomon of Japan. Chang (1961:68) thinks that flat-based pottery in East

Asia is later than pointed-bottomed vessels. The next stage in Manchuria, the Lin-hsi, is even less likely an antecedent to Chulmun, for the pottery is mostly wheel-made.

At the end of the Liaotung peninsula and on Shang-ma-shih Island nearby, there are sites resembling northeast Korean Chulmun on the Yalu River (Kim Wy 1967a), which Kim also believes are from the later part of the Chulmun period because of their flat bases. Therefore, according to Korean chronology as well, the influence went from Korea to Manchuria rather than in the opposite direction.

The Soviet Maritime Region

As the Soviet Maritime Region is contiguous with northeast Korea, it is not surprising that definite affinities have been noted between the Chulmun of the Tuman River and northeast coast of Korea, and sites farther up the coast and on the Amur River. The regions are also similar ecologically and have similar total assemblages. Okladnikov (1962:284) and Chard (1960) consider the Soviet Maritime Region and northeast Korea as one culture area. It should be noted, however, that the pottery from these sites differs in several important ways from the classic Chulmun of central Korea. Although the shape of the northeast pottery is generally conical, the bases are flat rather than pointed or rounded. And while the pottery of the Maritime Region often has zigzag patterns and a separate band, the motifs are frequently created with stamps and roulettes rather than by incising. As pointed out by Okladnikov (1964:38) the pottery resembles in shape and design the entodoki of northern Japan, a variant within Jomon, more closely than it resembles classic Chulmun.

Looking more closely at specific pottery types, we find at the mouth of the Tetyukhe River an early pottery with impressed diamond-shaped designs forming a band around the rim. The pots are tall with narrow, flat bases. Farther south, near the mouth of the

Batalyanza River, there is pottery of the same shape, some decorated with stamped designs but other having incised vertical zigzags covering most of the vessel. The southernmost site of the Soviet Maritime Region, near the mouth of the Gladkaya River, contains vessels of three different shapes which can be arranged in a developmental series (Okladnikov 1965:59). The earliest of these is not the truncated cone, but rather a bowl with flaring sides. Thus it seems strange to derive the tall vessels from southern basketry, as Okladnikov does elsewhere.

In sum, the pottery of the Soviet Maritime Region is clearly linked with the northeast Korean Chulmun, but relationships to central Korean Chulmun are less well established. Nothing is known of the relative dating.

The Ryukyu Islands

It is sometimes suggested that the incised pottery of Korea is linked with the Ryukyu Islands via southern Japan and ultimately with Southeast Asia. This suggestion is based on two similarities, between the pottery of Korea and a few sites in the Ryukyus, and between both kinds of pottery and basketry in Southeast Asia.

For instance, Okladnikov (1964:38) says in a summary paper on Siberian neolithic that ceramics of the Amur sites are:

> covered with a fine broken line and comb-type pattern in the form of parallel vertical zigzags. Closely resembling the very ancient cylindrical (Ento-doki) vessels of the Neolithic settlements on the Japanese islands in shape and pattern, these pots are evidently descendants of the original, high cylindrical baskets of the southern regions of eastern Asia and neighboring islands. These baskets had the same narrow, upright strips of vegetation in zigzags.

Unfortunately no specific reference is given to the basket-using

groups which may have provided the prototype for the pottery.

That this particular type of pottery is modeled after basketry prototypes is a reasonable conjecture. But on the basis of archaeological evidence presently available, the transition from basketry to pottery neither occurred in the Ryukyus nor was transmitted through the island chain.

Pottery descriptions from Ryukyu sites (Pearson 1969) include shapes, decorative techniques, and decorative motifs which are similar to Chulmun. For instance, at the Kadena, Oyama, and Kaneku sites horizontal zigzag lines are present. Rows of punctates are reported from Omonawa, Akajanga, and Tsuken Island in addition to zigzag lines, but not necessarily on the same sherds. These are variations within a large repertoire of surface treatments. One would expect the earliest "ceramic baskets" to be closer copies of woven baskets.

The hypothesis is not only weak stylistically, it is impossible as the dating is now understood. Pearson (1969:110), after studying reports and museum collections throughout the Ryukyus, concludes that "all remains of the Ryukyus, with the exception of the pig bones from Ishigaki and perhaps the deer bones from Okinawa, apparently postdate the beginning of the Ichiki type in southern Kyushu." Both the pig bones and the deer bones are from aceramic sites, therefore Pearson evidently believes that the earliest pottery in the Ryukyus is derived from Jomon. The earliest radiocarbon date is 1408±80 B.C. at the Attaburu site, thus corroborating his judgment (Pearson 1969:112).

The pottery of the southern Ryukyus resembles types found in eastern Taiwan, but as the Taiwan pottery is later than the Early Jomon pottery, it cannot provide a derivation of Jomon from south China. Chang (1970:40) suggests that Hoabinhian, Jomon, and northern Chinese "reflect separate and largely independent developments in three widely divergent ecological situations." At any

rate, the Ryukyu chain does not provide an archaeological link between the early ceramics of Japan and Southeast Asia, nor from the south to Korea.

Japan

Japan, containing pottery associated with early radiocarbon dates and within easy sailing distance of Korea, already has two points in its favor as the source of Chulmun. On the basis of stylistic similarities the closest links can be found with the Jomon pottery of Japan as well.

The division of Jomon into five periods: Soki, Zenki, Chuki, Koki, and Banki, is generally accepted. English translations of these terms, however, vary. Chard (1972:383) follows Beardsley's (1955:323) usage of Initial, Early, Middle, Late, and Final, while Kidder first proposed Early, Early-Middle, Middle, Late-Middle, and Late (1957:4) but now uses Earliest, Early, Middle, Late, and Latest (1959, 1968a). It is not always clear, therefore, to which of the first two periods the term "Early Jomon" applies. The terminology suffered a further strain when pottery earlier than Earliest or Initial Jomon appeared. This very crude pottery, from Fukui Cave in Kyushu and elsewhere, has generally been called Incipient Jomon. However, Mohr (1969:10) contributes to the general confusion by extending Initial Jomon to cover this early pottery and by referring to the period known in Japanese as Soki, as Late Initial Jomon. The earlier pottery is distinctive enough and separated enough in time to warrant a separate term. Therefore the terminology with the fewest overlapping referents would seem to be Beardsley's, that is, Incipient, Initial, Early, Middle, Late, and Final.

Chard (1972:383) has outlined a tentative chronology of these periods based on radiocarbon dates: Incipient Jomon 11,000-7500 B.C., Initial Jomon 7500-5500 B.C., Early Jomon 5500-3200 B.C., Middle Jomon 3200-2000 B.C., Late Jomon 2000-1000 B.C. and Final

Jomon 1000-600 B.C. Thus Incipient Jomon, Initial Jomon, and part of Early Jomon all precede classic Chulmun, even if Sohn's earliest date of 4000 B.C. is accepted.

Not all ascriptions of Jomon pottery types to a particular period, however, are based on radiocarbon dates. Sequences which were worked out in the Kanto Plain on the basis of stratigraphy and stylistic progression have been extended to other areas on the basis of stylistic similarities alone. While this procedure has been partially validated by radiocarbon dates, it has not always proved to be accurate in detail. Thus, most of the pottery types considered to be Initial Jomon are conical pots with pointed bases, but some of these have been ascribed to Initial Jomon because of their shape where stratigraphic or other confirmation is lacking.

The conical pot with rounded or pointed base is found widely in Japan. Its Initial Jomon manifestations include sites in Kyushu (Kawasaki, Oita), the Kansai (Kozanji shellmound, Wakayama), the Kanto Plain (Daimaru, Yokohama City), and northern Honshu (Fukurizawa, Aomori) (Kidder 1955:60-61).

Although Jomon literally means "cord-marked," there are other decorative techniques represented in the assemblages. Early pinched and appliqued types have been found in Kyushu, and early Inland Sea examples are commonly impressed with a grooved roller. Incised and grooved types were popular early in the Kanto Plain, usually but not always associated with cord-marking. The fingernail impression is widely used in the central and eastern districts, and Incipient Jomon contains fingernail impressions in Kyushu. Grooving continued as an important decorative technique even into Middle Jomon in Kyushu, especially in the form of short, parallel lines.

In terms of decorative motifs, the herringbone pattern is frequently found in all stages of Jomon, although it was usually created by rolling twisted cords across the surface of the damp

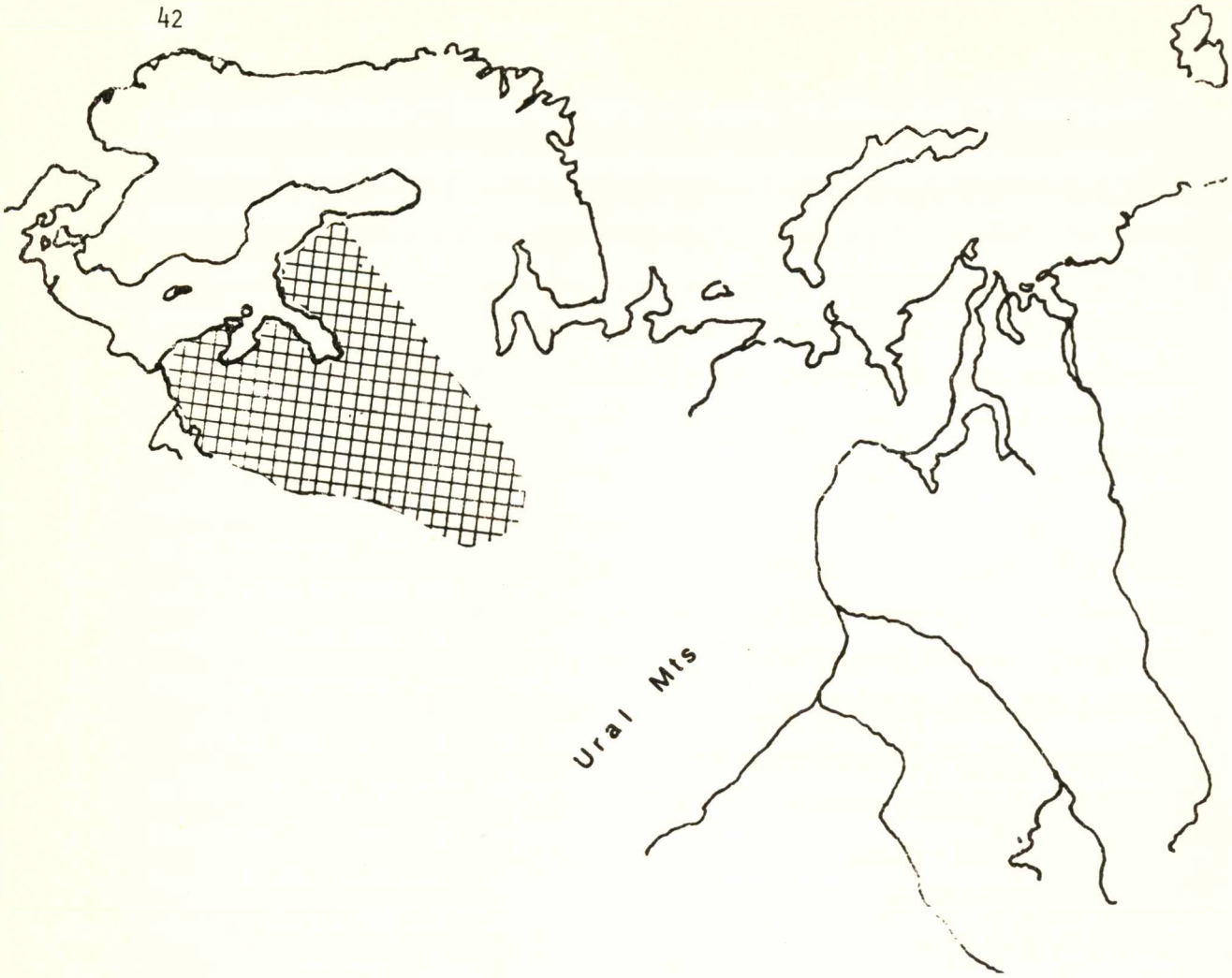
clay rather than by incising. The separate band also appears.

All the design elements, decorative techniques, and pottery shapes of Chulmun were thus also found in Incipient or Initial Jomon. It should be emphasized, however, that there is no particular Incipient, Initial, or Early Jomon pottery type from which any specific kind of Chulmun can be derived. Although all style elements are present in Jomon, there is no single pottery type that contains all of them. Besides, Jomon types have style elements that do not appear in Chulmun at all.

In spite of this, however, stylistic similarities are greater between Chulmun and Initial Jomon than any other area or horizon. Thus by all three criteria of antecedent time, propinquity, and style similarities, Initial Jomon is the most likely source of Chulmun.

Students of East Asia as a whole have also linked Korean Neolithic more closely with Japan than with Siberia. Chard, for instance, dividing Northern Asia into three culture areas in the Neolithic, includes Japan and Korea in the Pacific Area, and divides Siberia between the other two (Chard 1960). Okladnikov (1962:284) also notes that Japan, Korea, and the Soviet Maritime Region formed one culture area in the Neolithic. Larichev (1964: 219-221) also links these regions on the basis of stone tool types rather than pottery.

In summary, if stylistic similarities in pottery are to be taken as evidence of relationship, then unless the radiocarbon dates from Japanese sites are in error or still earlier dates are obtained for sites on the Korean peninsula, the direction of influence must have been from Japan to Korea and perhaps from there northward. As diffusion from this center spread out, ceramic traditions developed to the west would have been encountered, and reciprocal influences, including the potter's wheel, would eventually have been transmitted through Korea back to Japan.

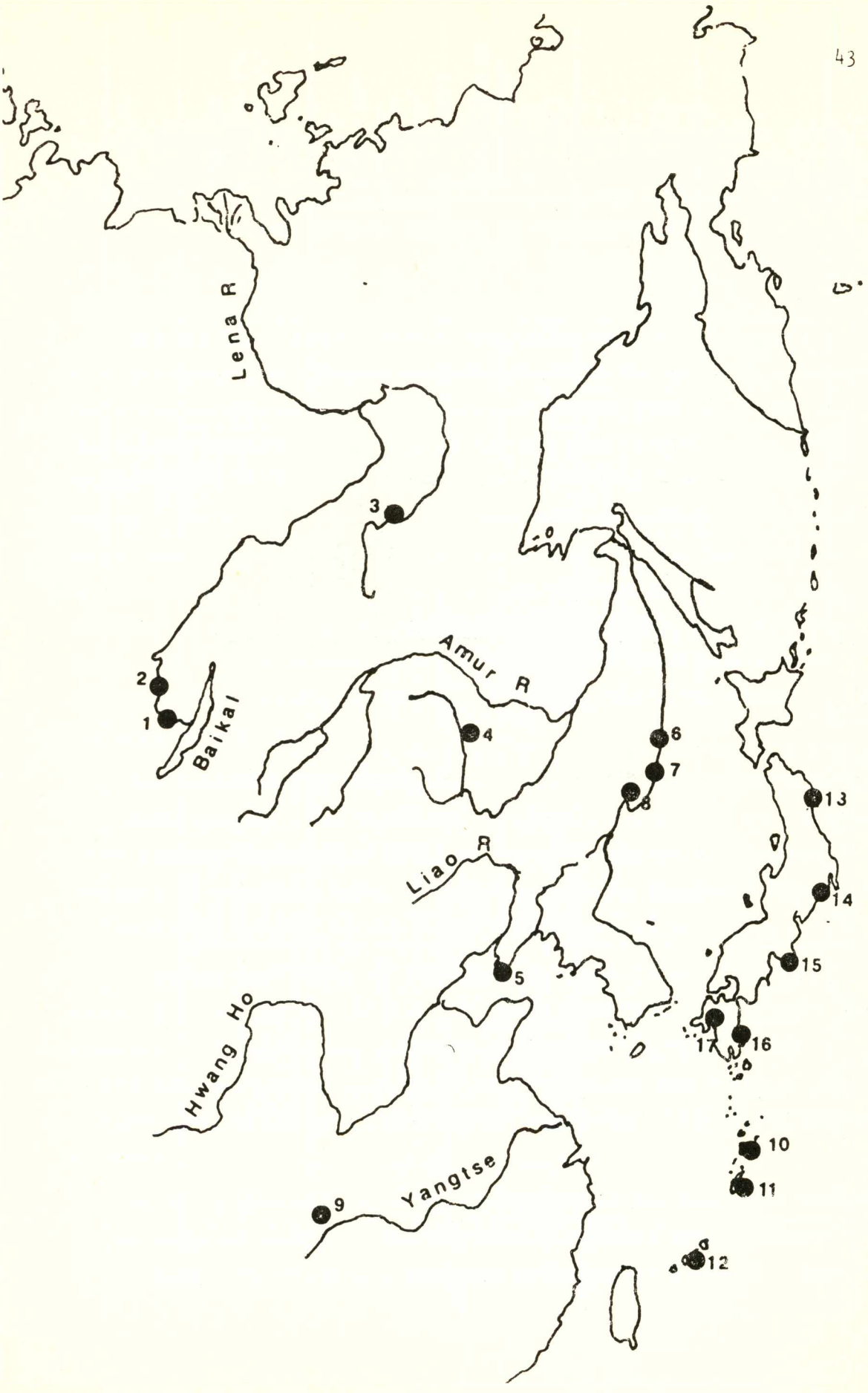


Legend

East Baltic Comb Ware

1. Isakovo
2. Serovo
3. Belkachi
4. Ang-ang hsi
5. Shang-ma shih
6. Tetyukhe
7. Batalyanza
8. Gladkaya
9. Hsien-jen-chiao
10. Omonawa
11. Okinawa sites:
    Akajanga
    Kadena
    Oyama
    Tsuken Is.
    Attaburu
12. Ishigaki
13. Aomori
14. Daimaru
15. Kozanji
16. Kawasaki
17. Fukui Cave

Fig. 10. Prehistoric Pottery Sites in East Asia


Lena R
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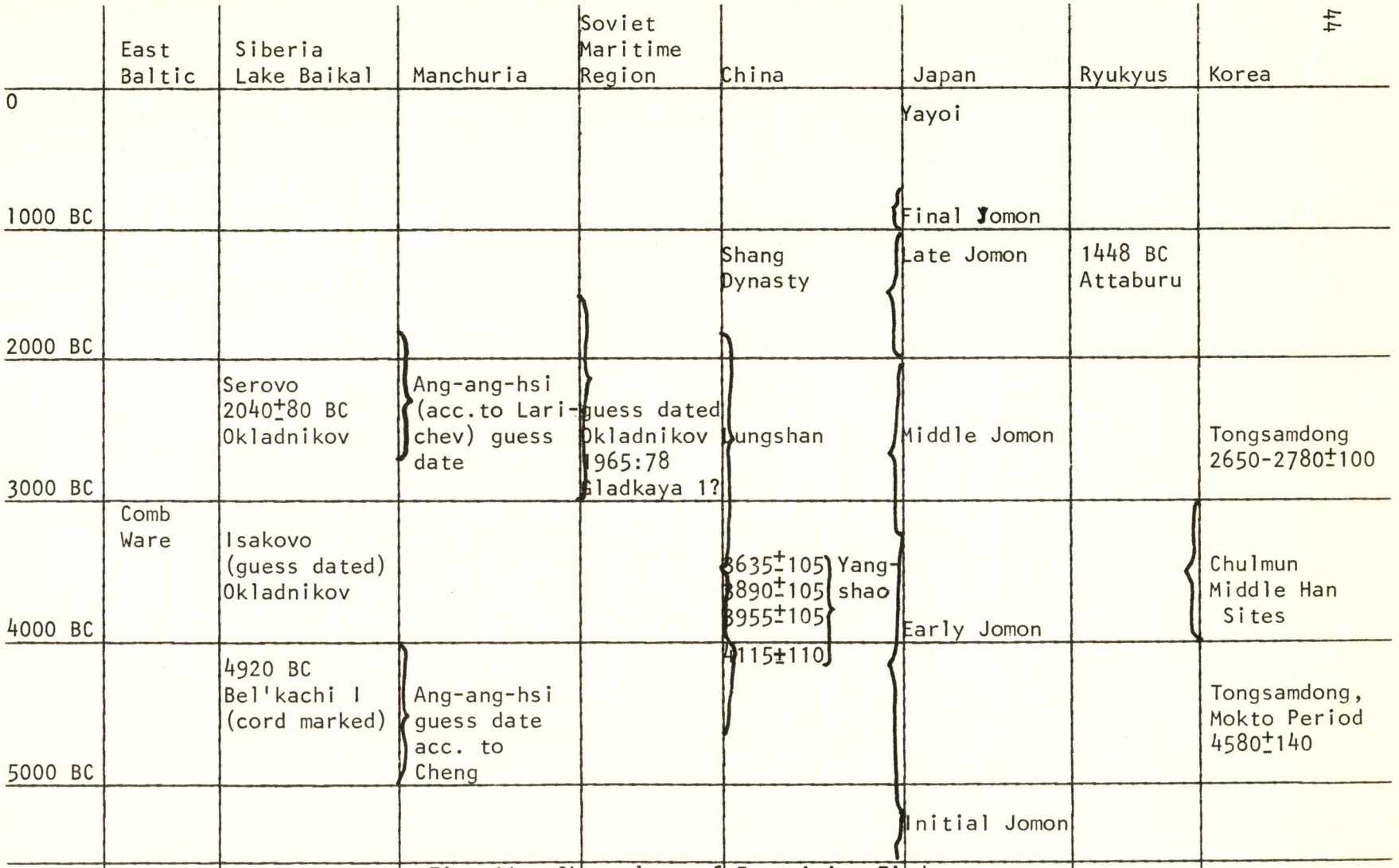


Fig. 11. Chronology of East Asian Finds

Chapter V

THE NATURAL SETTING OF THE MIDDLE HAN

The Han River basin forms a particular variant of Korea's physical geography. Ruggedness characterizes the terrain, although there are no high mountains. The river itself (485 km. long) is the second longest river in Korea and has the largest basin, of 25,850 square kilometers. The annual flow is 16.7 million cubic meters. The river flows from the mountains of eastern and central Korea generally westward and empties into the Yellow Sea near Kanghwa Island. The river rises in the eastern mountains in two branches of nearly equal length and flow, the North Han and the South Han. These branches join 35 km. east of Seoul and meander their combined way nearly 200 km. to Inchon, while the direct distance is only 40 km.

The headwaters of both branches rise in extensive outcroppings of granite-gneiss. The South Han intersects a block of mica schist, flows between limestone cliffs, and in a few places cuts across remnants of siltstone beds. The North Han cuts through a deposit of red sandstone as well as the usual granite-gneiss hills.

From the confluence of the branches there is only a drop of about 15 m. to the sea, giving the river from that point a very low gradient. Tides are measurable as far upriver as Seoul. The Middle Han is thus the section of river from the beginning of the low gradient at the confluence to the beginning of the tidal estuary at Seoul.

It is largely only from the confluence of the two major branches to the sea that much alluvium has been laid down, and even here it is not deep. The thickness has been estimated at 8 meters. Sand

and gravel islands are found at fairly regular intervals, particularly at bends in the river.

Fauna

There is unfortunately very little information on the prehistoric subsistence resources which were available to the people of the Middle Han phase. The following discussion rests on the assumption that there has been no significant change in the climatic pattern in the last 5000 years. If this is so, then uncultivated plants, undomesticated animals and marine resources available today can be presumed to have also been present during the Chulmun period. A few species that may have disappeared or become less frequent due to the activities of man and his expanding population are mentioned in early historic sources and are included for completeness.

Marine Resources

Fish of many sizes and kinds, shellfish, seaweed, and other sea plants are intensively utilized by Koreans at present. Lee (1955: 178) reports that there are 75 kinds of edible fish, 20 kinds of shellfish, 15 algae and 10 kinds of other sea animals and plants used by Koreans for food. This abundance is partly due to the existence in the seas off Korea of both cold and warm currents which sustain diverse sea life. In addition, a very long coastline with many indentations, peninsulas, and islands on the west and south, adding up to about 18,000 km., provides a great variety of niches for creatures of the sea.

The intensive utilization of resources of the sea can be confirmed by a visit to the open-air markets during any season of the year. Both the abundance and variety of fish and other sea products are often quite remarkable. Dried fish are for sale in any season. According to Lee (1955:178), "it has been indicated that as much as 85 per cent of the animal protein consumption of the Korean people

was provided by sea food."

The marine fish yellow corvina is the most important commerical fish, with spawning grounds in the Yellow Sea off Kyonggi Do to which the fish return in May and June. The fish are carried by tidal currents into large weighted nets supported by long poles up to 60 feet long. Squid, savory pike, Alaska pollack, and shrimp are caught off the east coast of Korea, while hairtail mackerel and anchovies in addition to yellow corvina are obtained from the west coast. Seaweed (laver) is collected and dried along the east and southwest coasts. It is harvested in the spring and summer, then dried and used all year for flavoring. There is also a reddish sea creature called yonggi, considered a great delicacy and collected all year. So are oysters and clams; the former are a frequent ingredient of winter kimchi. Sardines used to be an important food resource, but due to overexploitation they have disappeared from Korean waters in this century.

Riverine Resources

River fish and shellfish are far less abundant than sea products. This is probably due to the large seasonal differences in river flow, especially the yearly floods in summer which disturb any quiet pools where shellfish might have developed. It can be seen, however, from the river deposits in several places that marshes did develop and persist for long periods. The probable backswamp at Misari will be described below. A later backswamp, evidenced by sticky grey clay, is found farther down the river past Amsari. In it was found a wooden platform and Paekche objects. Perhaps the use of marshy land for rice paddies and the creation of other wet lands by spreading out the waters of tributary creeks has inhibited the development of natural marshes. In any case, there are no true shell middens along the rivers nor other indications of previous large populations of river molluscs.

As far as we know, shellfish were not taken from the Han River, although a few small (3 cm. long) bivalve shells were collected from the edge of the river, and a collection of perhaps 100 such shells was found by the river on a hillside at Kusan. Considering their small size, it would take large numbers to be a significant part of the diet.

Han River fish are not commercially exploited except in early spring, when fish, which are caught in the South Han a short distance above the confluence of the two branches, are eaten on the spot by people from miles around. Sporadic net fishing by the riverside inhabitants occurs, but the fish are rarely over 6 or 7 cm. long and thus cannot form a basic part of the diet. Bishop (1905: 91) reports from the Han "that the river fish...were very minute and bony." There are a few larger fish between 20 and 30 cm. in length in the deeper parts of the rivers throughout the year. Species found in the Han River include Ophiocephalus argus, Cyprinus carpio, Plegoglossus altivelis, and Coilia ectenes (Anonymous 1961). Trout is caught in the Naktong River, which flows to the south, and all the eastern rivers, but not in the Han River.

Methods of Fishing

Fishing in Korea, as reported by onlookers within the last century, has retained some methods that may go back to prehistoric times. Zaichikov (1952:79), for instance, says that

> Korean fishers use mostly small wooden sail-vessels, with very heavy masts. Sails are sometimes made of matting instead of canvas. Such vessels can risk going to sea in quiet weather only. Fish are caught with nets. In the rivers and along the sea-coast fish, molluscs, and crabs are caught chiefly with primitive equipment (weirs, nets, and others), or simply by hand. Fish are collected on sand banks and are dived for in the water.

Bergman (1938:97) reports women and small girls "continually to be seen catching small crustaceans (Gammaridae)" along the coasts. The women caught them in their skirts. He also saw shrimps harvested in a lake near the sea, with a long pole-net dragged along the bottom.

Mammals

As far back as the beginning of recorded history, and even in the origin myths, the wild animals associated with Korea have been animals of the forest. This accords with the assumption of little climatic change and a similar vegetation for prehistoric Korea, allowing only for changes wrought by agriculture.

According to the most widespread origin myth, the ancestor of Korea, Tangun, was born of a bear in 2333 B.C. There are, however, few bears in present-day Korea, nor does the bear figure widely in folk tales and folk art. The bear legend is probably linked with the widespread bear cult of various peoples of Northeast Asia.

The tiger appears in the origin myth also, and although the bear was believed to be the progenitor of the Korean people, the tiger appears much more often in the folklore of Korea. A pre-Buddhist deity, known only as the Mountain Spirit, is frequently found in side shrines of Buddhist temples, recognizable by the presence of a tiger. The tiger is greatly feared, apparently with some reason. An English traveler in the 1890's tells of tiger traps baited with live animals placed at either ends of villages (Bishop 1905:173); they are also mentioned by Hulbert (1906:21). Even in this century the tiger was still a menace (Bergman 1938). Tiger skins were sent to China in tribute in early historic times (Gardiner 1971).

A painting from the tomb, dating from the 5th-6th century A.D., of a tribal chief at T'ung-kou, just across the Yalu River in Manchuria, shows a hunting scene, with deer and tiger being hunted

by mounted horsemen using bows and arrows. Colby (1966:95-98) calls the deer of Korea Cervus nippon nippon, known popularly in Japan as Sika deer. They are two to three-and-a-half feet at the shoulder. Their coat is a bright chestnut dappled with rows of white dots in summer, but in winter they grow a heavy coat of blackish brown. A different species is mentioned by Bergman (1938:119), Pseudaxis dybowskii (cervus nippon hortulorum, according to Colby 1966:99), which are found in the woods of northern Korea. The antlers of these deer, when in the velvet, have been much sought after since antiquity and are still exported to China where they are believed to have medicinal value. Antlers have been found in a number of coastal shellmounds of the Chulmun period, frequently fashioned into artifacts. The deer population in central Korea is now very low, but some idea of the potential can be gained by the rise in numbers of deer within the Demilitarized Zone. It is said that nearly every shooting by sentries at noises in the night, which occurs several times nightly, turns out in the morning to have been a deer.

Very large wild boar are found in the northern mountains and are reported to be even more terrifying than the tigers. They are five to six feet long, with long, black fur. Paintings from the Yi Dynasty (14th-20th Century) show rather smaller wild boars being hunted. The relationship of the domestic pig of Korea to the wild boar is unknown. The domestic pig is small but also black. Zaichikov (1952:63) remarks that "hogs are raised in all the provinces, but they do not have any especial significance in the Korean economy. Only a small number of peasant households breed hogs." However, the pig figures widely in Korean folk tales and humor. Lattimore (1951:110,111) links pigs with shamanism and also with women in Manchuria. Certainly this linkage exists in Korea where the mudang (female shamans) often dance with a pig's head on a trident.

One species of Korean dog, from the island of Chindo, is reputed to be a Pleistocene survival (Sohn et al., 1971:4). Koreans, like the Chinese, have been known to raise dogs for food (Osgood 1950:77-78).

Other wild animals include the goat antelope or goral (Nemorhaedus raddeanus), rabbits, sables, ermines, foxes, martens, beavers, otters, leopards, and panthers. Zaichikov says that marmosets used to be found in southern Korea.

Flora

Because of intensive agriculture and extensive cutting of forest trees, it is difficult to reconstruct the prehistoric vegetation on the basis of the still remaining forests. In 1940, 52.5 per cent of the land in Korea had standing trees (McCune 1956:58), but during and shortly after the Korean War many more slopes were denuded of trees and brush in a desperate search for firewood. Reforestation has been undertaken, with millions of new trees planted on the hillsides. Present distribution of species, then, is largely recently man-made and not aboriginal.

Korea's natural vegetation is classed as a mixed forest ecotone between boreal forest and deciduous summer forest (Eyre 1968:82) and is part of the East Asian Formation which surrounds the Yellow Sea and extends into the lowlands of Manchuria. This formation is dominated almost entirely by deciduous trees, especially oak, beech, ash, and birch, but it is in contrast to the overwhelmingly pine and scrub oak forests presently found in Kyonggi Province.

Trees of the deciduous forests of Korea produce many edible fruits and nuts. They include acorns, chestnuts, pinenuts, walnuts, and ginko nuts, as well as Oriental pear, persimmon, pomegranate, peach, plum, cherry, and apricot. Several wild shrubs produce edible berries, as does also the yew tree "which in Korea bears

sweet berries, usually considered edible" (Zaichikov 1952:31). Wild grapevines have been reported, and mushrooms grow in sufficient quantity to be exported. The ginseng root, Ginseng panax, grows wild in heavily shaded forests. Many kinds of small leafy herbs and roots are still extensively exploited as food by Korean country people, especially in the spring when the leaves are still tender. On a plant collecting expedition one April, some 35 varieties of edible wild plants were collected in the space of an hour. Some of these are familiar as greens in the West also; they are dandelion, wild onion and wild garlic, the latter often dug in the woods. At least one chenopod is exploited wild, one member of the rose family, one member of the apple family, of which the seeds are eaten, and three Brassicaceae to which family both the Chinese cabbage and possibly the aboriginal form of the Korean turnip belong (Appendix C). Many plants are also used as medicines (Crane 1931).

Other useful plants of historic times include various types of reeds and rushes as well as bamboo. The paper mulberry grew aboriginally in Korea, and from it is made several superior kinds of paper. The oiled and polished paper found covering the walls and floors of many Korean houses comes from this plant.

Ramie, or Chinese nettle, is another plant which has been used for its fibers which are very long and strong. It was used to make fish nets and summer clothing. It was apparently deliberately grown, but not in fields: "This staple grows in rows scattered among shrubs and mulberry plants" (Zaichikov 1952:60).

Ramie grows only in the southwest, but hemp (Cannabis sativa) is widely grown and also grows wild. The first Westerner ever to explore the South Han River, Isabella Bird Bishop, noticed and recorded an unusual method of hemp processing:

> At the bottom of a stone-paved pit large stones are placed which are heated from a rough oven at the side. The hemp is pressed down in bundles upon these, and stakes are driven in among them. Piles of coarse Korean grass are placed over the hemp, earth over all, well beaten down. The sticks are then pulled up and water is poured into the holes left by them. This, falling on the heated stones, produces a dense steam, and in twenty-four hours the hemp fibre is so completely disintegrated as to be easily separated. (1905:105)

This method in itself argues for the local discovery of the use of hemp, for it is quite different from methods used elsewhere, such as water retting and dew retting.

Even flowers are put to a variety of uses. Azalea, growing wild in the woods, is used for wine-making. Chrysanthemum petals are added to small cakes. There is almost no plant that is not utilized in some way.

The only direct evidence of the plant resources of the Chulmun Period comes from the flotation from the soundings. This unfortunately produced less than was hoped, for most of the materials could not be identified. However, charcoal from the soundings was analyzed by R. C. Koeppen, botanist of the U.S. Forest Service. The larger specimens, which were identifiable, included Ulmus (elm), Prunus (plum or cherry), Quercus (white oak group), Pinus (pine), and Picea (spruce). Thus the presence of the mixed deciduous forest and the use of some of its resources is confirmed.

Cultigens

Some of the present cultigens of Korea have a long history, and among them are some which might have been independently domesticated in Korea. The most important of these from the point of view of prehistoric cultivation will be discussed below.

Turnip and Chinese cabbage, both cultivated in Korea in great quantities for preservation, are botanically close relatives (family Brassicaceae) and may both be domesticates of the same wild plant. The vegetable currently widely in use for making kimchi is a form of radish. Three of their wild relatives were gathered on our plant collecting expedition. One of the characteristics of plants which have been cultivated for a long time is that many uses have been found for various parts of the plant (Harris 1967:106). The turnip/cabbage is a case in point, one variety now having gigantism in the root (or rather the underground stem) and the other in the leaves.

The cabbage is not high in calories (320 calories per kg.), but it is rich in vitamins A, B, and C, as well as containing abundant iron and calcium. It also contains enough sugar, salts, and nitrogenous matter to undergo both alcoholic and acid fermentation. Thus it can be preserved without adding other ingredients.

Turnips are high in sucrose but, like the cabbage, a great deal would have to be consumed to fill daily calorie requirements. Turnips are a good source of Vitamin B and an excellent source of Vitamin C. The turnip is a biennial plant requiring two fields in order to have a harvest every year. It is a cool season plant, maturing in November in time for large quantities of winter kimchi to be made. Bishop (1950:Vol. 2:108), calling the turnip a "radish weighing 2 to 4 pounds," remarks that it forms "one great article of a Korean peasant's winter diet."

Although Sauer (1952:25) bases his hypothesis of the primacy of Southeast Asia in food production on the usage of root crops rather than grains in the tropics, Harris (1969:10) points out that "ecologically the common denominator of the root crops is that, through their ability to store starch, they are well adapted to survive long dry or cold seasons and to mature quickly once the rains begin or the ground warms up." Their wild ancestors,

he concludes, must derive from areas of markedly seasonal climate. The Korean turnip, of course, meets this requirement.

Millet is the one grain which is known to have been used in prehistoric times, probably Panicum millaceum (Sohn et al., 1970: 15). Zaichikov (1952:58) notes extensive use of millet in Korea:

> Millet and bean staples are very common everywhere in Korea . . . they occupy an important place in the nation's diet. Among the millet staples chimizu is most commonly sown. This differs from ordinary millet by its small grain, and is noted for its resistance to drought as well as by its high yield.

He also mentions grain sorghum (Manchurian millet or kaoliang) as an important cultigen. His observations were mostly made in the north of Korea where rice does not grow well, but the pattern observed may reflect the pre-rice situation in all of Korea. (The first mention of rice in Korea dates back to the first century A.D.) Hulbert (1906:17) writes of "many varieties of millet, all of which flourish luxuriantly in every province."

Millet was stored in "great earthenware jars, big enough to contain a man," according to Bishop (1905:84). She also reports that rice, barley, and water were kept in these jars, although it was my observation that dry items were stored in containers made of straw.

Hemp is often suggested as an early cultigen. It requires a nitrogenous soil and an open habitat, such as can be found in and around camps (Hawkes 1969:19). The plant is useful for its oily seeds as well as its fiber. None of the writers on early Korea mention the leaves being used as a hallucinogen, although they were so used by related steppe peoples. Ancient writings in China indicate that the fiber was used prior to the Shang dynasty. Generally, planting takes place in the spring, and no subsequent cultivation is required. When ready for harvesting the plant is

simply cut off at ground level.

Information on the soybean (Glycine max) is scanty. Its wild progenitor, Glycine ussuriensis, is a native of China and Manchuria as well as Korea (Piper and Morse 1943). Few farm families in the vicinity of Seoul grow their own beans at present. The soybean is much used in cooking, both as bean curd and the liquid from the fermented beans, as it is used in both China and Japan. Bishop (1905:179) mentions the "fermented rotten beans which are the basis of many sauces." Soybeans were probably an early cultigen, but none of the methods of preparation are unique to Korea.

Most of these possible early cultigens in Korea are anthropochorous; they like disturbed soil high in nitrogen content and, therefore, tend to thrive near human dwellings. Schwanitz (1969: 121) particularly mentions hemp and cabbage in this connection. Certainly many useful plants must have been available within a short distance of a site, and the step to planting would have been a short one.

Chapter VI

THE HAN RIVER PROJECT

Isolating a cluster of Chulmun Period sites and studying it from as many points of view and with as many kinds of data as possible seemed to be the most efficient way to begin analyzing the subsistence base of the Chulmun Period. A small cluster of sites exists on the middle portion of the Han River, with other known sites farther upriver and on the coast and nearby islands. As a fairly well-known area near Seoul, it was chosen because it provides more environmental and archaeological data than other similar clusters at present.

The larger region chosen for spot surveys is shown in Figure 12 with Chulmun period sites located and the surveyed areas shaded. Figure 13 shows the Middle Han region, with the area of intensive survey similarly marked.

Surveys were conducted in the fall, during the winter whenever snow conditions permitted, and in the early spring, concluding just as spring planting began. Vegetation, both cultivated plants and weeds, covers the ground surface in summer, making summer surveying unrewarding. The best time to survey proved to be late winter and early spring when the ground was bare of ice, snow and vegetation, but before flooding of the rice paddies began.

Although this region had been surveyed previously (Chase 1964), that survey was described as "limited." As the most complete series possible was desired, it was decided that the area designated for intensive survey, the middle Han basin, should be carefully searched for other sites. In spite of thorough search in several seasons, no previously unknown Chulmun Period sites were found.

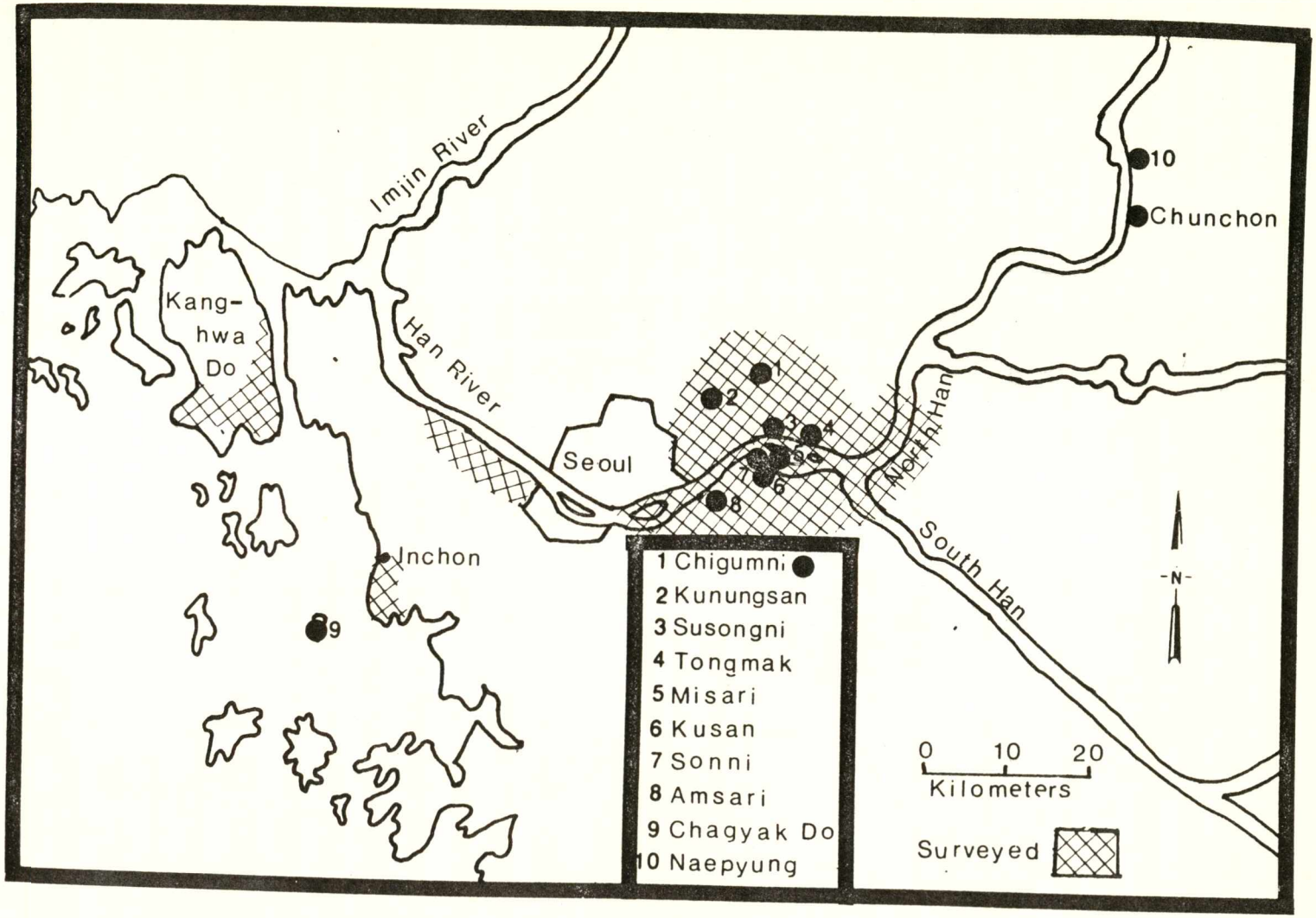


Fig. 12. Extended Survey Region

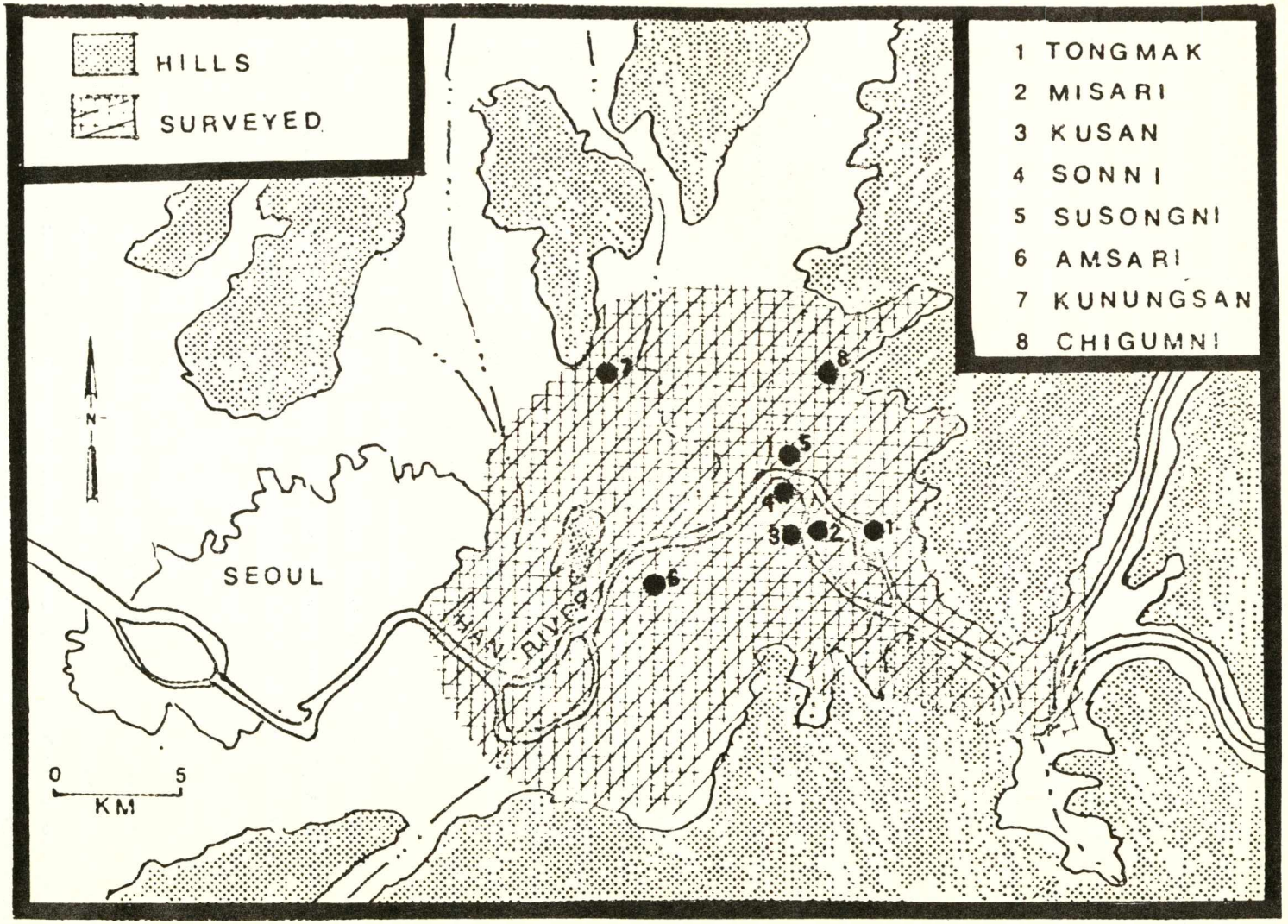


Fig. 13. Intensive Survey Region

In fact, not all the previously described sites could be located. In addition to walking over the terrain, Chulmun Period sites which had been reported in Korean journals were expressly sought. Those that could not be found were further checked when possible by contacting the person who had reported the site or find, to pinpoint the location more specifically. Sites which had been reported (Kim WY 1965, Oh SH 1961) and their condition as found by the survey team are discussed below.

Tongmak

The site of Tongmak, 25 km. upriver from Seoul, occupies a small terrace remnant of alluvium, about 10 m. above the winter level of the river. The river is fairly shallow at this point, although not fordable by wheeled transport or on foot, even in winter. There is a sand and gravel island in the river, and across the river to the southwest a large hill looms. There is a small wooded hill east of the site and another to the north.

The soil of the site itself is a sandy clay. Gravel and sand layers alternate near the river level, but there is no indication that the site itself has been flooded since the Chulmun layer was deposited. The soil above the Chulmun level appears to be slope-wash.

The site was mentioned briefly by Chase (n.d.), and in 1964 three soundings were dug by a crew from Seoul National University. The field notes indicate that no structures, pits, or burials were encountered. The typical Chulmun period inventory of incised sherds and chipped pebble tools was recovered from the soundings.

The surface scatter of "hoe-axes," net sinkers, and sherds covers the whole of an approximately 35 x 20 m. plowed area, and it is continuous for 5 to 10 m. past the cultivated area toward the river. The density of artifacts on the surface is not great, but it is frequently picked over by collectors.

One further sounding was made at this site, on the south side between two of the previous soundings (Figure 14). At a depth of 60 cm. incised sherds began to appear, and from that point on all dirt was screened. Beginning with the 60-65 cm. zone, 9 separate layers were bagged in 5 cm. intervals. Later analysis indicated that these layers had no relevance. Both the texture and color of the sandy clay matrix remained the same throughout—a dark red-brown, with more clay than sand. Below 110 cm. only sterile sand was encountered.

Scraping the profiles confirmed the lack of visible stratigraphy. The only variation was a small, shallow pit in the north wall which was well above the Chulmun level. Artifacts from this and other sites will be described in a later section.

Misari

Misari is on a shifting island in the middle of the river. At present it is not cut off from the south bank for most of the year but becomes a real island in the rainy season. Some old maps show it as a real island, and from the river deposits it appears that the main channel has been on each side of the island at different times.

The core of the present island seems to be a remnant of alluvial terrace capped by a soil. This remnant was isolated from the main terrace to the south by a cutoff channel. The north side of the island consists of flood sediments.

The site is rapidly being eroded by rains and the river. That which remains is probably only a small part of the original site. The site is on a bluff on the south side of the island, about 10 m. above low water level. Along the bluff, for about 50 m., there is a distinct blackish layer 50 cm. thick, beginning 65 cm. from the top of the bluff. Chase, who found this site, believed that this

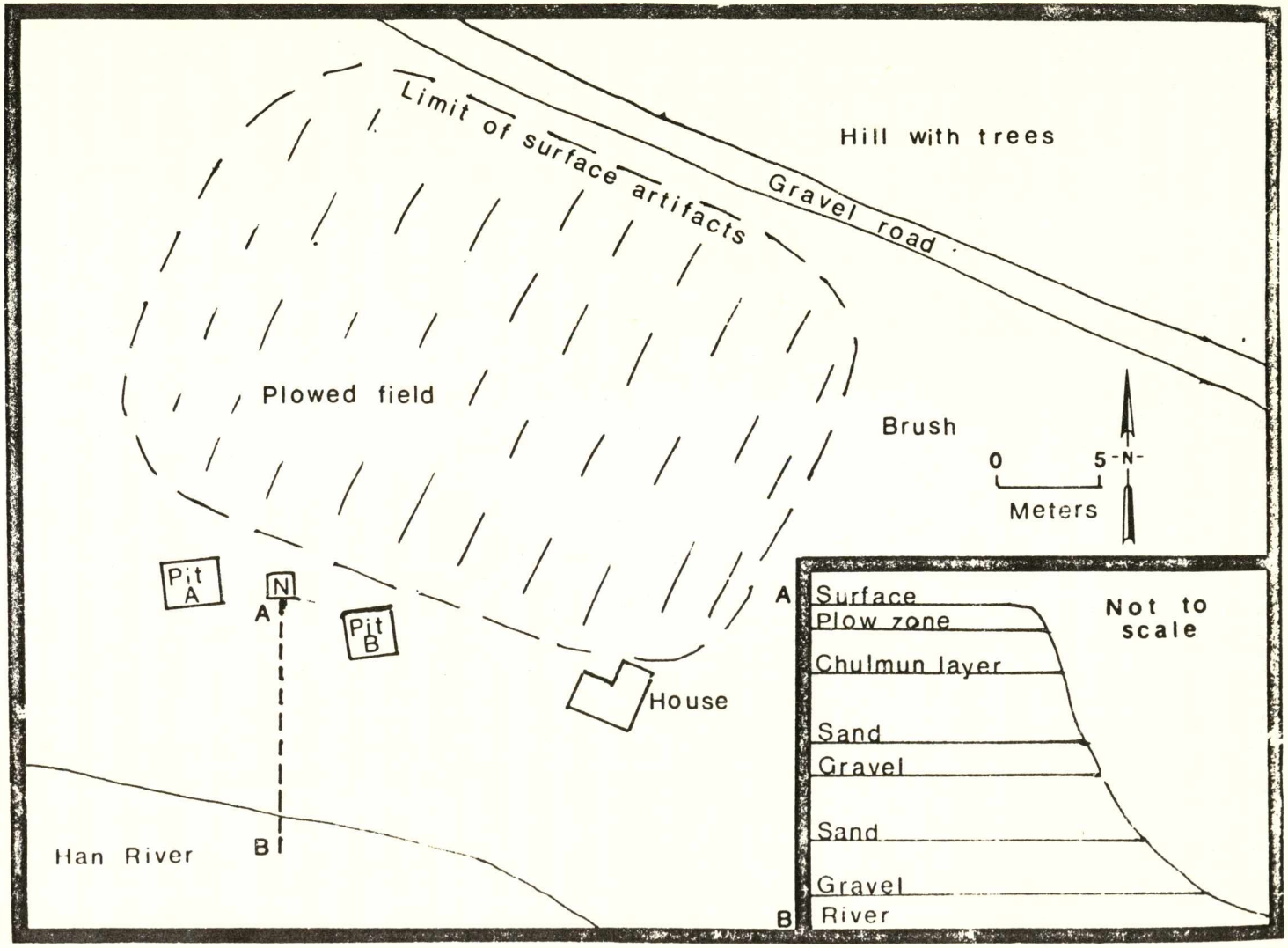


Fig. 14. Sketch Map of Tongmak. N = New Sounding.
Inset: soil profile.

dark layer contained the Chulmun Period deposit. Tests were made by Chase (n.d.) and Kim WY (2969a). Chase illustrates a Mumun jar found almost intact within the black layer. There were also artifacts not usually found with Chulmuntogi, such as grooved net sinkers and polished axes. Very few Chulmun Period sherds were found.

Two other soundings were made at this site (Figure 15). The first was made a meter from the edge of the bluff, near a previous excavation, the outlines of which were still visible. In this sounding, the top layer consisted of brown sandy clay in which no artifacts were encountered for the first 50 cm. From 50 to 65 cm. there were few artifacts. Flotation produced only roots in the first two layers. From 65 cm. to 115 cm. the soil was black and seemed to be full of humus. It is the opinion of a professional geologist (Casper Cronk, personal communication) that the black soil could have formed in a shallow back-swamp of the river. Only one stone and seven sherds were found. Beneath the black layer was more brown sandy clay with no artifacts. Below this was another darker layer, not as black as the one above but dark brown, which yielded eleven Chulmun sherds.

From these results it was suspected that the Chulmun sherds found on the gravel below actually came from the lower dark layer rather than the conspicuous black one as had been previously reported. An isolated pedestal in the eroded bank was therefore chosen, which was exposed in steps. From this excavation it was clear that the Chulmun sherds, which were quite plentiful, came from the dark brown level 35 cm. below the black soil. Only the soil surrounding the Chulmun sherds was flotated, from which came several pieces of carbon and some small bone chips.

Kusan

Across the south arm of the river from Misari there is a granite hill which has limited the extent of the river erosion in

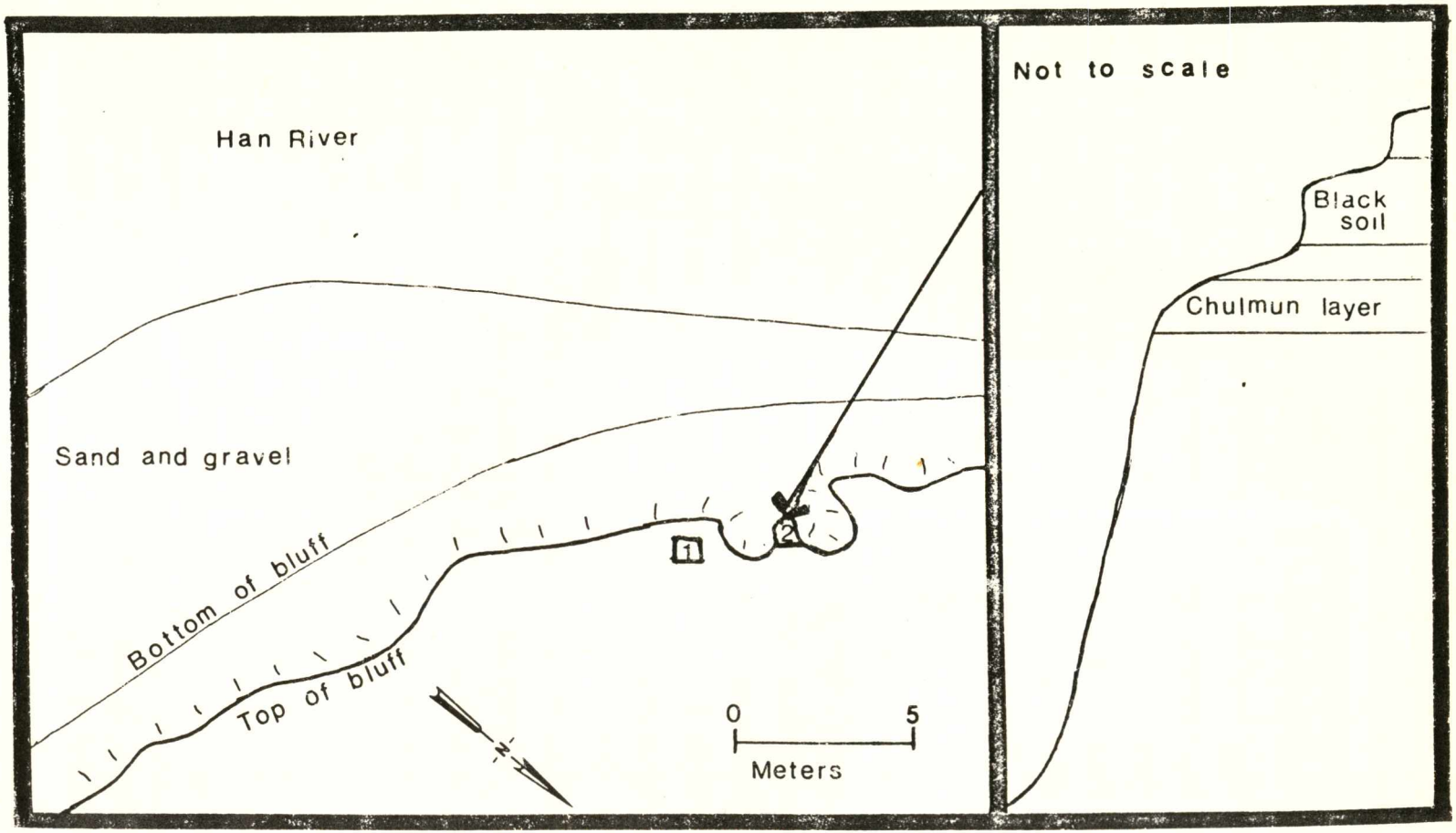


Fig. 15. Sketch Map of Misari.
New Soundings: 1 and 2.
Inset: soil profile.

this direction. This hill, and the village beside it, are both called Kusan. A small collection of bivalve mollusc shells, some acorns, some seeds, and a number of irregularly pointed rocks were found in a soil deposit. No sherds were found, and the quantity of shells was too small for an adequate radiocarbon sample. Therefore it is unknown what group of people partook of this meal, although the location points to the possibility of association with the Chulmun Period.

One Chulmun sherd has been reported from Kusan village (Kim WY 1965:8). Thorough exploration of both village and hill, however, turned up only a Mumuntogi site.

Sonni

This spit of land is an island during the rainy season, but at the time of survey it was joined to the south bank by a wide sandy strip. No excavations have been made here, although it was reported as a site by Fujita and the National Museum (Kim WY 1965: 8). Only one water-worn sherd was found in the course of two very careful surveys. That particular sherd almost certainly came from Misari, less than 500 m. upstream. The whole island, although higher than the intervening sand strip, is inundated in years of exceptional precipitation. Traces of a recent village can still be seen, which an elderly informant told us had been a village of about 100 houses that was abandoned during a devastating flood in 1925. Probably there is a site at Sonni covered by alluvium, but nothing could be found on the surface, and the exact location of the previous finds was impossible to ascertain.

Susongni

The site of Susongni is near the top of a steep hill 60 m. high. The hill is at the river's edge on the north bank, but the site is just below the crest of the hill on the north. This site

was first discovered by Chase (1961 n.d.) and subsequently excavated by a team from the National Museum (Kim WY 1966). Only a handful of incised sherds was found, which differed in several characteristics from the Chulmuntogi of the other Han River sites.

Amsari

Amsari is at present almost a kilometer from the south bank of the Han River. The river is eroding the opposite bank at this point and has left a wide expanse of sand and gravel between the site and the present river channel. The village itself nestles in a horseshoe of low hills, but the site is on the edge of the hills, beyond the village on the side toward the river (Figure 16). The site was exposed by the same flood that destroyed Sonni, and afterwards large quantities of sherds and stone artifacts were collected from the surface by Japanese archaeologists. In 1968 the site was jointly excavated by several Korean universities (Kim KS 1970). Many of the artifacts and field notes were available for study. Since my departure from Korea further excavations have been carried out by the National Museum. Flotation samples were sent to me, as well as brief reports from Korean and English language newspapers in Seoul (Korea Times, Nov. 30, 1971; Hanguk Ilbo, August 12, 1971).

Chigumni

A site was reported at Chigumni from purported surface finds. The village is on the edge of the hills in the valley of a small tributary of the Han River. However, the survey crew found nothing but a polished stone projectile point of a type usually associated with Mumuntogi, and historic sherds. The villagers could tell us of no site.

Kunungsan

Kunungsan is across the flood plain of a small Han tributary

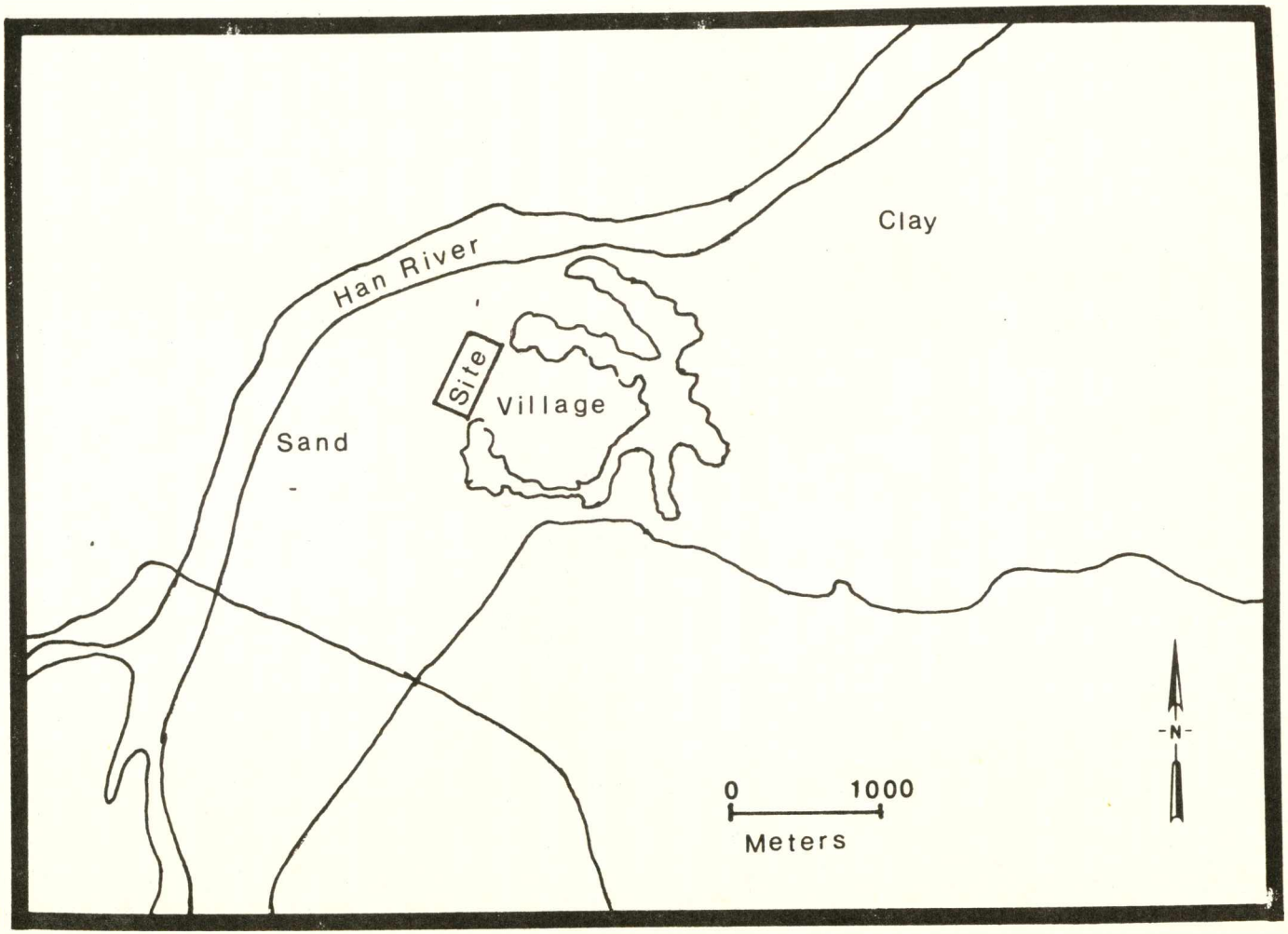


Fig. 16. Sketch Map of Amsari

from Chigumni. Meaning "Nine Royal Tombs Hill," this large eminence and its tombs are a favorite excursion from Seoul. The area has been thoroughly explored by picnickers, but no one could be located there who knew of any Chulmun site in the vicinity. There was a report of an isolated sherd, the exact location of which could not be pinpointed. No site was found by the survey crew.

Other Surveyed Areas

No additional Chulmun Period sites were found in the central survey area, although several unreported Mumuntogi sites were found, and Paekche sherds were found to be almost continuous on both sides of the river. If other Chulmun Period sites exist, they have been washed away or covered by fluvial deposits.

Other areas that were spot surveyed include Kanghwa Do, the lower part of the Han River north of Kimpo on the west bank, Chagyak Do off the west coast at Inchon, and both banks of the North Han between Yangsun and Chongpyung. Chulmun sherds were found only at Chagyak Do. A reported Chulmun Period shell mound on Kanghwa Do proved to be unreachable by the time we looked for it, in the rainy season.

Chagyak Do

Chagyak Do is a small steep island about 1 km. off the west coast of Korea at Inchon. On the east side of the island there is a mound composed largely of oyster shells. The shells form a heap on a steep slope approximately 10 m. wide and 15 m. long. The bottom of the mound is above the high tide mark. On the surface no pottery was seen, but one Chulmun sherd was found in a drainage ditch, and others had previously been collected from the site. A small sounding was made in the center of the mound. Near the top there were three Paekche sherds, and close to the base soil there

was one plain red sherd, compatible with Chulmun although undecorated. Since the hill slopes quite steeply, it was only 104 cm. from the surface of the mound to the ground at this location. Another area was tested where a piece of modern glass was found below a sherd of Koryo celadon. From this it was concluded that the mound had been disturbed, and it would not be possible to tell which parts of the mound were associated with the Chulmun Period. No further investigation was made of this site.

Naepyung

Naepyung is a site 130 km. from Seoul on a tributary of the North Han River. The site had been excavated the previous season by the National Museum and had not been backfilled since the entire region was to be flooded on completion of a nearby dam. The site is located on a sandy river terrace about 9.5 m. above river level, at a bend in the river. The excavations had revealed two house floors of nearly equal size (about 3 x 5 m.). Associated with one of them was Mumuntogi, with the other Chulmun sherds. The structure associated with Chulmuntogi was marked by a subrectangular ring of cobbles, with a large hearth toward one end.

Since no further excavations were planned for the site and the site was soon to be covered by a lake, we made three small excavations for the purpose of recovering carbonized plant and bone. The usual small scraps were collected. Some larger pieces of charcoal were taken from the hearth for identification.

Chapter VII

THE MIDDLE HAN PHASE

In order to discuss the sites of the Chulmun Period along the middle Han river as a group, it is necessary to demonstrate that the sites do indeed comprise a closely related series. Since ceramic types have been used for sensitive dating in many other areas, it was hoped that types could be discriminated for this purpose within the Han River sites of the Chulmun Period, creating subtypes of Misari Incised, or "Classic Chulmun." An additional goal was to differentiate between contemporaneous and sequential relationships. The pottery will be described in detail in the following section.

Hand sorting was not possible since collections were studied which belong to different institutions and, therefore, could not all be sorted at one time and place. It was therefore deemed most practical to record as many attributes as possible for each sherd and to sort them into types by means of statistical analysis. Collections were used from the Anthropology Museum of Seoul National University, the History Museum of Soong Sil College in Seoul, Chase's type collection borrowed from the Texas Archaeological Research Laboratory of the University of Texas at Austin, and surface collections made by the survey crew.

Several of the attributes which were originally measured and recorded were omitted in the final studies. Hue, value, and chroma were recorded from the Munsell color chart for about 200 sherds. The variations in each were slight, and none of the color variables correlated with any other variable. Therefore color variables were

not recorded for the remainder of the sherds nor used in the final analysis.

Some of the incised patterns were executed in a very precise manner, and others were done less carefully. Therefore a category crude/fine was originally included. It was found, however, that most of the sherds fell into an intermediate category, making discrimination arbitrary. Eventually this category was also dropped.

Distance between the lines of the pattern on both the band and the body was measured on the first two groups of sherds. The distance, however, was rarely constant on a single sherd and often diverged widely. This attribute was also omitted as unreliable.

Some of the lines were made with a wider implement than others, and a category of wide lines versus narrow lines was included. Again the problem of discrimination arose, as most of the sherds fell into a middle range.

The final attributes punched on data cards included three variables of rim diameter, reflecting the trimodal distribution, five variables of thickness, the number of band rows (five variables), four variables of body motif, and seven variables of band motif. These are shown in Appendix D. The intention was to use only rim sherds which included some of the body pattern; therefore, no provision was made for missing data.

The Whallon method (Whallon 1971, 1972) for the discovery of pottery types by monothetic subdivisive classification was used. Several runs were made with the data to see which of the program options produced the most reasonable types for these data.

For the results shown in Figure 17, most of the options available with the program were not used. Simple sum of chi-squares was used for division, without the Yates correction. The stopping rule used was the $\alpha = .05$ level of significance of chi-square at 1 df

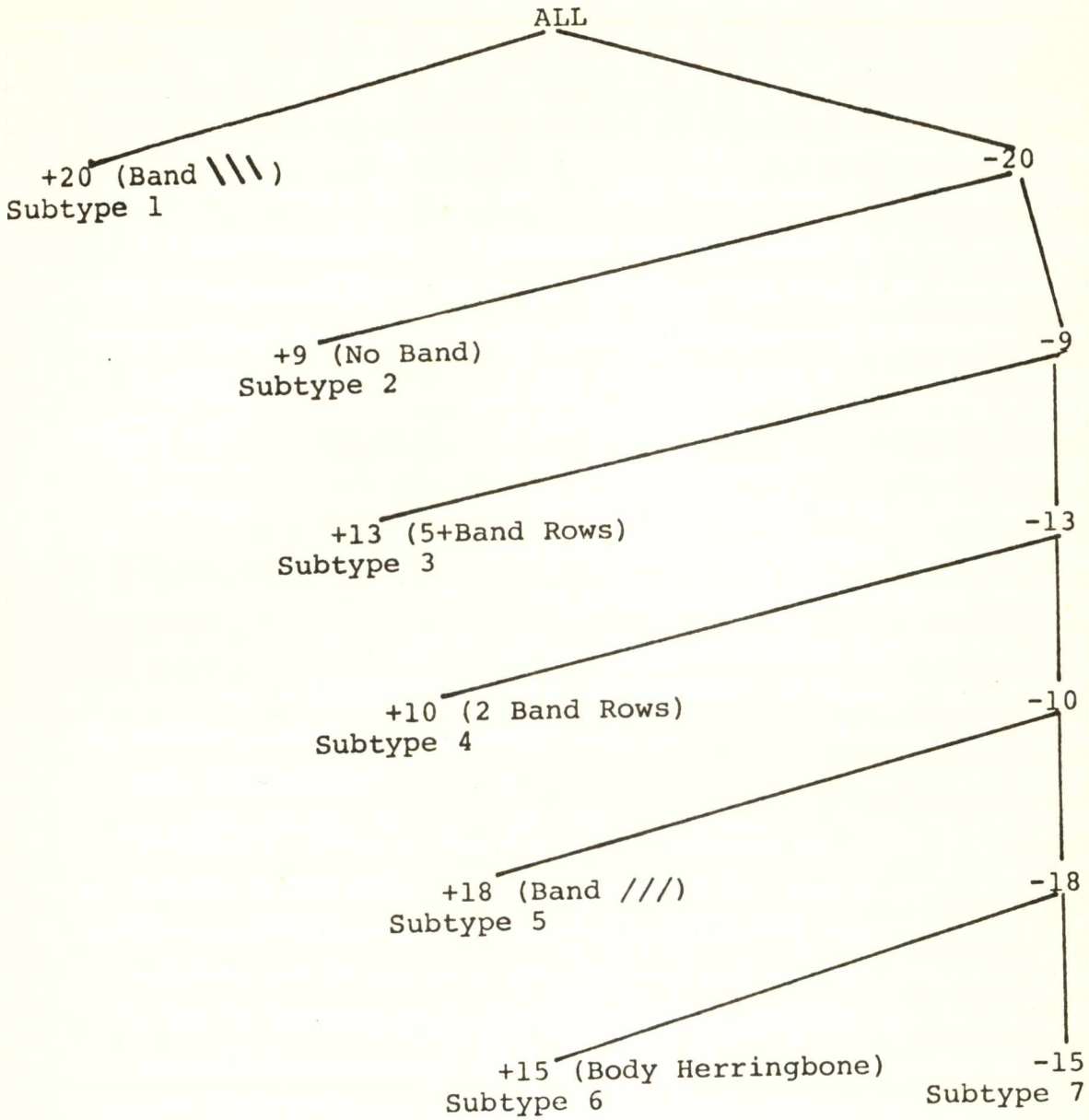


Fig. 17. Subtypes created by monothetic subdivisive classification. Sherds from Amsari, Misari, Tongmak, Naepyung, and Western Islands. For the number and percentage of sherds from each site in each subtype, see Appendix F.

(3.84), and the minimum expected value was set to 0.5.

After several trial runs with all the punched variables, a consistent tendency for the data to divide on thickness attributes was observed. This was seen to derive from the redundancy of thickness with diameter, since both are size characteristics. The division of thickness into five categories had followed from the incidental fact that thickness was recorded in millimeters, as if the measurements were discrete rather than continuous, and happened to fall almost entirely between 4 and 8 mm. In fact, the underlying distribution is normal, peaking quite sharply at 7 mm. for all sites. The first attempt to suppress the "noise" from mechanical associations of thickness with diameter was not to allow division on Variables 4-8, but to include them. Another series of runs without the thickness variables at all, however, produced divisions that split the sherds more evenly and more definitively. Figure 17 therefore shows this final run, without thickness variables at all. The original variable numbers have been retained. Appendix E shows the sites and numbers of sherds used in the analysis. The data may be found in Appendix A and the first chi-square matrix in Appendix B.

Nine subtypes were generated in the final run. These results, when analyzed, called into question the accuracy of the recording of some of the Naepyung and island sherds. No examples of two of the supposed subtypes could be found. It was concluded that not all the sherds in this group included both rim and body motifs. As re-recording of the attributes was impossible, these two divisions of the data were suppressed, leaving seven subtypes.

The final seven subtypes are shown, along with the number of sherds from each site and the percentages of sherds from each site, in Appendix F. The subtypes can be characterized as follows:

Subtype 1: Band with rows of short backward slanting lines. Only Naepyung (72.8 per cent of the sherds from the site) and the islands (14.7 per cent) were represented (Figure 18).

Subtype 2: No band, body pattern to the rim. Some in each site, but including 64.7 per cent of the island sherds (Figure 19).

Subtype 3: Band with five rows. Thirty-seven per cent of the sherds from Amsari and 33 per cent of those from Misari, along with a single sherd from Tongmak and two from islands (Figure 20).

Subtype 4: Band with two rows. Scattered throughout the sites (Figure 21).

Subtype 5: Three or four rows of forward slanting lines in the band. Again well represented at Misari and Tongmak (24 per cent and 23 per cent, respectively), and two island sherds (Figure 22).

Subtype 6: Herringbone on the body, with three or four rows of either punctates or fingernail impressions. Only found at Middle Han sites. Amsari 15 per cent, Misari 28 per cent, and Tongmak 35 per cent (Figure 23).

Subtype 7: Same as Subtype 6, but with pattern other than herringbone on the body. This included 14 per cent of the Amsari sherds, all of which were brushed (Figure 24).

Differences Among the Sites

Three different tests for similarity were run between pairs of sites for each of the final nineteen variables and for all twenty-four variables in two of the tests. The t Test, a test of the significance of proportion (Dixon and Massey 1957:232), and chi-squares were performed. The results are summarized in Appendixes G, H, and J. All show the same trend, with few differences among the Middle Han sites, and a great many significant differences between the Middle Han sites as a whole and either Naepyung or the

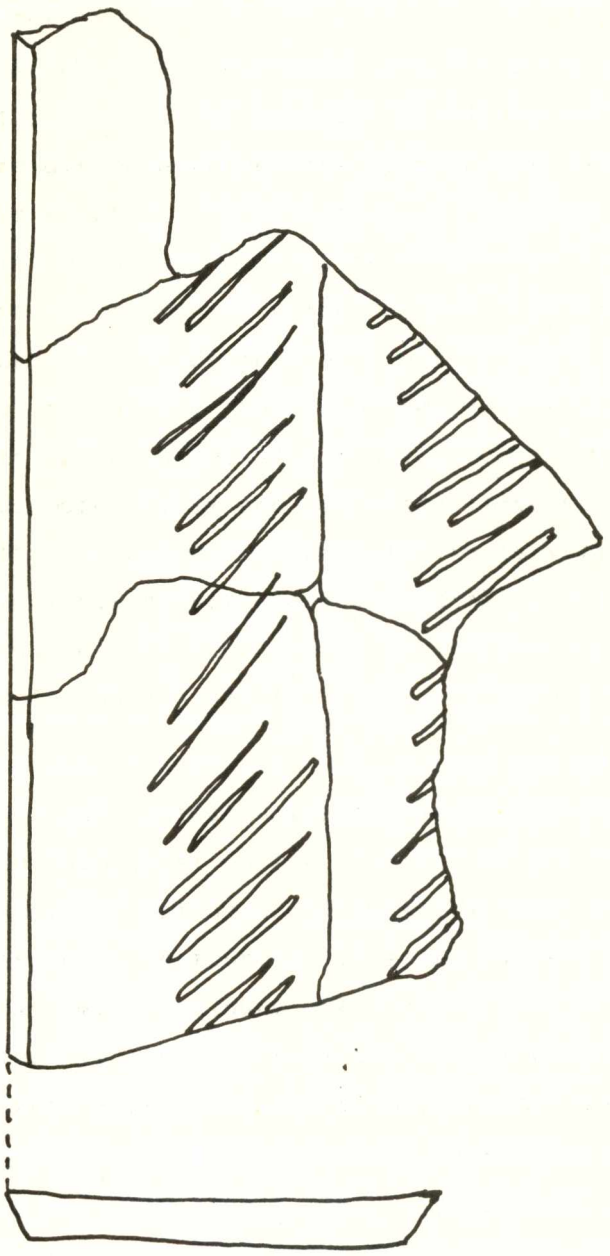


Fig. 18. Subtype 1 From Naepyung Surface. Actual Size.

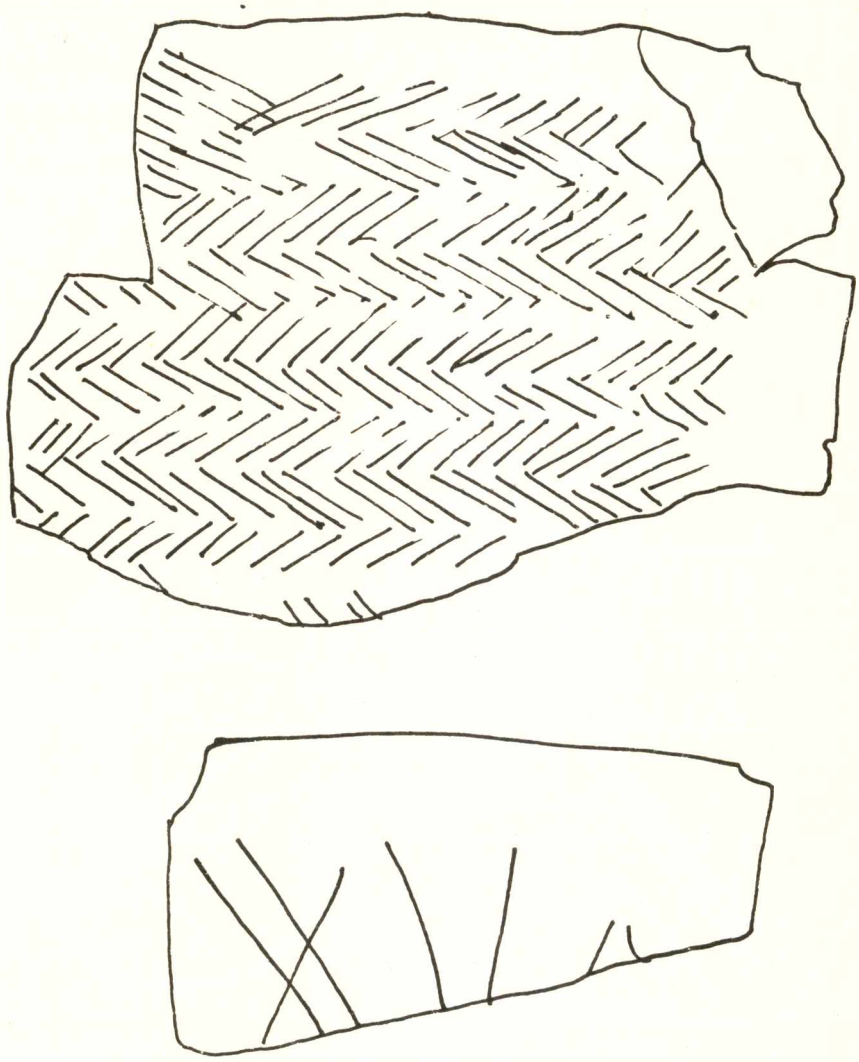


Fig. 19. Subtype 2 from Yonpyung Do, Western Islands. Drawn from Photographs in Im 1969, Figs. 7 and 8. Size unknown.

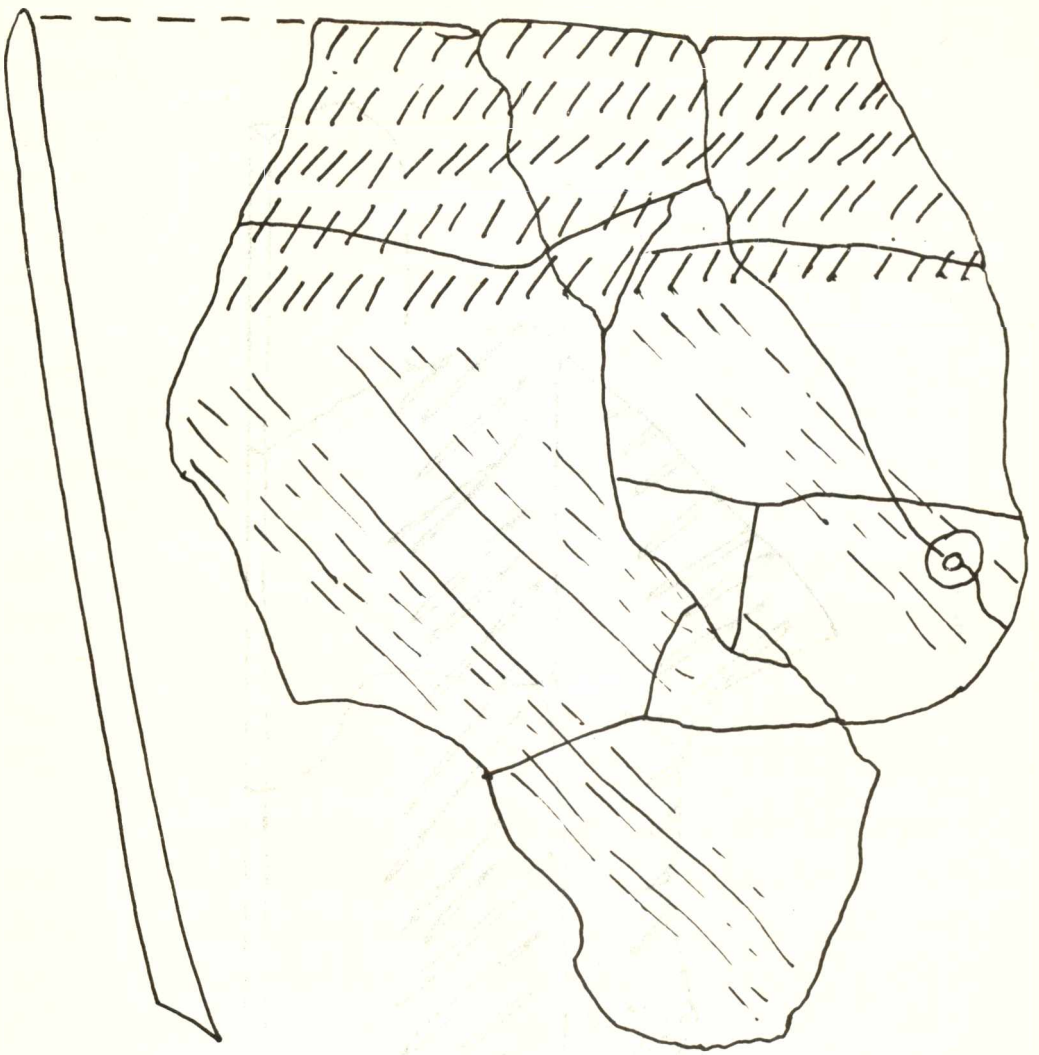


Fig. 20. Subtype 3 from Misari Chase Collection. Actual size.

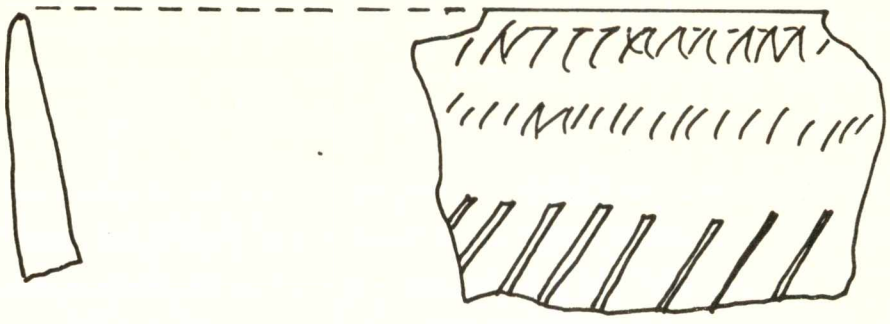


Fig. 21
Subtype 4 From Chagyak Do
Seoul National University Collection
Actual size.

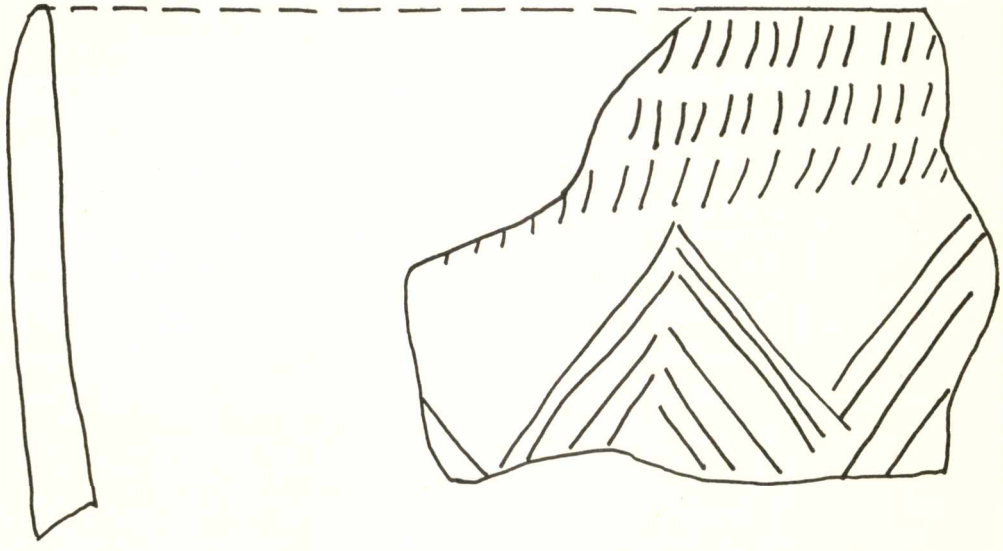


Fig. 22
Subtype 5 From Misari
Seoul National University Collection.
Actual size.

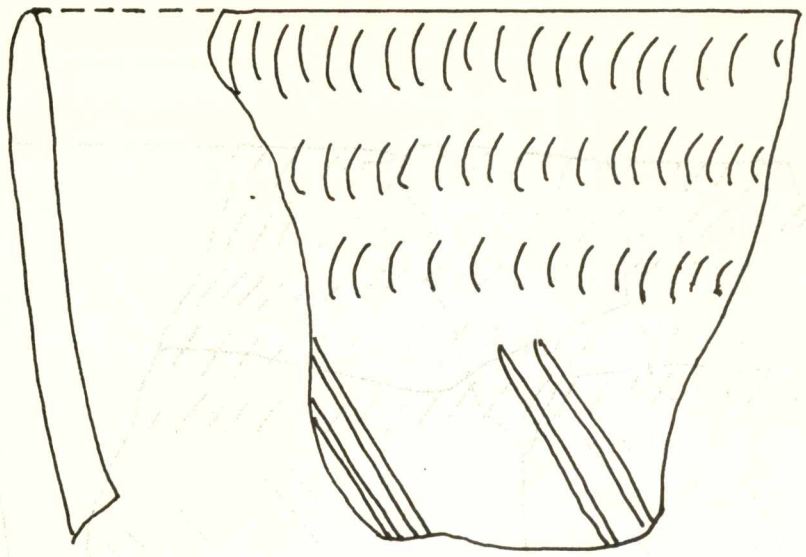


Fig. 23. Subtype 6 From Amsari. Surface. Actual size.

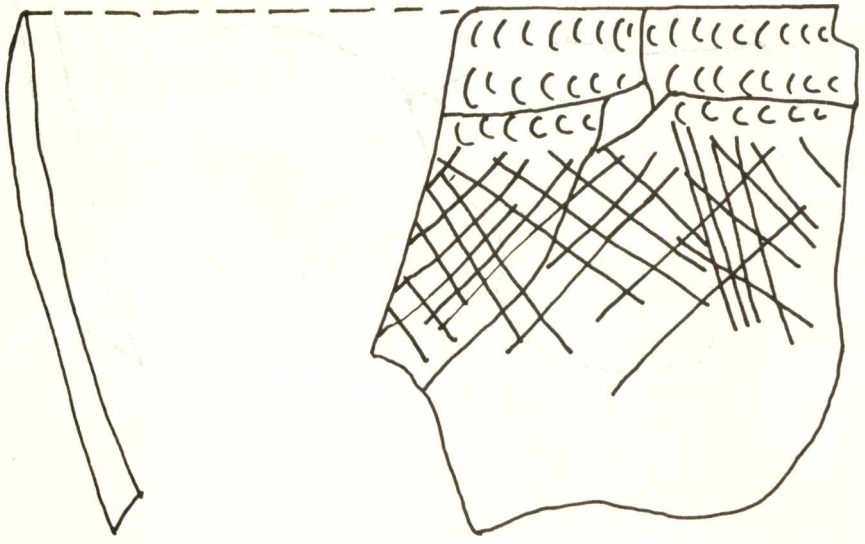


Fig. 24. Subtype 7 From Tongmak. Surface. Actual size.

islands. Although a suspicion of incommensurate data for some of the Naepyung and island sites exists, the trend toward differences is so marked (see especially the cumulative chi-squares) that the margin for error is probably not exceeded.

The results of all three tests strengthen the inference that the Middle Han sites are a meaningful unit which can be contrasted with other such units farther inland and off the coast.

Chapter VIII

CHULMUN ARTIFACTS AND SETTLEMENTS FROM THE MIDDLE HAN

Pottery

The incised pottery is not only the "type fossil" for the sites of the Chulmun Period but also the most abundant artifact. Sherds represented 92 per cent of the artifacts from the soundings at Misari and 82 per cent from the sounding at Tongmak.

Although the Han River Chulmuntogi was known at least as early as 1925 when Yokoyama collected a great many sherds which had been exposed at Amsari by a flood (Arimitsu 1962), a type description as such was not made at that time or later. The site was considered "destroyed," and no further attention was paid to it.

The earliest type descriptions of Han River pottery are those of Chase (1964:144-149). Up to that time Korean archaeologists evinced very little interest in prehistoric sites. In the report of his pioneering survey of the Middle Han region, Chase describes two incised types, Soksil Incised and Misari Incised, both under the heading of Early Neolithic Types.

Soksil Incised is described from a handful of sherds found in the lowest layer of a site excavated by Kim and Chase (Kim WY 1966). The site is on the north side of the Han, on the north side of a hill between two villages. It happened that Chase named the site after the village to the east, Soksilli, while Kim called it by the name of the other village, Susongni. To compound the confusion, Kim transliterated the name as Susok-ri. This is a syllable-by-syllable transliteration which does not observe the euphonic changes in the

actual pronunciation. The usage "Susongni" follows the McCune-Reischauer system of Romanization.

The few incised sherds that were found at Soksilli/Susongni have some characteristics of Mumuntogi and some of Chulmun. The color of Soksil Incised is lighter than Chulmun, and the sherds are tempered with coarse chunks of grit rather than sand and mica. The thickness of the walls, however, and the exterior decoration, are consistent with Chulmuntogi. No sherds were recovered which could indicate the shape, placement of designs or sizes of vessel. Very little can be said of this pottery type, except that it is recognizably different from Misari Incised and may be transitional between Chulmuntogi and Mumuntogi. The radiocarbon date of 2340± 120 BP is rather late, but it corroborates such an intermediate position for the Han River Area.

Chase's description of Misari Incised is general enough to apply to all the Chulmun pottery on the middle Han. To Chase's description should be added the fact that a few sherds have been found with string impressions which form patterns similar to those made by incising. The pottery is all in the yellow-red hue. Most of it is reddish-brown (5/4 7.5 YR on the Munsell Soil Color Chart).

Chase remarks that not <u>all</u> parallel lines were comb applied. In fact, there are very few sherds with markings that could have been made with a comb-like implement, although there are some that might have been. The very name of Chulmuntogi may have arisen through a misunderstanding of the nature of Kammkeramik which is comb-impressed rather than comb-incised. Among those who objected to the misnomer of "comb-pattern pottery" in the past was Yokoyama who believed there was such a thing as "undecorated comb-pattern pottery" (Sample 1967:15). The name nevertheless persists; it is probably too entrenched in the literature to be changed.

Shape

In the Middle Han region the Chulmun pottery is overwhelmingly (99.9 per cent) of a single shape. This shape is an almost perfect cone, rounded off at the base, with the height very nearly equal to the rim diameter. A correlation was made of height with rim diameter using measurements of complete and nearly complete pots from Amsari. The coefficient of determination is 0.936 and the multiple correlation coefficient is 0.969. This is a very close agreement of the two variables. The one markedly divergent sherd was found at Tongmak. The large sherd consisted of almost half of a small, globular, narrow-mouthed jar which was broken at the rim but may have had a neck.

Volume

Because of the high correlation value of rim diameter with height, the volume can be calculated when only the rim diameter is known. Rim diameter was projected for each rim sherd by means of its curvature which was compared with a rim diameter chart. Then, using the formula for the volume of a cone ($1/3\pi r^2$), the approximate volume of the pot represented by each sherd was calculated (Appendix K).

Rim diameters range from 10 to 70 cm., volumes thus range from less than 1/3 liter to 90 liters. Both ends of the range are rare, however. For instance, at Amsari there are only four sherds (3 per cent) representing vessels with diameters of 10 cm. or smaller, and only four with diameters of 46 cm. or larger. Distribution, plotted in grouped data histograms (Appendix L), looks definitely trimodal at Amsari and less clearly trimodal at Misari, probably due to insufficient data. At Tongmak, where the sample is smaller still, only two of the three size ranges are represented. To test the trimodality an Analysis of Variance was run on the three groups

of diameters at Amsari. F = 42, which is significant at p = .05, therefore the trimodality can be accepted.

The group containing the largest diameters comprises only 3 per cent of the rim sherds at Amsari, while the middle range includes 20 per cent of the sample. The bulk of the pottery falls into the smallest range which peaks at 21-25 cm. diameter. Twenty-four per cent of the sherds fall into this group alone. This means that one-fourth of the pots held four liters, another 35 per cent from 1 to 3 liters, 20 per cent from 11 to 24 liters, and 3 per cent from 33 to 90 liters.

At Misari, with a much smaller sample, the most frequent diameter is the same as Amsari, and 45 per cent of the sherds fall into this grouping. Only one medium large and one very large sherd are represented in the sample. Tongmak has no very large diameters and only two medium large, from a very small sample. Again the 20-25 cm. group has the most sherds and represents 35 per cent of the sample.

Thickness

Sherds vary in thickness at the rim from 0.4 to 1.1 cm., while thickness at the base can be up to 1.6 cm. Most sherds showed no variation in thickness, but 26 per cent were slightly variable, with their thickest part 0.1 to 0.2 cm. greater than their thinnest part. This is not surprising in handmade pottery. The mean thickness of the sherds is 0.7 cm.

Paste and Temper

The clay from which the Han River pots were made is thought to come from the south side of the river adjacent to Amsari (Kim WY 1962a). This bright red clay is full of small particles of mica, as is the pottery. It is therefore assumed that this naturally tempered clay was used to make all the Chulmun pottery of the middle

Han region. There is some variation in the amount of mica in the sherds, but the clay also varies. No differences in the amount of mica tempering were noticed among the three sites.

Manufacture

The pottery was created by the coil method, using slightly flattened coils which were overlapped like shingles and then were smoothed with the fingers. Sherds are most often found with a slanting break rather than a straight one, which probably follows this line of weakness. The pots were formed from the base up, beginning with a thick, twisted coil. The same technique was used for all sizes; in order to make a larger container the potter had only to add more coils. The potters, however, apparently decided from the start whether a pot was to be large since the large and very large pots tend to have thicker walls.

The color of the sherds is a rather uniform reddish-brown. This indicates that the pottery was fired in an oxidizing atmosphere, probably on an open fire. The sherds are never smoky on the outside. A few sherds are darkish grey on the inside. The pots may have been stacked and fired upside down, thus causing reduction of the inner surface, or fired over a pit as in Kim Won-Yong's experiment (1960).

Eleven per cent of the sherds from Amsari have holes in the rim, usually single but sometimes in pairs. These were drilled after firing and bear no relation to the rim decoration in terms of placement. Therefore they seem to have been functional rather than decorative. They do not occur beside breaks and, therefore, were not used for repairs. As no ceramic lids have been found, a likely function would have been the securing of hide or basketry covers.

Decorative Techniques

All the decorative techniques used on this pottery involve roughening of the surface in some way. Among the Middle Han sites the decoration was almost exclusively executed by incising, gouging, grooving or punching with various instruments such as sticks, pointed stones, birdbones, fingernails, or shell. Multiple instruments or "combs" were possibly sometimes used. However, on 32 per cent of the Amsari body sherds, the decoration was applied with a multiple soft brushlike implement. In most cases single incised lines were made with a rather thin tool. The irregular intervals and converging lines make it quite evident that they were separately drawn.

One sherd from a Han River site is cord-marked on the band. This technique is found much more widely in the south, especially in the southern islands and the area near Pusan.

Shell rocker stamping was seen on the only sherd we found at Chagyak Do. Appliqued filets of clay are seen on some Chulmun pottery from sites in the south. Neither of these techniques was used on any Middle Han Phase pottery.

Placement of Designs

The Middle Han pottery tends to be decorated all over, with the motifs divided into two zones. The upper zone is a horizontal band around the rim, created by two or more parallel rows of the same design. Below this there is occasionally a row of punched dots which can be straight, wavy, or made of two lines crossing over each other. Below this, down to and including the base, the entire pot is usually covered with incised lines. These most often take the form of zigzags, either horizontal or vertical, frequently referred to as the herringbone pattern. Other designs that appear on body sherds are crossed lines forming diamonds and triangular areas of

slanting lines, both of which may have arisen as variants of the herringbone pattern. There is almost always a band, and the body pattern continues to the rim. No decoration is ever found on the inside or on the lip.

Decorative Motifs

There is a different inventory of design motifs for the band than for the body. Band designs are most frequently made up of rows of short incised lines which may be vertical or slant right or left. Rows of punched curved lines, such as might have been made with the fingernail, are also popular along the Han River. Rows of dots punched with a stick also occur, sometimes as the only band motif but more often in connection with the straight line or fingernail motif.

Stone Technology

All the stone tools found in the Middle Han sites were created by modifying cobbles from the riverbed. They include ovate digging and/or chopping tools ("hoe-axes"), end-notched net sinkers, grinding stones, small polished slate points, and miscellaneous flakes and cores with points or thin edges which may have been used as tools. The following description includes all the stone, both waste and artifacts, from Tongmak, and the artifacts from Misari. A description of points from Amsari, gleaned from the literature, is included since no points were found in the soundings at Misari or Tongmak.

Material

Only locally available stone was used for tools, and that was brought to the sites by the river in the form of rounded cobbles. A variety of stone is found along the course of the Han River,

including granite-gneiss, shale, mica schist, limestone, sandstone, and quartizite. There is, however, no source of stone that can be easily chipped, which partly accounts for the crudity of the tools.

Of the stone found at Tongmak, 90.8 per cent is granite-gneiss (Appendix M). This is not surprising, since the underlying granite-gneiss system is extensively exposed throughout Kyonggi Province. Granite was suitable for grinding stones, it could be chipped into rough hoe-axes, and small flat pebbles of granite were made serviceable as net sinkers by removing small chips from the long ends.

Mica schist was represented by about 7 per cent of the stone, most of this being unmodified, with some irregular blocks and three possible crude artifacts. It crumbles too readily to make useful tools. Possibly it was crushed to make tempering for the pottery, which contains much mica. However, there is micaceous clay at Amsari which has been suggested as a more likely source of the mica temper.

Slate, or siltstone, is represented in small quantities, less than 2 per cent. It was useful for flat objects since it fractures naturally into thin plates. The artifacts include several irregular points and one small butterfly-shaped object which had broken when holes were bored in the center. At other sites, notably Amsari, flat polished arrow points of slate have been reported.

Four irregular, roughly made possible artifacts comprise the only quartzite at the site.

It is evident, then, that no trade in stone or artifacts occurred, although the available stone was inferior for chipping. The stone did, however, possess the useful feature of being already well rounded by the river. These smooth pebbles were selected to be worked into artifacts by their size and shape rather than by the qualities of the stone. Granite was utilized most simply because most of the rock in the river bed is granite.

Grinding Stones

Long cobbles with round or slightly oval cross section, of a size suitable for holding in the hand, were selected for grinding stones and used unmodified (Appendix N). One was found with a battered end, as if it had also been used as a hammer.

Hoe-axes

"Hoe-axes" were made on cobbles of the same length range (9-13 cm.) as grinding stones, but the selected cobbles were always oval and quite thin. They were further modified by chipping the edges, usually on both faces. One end of the tool tends to be thinner and narrower than the other, possibly for hafting (Figure 25). From the sample of hoe-axes it can be seen that the range of allowable thickness was from 1.2 to 3.3 cm. (Appendix O(1)). Eight of the thirteen examples are 1.8 cm. or thinner, and all except one of the broken ones also fall into this category. This suggests that thinness was desirable, although it made the tool more fragile.

Uses of the Hoe-axe

Such a thin tool could not have chopped large hardwood trees but only small branches of softwoods such as pine. The tool was much too fragile to have been an axe for clearing large tracts of trees. If land was cleared (and this was probably not necessary because of the natural open habitat at the edge of the river), it must have been primarily by ringing trees and burning them. This method of forest clearance is practiced in some mountainous districts even now in spite of official discouragement.

The other use implied in the term hoe-axe, that of digging, is also possible. The implement would have made an adequate tool for digging roots, whether cultivated or not. A pointed stick, however, is probably an easier tool to use for this purpose and simpler to make. Some elderly Korean women were observed gathering mountain

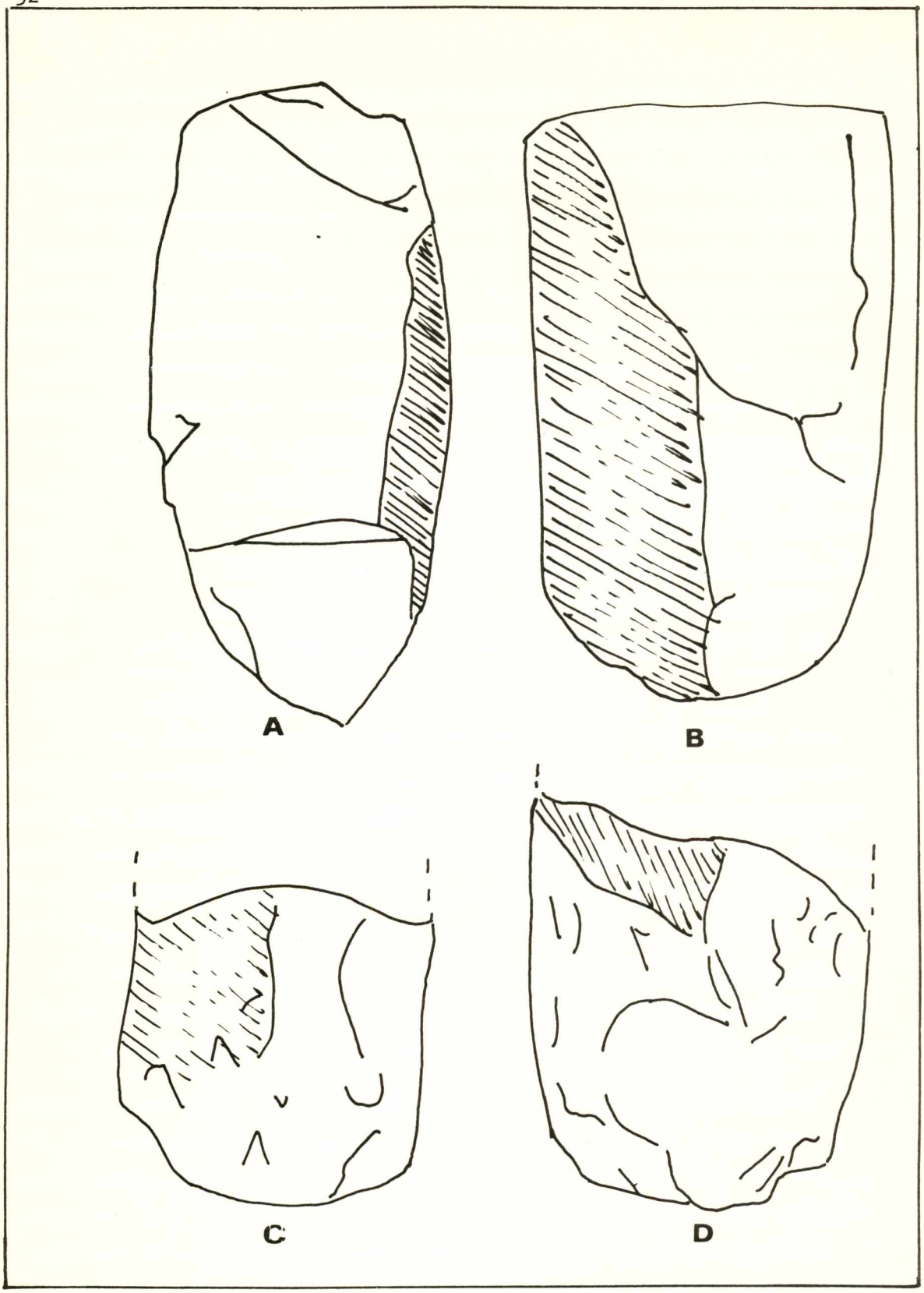


Fig. 25. Hoe-axes from Tongmak. Actual size.

garlic with the aid of such a stick which was procured after finding the garlic.

Consideration must be given to the use of the hoe-axe as a tool for chopping shrubs. Plant fibers were almost certainly used in the making of nets, and these would be needed in some quantity. A tool that was not strong but fairly sharp would be adequate for this. Hemp was much used in Korea before Western contact for rope, clothing, shoes, nets, and may other purposes. The hoe-axe could have been used to chop down hemp plants for processing.

For digging the semi-subterranean houses, a tool would also have been required. Inspection of the tools under a microscope revealed scratch marks about 4 cm. long on the broader and sharper edge, perpendicular to that edge, on the slate hoe-axes. Those made of granite were too coarse-grained to show scratches.

In an experiment using hoe-axes from Tongmak, the hoe-axe was found to be an inefficient tool for chopping even small branches. It was adequate for digging in sandy soil. A very crude form of hoe is still used in the Taklamakan oases of Sinkiang, "used not only for cultivation but for making irrigation channels and for all kinds of excavation work" (Lattimore 1951:156).

It is quite possible that the hoe-axe was indeed a multi-purpose tool, used for both chopping and digging. Whatever its use may have been, it was not used in the preparation of food, for not a single one was found at Amsari in an area that all evidence points to as a food processing area.

Net Sinkers

Pebbles for net sinkers were selected which were thin in one dimension (up to 1.6 cm.) and not over 6.5 cm. in length. They could be round, oval, or sub-rectangular. They were made serviceable by taking at least one chip out of each end, usually on

opposite faces, so that they could be secured to the net (Figure 26). All but one of the larger examples were found on the surface at Tongmak, the site nearest to the deeper pools with larger fish at the confluence of the North and South Han. The largest of the sinkers found in context was 4.8 x 3.4 x 1.4 cm. (Appendix O(2)).

The distribution of length appears to be trimodal, of width bimodal, and of thickness unimodal and slightly skewed (Appendix P). A plot of length against width shows two distinct clusters (Appendix Q). This may represent two sizes of nets, one requiring larger but not thicker sinkers. The unimodality of the thickness dimension shows that 0.7 to 0.8 cm. was the preferred thickness.

Other Possibly Utilized Stone

The assortment of pointed stones (Appendix R), flakes (Appendix S), and other possible artifacts (Appendix T) lacks any regularity. Different sizes of flakes and pointed stones seem to have been selected for various tasks but not manufactured according to a pattern (Figure 27). No consistently manufactured knives or points were found in any of our soundings nor on the surface.

One small triangular projectile point is reported by Lim from Amsari (personal communication), and four with concave bases are illustrated by Kim Jong-Hak (1968:99). Two knives with edge retouch from the same site are illustrated by Kim Jong-Hak (1968:13). The bulk of the stone tools from all these sites is represented by hoe-axes, sinkers, and grinding stones.

Cordage

There are no actual remains of cordage, but it is known to have existed by indirect evidence and inference. The inference is that if there were net sinkers there must have been fish nets. Nets could have been made of hair, but with ample appropriate plants they were probably made of plant fibers. Indirect evidence comes from

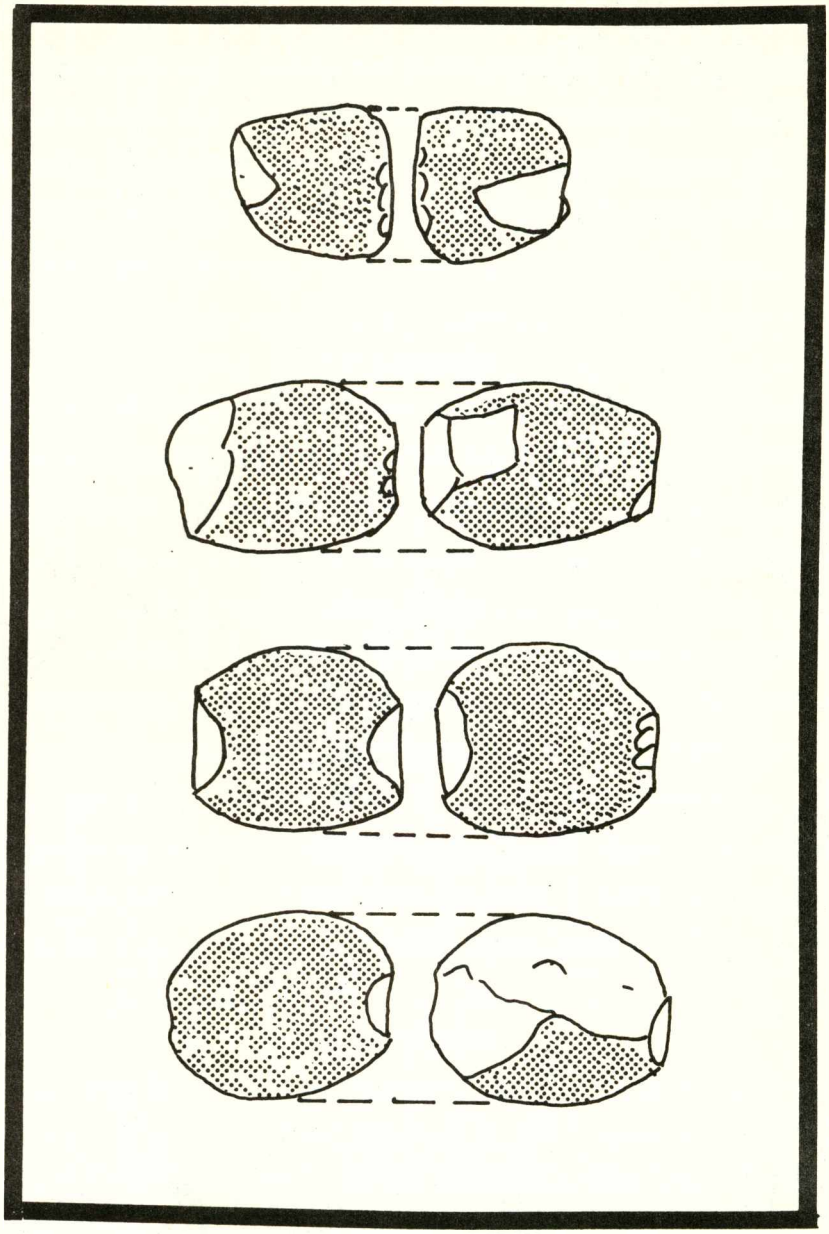


Fig. 26. Net Sinkers from Tongmak. Actual size.

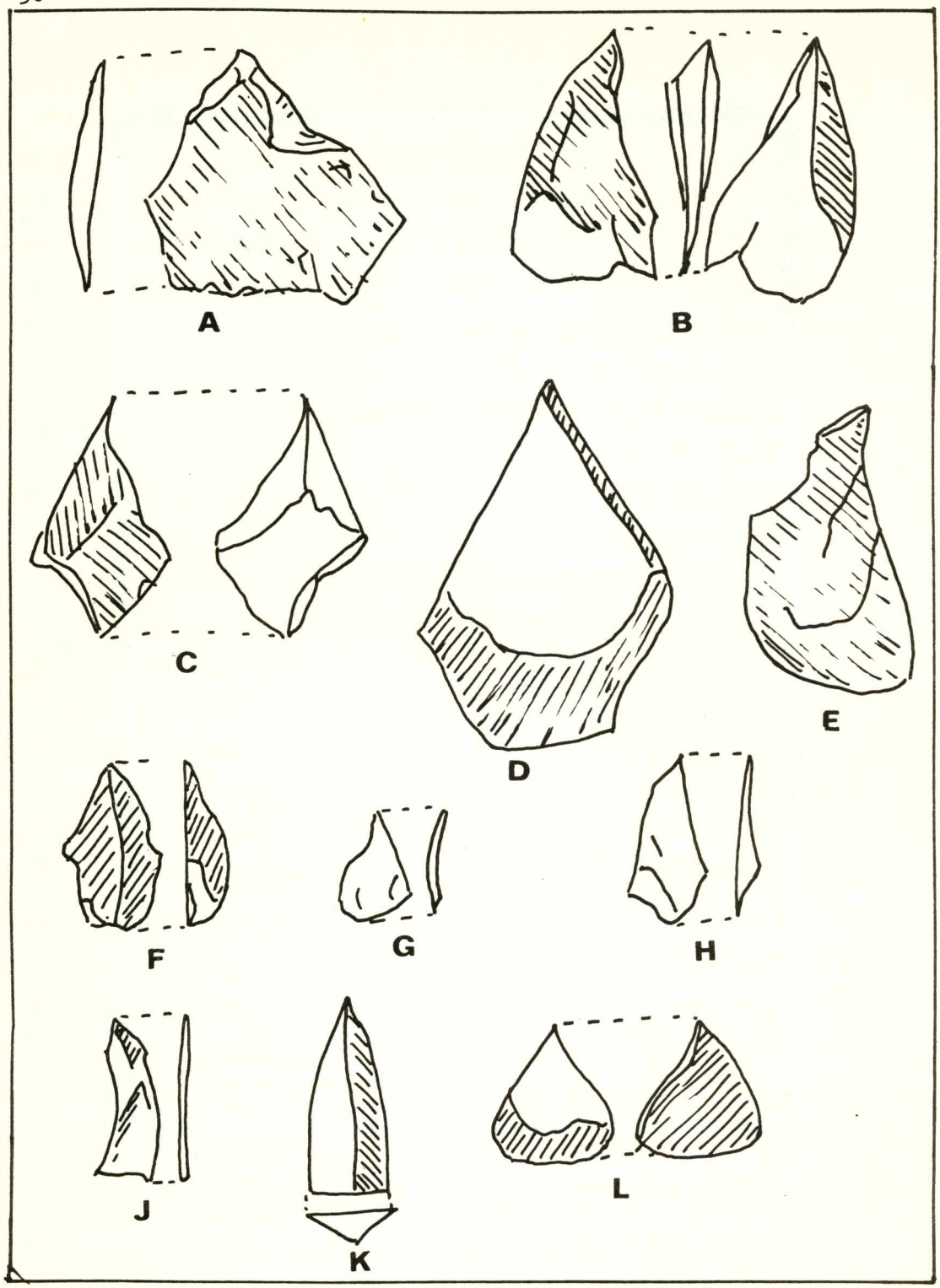


Fig. 27. Pointed Stones from Tongmak. Actual size.

a single shard with vertical cord markings around the rim. These were made with a narrow double cord twisted to the right. Probably many artifacts were made of perishable plant fibers. Sohn (Sohn et al. 1970:14) suggests that the earliest cultivation may have been of plant fibers because of the extensive use of nets for fishing and fibers for caulking canoes.

Settlements

So little information has been gathered about living floors, habitations, and settlement size that it still does not tell us much. Nevertheless, some patterns emerge.

Dwellings

At least twelve dwellings have been excavated at Amsari. They are semi-subterranean, with a single central hearth made of puddled mud and edged with cobblestones. They are all appropriate sizes for nuclear families, ranging from 6 to 25 square meters. Apparently the dwellings were grouped together, although data from the separate excavations have not been published to permit correlation of locations. An unknown extent of the site remains unexcavated.

Activity Areas

South of the dwellings at Amsari, on the side away from the river, an area of burned clay, charcoal, and smoke-covered stone was unearthed (Kim KS 1968). It is possible that this represents cooking fires, but it is not adjacent to what seems to be a food preparation area. Possibly it is the section of the site where pottery was fired.

Another activity area seems to be indicated by a collection of nine or ten very large pots, mostly intact or with all the broken pieces together (Lim Byung-Tae, unpublished site plan). This seems to be a group of storage jars which would hold enough turnip kimchi

to last an extended family through the winter.

Around the jars there is an empty space. An adjacent area contains many smaller pots. At least thirty-four such pots are represented in an area about 5 m. square. Small stones abound in this area, with two or more stones often associated with the small pots, which might indicate their use for stone boiling. Around the edges of this small pot area were found three grinding slabs, each with an associated grindstone, and two other grindstones. There are fairly abrupt edges to the small pot scatter. This is consistent with an outdoor food preparation area, perhaps with some kind of light roof or other delimiting structure. At any rate most of this part of the site seems to represent a community food preparation area, with storage jars in a group about half a meter away.

Site Size and Variability

At the present stage of investigations, the size of these settlements is uncertain. None has been completely excavated or systematically sampled. Amsari has been disturbed by floods, and an unknown part of Misari has been eroded by the river. Tongmak has not really been excavated at all. None of the sites seems to be larger than 10,000 square meters. On the basis of quantities of pottery recovered, Amsari is probably the largest site. There is little indication, however, that it had any special functions. The same artifact inventory is present in all the sites, and basically the same ranges of pottery size. A greater percentage of the potsherds from Amsari represent large and very large pots, but this probably reflects the very small size of the sample from Misari and Tongmak. There is more elaboration of decoration at Amsari. The only extremely deviant pottery shape, however, was found at Tongmak.

The only localized resource known to have been utilized in the Middle Han Phase is the deposit of red clay mixed with mica on the

south bank of the river adjacent to Amsari. The greater size of Amsari can possibly be related to the proximity of this intensively utilized resource.

No evidence of stratification or ranking was found, and only a few items of personal adornment have been reported. No burial has yet been discovered. Perhaps the dead were given secondary burial in family bone boxes, as was done by the Okjo tribe in the tribal period (Han 1971:31).

Contemporaneity of Sites

Detailed analysis of pottery design indicates that these sites were probably contemporaneous (see Chapter VII). The rather shallow midden layers at Tongmak and Misari seem to indicate that these sites were not occupied for long. However, since most organic matter has decayed, a great deal of other discarded material would not have accumulated rapidly, with no bulky bones or shell to form the midden and no permanent house materials to form a "tell." There is no evidence at any Middle Han site of abandonment and resettlement by Chulmun Period people.

No type changes in the pottery could be detected from the artificial layers at Tongmak. Indeed, chips that seemed to be from the same core of an unusual mottled pink and black granite were found in levels 3, 6, and 8. There is, of course, the possibility that the midden may be horizontally stratified; no evidence of horizontal stratification would appear in a small excavation. Collections made at Misari in 1961 and 1971 seem to show different percentages of rim designs. Since the bank is continuously eroding, the collections were made from different locations, and the differences may indicate horizontal stratification at this site. Amsari has more variability of surface decoration, but this is not necessarily an indication of longer occupation. There are neither visible multiple layers nor

evidence of style change through time.

Comparison of potter attributes shows that the three sites of Amsari, Misari, and Tongmak are closely related. There are differences among them, but compared with Naepyung, for instance, or the group of western islands, they can be grouped together as a single population.

Spacing

The sites are strung out along the middle Han valley at a distance of 2 kilometers or so apart. Each site represents a village of perhaps ten to twenty nuclear families, i.e., from fifty to one hundred people in each village. If the main subsistence were river fish, such spacing would not be reasonable. Other possible micro-environments, such as backswamps or islands, do not seem to coincide with the site locations. The need for fields along the narrow valley is one possible explanation for the spacing of the sites.

Chapter IX

DISCUSSION AND CONCLUSIONS

Subsistence Activities

Having outlined the physical properties of the stone and ceramic artifacts, it is possible to consider the subsistence activities that can be inferred from the existence, quantity, and context of these artifacts, and their relationships with other relevant data.

Hunting

The only tool for hunting that is found in the Middle Han Phase is a small slate projectile point. Such points are not found in any abundance. None were found in our soundings. According to published site reports, projectile points have been found at less than 25 per cent of Chulmun sites. From this it may be inferred that hunting, although present, was either not a major activity or was accomplished largely by means of traps or other perishable artifacts. Very little animal bone was found in the sites, although this can be explained by the decomposing properties of the Korean soil. Human bones in burials usually completely disappear in a few centuries. At Tongmak a few small scraps of burned bone were found in the flotation process. They seem to be from medium-sized mammals, perhaps deer, boar, or dog. One piece of possible deer antler was among the bone chips.

Fishing

Fairly intensive fishing is evidenced by the large numbers of net sinkers found at all the sites. Fish hooks are reported from some coastal and island sites, but not from the Han River sites. Net fishing was probably more efficient on the river, given the small

size of the fish. Since there are two sizes of sinker there were probably large- and small-meshed nets. Since most of the fish are very small, fine-meshed nets would have been necessary to catch them. Probably these nets were long and required many small sinkers along the edges. The larger sinkers may have been used in the deeper pools farther upstream, where larger fish are caught in the spring. If the size and quantity of fish in the river has not changed, no group of people could make fish their primary subsistence base here. Fish certainly provided a much needed source of storable protein, more easily obtained than wild game, but it was not available in abundance and must have been supplementary to other foods.

Gathering

No artifact has survived which was certainly used for gathering. With an abundance of fruits, nuts, roots, and herbs in the forest, it is very likely that a large number of edibles was simply gathered. There were probably baskets and nets in addition to the pottery.

Hoe-axes, as has been discussed, could have been tools for chopping or digging. Their physical properties tend toward an interpretation of digging. Their large number in the Middle Han sites implies that whatever they were used for, it was a relatively frequent activity.

Food Processing

Grinding slabs and oblong grinding stones indicate the use of some plant food that was ground to meal. There are two likely possibilities: seeds and nuts. Acorns are reported from several sites, including all three on the Han River. Koreans still make a kind of jelly from ground acorns. As for seeds, a single grass seed impression was found on a sherd at Tongmak, which indicates at least that grass seeds were brought into the settlement. Millet

grains have been reported at Chitamni in North Korea (Kim, J. H. 1967:637), found in a conical pot. If millet was gathered or cultivated, it may have been just another, although storable, source of food, and not the staff of life.

The rough knives with secondary retouch on one side from Amsari, as well as the denticulate tool from Tongmak, could also be food processing utensils.

Some of the pottery was probably used for food processing as well. Most of the wild greens eaten by Koreans now require soaking in several changes of water. Two- and four-liter pots would be about the right size for this process.

Cooking

Only one thing is obvious about the cooking processes, and that is that pots were not placed directly on the fire. No sherds show any trace of fire on the outside. From the very charred condition of the animal bone recovered, it can be supposed that meat was cooked on sticks above the fire or directly in it. The neighboring Ainu cook their meat, and fish as well, by the stick method (Hilger 1970:Plate 3).

In Lim's site plan of Amsari (unpublished), it can be seen that in seven cases two smallish stones are associated with entire (but broken) pots. This association may indicate stone boiling. Stone boiling is a very adequate method of cooking certain foods such as vegetables and fish, but it would be very cumbersome for foods that require long boiling, such as meat. Perhaps the Korean use of many kinds of soups dates back to this period. Munro (1911:54-55) suggests stone boiling for the Jomon period in Japan based on evidence from the shell mounds.

Storage

The large and very large pots, with capacities up to 90 liters, almost surely were used for storage. The one problem with such an interpretation is that there are no pottery lids. It is of course possible that lids were made of some other material, such as skins or matting, which were secured to the pots by means of the holes in the rim.

The ethnographic analogy that immediately springs to mind is that of the kimchi jar. Kimchi is a vegetable preserve, made primarily of large turnips in the fall and Chinese cabbage in the spring, although other vegetables, fish and sea food are also sometimes added. Turnip kimchi is prepared in November in quantities to last all winter, and it accompanies every meal. An average housewife prepares about 150 liters to last her family through the winter. In the cities the jars are set out on balconies for the winter, but in the countryside the jars are half-buried in the ground, which helps keep the contents cool. It is obvious that for jars that are to be sunk into the ground, a pointed base is at least as functional as a flat one.

Modern kimchi jars, however, have flat bases. They are barrel shaped and have matching pie-pan shaped lids which sit loosely atop the jars. They are made of a porous red-brown clay, thinly glazed in brown. One persistent find by the survey team was a lid of the same shape and size, but made of the typical grey Paekche ware. It appears that kimchi jars in their present form date back at least to the Paekche period.

Another possible link of the kimchi jar with the past is the pottery-making village. These villages are located where there is good clay, water, a source of fuel (trees), and a hill slope facing in a direction to take advantage of the wind. River valleys, with brisk breezes frequently blowing, are favored locations. The kilns

are constructed as long and narrow wind tunnels rising up the slope of the hill. With the wind to fan the fire, less fuel is needed, and a hotter fire is produced.

These village kilns produce nothing but kimchi jars in a variety of sizes, ranging from 2 to 40 liters. Until this century, other ceramic kilns were state-owned and produced a fine pottery for the nobility in a wide variety of shapes and sizes. Peasants, however, used little pottery other than kimchi jars. Gourds were grown on the roofs of houses; dried and halved the gourds made entirely serviceable bowls, cups, and dippers. This usage accords with the fact that no vessels are found of bowl or cup shape in the Middle Han Phase and few are even small enough to have been used as individual serving dishes.

Alternatives of Subsistence and Settlement

We have presented the data of geography, resources, settlements, pottery, and other artifacts of the Chulmun Period as far as they are now known or can be inferred. It is appropriate now to return to the alternatives of subsistence and settlement proposed in the introduction, to see which of these can incorporate all the data in the simplest and most logical manner.

Settlement

First, the question of year-round versus seasonal settlements will be considered. Because so little organic matter has been preserved in the Middle Han sites, there is no direct evidence of seasonality. Inferences must be made from the resources, the pottery types, and the dwellings.

There are three broad resource areas in west-central Korea: the forest, rivers and river banks, and coasts and the sea. The forest resources include mammals such as deer and boar, and products

of deciduous trees such as fruits and nuts. The forests of aboriginal Korea are thought to have been more widespread than at present, clothing those hills which are now bare and extending into areas now cultivated. Even at present, however, forest covers 30 per cent of the land, and it is a rare village whose dwellings do not have steep hills covered with trees rising behind them. The forest and its resources were thus within easy reach from any settlement, whether on the coast or inland.

If the forest resources can be taken as a constant in any given locality, the only seasonal movement that would make sense for the use of different resources would be alternation between the rivers and the coast. There is, however, no time of unusual abundance in either the river-and-riverbank or coast-and-sea habitat. Throughout the year there are fish in the rivers and seafood on the coast. The open habitat on the river banks where leafy plants and berries could grow produced edibles from spring through fall. The only clue in terms of resources near the Middle Han sites is that there is a season of scarcity, and this season is the cold, dry winter. On the basis of resources, logic leads to the conclusion that if the sites were occupied seasonally, they would not be occupied in the winter when resources were scarcest.

Pottery Types

Analysis of pottery attributes has shown that the Chulmun pottery of the Middle Han has close affinities among the sites and is only distantly related to the island sites. If all or part of the population of each river site had indeed migrated to the coast for part of each year, we would expect to find a one-to-one correspondence of each inland site with a coastal or island site. It is, of course, unlikely that the entire set of matching sites would have been discovered; nevertheless, if such were the underlying pattern, it should be reflected in a general similarity of

both attributes and types rather than a marked divergence.

It might be argued that coastal collecting stations would contain no pottery and cannot therefore be ruled out, but no such aceramic sites are known. Furthermore, the presence of Chulmun pottery in coastal sites indicates that the niche was being exploited by other groups.

Dwellings

The semi-subterranean dwellings found at Amsari have all the characteristics of winter occupation. They are dug into the ground for better insulation against the cold arctic winds, rather than being made of the wood and brush which was plentiful and readily available. Each pithouse contains a central hearth, the warmth from which would have been as welcome in winter as uncomfortable in the heat of the summer. Evidence of the dwellings seems to point to winter occupation of the Middle Han sites.

In sum, resources are only scarce in winter, but the dwellings indicate winter occupation of the site. This leads to the conclusion that the sites were essentially permanent, year-round settlements, a conclusion which is bolstered by the evidence of pottery types on the Middle Han which are different from any known coastal or island sites.

Subsistence

Fishing as the essential subsistence activity of the Chulmun Period is traditionally accepted in Korea. This interpretation has in its favor the consistent location of sites where fishing and/or shellfish collecting is possible, the large number of coastal sites which consist of shell mounds, and the large number of net sinkers and/or fishhooks in the assemblages. The intensive use of fish as a basic resource, however, becomes less likely for the Middle Han

sites. The fish are too few and too small to have supported even one village of 100 inhabitants year-round, much less several such villages within a few kilometers of each other. That these fishing conditions are not due to modern conditions such as industrial pollution in the river can be seen by the fact that pre-industrial fishing was also disappointing; a single English traveler in 1894 could not feed herself and her entourage of three on fish from the Han River (Bishop 1905:77ff).

It might also be argued that overpopulation leading to overuse and therefore extinction of larger fish could have occurred. There is no way to rule out this possibility, but it can be shown that it is unlikely. The size and quantity of fish are related to the character of the rivers they inhabit. Deep pools are required to support larger fish. Because of the precipitation pattern, pools deep enough for large fish are very rare in the Han River. Neither the large volumes of rapidly running water in summer, nor the wide and shallow river of the rest of the year, will support fish in great size or quantities. There is no reason to suppose the climate has changed in the last 5000 years, therefore the characteristics of the river should be the same.

Deforestation has been suggested as a possible cause of a change in run-off patterns and, therefore, in the character of the river. However, severe deforestation took place only in this century, and erosion was checked before the hills lost their soil. Bare granite hills are exceptional and tend to occur only in the steepest and highest locations. Furthermore, whole trees are usually not chopped down for firewood; rather, the lower branches are removed, leaving the roots to retain the soil. Only the parts of hills near streams which can be terraced for crops have been altered by centuries of cultivation, leaving the greater part of the countryside unaltered. On balance, it seems that agriculture and deforestation have had little effect on river flow. The existence of large cobbles in

lower strata is further evidence that the river flow patterns have not changed (Pak 1968).

It follows that substantial amounts of fish were probably not available during the Middle Han Phase and could not, therefore, have been the essential subsistence base.

Generalized Collecting

The possibility of a broad-spectrum subsistence base, exploiting resources that were seasonally available locally, will be considered next. Certainly there is abundant evidence of fishing, with two sizes of net sinkers implying two sizes of fish. The small projectile points and the burned mammal bone broth show that some hunting of wild animals (probably at least deer) occurred. Intensive use of wild plant resources, even in a country where rice agriculture has been practiced for two millennia, argues for a very great antiquity for the utilization of these varieties of plants. Since there is no firm evidence that any one resource made up a large proportion of the diet, the broad spectrum model seems to fit these data very well.

Looking at the seasonality of the resources, however, it becomes clear that in winter very little food would have been available in its natural state. This fact points to the likelihood of some method of food storage, and the large number of pots which appear to be storage jars tend to corroborate this inference. Therefore, the collection and preparation of foods to store through the winter can be added to the model.

Neither fish nor wild animals appear to have been abundant enough to provide a storable surplus for winter food. No method of meat preservation is known ethnographically, although dried marine fish are common in Korea. It is most probable that plant food was stored in the pots. Among the many possibilities are: millet,

which was found in a (later) Chulmun Period pot further north; acorns, which have been found in all three of the excavated Middle Han sites; turnips and cabbage, which are preserved in water and salt in a large pot by the present day Koreans; fruits, which could be dried; and dried wild greens, which are also used by the present inhabitants.

There is no logical way to choose among these, and indeed all of them may have been stored. Analysis of the pot capacity has shown that at least three different sizes of pots were utilized, which may indicate three different kinds of food being stored. However, baskets are as useful for dry storage as pottery and, if not easier to construct, probably longer lasting and more convenient to use. Why would there be so many large pots if something wet were not being stored? The porosity of the pottery has been pointed out as an argument against such an interpretation (Kim Won-Yong, personal communication), but ceramic ware of similar porosity is used elsewhere (Spain, e.g.) to contain liquids. In the case of liquid storage, it is possible that some form of prehistoric kimchi was being made, using turnips and/or cabbage since they can be preserved easily and are highly nutritious.

This brings us to the final possibility, that of broad-spectrum utilization of available resources and planting of those resources which had proven most useful for winter storage. Clearly, if winter storage was a requirement, surpluses to last through the winter had to be collected or grown. Ethnographically, only exceptionally favored locations with abundant resources available all year long can support settled villages without domesticated plants or animals. Such abundant resources were not available on the Middle Han, and a means for increasing productivity, such as planting, seems to have been a necessity.

Although conclusive evidence to support this inference is not

available, all the data from sites on the Middle Han are consistent with such a conclusion. An implement which could have been used for cultivation is found in quantity in the sites. The open habitat of the river banks was suitable for cultivation without extensive preparation, and the sandy clay still supports the undomesticated relatives of many locally utilized plants. The spacing of the sites, a kilometer or two apart along the river, leaves room between them for planted fields on the banks. Therefore the construct which fits all the data most economically is that of settled villages cultivating some plants in order to store food to last through the winter.

Early Agriculture in East Asia

A conclusion that small groups of people with scanty archaeological assemblages were cultivating some of their own food would have been surprising if not unthinkable a few decades ago. Although Sauer (1952:25) suggested the primacy of root crops over grains, the trend was to consider only grain cultivation to be true agriculture. Agriculture was often defined by the use of the plow rather than the digging stick, necessarily restricting the meaning to the cultivation of grains.

Recently, however, agriculture has been defined in a much wider sense, to include any manipulation of plants by man. And, with this more generous definition, independent beginnings of agriculture have been postulated much more widely than before. Vavilov's (1951) theory of many centers of origin of cultivated plants opened the way for botanical study of widely diverse areas, and archaeologists became more acutely aware of the possibilities for recovering botanical data from their excavations. The result has been the appearance of new evidence, along with new interpretations of old evidence. From many regions of the world there are suggestions of agriculture much earlier than had been previously expected. This has occurred quite notably in East Asia where early agriculture has recently been

postulated in several regions.

In a recent paper, Chang (1970) has reexamined the evidence for early agriculture in East Asia. He suggests that there were three separate centers of origin in this part of the world: Japan, Southeast Asia, and north China. Chang does not address himself directly to the beginnings of agriculture in Japan but concentrates on north China (the Hwang Ho basin) and Southeast Asia, especially Thailand, summoning the as yet scanty but growing evidence of plant domestication in these regions, and pointing out that the archaeological assemblages in fact produce a good fit with the descriptions of the kinds of adaptations that early cultivators would have had.

The case for Japan has been summarized by Kidder (1968b). Kidder, like Chang, defines agriculture broadly, to include deliberate planting of fruit and nut trees. Remains of actual vegetable food, including carbonized "bread," have been found but are not accepted as conclusive evidence for agriculture. Nevertheless they are suggestive, and an increase in food volume by means of agriculture would go far to explain the population increase and cultural elaboration of Middle Jomon.

Even the Soviet Maritime Region is cited as having evidence for early agriculture. Sifting through old reports, Okladnikov (1965:75) found that carbonized grains had been discovered in a large pot in an early excavation. He believes this lends support to the inference of agriculture that might be made from the numerous grinding stones found in this region.

Thus, indications of early plant cultivation are beginning to be sought and found throughout East Asia. In this context a mixed economy of fishing, hunting, gathering and agriculture for the Middle Han sites is not out of line with other developments in East Asia.

Hypotheses Concerning the Beginning of Agriculture

It is interesting to compare the Middle Han data with various hypotheses concerning preconditions of and causes for the beginning of agriculture. Sauer (1952:20-22), for instance, sets forth six basic premises for the beginning of agriculture: (1) agriculture did not originate from a shortage of food, (2) agriculture did originate where many plant genes were available for recombinations, i.e., in areas of diversified terrain and/or climate, (3) agriculture did not originate in large river valleys requiring large-scale hydraulic works, (4) agriculture began in wooded lands, (5) some special skills predisposed a group to agriculture, and (6) sedentism is a necessary precondition for agriculture. The Middle Han sites are not in a location requiring any kind of water diversion (except to grow rice, which is a special case) because the wet season coincides with the growing season. The sites were on the edge of a forest, and perhaps the transition zone between forest and river adds diversity. Certainly the ruggedness of the Korean terrain provides diversity in elevation. In terms of specialized skills, the Middle Han people probably had the postulated fishing and gathering, as opposed to hunting, antecedents. Settlements seem to have been permanent. As to whether there was a shortage of food, the inference has been made that food was short only in the winter, requiring storage. Thus, although Korea is in a temperate rather than a tropical zone, the Middle Han sites conform to five of Sauer's six postulated criteria.

Harris (1969:9) has also made some suggestions about the kinds of locations where agriculture could arise. He particularly suggests "marginal transition zones or ecotones between major ecosystems," especially forest and woodland edge situations. He mentions forest and river, or forest and coast as particularly suitable places. He also suggests that generalized hunter-fisher-gatherer populations

would be likely to inhabit such areas, and that they would be less nomadic with a more generalized subsistence base. The Middle Han sites can easily fit into this scheme.

However, even if it is granted that the necessary preconditions for the beginnings of agriculture were present during the Middle Han Phase, existence of preconditions does not constitute an explanation. In contrast to Sauer, who believes that hunger could not have been an impetus to agriculture, Binford (1968) has hypothesized that population pressure creates a need for food production. He proposes a model in which settled populations by the seashore would have been able to increase due to their sedentism, which reduces constraints on population increase. As populations of these efficient exploiters of sea products increase, by budding off they eventually fill the coastal niche, and new daughter colonies must then move inland. There they would meet an established population already using the local resources to the full, and the result would be population pressure. One result of this pressure could be more intensive use of the land in the form of incipient cultivation.

In the case of the Chulmun Period, there is considerable reason to postulate a development from Early Jomon because of pottery resemblances as well as similarity of niches, although this needs to be investigated more thoroughly. It could be argued that the populations of the Japanese coast, successfully exploiting the seacoast resources, repeatedly fissioned, rapidly filling the niche of warm coast in both Japan and Korea. This much would be in accord with Binford's hypothesis. The demographic element which Binford proposes, however, which is the crux of his model, does not seem to be present in the Middle Han Phase. The only pre-existing populations in this area which have left their traces seem to be Upper Paleolithic, and even these sites are very rare.

Binford suggests that attempts to explain the beginnings of cultivation must postulate a change in either the environment or

the demographic composition of the population involved. In this case, however, it appears that neither a change in the size of the groups nor a local change in environment occurred. Rather, the beginnings of cultivation appear to have been caused by the gradual movement of a group of people from one ecosystem to another.

The Middle Han area is astride a geographic boundary, the edge of double-cropping. It is possible that groups which had been successfully exploiting sea coasts expanded and eventually moved inland up the river valleys. Farther south, winter survival would not have been difficult, and wild food resources could have been exclusively utilized throughout the year. Eventually, however, a latitude was reached which required the storage of food for winter consumption, due not to larger populations but to smaller carrying capacity of the environment. The pressure of the added requirement of winter storage would have led to the necessity of producing more food. Hence population pressure as such would not account for the beginnings of food production.

In this case, the storage of food does not represent surplus food, but food to last through a season of scarcity. Even with rice cultivation, there is an expression in Korean meaning "spring hunger," the time when the stored food is running out and the early crops are not yet available. Cultivation, therefore, does not necessarily imply increased amounts of food.

The size of the social groups seems to have been determined by the previous niche. Finding themselves in a region of reduced resources, the Chulmun people might have rearranged their social habits to conform to the realities of the forest ecosystem. Instead of doing this, however, they found a way to preserve their social structure by more intensive use of the available resources.

Binford points out the usefulness of distinguishing between "functional" and "structural" variants, and in this case the

cultivation appears to be a functional variant of seacoast subsistence. There is no evidence that the new element has changed the system; the villages become neither denser nor more complex.

Conclusions

The Han River Project, then, has produced the tentative conclusion that the subsistence base of the Middle Han Phase included broad-spectrum utilization of both wild and cultivated resources. This could only be conclusively confirmed by the finding of definite cultigens within Middle Han Phase layers, an unlikely event even if such evidence is deliberately and carefully sought.

Various parts of the explanatory model, however, could be tested in several ways. Since the model rests on the assumption of fissioning of seacoast populations, the demonstration of a relationship between Early Jomon and Chulmun is required. Radiocarbon dates indicate that Early Jomon antedates Chulmun, and the resemblances are apparent. A chain of related pottery across the southern and western coasts of Korea would be convincing evidence of such a relationship. Careful comparative study of the attributes of the pottery types also might reveal such relationships.

If the hoe-axe was indeed used for cultivation in the Middle Han Phase but not in the (presumed) earlier sites further south, it should appear in relatively larger numbers in the Middle Han sites. With controlled excavations including random sampling, this could be easily tested.

If the larger sizes of pots were created especially for winter storage, they should be found either exclusively in the Middle Han sites, or earlier there. Of the sherds that have been measured, the large sizes are found exclusively on the Middle Han, but a larger sample, including more coastal sites, should be measured to test this result.

More research, then, is needed before the model which has been presented can be accepted. For the moment, however, it is the one which best fits the available data.

APPENDIXES

A. Attributes of Sherds Used in Typological Analysis

	1	2	3	4	5	6	7	8	9	10	11	12	13
	Diameter			Thickness					Band Rows				
Tag	0-30	31-45	46-70	0-5	6	7	8	9+	0-1	2	3	4	5+
KG7001	1						1					1	
KG7002	1				1						1		
KG7003	1				1								1
KG7004	1				1				1				
KG7005		1		1					1				
KG7006	1				1						1		
KG7007		1		1							1		
KG7008	1					1				1			
KG7009	1					1					1		
KG7010	1							1				1	
KG7011	1							1	1				
KG7012	1							1			1		
KG7013	1					1			1				
KG7014	1					1				1			
KG9001	1					1							1
KG9002	1				1						1		
KG9003	1					1					1		
KG9004	1				1							1	
KG9005	1				1								1
KG9006	1					1							1
KG9007	1					1							1
KG9008	1						1				1		
KG9009	1						1				1		
KG9010	1					1						1	
KG9011	1				1					1			

	1	2	3	4	5	6	7	8	9	10	11	12	13
	Diameter			Thickness					Band Rows				
Tag	0-30	31-45	46-70	0-5	6	7	8	9+	0-1	2	3	4	5+
KG9012		1						1					1
KG9013	1					1					1		
KG9014	1					1			1				
KG2001		1			1							1	
KG2002	1				1							1	
KG2003	1			1							1		
KG2004		1						1					1
KG2005	1						1		1				
KG2006	1						1						1
KG2007	1					1						1	
KG2008	1				1							1	
KG2009	1				1							1	
KG2010	1						1					1	
KG2011	1					1							1
KG2012	1				1								1
KG2013		1				1				1			
KG2014	1					1							1
KG2015	1				1							1	
KG2016			1			1						1	
KG2017	1			1									1
KG2018	1					1							1
KG2019	1					1							1
KG2020			1					1					1
KG2021	1			1							1		
KG2022	1			1							1		
KG2023	1			1									1
KG2024	1				1								1
KG2025	1					1				1			
KG2026	1			1					1				

	1	2	3	4	5	6	7	8	9	10	11	12	13
	Diameter			Thickness					Band Rows				
Tag	0-30	31-45	46-70	0-5	6	7	8	9+	0-1	2	3	4	5+
KG2027	1				1						1		
KG2028	1				1							1	
KG2029		1				1							1
KG2030		1			1								1
KG2031	1				1						1		
KG2032	1				1						1		
KG2033	1				1				1				
KG2034	1					1					1		
KG2035	1					1							1
KG2036		1			1						1		
KG2037		1		1								1	
KG2038	1				1							1	
KG2039	1				1						1		
KG2040	1						1					1	
KG2041		1				1							1
KG2042	1						1						1
KG2043	1				1							1	
KG2044	1						1					1	
KG2045	1					1						1	
KG2046	1					1							1
KG2047	1					1					1		
KG2048	1						1					1	
KG2049		1			1							1	
KG2050		1			1								1
KG2051		1						1					1
KG2052		1				1							1
KG2053	1				1								1
KG2054	1				1								1

	1	2	3	4	5	6	7	8	9	10	11	12	13
	Diameter			Thickness					Band Rows				
Tag	0-30	31-45	46-70	0-5	6	7	8	9+	0-1	2	3	4	5+
KG2055		1						1			1		
KG2056	1				1							1	
KG2057			1					1					1
KG2058	1					1						1	
KG2059	1					1						1	
KG2060	1						1						1
KG2061	1				1							1	
KG2062	1					1						1	
KG2063	1				1							1	
KG2064	1				1							1	
KG2065	1					1					1		
KG2066	1				1						1		
KG2067			1			1							1
KG2068	1					1					1		
KG2069	1			1								1	
KG2070	1					1							1
KG2071	1				1				1				
KG2072	1					1						1	
KG2073		1				1						1	
KG2074		1				1						1	
KG2075	1						1						1
KG2076	1				1						1		
KG2077	1				1							1	
KG2078	1					1						1	
KG2079	1					1							1
KG2080	1					1							1
KG2081	1					1						1	
KG2082		1				1						1	

	1	2	3	4	5	6	7	8	9	10	11	12	13
	Diameter			Thickness					Band Rows				
Tag	0-30	31-45	46-70	0-5	6	7	8	9+	0-1	2	3	4	5+
KG2083	1			1									1
KG2084	1				1							1	
KG2085	1					1							1
KG2086	1						1					1	
KG2087	1				1							1	
KG2088	1				1				1				
KG2089	1						1					1	
KG2090	1						1						1
KG2091	1					1							1
KG2092		1					1						1
KG2093		1					1						1
KG2094		1				1							1
KG2095	1						1						1
KG2096	1				1								1
KG2097	1				1							1	
KG2098	1					1							1
KG2099	1				1								1
KG2100	1					1						1	
KG2101	1				1							1	
KG2102	1				1							1	
KG2103		1				1			1				
KG2104	1					1			1				
KG2105	1				1							1	
KG2106	1					1						1	
KW1001	1						1					1	
KW1002	1				1					1			
KW1003	1					1			1				
KW1004	1						1		1				
KW1005	1					1			1				

	1	2	3	4	5	6	7	8	9	10	11	12	13
	Diameter			Thickness					Band Rows				
Tag	0-30	31-45	46-70	0-5	6	7	8	9+	0-1	2	3	4	5+
KW1006	1				1				1				
KW1007	1					1				1			
KW1008	1					1				1			
KW1009	1						1		1				
KW1010	1					1			1				
KW1011	1					1			1				
KW1012	1							1	1				
KW1013	1					1			1				
KW1014	1							1	1				
KW1015	1				1				1				
KW1016	1					1			1				
KW1017	1					1					1		
KW1018	1					1			1				
KW1019	1							1	1				
KW1020	1					1			1				
KW1021	1						1		1				
KW1022	1						1			1			
KW1023	1						1			1			
KW1024	1						1			1			
KW1025	1					1			1				
KW1026	1					1				1			
KW1027	1							1	1				
KW1028	1						1		1				
KW1029	1						1		1				
KW1030	1							1		1			
KW1031	1					1			1				
KW1032	1						1		1				
KW1033	1					1			1				
KW1034	1						1		1				

	1	2	3	4	5	6	7	8	9	10	11	12	13
	Diameter			Thickness					Band Rows				
Tag	0-30	31-45	46-70	0-5	6	7	8	9+	0-1	2	3	4	5+
KW1035		1					1		1				
KW1036	1					1			1				
KW1037	1				1					1			
KW1038	1						1		1				
KW1039	1						1		1				
KW1040	1				1				1				
KW1041	1						1			1			
KW1042	1						1		1				
KW1043		1					1			1			
KW1044	1					1			1				
KW1045	1						1		1				
KW1046	1					1			1				
KW1047	1					1			1				
KW1048	1					1			1				
KW1049	1					1			1				
KW1050	1					1			1				
KW1051	1				1				1				
KW1052	1					1			1				
KW1053	1					1			1				
KW1054	1						1		1				
KW1055	1			1					1				
KW1056		1			1					1			
KW1057	1			1					1				
KW1058	1					1			1				
KW1059		1					1		1				
KW1060	1				1					1			
KW1061	1						1			1			
KW1062	1						1		1				
KW1063	1						1		1				

	1	2	3	4	5	6	7	8	9	10	11	12	13
	Diameter			Thickness					Band Rows				
Tag	0-30	31-45	46-70	0-5	6	7	8	9+	0-1	2	3	4	5+
KW1064	1						1		1				
KW1065	1					1			1				
KW1066	1						1		1				
KW1067	1					1			1				
KW1068	1					1			1				
KW1069	1				1				1				
KW1070	1					1			1				
KW1071	1				1				1				
KW1072	1					1			1				
KW1073	1					1			1				
KW1074	1					1			1				
KW1075	1				1				1				
KW1076	1						1		1				
KW1077	1						1		1				
KW1078	1					1			1				
KW1079	1					1			1				
KW1080	1					1			1				
KW1081		1					1		1				
KW1082	1							1	1				
KW1083	1						1		1				
KW1084	1					1			1				
KW1085	1					1			1				
KW1086	1							1	1				
KW1087	1				1				1				
KW1088	1							1		1			
KW1089	1				1				1				
KW1090	1					1			1				
KW1091	1						1		1				
KW1092	1				1				1				

	1	2	3	4	5	6	7	8	9	10	11	12	13
	Diameter			Thickness					Band Rows				
Tag	0-30	31-45	46-70	0-5	6	7	8	9+	0-1	2	3	4	5+
KW1093	1						1		1				
KW1094	1						1		1				
KW1095	1					1			1				
KW1096	1				1				1				
KW1097	1					1			1				
KW1098	1							1	1				
KW1099	1					1			1				
KW1100	1						1		1				
KW1101	1				1				1				
KW1102	1						1		1				
KW1103	1						1		1				
KW1104	1				1				1				
KW1105	1					1			1				
KW1106	1						1		1				
KW1107	1						1		1				
KW1108	1							1	1				
KW1109	1							1	1				
KW1110		1					1		1				
KW1111	1					1					1		
KW1112	1					1			1				
KW1113		1					1			1			
KW1114	1						1		1				
IS1001	1							1					1
IS1002	1							1			1		
IS1003		1						1				1	
IS1004		1						1	1				
IS1005	1						1			1			
IS1006	1							1	1				
IS1007		1			1				1				

	1	2	3	4	5	6	7	8	9	10	11	12	13
	Diameter			Thickness					Band Rows				
Tag	0-30	31-45	46-70	0-5	6	7	8	9+	0-1	2	3	4	5+
IS1008		1						1	1				
IS1009	1							1				1	
IS1010		1						1	1				
IS1011		1						1	1				
IS1012		1						1	1				
IS2001	1						1		1				
IS2002	1					1			1				
IS2003		1						1	1				
IS2004	1					1			1				
IS2005		1				1			1				
IS2006	1					1			1				
IS3001		1				1							1
IS3002		1				1			1				
IS4001	1						1			1			
IS4002	1				1				1				
IS4003	1				1				1				
IS5001	1					1			1				
IS6001	1							1	1				
IS6002		1				1			1				
IS6003	1							1	1				
IS6004		1					1		1				
IS6005		1					1		1				
IS6006		1						1	1				
IS6007		1						1		1			
IS6008	1					1			1				
IS6009	1						1		1				
IS6010	1				1				1				
KW2001		1				1							1
KW2002	1							1	1				

	1	2	3	4	5	6	7	8	9	10	11	12	13
	Diameter			Thickness					Band Rows				
Tag	0-30	31-45	46-70	0-5	6	7	8	9+	0-1	2	3	4	5+
KW2003	1						1		1				
KW2004	1					1			1				
KW2005	1				1				1				
KW2006		1			1				1				
KW2007	1							1	1				
KW2008	1						1		1				
KW2009	1					1			1				
KW2010	1						1		1				
KW2011	1						1		1				
KW2012	1						1			1			
KG9C67	1						1						1
KG9C08	1					1					1		
KG9C19		1			1								1
KG9C47	1					1					1		
KG9C14	1				1						1		
KG9C30	1					1						1	
KG9C21	1					1						1	

	14	15	16	17	18	19	20	21	22	23	24
	Body Design				Band Design						
Tag	Plain	HB	Brushed	Other	\\\	///	//	))	...	Plain or Body	Other
KG7001		1						1			
KG7002		1						1			
KG7003		1									1
KG7004	1									1	
KG7005			1								1
KG7006		1						1			
KG7007			1					1			
KG7008		1						1			
KG7009		1						1			
KG7010			1						1		
KG7011		1								1	
KG7012		1						1			
KG7013		1								1	
KG7014				1							1
KG9001			1					1			
KG9002		1			1						
KG9003		1			1						
KG9004		1						1			
KG9005	1				1						
KG9006			1		1						
KG9007		1			1						
KG9008		1						1	1		
KG9009		1							1		
KG9010		1						1			
KG9011		1						1			
KG9012		1						1			
KG9013		1			1						
KG9014		1								1	

	14	15	16	17	18	19	20	21	22	23	24
	Body Design				Band Design						
Tag	Plain	HB	Brushed	Other	\\\	|||	//	)))	...	Plain or Body	Other
KG2001				1				1	1		
KG2002				1				1			
KG2003				1	1						
KG2004		1			1						
KG2005		1									1
KG2006		1			1				1		
KG2007		1						1			
KG2008		1			1						
KG2009		1			1						
KG2010		1			1						
KG2011		1			1						
KG2012		1			1						
KG2013			1					1			
KG2014		1			1						
KG2015		1						1			
KG2016			1			1					
KG2017		1			1						
KG2018		1									1
KG2019			1		1						
KG2020		1			1						
KG2021			1					1			1
KG2022	1										1
KG2023		1			1						
KG2024		1			1						
KG2025		1									1
KG2026		1									1
KG2027		1						1			

	14	15	16	17	18	19	20	21	22	23	24
	Body Design				Band Design						
Tag	Plain	HB	Brushed	Other	\\\	///	//	)))	...	Plain or Body	Other
KG2028				1	1						
KG2029		1			1						
KG2030		1			1						
KG2031				1							1
KG2032			1			1					
KG2033		1								1	
KG2034			1						1		
KG2035		1			1						
KG2036		1						1			
KG2037				1							1
KG2038			1								1
KG2039		1						1			
KG2040			1		1						
KG2041		1			1						
KG2042		1			1						
KG2043		1			1						
KG2044			1		1						
KG2045			1		1						
KG2046			1		1						
KG2047				1				1	1		
KG2048		1			1						
KG2049		1			1						
KG2050		1			1						
KG2051		1						1			
KG2052		1			1						
KG2053		1			1						
KG2054			1		1						
KG2055		1							1		

	14	15	16	17	18	19	20	21	22	23	24
	Body Design				Band Design						
Tag	Plain	HB	Brushed	Other	\\\	|||	//	)))	...	Plain or Body	Other
KG2056		1						1			
KG2057		1			1						
KG2058		1			1				1		
KG2059		1						1			
KG2060		1			1						
KG2061		1			1						
KG2062			1						1		
KG2063		1			1						
KG2064		1									1
KG2065		1						1			
KG2066		1							1		
KG2067	1				1						
KG2068			1		1						
KG2069	1				1				1		
KG2070		1			1				1		
KG2071		1									1
KG2072	1				1						
KG2073	1							1			
KG2074		1			1						
KG2075		1			1						
KG2076		1						1			
KG2077		1									1
KG2078		1			1				1		
KG2079		1						1			
KG2080		1			1						
KG2081		1						1			
KG2082				1	1						

	14	15	16	17	18	19	20	21	22	23	24
	Body Design				Band Design						
Tag	Plain	HB	Brushed	Other	\\\	|||	//	)))	...	Plain or Body	Other
KG2083				1							1
KG2084		1						1			
KG2085		1			1						
KG2086		1									1
KG2087		1			1						
KG2088		1								1	
KG2089		1			1						
KG2090	1							1			
KG2091	1				1				1		
KG2092	1				1						
KG2093				1	1						
KG2094	1				1						
KG2095				1	1						
KG2096	1							1			
KG2097	1			1	1						
KG2098				1	1						
KG2099				1	1						
KG2100			1		1						
KG2101	1				1						
KG2102	1				1						
KG2103				1						1	
KG2104		1									1
KG2105				1				1			
KG2106				1				1			
KW1001				1			1				
KW1002				1	1		1				
KW1003				1			1				

	14	15	16	17	18	19	20	21	22	23	24
	Body Design				Band Design						
Tag	Plain	JB	Brushed	Other	\\\	|||	///	)))	...	Plain or Body	Other
KW1004				1			1				
KW1005				1			1				
KW1006				1			1				
KW1007				1	1		1				
KW1008				1			1				
KW1009				1			1				
KW1010				1			1				
KW1011				1			1				
KW1012				1							1
KW1013				1							1
KW1014				1							1
KW1015				1							1
KW1016				1			1				
KW1017				1			1				
KW1018				1			1				
KW1019				1			1				
KW1020				1			1				
KW1021				1			1				
KW1022				1	1		1				
KW1023				1	1		1				
KW1024				1	1		1				
KW1025				1			1				
KW1026				1	1						
KW1027				1			1				
KW1028				1			1				
KW1029				1	1						
KW1030				1	1		1				

	14	15	16	17	18	19	20	21	22	23	24
	Body Design				Band Design						
Tag	Plain	HB	Brushed	Other	\\\	|||	///	)))	...	Plain or Body	Other
KW1031				1			1				
KW1032				1			1				
KW1033				1			1				
KW1034				1			1				
KW1035				1			1				
KW1036				1			1				
KW1037				1	1		1				
KW1038				1			1				
KW1039				1	1						
KW1040				1			1				
KW1041				1	1		1				
KW1042				1			1				
KW1043				1			1				
KW1044				1	1						
KW1045				1	1						
KW1046				1			1				
KW1047				1			1				
KW1048				1			1				
KW1049				1			1				
KW1050				1			1				
KW1051	1						1				
KW1052				1	1						
KW1053				1			1				
KW1054				1			1				
KW1055				1			1				
KW1056				1	1						
KW1057				1			1				
KW1058				1			1				

	14	15	16	17	18	19	20	21	22	23	24
	Body Design				Band Design						
Tag	Plain	HB	Brushed	Other	\\\	///	//	)))	...	Plain or Body	Other
KW1059				1			1				
KW1060				1	1		1				
KW1061				1	1		1				
KW1062				1			1				
KW1063				1			1				
KW1064				1			1				
KW1065				1			1				
KW1066				1			1				
KW1067				1			1				
KW1068				1			1				
KW1069				1			1				
KW1070				1			1				
KW1071				1			1				
KW1072				1			1				
KW1073				1			1				
KW1074				1			1				
KW1075				1			1				
KW1076				1			1				
KW1077				1			1				
KW1078				1			1				
KW1079				1			1				
KW1080				1	1						
KW1081				1							1
KW1082		1									1
KW1083		1				1					
KW1084		1									1
KW1085				1	1						
KW1086		1			1						

	14	15	16	17	18	19	20	21	22	23	24
	Body Design				Band Design						
Tag	Plain	HB	Brushed	Other	\\\	|||	⫽	⟩⟩⟩	...	Plain or Body	Other
KW1087				1			1				
KW1088				1							1
KW1089				1	1						
KW1090				1	1						
KW1091				1			1				
KW1092				1			1				
KW1093				1			1				
KW1094				1	1						
KW1095				1			1				
KW1096		1								1	
KW1097				1			1				
KW1098				1			1				
KW1099				1			1				
KW1100				1	1						
KW1101				1	1						
KW1102				1	1						
KW1103				1			1				
KW1104				1			1				
KW1105				1			1				
KW1106				1			1				
KW1107		1								1	
KW1108				1			1				
KW1109				1			1				
KW1110				1						1	
KW1111				1							1
KW1112				1			1				
KW1113				1	1						
KW1114				1	1						

	14	15	16	17	18	19	20	21	22	23	24
	Body Design				Band Design						
Tag	Plain	HB	Brushed	Other	\\\	|||	///	)))	...	Plain or Body	Other
IS1001				1	1						
IS1002	1				1						
IS1003				1	1						
IS1004	1					1					
IW1005				1			1				
IS1006				1							1
IS1007				1							1
IS1008				1			1				
IW1009				1		1					
IS1010				1	1						
IS1011				1							1
IS1012		1								1	
IS2001				1	1						
IS2002				1							1
IS2003				1			1				
IS2004				1			1				
IS2005				1			1				
IS2006				1	1						
IS3001				1	1						
IS3002				1	1						
IS4001				1							1
IS4002				1							1
IS4003				1							1
IS5001				1							1
IS6001				1							1
IS6002				1		1					
IS6003				1		1					

	14	15	16	17	18	19	20	21	22	23	24
	Body Design				Band Design						
Tag	Plain	HB	Brushed	Other	\\\	|||	///	)))	...	Plain or Body	Other
IS6004				1	1						
IS6005				1		1					
IS6006				1		1					
IS6007				1				1			
IS6008				1	1						
IS6009				1	1						
IS6010				1					1		
KW2001				1					1		
KW2002				1	1						
KW2003				1			1				
KW2004				1							1
KW2005				1							1
KW2006				1			1				
KW2007				1			1				
KW2008				1							1
KW2009				1	1						
KW2010				1	1						
KW2011				1			1				
KW2012				1		1					
KG9C67			1		1						
KG9C08		1			1						
KG9C19				1	1						1
KG9C47				1				1			
KG9C14		1			1						
KG9C30		1				1					
KG9C21		1					1				

B. Matrix of Chi-Square Values, Middle Han, Naepyung and Island Sites--First Division of the Data

	1	2	3	9	10	11	12	13	14	15
1	0.0	-	-	1.92	-0.18	1.52	0.16	-8.57	-1.36	0.22
2	-	0.0	-	-0.71	0.40	-1.11	-0.29	4.21	0.50	-0.53
3	-	-	0.0	-3.46	-	-	0.15	9.44	-	0.59
9	1.92	-0.71	-3.46	0.0	-	-	-	-	-6.66	-45.84
10	-0.18	0.40	-	-	0.0	-	-	-	-1.74	-4.64
11	1.52	-1.11	-	-	-	0.0	-	-	0.0	10.66
12	0.16	-0.29	0.15	-	-	-	0.0	-	3.25	12.23
13	-8.57	4.21	9.44	-	-	-	-	0.0	6.25	18.47
14	-1.36	0.50	-	-6.66	-1.74	0.0	3.25	6.25	0.0	-
15	0.22	-0.53	0.59	-45.84	-4.64	10.66	12.23	18.47	-	0.0
16	-0.03	-0.07	-	-15.52	-0.37	4.05	6.52	2.01	-	-
17	0.07	0.17	-4.89	91.23	8.68	-17.48	-27.38	-36.48	-	-
18	-1.44	0.56	2.40	-47.03	3.02	-2.10	3.37	50.47	4.47	4.24
19	-7.46	4.29	-	0.81	-0.94	-0.01	1.09	-2.17	0.25	-0.70
20	10.21	-8.29	-1.78	69.48	6.95	-12.15	-23.73	-26.47	-5.62	-60.04
21	-0.25	0.60	-0.63	-38.44	0.23	29.83	13.44	-0.12	0.17	21.05
22	0.31	-0.18	-	-10.78	-1.53	12.68	4.59	0.02	1.14	2.46
23	-0.73	1.02	-	13.41	-1.04	-1.37	-2.45	-2.39	0.16	8.61
24	0.06	-0.0	-0.60	1.10	0.35	-0.0	-0.50	-1.25	-0.90	0.0
SUM	34.49	22.91	23.93	346.38	30.07	92.95	99.16	168.33	32.47	190.29

	16	17	18	19	20	21	22	23	24
1	-0.03	0.07	-1.44	-7.46	10.21	-0.25	0.31	-0.73	0.06
2	-0.07	0.17	0.56	4.29	-8.29	0.60	-0.18	1.02	-0.0
3	-	-4.89	2.40	-	-1.78	-0.63	-	-	-0.60
9	-15.52	91.23	-47.03	0.81	69.48	-38.44	-10.78	13.41	1.10
10	-0.37	8.68	3.02	-0.94	6.95	0.23	-1.53	-1.04	0.35
11	4.05	-17.48	-2.10	-0.01	-12.15	29.83	12.68	-1.37	0.0
12	6.52	-27.38	3.37	1.09	-23.73	13.44	4.59	-2.45	-0.50
13	2.01	-36.48	50.47	-2.17	-26.47	-0.12	0.02	-2.39	-1.25
14	-	-	4.47	0.25	-5.62	0.17	1.14	0.16	-0.90
15	-	-	4.24	-0.70	-60.04	21.05	2.46	8.61	0.0
16	0.0	-	0.95	2.49	-9.91	0.60	3.31	-0.90	0.04
17	-	0.0	-10.98	-0.09	99.71	-24.53	-8.82	-6.14	0.07
18	0.95	-10.98	0.0	-	-37.40	-	-0.0	-	-
19	2.49	-0.09	-	0.0	-	-	-	-	-
20	-9.91	99.71	-37.40	-	0.0	-	-	-	-
21	0.60	-24.53	-	-	-	0.0	0.40	-	-
22	3.31	-8.82	-0.00	-	-	0.40	0.0	-	-
23	-0.90	-6.14	-	-	-	-	-	0.0	-
24	0.04	0.07	-	-	-	-	-	-	0.0
SUM	46.77	336.74	168.42	20.30	371.74	130.28	46.24	38.23	4.88

C. Wild Edible Plants, Collected Near the Han River

No.	Korean Name	Family	Genus and Species	Part Eaten
1	Jomdolbaenamu	Malaceae	Pyrus Faurieri	Seeds
2	Ssuk	Carduceae	Artemisia asiatica	Leaves
3	Sumbakui	Chchoriaceae	Ixeris dentata	Root
4	Kosari	Pteridaceae	Eteridium aquilinum	Leaves
5	San Moorut	Liliaceae	Lloydia serotina	Leaves
6	Moorut	liliaceae	Scilla sinensis	Root
7	Kirincho	Crassulaceae	Sedum Kamtaschaticum	All
8	Minari	Apiaceae	Oenanthe stolonifera	All
9	Chamchui	Carduaceae	Aster Scaber	Leaves
10	Sanchu	Rutaceae	Fagara mandshurica	Top
11	Jaebisook	Carduaceae	Artemesia japonica	Leaves
12	Mattari	Valerianaceae	Patrinia scabiosaefolia	Leaves
13	Kirum namul	Apiaceae	Peucedanum terebinthaceum	Leaves
14	Wari	Ranunculaceae	Clematis mandshurica	Top
15	Som namul	Carduaceae	Leibnitzia anandria	Top
16	Sanmanui	Alliceae	Allium vixtorialis	Root
17	Chot namul	Unidentified	Unidentified	Top
18	Chui Namul	Carduceae	Aster scaber	Top

No.	Korean Name	Family	Genus and Species	Part Eaten
19	Myokchui	Carduaceae	Solidago viraurea	Top
20	Kyongepap	Juncaceae	Luzula capitata	Seeds
21	Wanchuri	Asphodelaceae	Hemerocallis aurantiaca	Top
22	Chik Namul	Fabaceae	Pueraria thunbergiana	Root
23	Teljoong	Liliaceae	Lilium amabile	Top
24	Chille	Rosaceae	Roas polyantha	Leaves
25	Kaji	Solanaceae	Unidentified	Top
26	Hwangsenengi	Brassicaceae	Cardamine flexuosa	All
27	Kimchi ttok	Unidentified	Unidentified	Top
28	Chilkengi	Plantaginaceae	Plantago asiatica	Top
29	Kalttutegi	Poaccae	Phragmites longivaluis	All
30	Kunkkachi suyeum	Primulacae	Lysimachia clethroides	All
31	Kottajo	Borraginaceae	Trigonatis peduncaleris	All
32	Nengi	Brassicaceae	Capsella Brusa-Pastoris	All
33	Mae	Convolvulaceae	Calystegia japonica	Root
34	Kkotaji	Brassiceae	Draba nemorosa	Top
35	Myongaju	Chenopodiaceae	Chenopodium album	Top
36	Toraji	Campanulaceae	Platycodon glaucum	Root
37	Tot namul	Crassulaceae	Sedum sarmentosum	Leaves

Source: Identifications by Prof. Lee Il Koo, Dept. of Biology, Kon Kuk University, Seoul.

D. Attributes Used in Typological Analysis
(Redundant classes are separated by lines)

Number	Attribute
1	Diameter 0-30 cm.
2	Diameter 31-45 cm.
3	Diameter 46-70 cm.
4	Thickness 0-5 cm.
5	Thickness 6 cm.
6	Thickness 7 cm.
7	Thickness 8 cm.
8	Thickness 9+ cm.
9	No Band
10	2 Band Rows
11	3 Band Rows
12	4 Band Rows
13	5+ Band Rows
14	Body Motif Plain
15	Body Motif Herringbone
16	Body Motif Brushed
17	Body Motif Other
18	Band Motif
19	Band Motif
20	Band Motif
21	Band Motif
22	Band Motif
23	No Band Motif
24	Band Motif Other

E. Site Designations Used in Typological Analysis

Number	Name	No. of Sherds	Abbreviations
KG2	Amsari	106	KG = Kyonggi Do
KG7	Tongmak	14	
KG9	Misari	21	
KW1	Naepyung	114	KW = Kangwon Do
IS1	Yongpyung Do	12	IS = Islands
IS2	Changbong Do	6	
IS3	Oi Do	2	
IS4	Soya Do	3	
IS5	Dukchok Do	1	
IS6	Tae Huksan Do	10	

F. Number and Percentage of Sherds From Each Site by Subtype

Subtype	Number of Sherds From Each Site						Percentage of Sherds from Each Site				
	TM	MS	AS	NP	IS	Total	TM	MS	AS	NP	IS
1	-	-	-	83	5	88	-	-	-	72.8	14.7
2	4	1	7	26	22	60	28.6	4.8	6.6	22.8	64.7
3	1	7	40	-	2	50	7.1	33.3	37.7	-	5.9
4	2	1	2	4	2	11	14.3	4.8	1.9	3.5	5.9
5	-	5	26	-	2	33	-	23.8	24.5	-	5.9
6	5	6	16	-	-	27	25.7	28.6	15.1	-	-
7	2	1	15	1	1	20	14.3	4.8	14.1	0.9	2.9
Total	14	21	106	114	34	289	100.0	100.1	99.9	100.0	100.0

G. Chi-Square Values for Each Variable (4-8 omitted) on Pairs of Sites and Pairs of Grouped Sites

Variable	MS&TM	AS&MR	AS&TM	MIDHAN&IS	MIDHAN&NP
1	0.4096	4.0932*	0.8417	10.3781*	10.1396*
2	0.4096	1.4535	0.4571	13.5038*	7.1073*
3	.....	7.3415*	.....	2.1368	3.7309
9	3.8542	0.5249	5.7583*	73.0991*	144.8696*
10	1.1506	.....	.....	1.2861	9.1066*
11	0.1693	6.1830*	4.9334*	6.2368*	20.0815*
12	0.4913	3.4380	3.7288	11.0509*	44.8301*
13	3.5978	0.2398	5.5658*	11.0509*	47.9806*
14	0.5625	1.5503	0.8030	1.0777	10.4339*
15	0.3123	1.3660	0.2893	36.9334*	84.9797*
16	0.4452	0.1122	0.3659	6.4962*	18.7292*
17	0.4909	0.9368	1.3004	77.7319*	160.0799*
18	9.6792*	0.6047	15.9299*	3.3632	18.0701*
19	.....	.....	.....	11.9670*	0.9783
20	.....	.....	.....	18.6195*	152.0918*
21	0.9262	0.3269	4.8122*	9.6402*	36.2928*
22	0.4009	0.2987	0.6925	2.5266	13.1368*
23	2.3451	0.2849	6.7295*	0.7239	1.0762
24	2.3451	1.9597	0.3659	3.1018	2.0960
Total	29.8215	33.6318	60.7352	300.8401	785.8109

* = Significant at .05.

H. T Values of Attribute Variables for Pairs of Sites and Pairs of Grouped Sites

	Variable Number	Amsari & Misari	Tongmak & Misari	Tongmak & Amsari	Middle Han & Islands	Middle Han & Naepyung
t(.05)		1.981	2.056	1.981	1.960	1.960
t(.01)		2.618	2.779	2.618	2.576	2.576
	1	1.341	0.593	0.709	3.295**	3.251**
	2	1.081	0.593	0.413	3.823**	2.681**
	3	0.735	0.000	0.735	1.017	1.865
	4	1.130	1.472	0.702	1.733	2.288*
	5	0.533	0.000	0.533	2.606**	3.388**
	6	0.951	1.147	0.599	1.181	0.066
	7	0.111	0.593	0.641	0.748	4.317**
	8	0.221	1.063	2.127*	5.856**	0.614
	9	0.075	1.486	2.738**	10.973**	17.699**
	10	1.181	0.593	2.470*	1.244	2.943**
	11	2.053*	0.000	2.053*	2.284*	4.406**
	12	2.053*	0.000	1.860	3.369**	7.372**
	13	0.146	1.894	2.299*	3.369**	7.688**
	14	0.557	0.000	0.557	0.914	3.357**
	15	1.447	0.816	0.411	6.825**	11.242**
	16	0.013	0.478	0.712	2.428*	4.454**

Variable Number	Amsari & Misari	Tongmak & Misari	Tongmak & Amsari	Middle Han & Islands	Middle Han & Naepyung
17	1.622	1.000	0.871	12.188**	21.035**
18	0.967	3.122**	4.238**	1.772	4.113**
19	0.515	0.000	0.515	4.123**	0.440
20	0.000	0.000	0.000	4.778**	18.865**
21	1.746	0.366	2.331*	3.072**	6.445**
22	0.322	0.593	0.469	1.465	3.775**
23	0.840	1.063	3.094**	0.555	1.032
24	1.506	1.883	0.712	1.857	1.395

* = significant at .05

** = significant at .01

J. Significance of Differences of Proportions of Attribute Variables for Pairs of Sites and Pairs of Grouped Sites

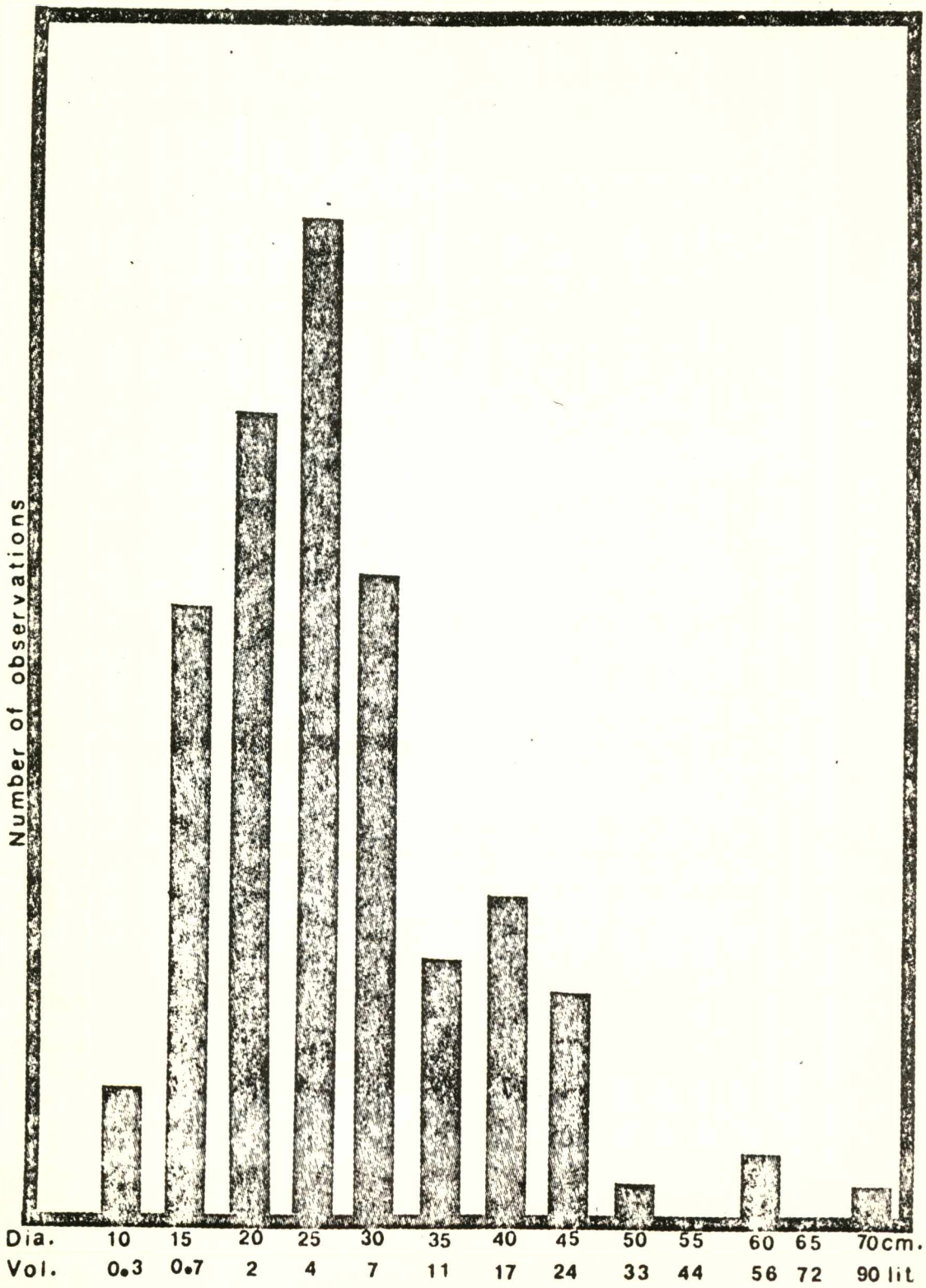
Variable No.	Amsari & Misari	TMK & MSR	TMK & ASR	MH & IS	MH & NP
1	0.006 , 0.3106	0.1549, 0.2989	0.1159, 0.2818	0.0904, 0.4496*	0.0616, 0.2800*
2	0.0350, 0.2710	0.1549, 0.2989	0.1509, 0.2428	0.1195, 0.4785*	0.1868, 0.3726*
3	0.0539, 0.1294	0.0000, 0.0000	0.0039, 0.0721*	0.0022, 0.0578*	0.0024, 0.0576*
4	0.0331, 0.1369*	0.0398, 0.3258	0.1319, 0.2478	0.0363, 0.1284*	0.1120, 0.0885*
5	0.1788, 0.3228	0.3337, 0.3337	0.1798 0.3238	0.0918, 0.3582*	0.0831, 0.2869*
6	0.1443, 0.4083	0.1382, 0.5662	0.1698, 0.3338	0.0615, 0.2775	0.1155, 0.1235
7	0.6015, 0.6195	0.1549, 0.2989	0.0869, 0.2089	0.0049, 0.0934*	0.1331, 0.3259*
8	0.1273, 0.1553	0.1120, 0.3962	0.0621, 0.3761	0.1936, 0.5384*	0.0476, 0.0896
9	0.1408, 0.1483	0.0467, 0.4767	0.1129, 0.5911*	0.5250, 0.8243*	0.6744, 0.8116*
10	0.0838, 0.1878	0.1549, 0.1549	0.0598, 0.3078	0.0470, 0.1490	0.0344, 0.1716*
11	0.0427, 0.4727	0.3545, 0.3545	0.0427, 0.4727	0.0726, 0.2434*	0.1004, 0.2376*
12	0.0484, 0.4576*	0.2600, 0.2600	0.0482, 0.4578*	0.1731, 0.3949*	0.2556, 0.4124*
13	0.2471, 0.2871	0.0018, 0.5702*	0.1422, 0.4698*	0.1731, 0.3949*	0.2646, 0.4214*
14	0.0959, 0.1999	0.1899, 0.1899	0.0959, 0.1999	0.0410, 0.1470	0.0501, 0.1559*
15	0.0326, 0.4346	0.1866, 0.4726	0.2091, 0.3251	0.4850, 0.6810*	0.4691, 0.6489*
16	0.1930, 0.1941	0.2108, 0.3528	0.1524, 0.2964	0.0902, 0.2078*	0.0902, 0.2078*

Variable No.	Amsari & Misari	TMK & MSR	TMK & ASR	MH & IS	MH & NP
17	0.0914, 0.2286*	0.0634, 0.2054	0.0615, 0.2395	0.7094, 0.8466*	0.7345, 0.8750*
18	0.1381, 0.4121	0.1705, 0.6875*	0.4720, 0.6600*	0.0181, 0.3561	0.1326, 0.3614*
19	0.0006, 0.0386	0.0000, 0.0000	0.0006, 0.0386	0.0325, 0.2895	0.0136, 0.0256
20	0.0000, 0.0000	0.0000, 0.0000	0.0000, 0.0000	0.0294, 0.2646*	0.6471, 0.8089*
21	0.0580, 0.4820	0.2966, 0.4386	0.0100, 0.5560*	0.2059, 0.3901	0.1955, 0.3425*
22	0.1520, 0.2320	0.1549, 0.2989	0.1429, 0.1501	0.0070, 0.1590*	0.0591, 0.1649*
23	0.0942, 0.1802	0.1102, 0.3962	0.1046, 0.4025	0.0420, 0.0880	0.0172, 0.0752
24	0.0770, 0.2070*	0.2036, 0.2276	0.1524, 0.2964	0.0271, 0.2891	0.0185, 0.1285

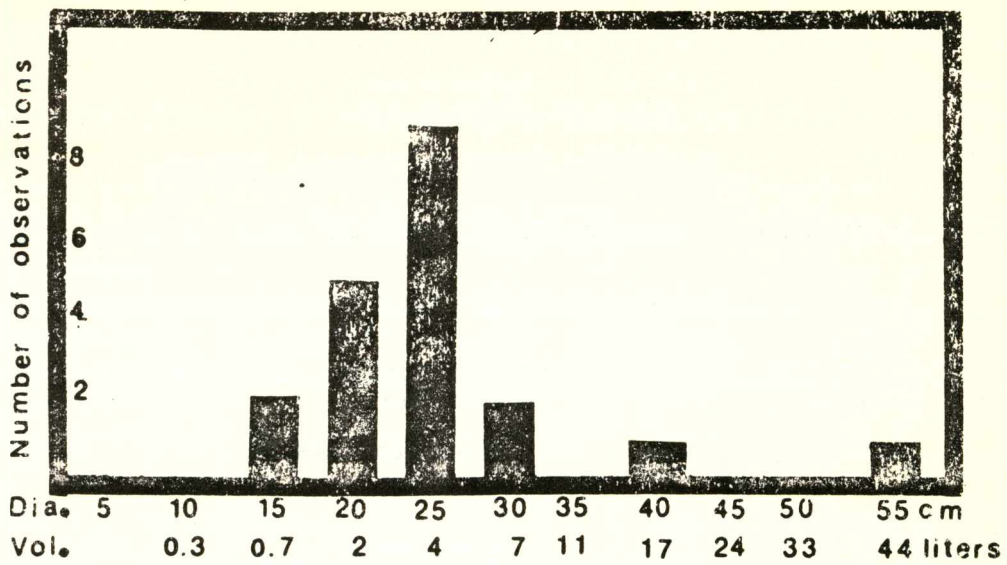
K. Volume Calculations

Diameter	Calculation ($1/3h\pi r^2$)		Cubic Centimeters	Liters (Approx.)
10 cm.	1/3 x 10 x 22/7 x 25	=	262 cc.	0.3
15 cm.	1/3 x 15 x 22/7 x 56	=	880 cc.	0.8
20 cm.	1/3 x 20 x 22/7 x 100	=	2,095 cc.	2
25 cm.	1/3 x 25 x 22/7 x 156	=	4,086 cc.	4
30 cm.	1/3 x 30 x 22/7 x 225	=	7,071 cc.	7
35 cm.	1/3 x 35 x 22/7 x 306	=	11,220 cc.	11
40 cm.	1/3 x 40 x 22/7 x 400	=	16,762 cc.	17
45 cm.	1/3 x 45 x 22/7 x 505	=	23,807 cc.	24
50 cm.	1/3 x 50 x 22/7 x 625	=	32,739 cc.	33
55 cm.	1/3 x 55 x 22/7 x 756	=	43,560 cc.	44
60 cm.	1/3 x 60 x 22/7 x 900	=	56,571 cc.	57
65 cm.	1/3 x 65 x 22/7 x 1,066	=	72,212 cc.	72
70 cm.	1/3 x 70 x 22/7 x 1,225	=	89,833 cc.	90

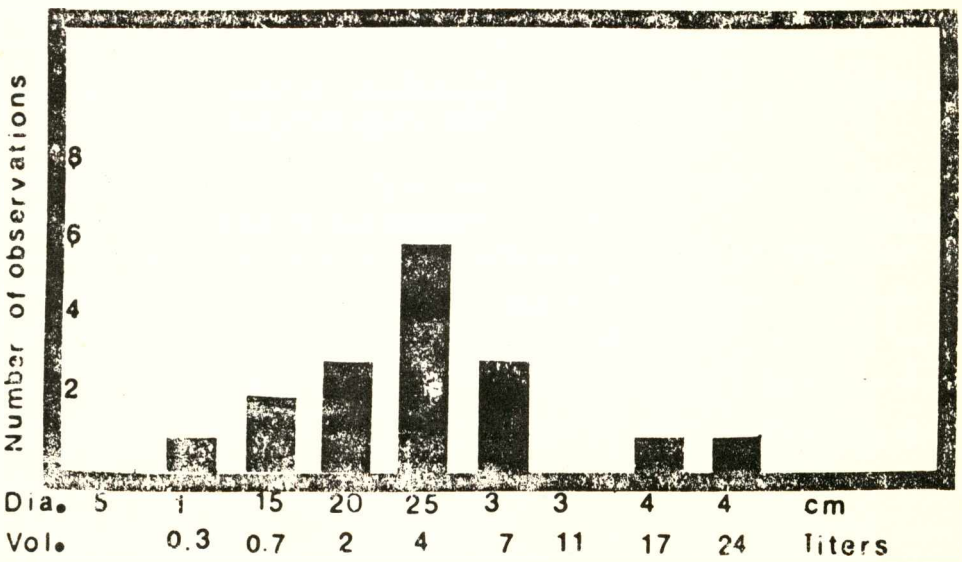
L. Grouped Data Histogram of Rim Diameters and Estimated Volumes
(1). Amsari. N = 118.



(2) Misari. N = 20.



(3) Tongmak. N = 14.



M. Stone Tools and Waste: Tongmak

Stone	Number of Artifacts	Kind of Artifacts	Approximate Weight, Waste and Artifacts
Pink granite	4	2 sinkers 2 pointed flakes	7 lb.
Grey granite	19	4 hoe-axes 2 sinkers 10 irregular points 3 unknown	20 lb.
Siltstone	8	8 thin, irregular points	0.5 lb.
Micaschist	3	3 unknown, irregular but chipped	2 lb.
Quartzite	4	irregular shapes	0.25 lb.

N. Grinding Stones
(in centimeters)

Provenience	Length	Width	Thickness	Stone
Tongmak surface	10.9	7.1	4.7	Slate
Tongmak surface	13.1	4.5	3.5	Granite
Tongmak N-8	12.5	5.6	3.5	Granite
Misari N-6	17.0	4.4	3.0	Granite
Misari P-4	9.0+	4.5	3.5	Granite

O. Dimensions of Hoe-axes and Net Sinkers (in centimeters)

(1) Hoe-axes

Provenience	Length	Width	Thickness	Stone
Tongmak surface	13.0+	11.0	2.8	Granite
Tongmak surface	7.0+	6.4	1.6	Granite
Tongmak surface	10.2+	5.5	3.3	Granite
Tongmak surface	9.0	6.3	2.2	Granite
Tongmak surface	6.8+	5.2	1.3	Slate
Tongmak surface	10.5	5.3	1.5	Slate
Tongmak surface	11.3	5.5	1.7	Slate
Tongmak surface	10.1	5.0	1.4	Granite
Tongmak N-3	7.0+	5.2	1.8	Micaschist
Tongmak N-6	7.5+	7.5	2.5	Quartzite
Tongmak N-1	5.2+	5.0	1.6	Granite
Tongmak N-2	9.8	5.9	3.1	Slate
Tongmak N-6	7.2+	5.8	1.2	Slate
Misari P	10.7	5.9	2.3	Granite

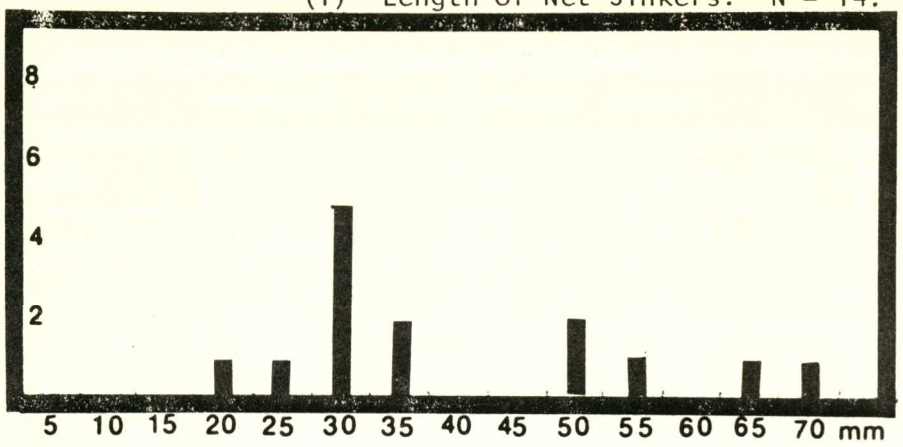
(2) Net sinkers

Provenience	Length	Width	Thickness	Stone
Tongmak surface	6.5	5.3	0.7	Slate
Tongmak surface	4.6+	4.8	1.6	Granite
Tongmak surface	5.0	4.5	1.2	Slate
Tongmak surface	6.2	3.5	0.8	Granite
Tongmak surface	4.8	3.3	1.0	Granite
Tongmak surface	3.0	2.5	0.8	Slate
Tongmak surface	2.4	2.2	0.7	Slate
Tongmak N-8	4.8	3.4	1.4	Granite
Tongmak N-3	2.6	2.4	0.6	Granite

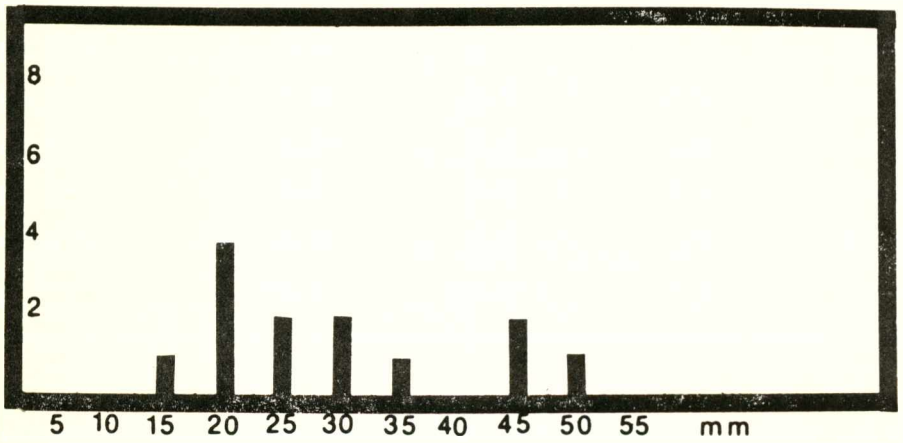
Provenience	Length	Width	Thickness	Stone
Tongmak N-9	2.9	2.9	1.0	Granite
Tongmak N-9	2.9	2.1	0.8	Granite
Tongmak N-9	1.9	1.9	0.8	Granite
Misari P-2	2.5	1.5	0.5	Granite
Misari P'	3.0	1.9	0.4	Granite
Misari P'	2.5	2.0	0.7	Granite

P. Grouped Data Histograms

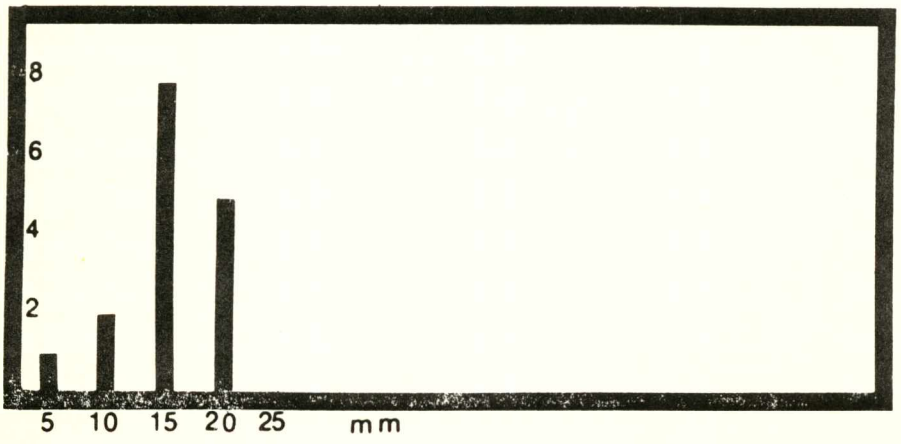
(1) Length of Net Sinkers. N = 14.



(2) Width of Net Sinkers. N - 13.



(3) Thickness of Net Sinkers. N = 16.



Q. Plot of Length and Width of Net Sinkers

6.1-6.5						1			1
5.6-6.0									
5.1-5.5									
4.6-5.0					1	1		1	
4.1-4.5									
3.6-4.0									
3.1-3.5									
2.6-3.0			2	2	1				
2.1-2.5		1	1	1					
1.6-2.0			1						
1.1-1.5									
0.6-1.0									
0.1-0.5									
	0.1-0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0

R. Dimensions of Pointed Stones

Tongmak	Length	Width	Thickness	Stone	Comment
N-1	3.2	1.9	0.9	Quartzite	Probably reject
N-3	4.5	4.0	1.4	Siltstone	" "
N-3	2.1	1.4	0.9	"	Use marks on point
N-3	2.3	0.8	0.6	"	
N-3	7.3	3.0	1.5	"	Reject, unfinished
N-5	2.2	1.2	0.6	Granite	Possible awl
N-5	2.5	0.8	0.8	"	Tanged
N-5	2.3	0.8	0.4	Quartzite	Blank?
N-8	3.4	2.6	0.9	Siltstone	Crude awl
N-9	4.0	1.8	0.9	"	Crude graver
N-8	3.7	2.0	0.7	Slate	Pointed flake
N-4	4.4	2.7	0.7	"	" "
N-6	3.4	2.0	0.8	Siltstone	" "
N-5	2.9	1.2	0.8	Granite	" "
N-5	2.2	1.2	0.2	Slate	" "
N-6	2.4	1.2	0.4	Granite	" "
N-8	2.5	1.0	0.2	Slate	" "
N-6	1.5	1.1	0.2	Slate	" "
N-1	4.4	2.7	1.8	Slate	Pointed chunk
N-3	4.1	4.0	1.8	Siltstone	" "
N-1	3.8	3.5	0.6	Granite	" "
N-4	5.7	3.8	0.8	Siltstone	" "
Misari					
P-2	7.3+	3.0	1.0	Schist	Broken end, possible awl

S. Dimensions of Flakes

Tongmak	Length	Width	Thickness	Stone	Comment
N-3	11.5	7.5	1.9	Siltstone	Possible knife
N-4	4.4	2.5	0.5	Slate	Rectangular, broken
N-5	4.0	3.5	0.6	Granite	Possible scraper
Misari					
P-2	8.6	5.1	1.2	Granite	Possible knife--use marks
P-2	8.9	7.8	1.4	Granite	" " "
P-4	9.3	7.8	2.2	Shale	" " "

T. Dimensions of Other Possible Artifacts

Tongmak	Length	Width	Thickness	Stone	Comment
Disc	8.8	8.5	2.2	Granite	Flaked all edges surface
Hammerstone	5.4	3.6	2.5	Granite	N-6
Denticulate	4.5	3.6	2,5	Quartzite	Crude N-8
?	3.3	1.8	0.3	Siltstone	Smooth sharp edges holes at edges, snapped across N-8
?	2.2	0.8	1.0	Siltstone	Irregular pebble N-7
"Limace"	7.8	2.5	1.3	Siltstone	
Misari					
Bladecore	3.4	1.9	0.9	Siltstone	3 tiny blades struck off one side P

GLOSSARY

Amsari 岩寺里

Arimitsu Kyoichi 有光教一

Chag-yak Do 自作島

Changbong Do 長峰島

Cheju Island 濟州島

Chigumni 芝錫里

Chindo 珍島

Chitamni 智塔里

Choi Mong-Lyong 崔夢龍

Chongpyung 定平

Chulmuntogi 櫛文土器

Chunchon 春川

Dukchok Do 德積島

Fujita Ryosaku 藤田亮策

Han (River) 漢江

Han (Tribes) 韓

Kwanghae Do 黃海道

Im Hyo-Jai 任孝宰

Imjin R. 臨津江

Inchon 仁川

Kanghwa Do 江華島

Kim Chong-Chol 金鍾徹

Kim Chong-gi 金正基

Kimhae 金海

Kim Jong-Hak 金廷鶴

Kim Kwang-Su 金光洙

Kim Won-Yong 金元龍

Kim Yang-Sun 金良善

Koguryo 高句麗

Kum R. 錦江

Kunungsan 九陵山

Kusan 구산

Kyonggi Do 京畿道

Kyongsang Nam Do 慶尚南道

Kyongsang Puk Do 慶尚北道

Kyushu 九州

Lim Byung-Tae 林炳泰

Lolang (Nangnang) 樂浪

Misari 漢沙里

Mumuntogi 無文土器

Naepyung 內平

Naktong R. 洛東江

Oh Chi-Young 吳智泳
Oh Sang-Hwa 吳相和
Oido 午耳島
Paekche 百濟
Pak Dong-won 朴東元
Pusan 釜山
Sam Guk Sagi 三國史記
Seoul 서울
Shido 矢島
Silla 新羅
Sohn Pow-key 孫寶基
Sonni 船里
Soya Do 蘇爺島
Susongni 水石里
Taedong R. 大同江
Tae Huksan Do 大黑山島
Tongmak 東幕
Tongsamdong 東三洞
Tuman R. 豆滿江
Yalu R. 鴨綠江
Yang kyung-rin 梁慶麟
Yangsun 양손
Yongpyung Do 延坪島

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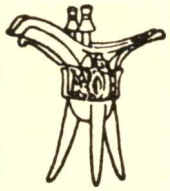

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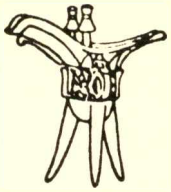

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