Part III

Spread to the North and the Northeast

10

Introduction and Deployment of the Ceramic Industry in the Xiongnu Empire

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Abstract: Xiongnu is the first nomadic empire in the eastern Steppe Zone. Unlike the nomads of the Mongolian plateau before them, they had innovative facilities such as earthen fortresses and kilns. The kilns emerged and were used not only to produce pottery, but also to produce the tiles and bricks that decorated the fortresses and their interior buildings. This essay introduces a few examples of the Xiongnu kilns so far known from the end of the Western Han or the beginning of the Eastern Han period, when kilns were introduced to the region. These kilns were presumed to have emerged under the influence of kilns from the northern rim of the Han Dynasty. Among them, kilns at the Khustyn Bulag site are of particular significance, as they are the first kilns whose detailed structure is known north of the Han Dynasty territory.

Keywords: Mongolia, Inner Mongolia, Altai Mountains, Xiongnu, nomadic empire

10.1. Introduction

The Xiongnu people established the first nomadic empire in the eastern steppes of Eurasia. According to *Shiji*, they appeared between the fourth and third centuries BC and often attacked states in China. At first the Xiongnu were harassed by the Yuezhi in the west and the Donghu in the east. After the rise of Modu Chanyu, however, they dominated the whole Mongolian plateau. Ultimately, they defeated the Han Dynasty, dethroned its emperor, Liu Bang, at the Battle of Baideng in 200 BC, and came to hold a hegemony in North and East Asia.

The initial Xiongnu period is not very evident in the archeological context. However, in the period from the first century BC to the first century AD, they built earthen fortresses and used roof tiles, unlike earlier nomadic people in this area. Although pottery production had been practiced before the emergence of the Xiongnu, the Xiongnu began to produce relatively uniform low-fired stoneware with kilns. Essentially, the ceramic industry did not fit the activities of a nomadic culture, because such kiln firing demands the consumption of large amounts of fuel and soil and thus requires being settled in the area of production. However, the Xiongnu pottery found from this era is regarded as evidence that various peoples in the steppe area belonged to the Xiongnu nomadic empire, because they were distributed not only in the territory of the original Xiongnu ethnic group (Mongolia, the northern China periphery and Zabaikalie) but also in Central Asia and South Siberia, which the Xiongnu Empire incorporated into its realm. In addition, it is believed that the system of Xiongnu ceramic industry was passed on to the steppe area by later peoples such as the Xianbei or the Kitai and others.

As mentioned above, despite the fact that scholars have recognized that the Xiongnu ceramic industry played an important role in the activities of the empire, scholarly research has not sufficiently clarified its production system and its technical characteristics. This paper aims to elucidate these more by examining the actual conditions of production sites.

10.2. Current issues in the ceramic industry of Xiongnu

The Xiongnu ceramic industry was surely recognized by researchers from the beginning of Xiongnu archeological study. As pottery found from Ivolga Fortress and burials in Transbaikal region were classified by measurements and production method, their characteristics were revealed (Konovalov 1976; Khamzina 1982). The fact that Xiongnu pottery was fired by kiln is especially important, because it proves the existence of skilled, dedicated potters. Moreover, pottery and roof tiles found in Abakan Palace, located in southern Siberia, were presumed to have been made by Xiongnu; researchers started to take notice of the distribution range and production system of Xiongnu pottery (Kiselev 1951). In their studies of Xiongnu pottery, Konovalov (1976) and Davydova (1995) classified more details and revealed the compositions of the ware. Pan Ling (2007) advocated chronological division by burial goods, including Derestai- and Suji-type pots.

As stated above, although the study of pottery as commodities has developed, the study of Xiongnu kilns and production systems has not, due to production sites remaining undiscovered. Kiln-like remains were found in Ivolga Fortress but cannot be confirmed as such. Later, pottery kilns of the Xiongnu were found and investigated at the Ustyd site in the Altai region (Kubarev, Zhraleva 1986).

Additionally, a kiln was found and excavated in the Khustyn Bulag site in north central Mongolia (The National Museum of Korea et al. 2001). As our research project team continues to excavate other points of the Khustyn Bulag site, we have been able to develop a study of the Xiongnu ceramic industry on the basis of concrete examples.

10.3. Kiln sites in the territory of the Xiongnu Empire

Although ceramic products such as pottery, bricks and roof tiles have been found in various places in North Asia, only a few examples of kiln ruins directly related to Xiongnu ceramic production have been discovered. They are discussed below (Fig. 10.1).

10.3.1. Yustyd site (Kubarev, Zhuraleva 1986; Fig. 10.2, 3)

This site is located in the Koshi-Agachi district of the Altai Republic, Russian Federation. As the Altai Mountain area was located outside the homeland of the Xiongnu group, it is believed that it was a territory of another nomadic people, such as the Ge kun or Hu jie. It appears that pottery production was introduced while the Xiongnu Empire was bringing the surrounding area under its control. However, the nomadic archeological culture that inherited the tradition of the Altai Mountain area continued there at that time, and the Xiongnu culture did not replace it. Similar phenomena are also found in neighboring southern Siberia, in places such as Khakassia and Tuba. This would indicate the political influence of the Xiongnu Empire on the surrounding area.

The Yustyd kiln site is located on a slope descending from the east to the west on a terrace of the right bank of the Yustyd River. Two survey sectors were excavated there in 1978. In the first survey sector, the pit of the kiln remains was discovered. It is in the shape of an irregular circle with a diameter of about 3 m and a depth of about 90 cm in the center. Flat stones are placed along its wall, and a clay layer is stuck onto its inner wall. The bottom is slightly rounded. On the west side, there is a dugout passage. This is assumed to be the remains of a stoke hole. A large number of earthenware and charcoal fragments and a clay wall with handprints were excavated from the filling soil of the pit. Thus, it is estimated that products were discarded due to a failure of firing after the final firing of the kiln. In addition, another hole, which was thought to be part of the remains of another, earlier kiln, was found where the thick coal layer was deposited at the eastern end of the survey area, but no detailed excavation was made of it.

In the second survey sector, the remains of four kilns lined up along the east and west sides of the slope were found. All were supposed to be elliptical. The first kiln, located at the east end, is an elliptical pit with a major axis of about 3 m, with flat stones placed around it. Clay is stuck onto the bottom and the wall. Its depth is about 1 m. The second kiln was confirmed in the layer below the first kiln, and it is believed that the upper part of it was broken by the first kiln. Based on the deposition condition of the soil layers, its use period is believed to have been short. The third kiln was located to the west of the second kiln, and is estimated to be an elliptical pit of about 3.5 by 2 m. Flat stones were installed along the edge of the kiln, inside

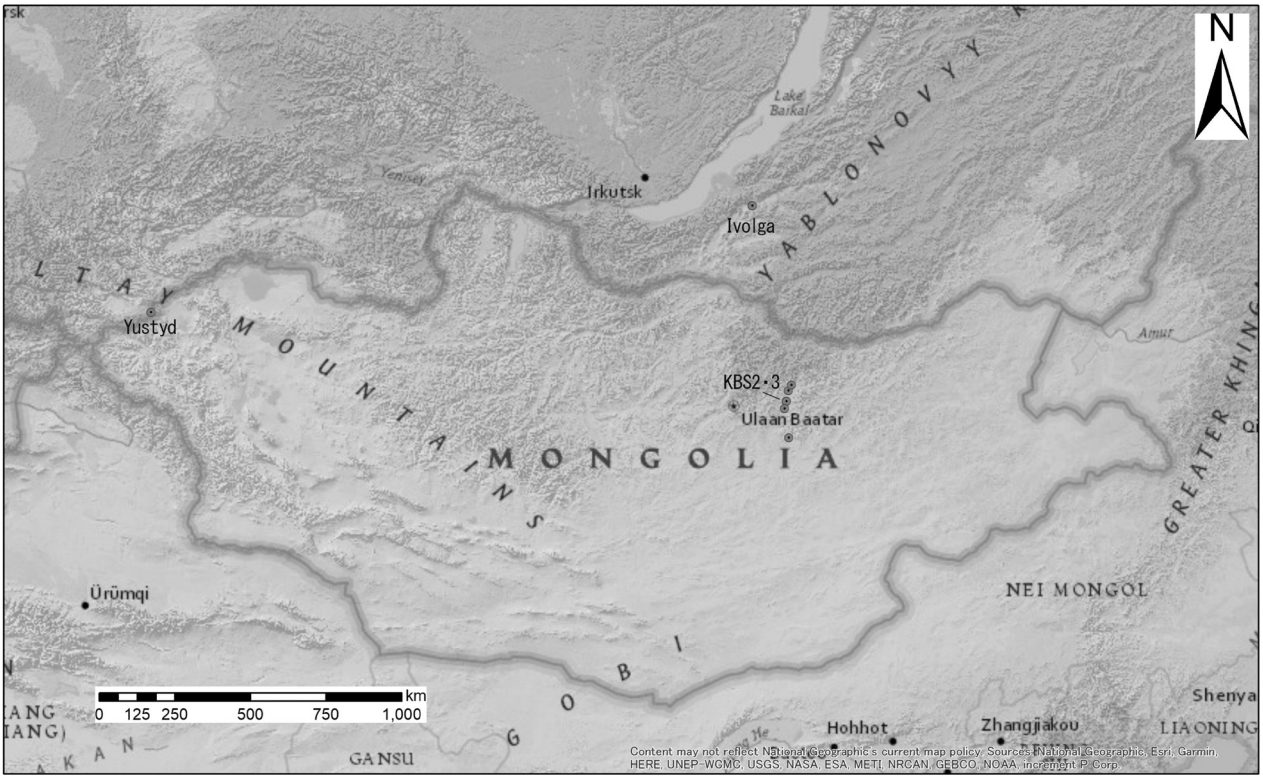

Figure 10.1. Location map of Xiongnu kilns and castle sites in the Kherlen River basin.

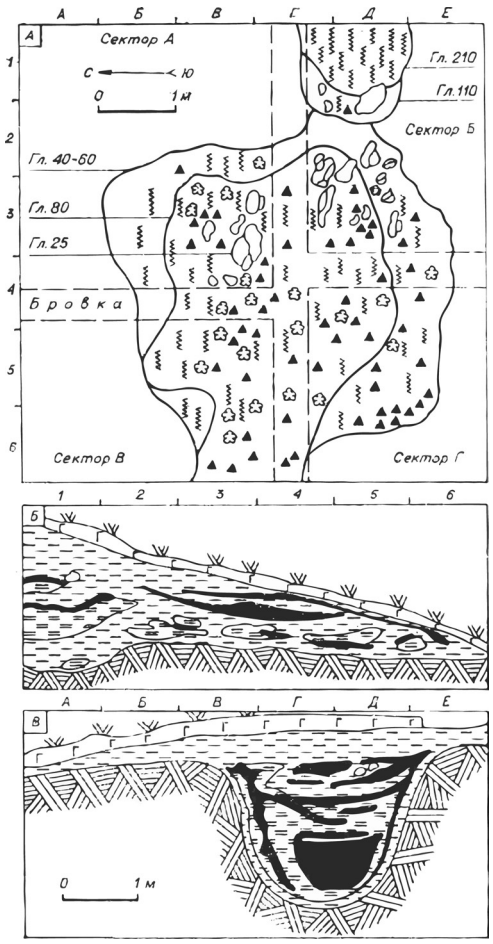

Figure 10.2. The kiln at the first survey sector of Yustyd site (Kubarev and Zhraleva 1986).

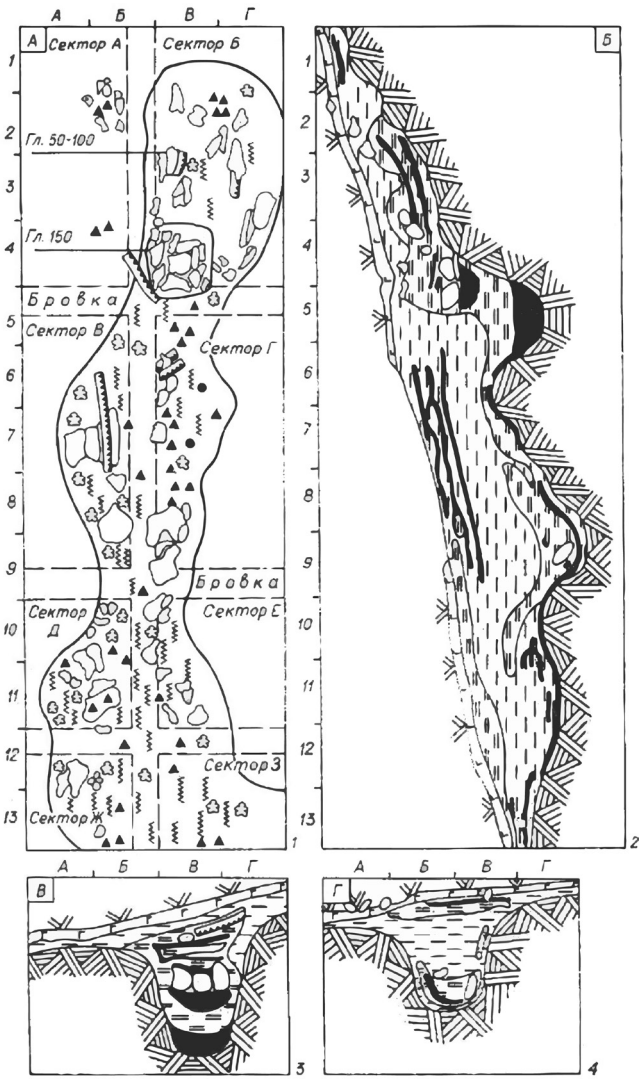

Figure 10.3. Kilns at the second survey sector of Yustyd site (Kubarev and Zhraleva 1986).

of which researchers discovered carbonized timbers and stuck clay. Because the third kiln destroyed the filling soil of the first kiln site, it is thought that this kiln was built later than the first kiln. The fourth kiln is located on the west side of the third kiln and has an oval shape of about 3 by 2 m in diameter. The same methods and materials were used to construct it as in the other kilns, such as the flat stone pavement and the stuck clay.

However, it is difficult to identify each of the above four kilns in the ground plan and stratum cross section. The basis for supporting the opinion of the excavator is not clear; therefore, the shapes of these remains are unclear. It can be judged that adjacent to the first kiln and the second kiln, between which there is a difference in height, are the firing chamber and the firebox of one kiln. The third kiln is also considered to have a two-chamber structure.

10.3.2. Ivolga castle site (Davydova 1995; Fig. 10.4)

The Ivolga castle site, which is a rectangular castle ruin that extends 348 m east and west, and 216 m north and south, was constructed on a river terrace located 16 km southwest of Ulan-Ude City, Buryat Republic, Russian Federation. On the edge of the river terrace, a rectangular earthen fort was built with ditches and walls, inside which many structures such as pit dwellings were built. Excavation in the southern part of the castle led to discovering many remains, such as a ground building, pit dwellings, a well and pits. Based on the excavated goods, it is presumed that the date of these remains is from the second century BC to the first century AD.

The excavator, Davydova (1995), pointed out that among these remains, pit No. 217 might have been a pottery kiln. This pit was dug near dwelling No. 49 and destroyed its entrance. Hence, the date of pit No. 217 is later than dwelling No. 49. It has an oval plan of 2.33 by 2.05 m and a depth of 1.15 m. The surface of its wall is pasted with clay lumps that were burned at a high temperature. Many fragments of burned timbers, charcoals and pottery were excavated from this site. Additionally, the skull of a woman buried in the wall was also found. The neighboring pit is separated by a thin wall extending from it, and it may have been fired from there. However, Dr. Davydova has not concluded that these remains were a kiln.

10.3.3. Khustyn Bulag 3 (KBS 3; Fig. 10.5)

The Khustyn Bulag site group is located in the upper basin of the Kherlen River in Tuv Aimag in Mongolia. It is located on a wide flat terrace on the northeastern shore of the Zuun Baidlag River, a tributary of the Kherlen River, and consists of many sites from the Paleolithic Age to the nineteenth century. In the Xiongnu era, large-scale iron-making and ceramics workshops operated in this area. The steel workshops are distributed over a range of about 1 km east–west at the western end of the terrace. Their operations continued from the third century BC to the first century AD. The ceramic workshops, in which roof tiles, bricks and pottery were produced, are located in the southeastern part of the terrace. There, kiln remains are distributed along the terrace cliff in the range about 1 km wide. We found the ceramics workshops at two locations (KBS 2 and KBS 3). ^{14}C dating confirmed that they operated from the first century BC to the first century AD.

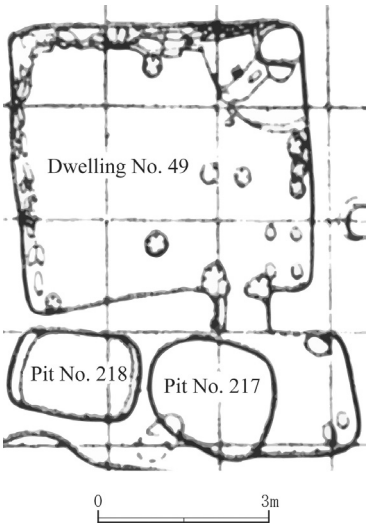

Figure 10.4. The kiln in Ivolga castle site, Pit No. 217 (Davydova 1995).

At KBS 3, mainly roof tiles and bricks were excavated. Here an elliptical pit (about 6.7 m north–south and 6 m east–west), which is regarded as kiln remains, was found. Its excavation revealed that the lower portion of the pit has a pentagon-like plan as a whole. Its northwest part is a rectangular platform. The southeastern part is a triangular space, and an elongated small pit is located at

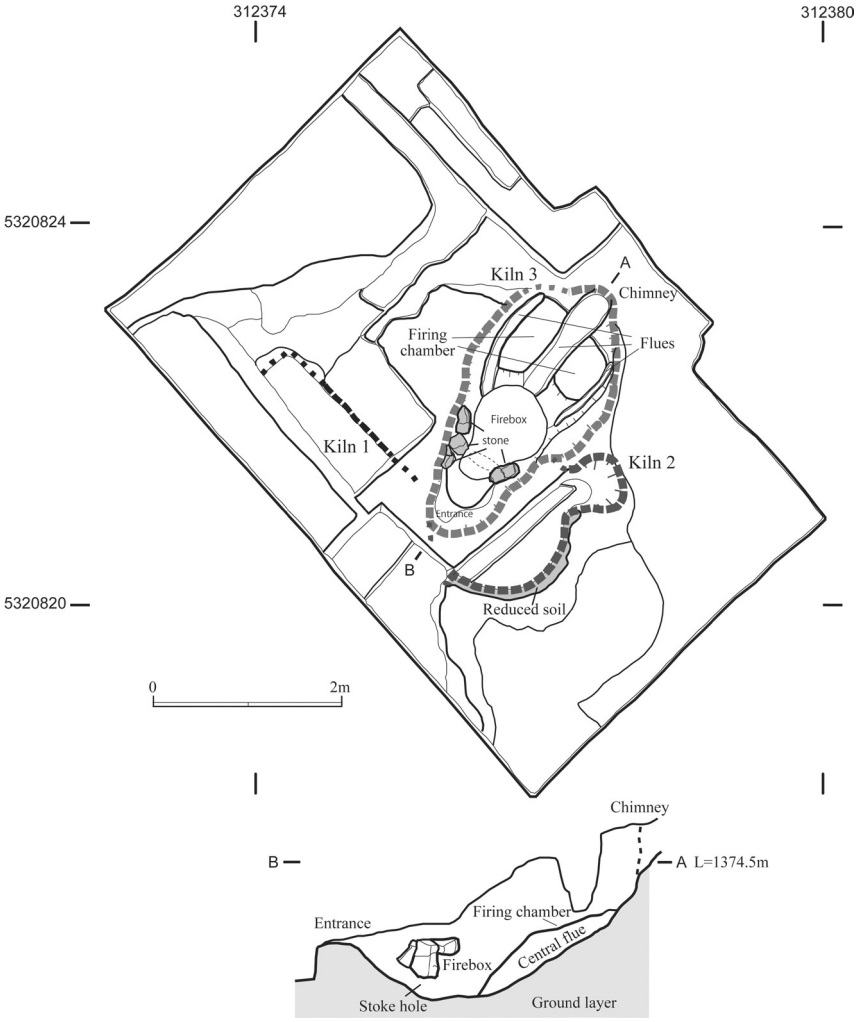

Figure 10.5. Estimated restoration of the kiln in KBS 3.

its tip. It is believed that these were the stoke hole, the firebox and the firing chamber of the kiln. On the north side of the pit, a vertical shaft and a horizontal shaft extending from the bottom of the vertical shaft to the elliptical pit were found. Those walls were burned hard. These are believed to constitute the chimney of the kiln. Another chimney was also detected in the east. Although there is uncertainty due to later destruction, another chimney would likely have been constructed in the west. An observation of the layer section of the firebox and the firing chamber revealed that the upper part of the kiln expanded into an elliptical shape after accumulations in the kiln built up after it was used several times. A large number of tiles, bricks, walls and carbide fragments had accumulated in the filling soil of the kiln. It is thought that these were intentionally left behind when the kiln was abandoned.

Based on the above, it is thought that this elliptical pit was originally a kiln that had a two-chamber structure and multiple chimneys, but that later it was reconstructed into an elliptical pit and unnecessary items and garbage were discarded there.

10.3.4. Mon-Sol project sector of KBS (National Museum of Korea et al. 2001; Fig. 10.6a)

A joint expedition led by the Institute of Archaeology, the Mongolian Academy of Sciences and the National Museum of Korea discovered kiln remains at the ridge of Khustyn Bulag, to the east of the KBS 3 site, and partly excavated it in 1999. In this excavation, the stoke hole and the work space of the kiln were discovered. The remains of masonry were found at the stoke hole. This is believed to have been the closure equipment of the kiln. Although the whole kiln has not been excavated, it appears to be a two-room-structure kiln like KBS 3.

10.4. Some characteristics of Xiongnu kilns

All of the above examples are semi-underground pit kilns. With the exception of the kiln of the Ivolga castle site, of which the details are unknown, it is thought that after the pits were dug, their walls and ceilings were constructed on the ground. Because the excavated fragments of pottery and wall pieces were fired with a reducing flame,

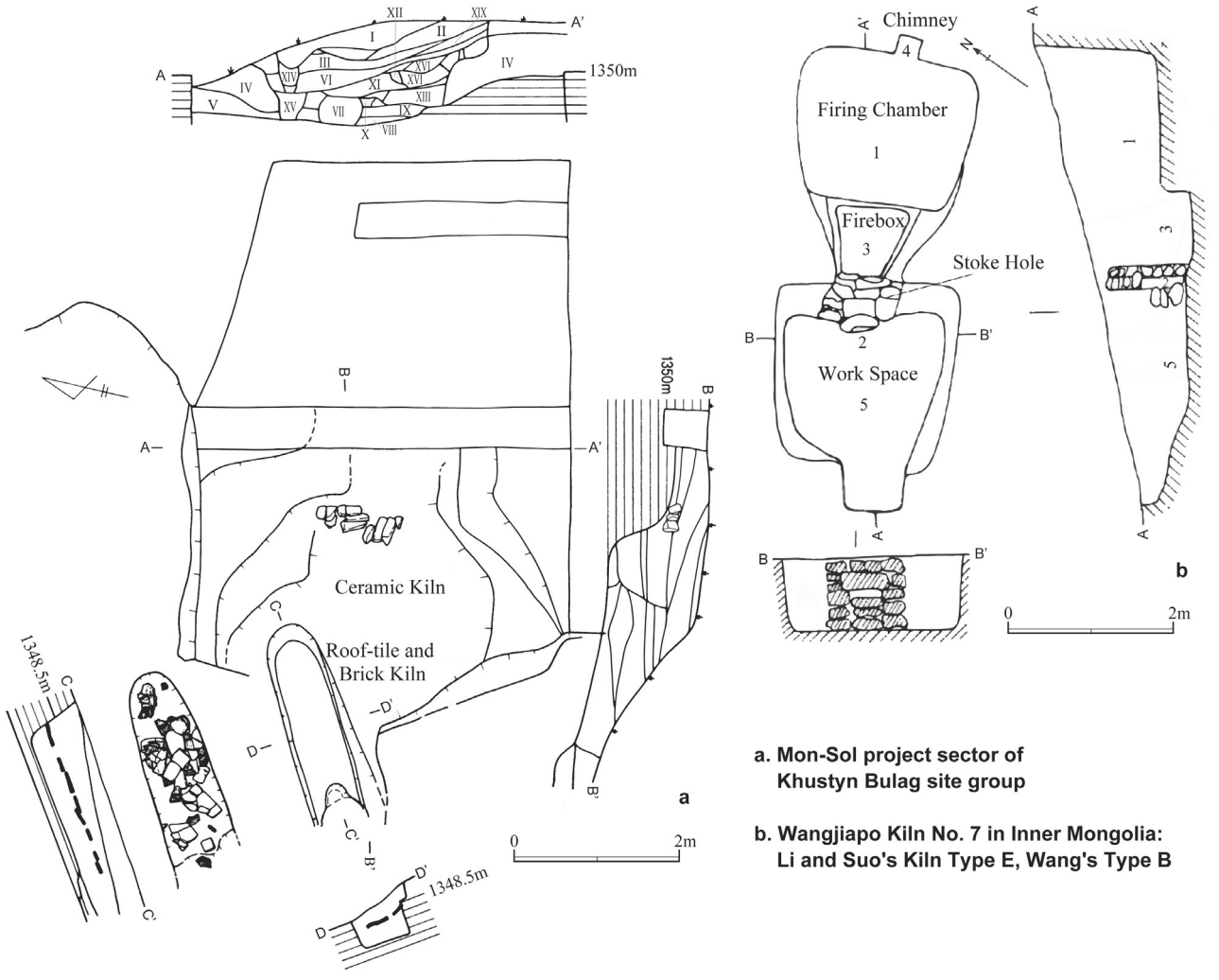

Figure 10.6. Kilns in Mongolia and Inner Mongolia (NMK et al. 2001, Wang 2011).

it can be assumed that the kiln was used in a sealed state. Furthermore, as mentioned above, some of the kiln remains of the second survey sector of the Yustyd site, as well as the kiln of KBS 3, are considered to be those of a two-chamber-type kiln.

In addition, the kiln of the second survey sector of the Yustyd site and KBS 3 have similarities, such as their location on the river terrace slope and walls constructed by pasting clay lumps, and they were intensely destroyed after firing. Based on the above points, it seems that they shared a common construction method and structure. However, as the kiln of KBS 3 has three chimneys, it seems that more advanced technology was introduced for it than for the kilns in the second survey sector of the Yustyd site.

In contrast, the kiln of the first survey sector of the Yustyd site is considered a whole kiln with a one-chamber structure. The inside of it was obviously burned. Furthermore, as it has points in common with the kiln of the second survey sector, such as flat stones at the wall side and clay lumps that show fingerprints, it is thought that it was a kiln. By the same token, the rectangular pit at the Ivolga castle site may be a similar kiln.

From the above findings, it is clear that there are two types of kilns in the Xiongnu ceramic industry. In the first type, firing is performed in one chamber. The second type consists of two rooms, a firing chamber and a firebox chamber, which are separated by a step. In the former, it is presumed that smoke was emitted from the ceiling, not the chimney. Also, the type 2 kiln has some variations in the number of chimneys or the shape of the firing chamber.

10.5. Chinese kilns from the Warring States period to the Han period

In the Mongolian steppes, pottery and roof tiles burned by a reduction fire were not made before the Xiongnu period, and such ceramic production obviously started under the influence of other areas. Moreover, the similarity in roof tiles and pottery between Han and Xiongnu shows the impact that the Chinese ceramic industry exerted. Indeed, the pottery and roof-tile-making technology, the paddling technique and the use of the potter's wheel began under Chinese influence. It is also necessary to consider the form of the Xiongnu kiln in comparison with the examples in China.

Regarding the construction of the ceramic kiln in the Han dynasty, Li Yufang pointed out that in the initial stage of the Former Han period, almost all kilns had an oval firing chamber, a single chimney and flue ditches along the wall, and that after the middle stage of the Former Han period, a rectangular firing chamber became common and a wall for separating flues or dividing flues appeared, and kilns with multiple chimneys increased (Li 1994).

Wang Chun Bin classified 69 kilns from the Warring States period to the Han dynasty into the following five types based on the planar shape of the firing chamber: A (gourd), B (circle), C (oval), D (horseshoe), E (square), F (triangle) (Wang 2011). The type A kiln had a two-story structure, in which the ceiling of a firebox became the floor of a firing chamber. In the others, the firing chamber and the firebox were separated by a step. Almost all examples of type B had no chimney. Types C, D and E had single or multiple chimneys. As there is only one example of type F, it is a unique type. It is distinctive that the floor of its firing chamber surface was inclined. The date of each type is as follows:

Type A: Warring States period
Types B and **C**: Middle Warring States period–Early Han period
Type D: Late Warring States period
Type E: Final Qin period–Han period
Type F: Qin period

Type D is considered a transitional form of types C and E because the side wall of its firing chamber is curved. Therefore, the above dating is generally reasonable.

Li Wanqi and Suo Xiufen examined the kilns of the Qin and Han periods in the middle south region of Inner Mongolia, and explained their characteristics (Li and Suo 2015). They were divided into two types, A and B. In type A, firing was performed inside the single pit, and smoke was emitted from the ceiling. In type B, the firing chamber and the firebox were separated by a step, and chimneys are often installed. Type B approximately corresponds to Wang's types C, D and E. Li and Suo pointed out that, regarding chimneys, after the middle stage of the Former Han period, installations of multiple chimneys increased, and in particular the installation of three chimneys emerged after the late stage of the Former Han period.

10.6. Introducing the processes of ceramic-making technology into Xiongnu society

A comparison of the examples in China with Xiongnu kilns suggests that the features at the Yustyd first survey sector and the Ivolga castle site are the type A kilns defined by Li and Suo.

Other Xiongnu features are considered representative of the type B kilns by Li and Suo. Kilns at the Yustyd second survey sector are regarded as Wang's type B, because each firing chamber has an elliptical shape and no chimney. The kiln in KBS 3 is close to Wang's type E, because its firing chamber is nearly rectangular, and the overall shape is close to a pentagon (see Fig. 10.6b). Also, because the kiln of KBS 3 is thought to have had three chimneys attached, its characteristics place it after the middle Former Han period. Although the whole shape of the kiln at the Mon-Sol project is unknown, it may have features similar to those of KBS 3.

Xiongnu kilns have many characteristics in common with Chinese kilns from the latter half of the Warring States

period to the Former Han period. Generally, Chinese kilns are a little older than the estimated age of Xiongnu kilns.

It is certain that Xiongnu ceramic technology was influenced by China. But the date of kilns is estimated to be from the first century BC (middle Former Han period) to the first century AD (early Latter Han period), so clearly somewhat older ceramic technology than the contemporary Chinese technology was used except for KBS 3.

In addition, the masonry in front of the stoke hole of the kiln in the Mon-Sol project site is similar to examples of kilns of the Han dynasty in the Inner Mongolia area (see Fig. 10.6b), and it is thought that ceramic technology was introduced from the peripheral area of northern China. However, technology with China was introduced almost simultaneously for the kiln of KBS 3, and it seems that more advanced technology was introduced than in other areas of the Xiongnu Empire because it was constructed in the special area where castles were concentrated. It is also important to note that not only the form and the pattern but also techniques, such as the potter's wheel, paddling and polishing, were introduced from the Han.

Pan Ling (Pan 2011) pointed out that the shape and ornament pattern of Xiongnu pottery was closely related to the northern peripheral area of China, such as Inner Mongolia and Shanxi. In addition, Sagawa observed that the form of the kiln and the roof-tile ornaments are strongly related to those of Inner Mongolia (Sagawa 2018; Sagawa & Usuki 2020).

It is thought that the Xiongnu ceramic industry was initiated with the introduction of engineers and technology from the Han district, and that before long the manufacturing of roof tiles and bricks had already started. New pottery forms such as the pot, bowl and steamer were introduced. Because these are found at many Xiongnu sites, it can be inferred that they spread rapidly after the start of their manufacture. It is also important that large vessels for storing things emerged. These are not daily items in conventional steppe life; therefore, it can be concluded that they were not produced merely for daily necessity. Rather, it is thought that the Xiongnu Empire intentionally introduced ceramic products related to new institutions and lifestyles, and that their production and use subsequently spread within the Xiongnu territory.

The existence of roof tiles and bricks indicates that the Han architectural style was introduced. Tiles are used for large buildings inside the castle as functional and decorative elements. These structures are considered to have been political and ceremonial places, such as aristocratic residences or government offices. New forms of pottery show the influence of China in daily life. In particular, the emergence of large earthenware vessels suggests that food storage had expanded within Xiongnu society. These items imply changes in the political regime and food management of the Xiongnu Empire. Changes in politics and economy produced new demands, and the ceramic industry was supposed to satisfy them and to strengthen the empire system. However, because people and technologies were introduced directly from adjacent boundary areas without interaction between states, it is generally thought that the most advanced technology in the central area at that time was not introduced into the Xiongnu Empire.

10.7. Conclusion

The introduction of pottery production by reduced firing in a kiln is believed to have started in the Xiongnu Empire in the third century BC. After that, many castles, Han-style architecture and large tombs were built in the empire around the first century AD. The production of tiles and bricks also began around this time. Products of the ceramic industry, such as pottery and roof tiles, were widespread in territories of the Xiongnu Empire, such as South Siberia. The existence of pottery production in the Altai region indicates that these products were locally produced in each area, and that the ceramic industry spread all over the steppe area. Kiln-fired pottery in the steppe area from after the Xiongnu era has some features in common with Xiongnu pottery in terms of technique and ornamentation; therefore, it is obvious that the Xiongnu tradition exerted a strong influence on the ceramic industry in the steppe area. In the future, it will also be necessary to clarify the transition process of the ceramic industry in the steppe area and the actual influence of the Xiongnu tradition in that area.

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11

Ceramics-Firing Kilns of the Southern Russian Far East: Technological and Temporal Dynamics

Irina Zhushchikhovskaya

Abstract: The temporal dynamics of ancient kiln-type ceramics firing structures in the southern Russian Far East bordering China and the Korea peninsula are introduced. The development of ceramics-firing kilns was an important component of technological and cultural history in the region. The oldest evidence of simple kiln-like devices discovered are from the Paleometal period, dating to between 1000 BC and 1000 AD. An example of a vertical updraft firing kiln dates to the Pre-State period around 500 AD, and elaborated kilns have been discovered at sites from the Bohai State period (698–926) and the Jin Empire period (1115–1234). Bohai kilns are of a tunnel-like sloped type, and Jurchen kilns are of a one-chambered "*mantou*" type. The quality of ceramic products indicates that technical capabilities varied, and the examination of specimens fired in certain kilns with scanning electron microscopy and other methods are discussed.

Keywords: Kiln remains, updraft kiln, cross-draft kiln, temperature and atmosphere regimes, pottery, roof tiles, SEM, archeometric analysis

11.1. Introduction

This chapter introduces the development of kiln firing technology in the pottery-making of prehistoric and ancient populations of the southern Russian Far East. The research area is the Primor'e Region, lying to the south of the Lower Amur River and bordering northeast China to the west and the Korean peninsula to the south (Fig. 11.1). According to archeological data the earliest evidence of ceramics-making technology in this territory are dated to around 10,000–7000 BC, which is close to the time of the appearance of pottery in northern China, 10,000–7000 BC, and the southern part of Korean peninsula, ca. 8000 BC (Cho & Ko 2009; Jordan & Zvelebil 2009; Zhushchikhovskaya 2009). During the Neolithic, around 6000–1200 BC, ceramic wares became common, judging by the numerous pottery assemblages coming from archeological sites excavated at various localities in the Primor'e Region. The technology of pottery production at that time was relatively simple and undeveloped. In particular, there is no evidence of pottery firing in kiln-like devices. According to the results of archeological ceramics examination and experimental studies, bonfire (open firing) technology with average firing temperatures of 600–50°C seems to have been practiced widely during the Neolithic (Zhushchikhovskaya 2005: 76–77).

Obvious progressive changes in the physical properties and functional qualities of ceramics took place during the Paleometal period, corresponding primarily to the first millennium BC. These changes concern technological skills as well as morphological and decorative standards. Among the most important changes were increased firing temperatures as a result of improved thermal processing techniques and technologies. The earliest archeological evidence of kiln-like structures in the southern Russian Far East is given in the fragmented remains of sites belonging to the Paleometal period. The remains of more complex, developed and better-preserved ceramics-firing kiln constructions were excavated at sites of the Pre-State period, fourth to seventh centuries AD, and especially at the sites belonging to the Ancient States period, eighth to thirteenth centuries AD. The research area at that time was initially part of the Bohai Kingdom, 698–926, and later part of Jurchen states – the Jin Empire and Dong Xia states – dating generally to 1115–1233 (Zhushchikhovskaya & Nikitin 2014, 2017).

For the Russian Far East as a whole, the Primor'e Region is the only one where the temporal sequence of excavated remains of early firing structures is known. These archeological relics give us important information about the temporal and cultural dynamics of the kiln firing technology applied to ceramics production in prehistoric and historic times. Various kinds of archeological evidence concerning kiln firing technology can be distinguished. The main evidence is, obviously, the excavated remains of firing devices, which are quite important for judgments about the type of kiln construction and its technical capabilities. The fired ceramics discovered inside the excavated structure or in close proximity are of great value for detecting a kiln's working conditions such as temperature and atmospheric regimes, and the estimation of the quality of the finished product. The bulk of ceramic artifacts discovered at

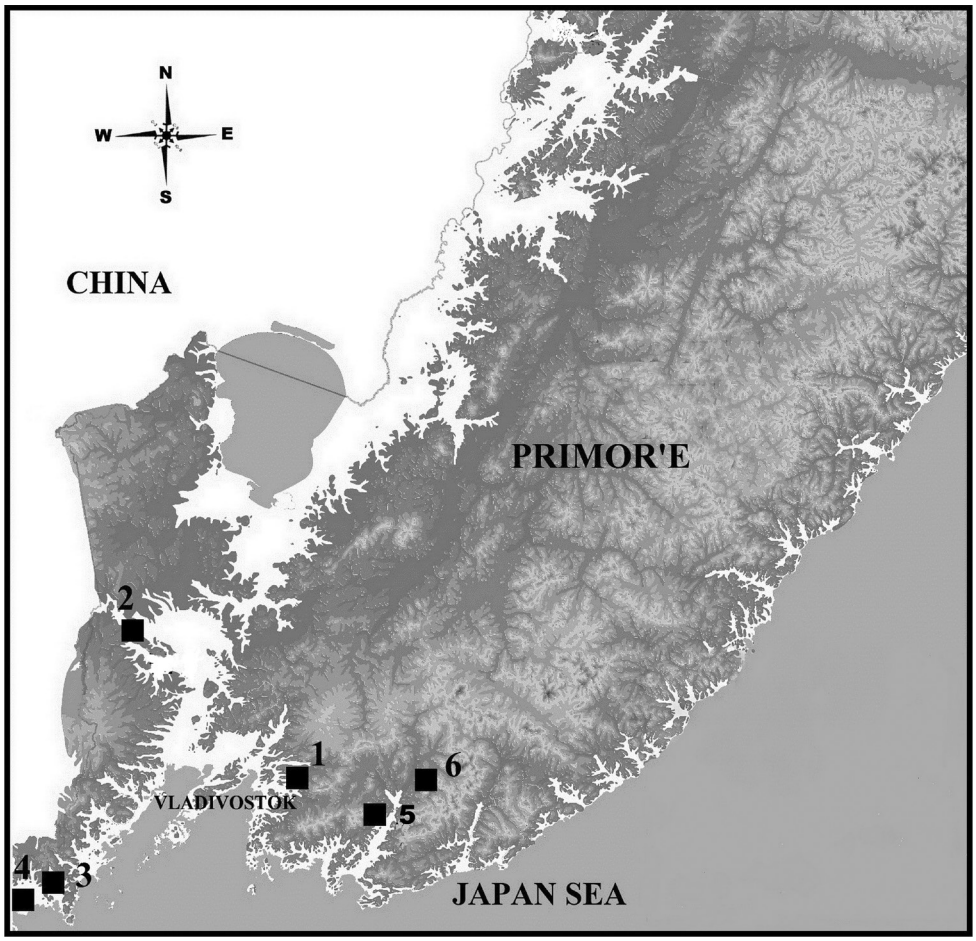

Figure 11.1. Research area and locations of referenced sites. 1: Malaya Podushechka; 2: Chernyatino-2; 3: Troitsa; 4: Kraskino walled settlement; 5: Sergeevka; 6: Lazovskoe walled settlement.

archeological sites is used as an additional source of information on firing technology. In current research the set of methods, including testing by refiring, color analysis, water absorption testing, surface hardness testing, thin-section analysis and SEM-EDS analysis, is applied to determine the ceramics' features and properties brought about by the conditions of firing. These methods are commonly used in archeological ceramics studies (Shepard 1985 [1956]; Bjork 1995; Daszkiewicz & Schneider 2001, Daszkiewicz 2014; Day et al. 2006; Quinn 2009; Maniatis 2009; Gasparic et al. 2014).

Archeological data from the Primor'e Region on kilns for firing ceramics are considered a part not only of technical and technological history but also of cultural history. By tracing the origin and spatial spread of the types of kiln construction it is possible to identify cultural interactions and influences. The history of the research area has been closely connected with the history of other territories of East Asia and, in particular, China, which from the earliest times was the "native land" of many technological innovations. This concerns in great measure ceramics technology, especially firing devices such as long ("dragon")-type kilns and *mantou* ("steamed bun")-type kiln construction (Kerr & Wood 2004; Hein 2008; Gerritsen 2012).

This chapter considers archeological materials on ceramics kilns and the dynamics of firing technology in the southern Russian Far East in chronological and historical order, distinguishing the Paleometal period, Pre-State period and Ancient States period.

11.2. Paleometal period: the oldest firing devices

The Paleometal period is represented by a series of archeological sites within the temporal framework of the border of the second to first millennium BC and the early first millennium AD. That was a time when the first metals – bronze and iron – appeared in the southern Russian Far East almost simultaneously, with very short temporal separation. Metal artifacts are few at sites of the Paleometal period, and no sure traces of local bronze and iron metallurgy have been detected to date. Currently, in archeological studies of the research area the term "Paleometal" has been adopted to be more flexible and correct than the classic definitions "Bronze Age" and "Iron Age" (Zhushchikhovskaya 2018; Popov et al., 2020). The origin of the imported early Russian Far East bronzes – ornaments and knives – is strongly debated (Kon'kova 1989, 1996). The first iron items – axes, knives, arrowheads – are also viewed as imported. The territories of northeast China and the Korean peninsula may be considered as probable

regions from which the first bronzes and irons could have come to the Primor'e Region in the first millennium BC. The sites containing the most important evidence of the first bronzes are concentrated in the western and northwestern Primor'e Region and are dated around the tenth to seventh centuries BC. Prehistoric sites containing iron artifacts are grouped in two archeological cultures – the Yankovskaya culture, ninth/eighth to third/second centuries BC, and the Krounovskaya culture, fourth century BC to third/fourth centuries AD. The Yankovskaya culture area occupied mainly the seacoast of southern and partially southeastern Primor'e; sites of the Krounovskaya culture are situated mainly in the continental areas of the southern part of the Primor'e Region. Although evidence of local iron artifact production is not yet known, traces of "cold" and "hot" metalworking have been detected at some sites of the Yankovskaya and Krounovskaya cultures (Popov et al. 2020).

The Paleometal period definitely marks a new level in the historical development of the southern Russian Far East. Archeological records of the Paleometal period indicate obvious changes in cultural traditions, economy and mode of life in comparison with the Neolithic. In particular, numerous pottery assemblages discovered in Paleometal sites differ significantly in their technological, morphological and decorative features from Neolithic pottery. In turn, the sites of the Yankovskaya and Krounovskaya cultures provide evidence of the most developed technological standards of pottery production. It must be emphasized that the earliest remains of kiln-like structures for ceramics were discovered in sites of these cultures (Zhushchikhovskaya 2005: 76–79; Popov et al. 2020).

11.2.1. Yankovskaya culture

The remains of firing structures were discovered at a single site of this culture – the long-term settlement of Malaya Podushechka (translated as "Small Pillow"), located on a small pillow-like hill in a river valley about 20 km from the seacoast in the southern Primor'e Region (Fig. 11.1). This is a two-component archeological site. The lower component is represented by a settlement of the Yankovskaya archeological culture that was almost completely excavated in the mid-1960s. According to the settlement, about 1000 m² contained the remains of seven pit-dwellings and 15 ground burials scattered around. An assemblage of iron artifacts, including several axes, knives and arrowheads, was found during excavations of the Yankovskaya cultural layers. The site is dated to 480±50 BC (Andreeva et al. 1986: 39–50, 190).

Three localities of fragmentary remains of kiln-like firing structures were discovered within the settlement area. The remains looked like amorphous oval-like heaps of burned pieces of clay with inclusions of traces of coarse straw. The thickness of the heaps of the burned clay pieces was up to 0.3–0.4 m. The heaps were situated on smooth ground and were arranged in a row at a distance of 3.0–4.0 m from one another. The horizontal plan of two heaps was about 3.0 m by 2.0 m, with one about 5.0 m by 4.0 m. At this largest location small pits were discovered around the burned clay heap – probably traces of a wooden canopy-like structure. At one locality the smooth ground under the heap of burned clay pieces was covered by a thin layer of burnt clay. Inside the heaps, assemblages of well-preserved fired ceramic vessels of mostly medium sizes were found. The number of vessels varied from to 5 to 10 at different heaps. The bright color of the vessels' surfaces indicates an oxidizing firing regime.

In general, the firing devices discovered at the Malaya Podushechka settlement can supposedly be reconstructed as simple structures built of daub, i.e. clay mixed with chopped straw. No clear evidence of fuel and firing chambers, or separate areas, was detected. Kilns of this type usually have two holes – one for loading fuel and another for the draft. It seems likely that the presumed firing structures were similar to devices still employed in traditional pottery-making in some regions of the world (Bareš et al. 1982: 191–208). The remains of simple kiln-like updraft firing structures built of clay or daub have been excavated in several places in the world. These are cases of kilns unearthed at Neolithic and Bronze Age settlements in Czech territory (Thér 2004; Thér & Gregor 2011), at Eneolithic settlements of Central Asia, about the middle of the fourth to the middle of the third millennium BC (Khlopin 1964: 120–23), and at the Eneolithic Krašnja site in Slovenia, dated to 4750±35 BP (Gasparic et al. 2014).

One cannot judge the temperature regime of the kilns discovered at the Malaya Podushechka site accurately, because the ceramics found inside have been studied by their morpholopgy and external technological features but not with scientific analyses. However, the examination of pottery samples from various sites of the Yankovskaya culture provides some knowledge about the adopted firing technology. Previously, based on the results of refiring testing and thin-section analysis of selected samples from several sites, it was supposed that the average temperatures of firing pottery in the Yankovskaya culture were 700–750°C (Zhushchikhovskaya 2005: 76–78). Such temperatures could be achieved in simple kilns or even in bonfires. Recent investigations are précising this conclusion.

The average water absorption (WA) index for oxidizing-fired ceramics from several Yankovskaya culture sites (settlements) varies from 12.4 percent to 18.6 percent. The measurement procedure is well established and described e.g. by Shepard (1985 [1956]: 127) and Rice (1987: 351–53), and explanation of the data gained from the measurements is based on the scientific evaluation of the ceramics WA indexes. WA values of 5.0 to 7.0 percent and less are evaluated as very low ones, corresponding to a true dense ceramic body of high quality. The 5.0 to 15.0 percent values are estimated as moderate ones, corresponding to a ceramic body of satisfactory

quality. Values of 15.0 percent and more are high ones, corresponding to a porous, fragile and weak ceramic body (Avgustinik 1975: 221–22; Shepard 1985 [1956]: 127–30). So, it may be concluded that different average WA indexes of the pottery from various Yankovskaya culture sites indicate different quality levels of the finished products.

SEM-EDS examination of pottery samples from different sites shows various kinds of ceramic body microstructure, depending on the degree of clay sintering (vitrification) and correlating in general with the measuring of data on the WA index (Zhushchikhovskaya 2017). In the ceramics assemblages with moderate average WA indexes (12.4–13.5 percent) there are certain samples

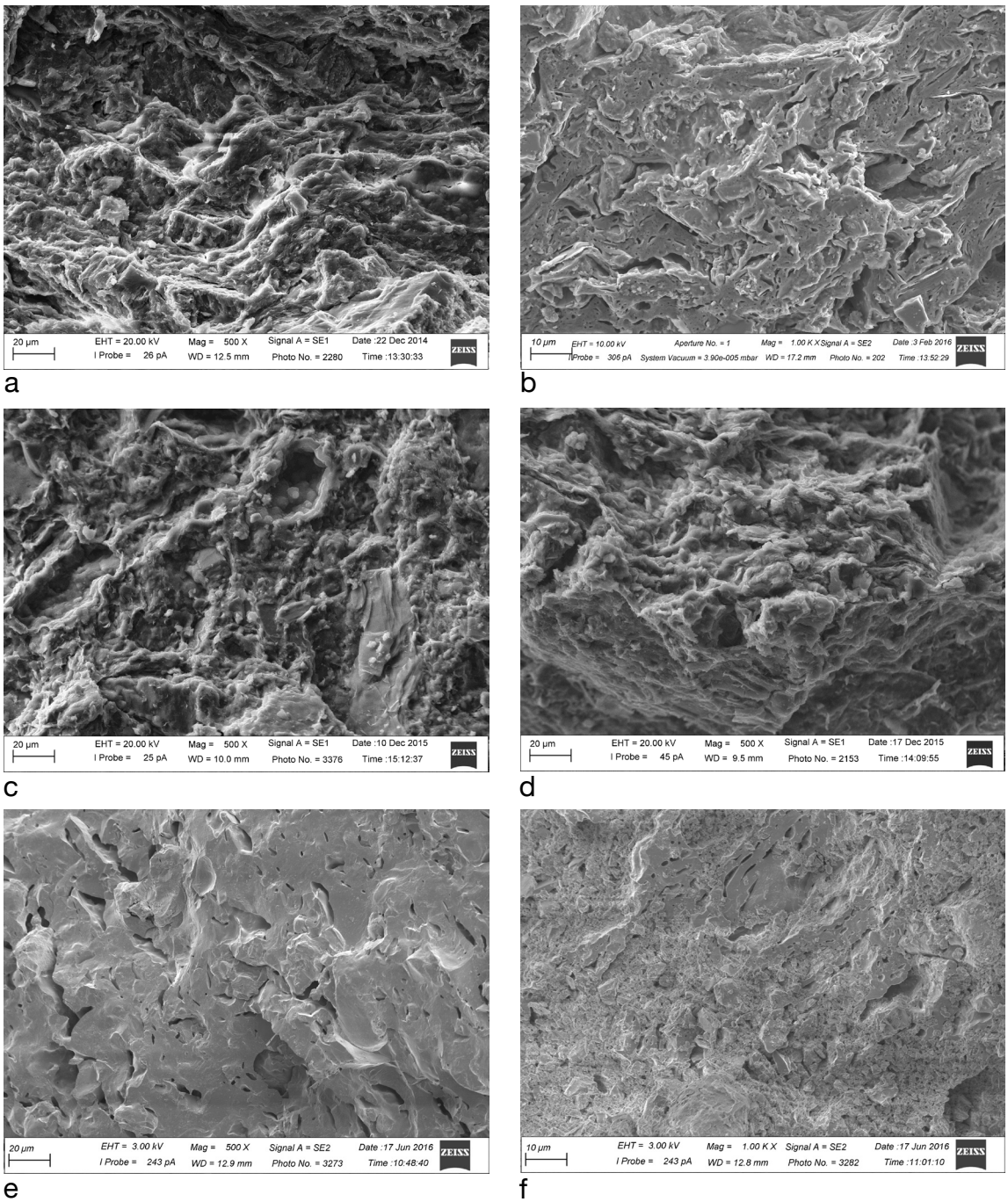

Figure 11.2. Electronic micrographs of ceramics body samples with different grades of vitrification. a: Paleometal period, Yankovskaya culture, Solnechnyi Bereg: initial vitrification (Zhushchikhovskaya 2017). b: Paleometal period, Krounovskaya culture, kiln area in Chernyatino-2: extensive vitrification (Zhushchikhovskaya & Nikitin 2019). c: Paleometal period, Krounovskaya culture, kiln area in Chernyatino-2: initial vitrification (see b). d: Pre-State period, Troitsa kilns site: initial vitrification (unpublished). e: Ancient States period, Kraskino walled settlement: extensive vitrification (Zhushchikhovskaya 2017). f: Ancient States period, Kraskino walled settlement: initial vitrification (see e). g: Baekje period, Korea. Neungsanri saji. Microstructure with the evidence of almost total vitrification (see e). h: Ancient States period, Sergeevka kilns site: extensive vitrification (see e). i: Ancient States period, Sergeevka kilns site, microstructure with evidence of almost total vitrification. j: Ancient States period, Sergeevka kilns site, microstructure with evidence of extensive vitrification. k: Ancient States period, Sergeevka kilns site, microstructure with evidence of initial vitrification.

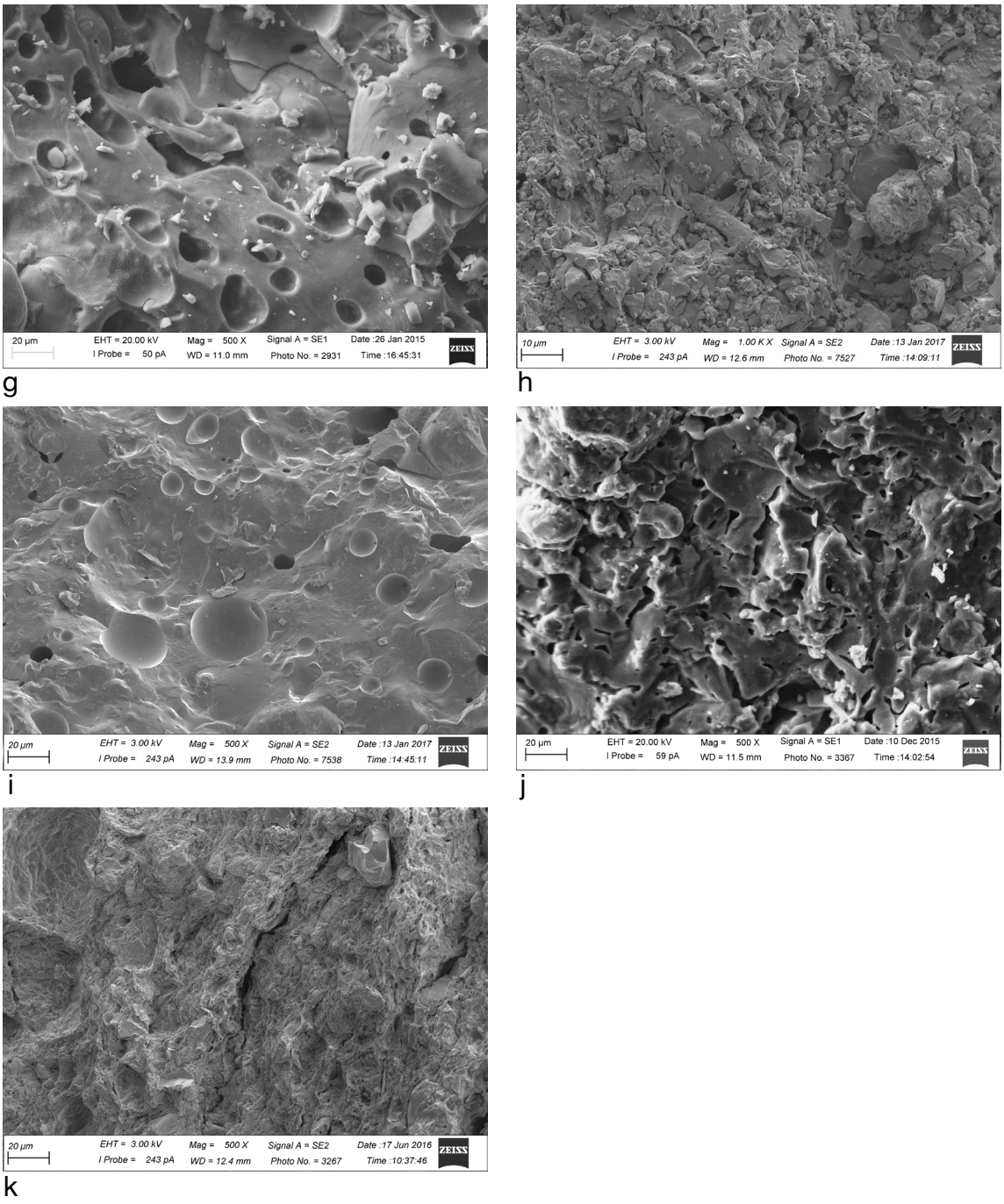

Figure 11.2. (*Continued*).

with relatively low WA values (8.4–10.5 percent) and traces of initial vitrification of the clay matrix (Fig. 11.2a). These observations indicate a probable firing temperature of 800°C and above for non-calcareous clays (Tite & Maniatis 1975; Maniatis 2009). For comparison, samples with WA values ≥ 12.0 percent show no evidence of clay matrix vitrification. According to research data a temperature up to 800°C may be achieved in the simplest prehistoric updraft kilns. This temperature is supposed for the Eneolithic kilns excavated at the Krašnja site in Slovenia (Gasparic et al. 2014).

Supposedly, the different qualities of ceramic bodies may be explained by some differences in firing technology. Temperatures of 800°C and above correspond to kiln firing rather than a bonfire. The discovery of simple kiln-like remains at the Malaya Podushechka settlement and the data of ceramics examination indicate the usage of kiln firing technology. However, it seems likely that this technology was practiced sporadically, not being the uniform standard of pottery-making.

11.2.2. Krounovskaya culture

The only evidence of a pottery-firing kiln structure was discovered at the multi-layered site (settlement) of Chernyatino-2, located on the bank of the Orlovka River in the western Primor'e Region (Fig. 11.1)

(following a description of the findings according to Zhushchikhovskaya & Nikitin 2019). The remains belong to a layer of the Krounovskaya culture substantially destroyed by the activity of later settlers, though preserved in some parts of the site. Preliminary dating of this cultural layer is about third to fourth centuries AD. It was definitely noted that a firing kiln was located inside the Krounovskaya culture settlement area, in the vicinity of the pit-houses. It is possible to determine the main structural features of the firing kiln.

The kiln's floor, lying 0.20 m deep below the surface, was oval-shaped in contour, 2.30 m in length and of 1.90 m maximal width. The floor had traces of burning and was inclined at 10–15 degrees from the southeast to northwest, with a step-like separation between the lower fuel section (firebox) of about 0.50 m² and the upper firing section (fire chamber) of about 2.48 m². Above the floor and on top of a thick accumulation of burned clay-straw mixture were heaped the remains of the destroyed above-ground part of the kiln. On some burned pieces impressions of a wooden framework were detected. It may be concluded that the firing structure was close to a type of tunnel-like sloping kiln with a dome-like upper part built of a clay-straw mixture on the wooden frame.

Few pottery fragments were uncovered inside the kiln, but many fragments were found in close proximity. Some fragments have visible traces of firing damage such as deformation, cracking and swelling. A few samples had a very fragile, crumbling structure indicating a low firing temperature that was not high enough to allow sintering of the clay. Examination of the pottery samples from the cultural layer where the kiln's remains were unearthed achieved the following results. The ceramics water absorption index rates were from to 7.4 to 13.1 percent, with an average value of 10.7 percent. SEM has shown that some samples, in particular the ones uncovered inside and near the kiln remains, have a microstructure with evidence of initial and extensive vitrification (Fig. 11.2b, c). Taking into account that, according to SEM-EDS analysis, the ceramics were made of non-calcareous clays, the SEM data hint at firing temperatures in the interval 800–900°C (Tite & Maniatis 1975; Maniatis 2009). Judging by the pottery surfaces and fracture colors, the ceramics-firing was conducted in most cases under an oxidizing atmospheric regime. However, at the Chernyatino-2 site and other sites of the Krounovskaya culture, series of dark gray or black pottery are present. The refiring of these ceramics samples at a temperature of 500–50°C causes the color to change from black to yellowish, reddish or brown. This definitely indicates a "blackening" firing in a smudging, carbon-saturated atmosphere (Shepard 1985 [1956]: 88–90, 220). The accumulation of "hard" carbon micro-particles causes not only the appearance of a black or dark gray color but also decreasing porosity and water absorption. Within the above-noted range of WA indexes of Chernyatino-2 ceramics the lowest rates are detected for black pottery samples.

The main structural features of the excavated kiln are the elongated contour, slightly inclined floor and step-like separation between the fuel and firing sections. This was a simple structure not of large capacity though the achieved temperatures were enough for producing ceramics of a satisfactory quality. The closest spatial and territorial analogies for these kiln structures are connected with archeological sites of the Korean peninsula of the third to early fourth centuries AD. The earliest evidence of tunnel-like sloping kilns have been recognized at the sites of Sansuri, Daegokri and some others. These tunnel-like sloping kilns were larger and more developed than the kiln at the Chernyatino-2 site. The supposed firing temperature achieved in the Korean kilns is around 1000°C (Barnes 2001: 107–14; Kim 2003). Researchers suggest that the earliest Korean tunnel-like kilns are descendants in their construction type of long, or dragon kilns (Barnes 2001), first invented in China in the first millennium BC (Hein 2008).

In general, the Paleometal period was a time of progressive change in pottery-firing technology in comparison with the Neolithic. Certainly, kiln firing began to be adopted in the research area during the Paleometal period, resulting in firing temperatures increasing and ceramics quality improving. Archeological records indicate a certain synchronization between the appearance of the first metals and metalworking knowledge in the southern Russian Far East in the first millennium BC on the one hand, and an improvement in firing technology in pottery-making craft on the other. The thermal processing of raw material is the technological essence and main condition for the production of both ceramics and metals. The problem of connecting the thermal processes and technical equipment of pottery-making with those of metallurgy and metalworking is a complex study. The data from other world regions allow the supposition that the invention and development of metallurgy and metalworking were the "catalyst" for innovations and achievements in ceramics-firing technology (Kushnareva 1970; Shangraw 1977; Saiko & Terekhova 1981). In the southern Russian Far East there is no definite evidence of the development of local metallurgy or metalworking in first millennium BC (Popov et al. 2020). In spite of this, it could not be excluded that even restricted knowledge about thermal metal processing influenced – directly or indirectly – the technical and technological potential of pottery-making.

11.3. Ceramics kilns of the Pre-State period

This stage of the past history of the southern Russian Far East, dated from the fourth to the seventh century AD, is marked by complex cultural and demographic processes, in particular the coming of new population groups. These processes are described by Dyakova (2014) as follows: The Mokhe (this name is known based on old Chinese historical chronicles) tribes spread widely over northeast China, the Primor'e Region and the Amur River valley down to the coast of the Sea of Japan. Settlements and cemeteries attributed to the Mokhe cultural community are

numerous in the research area, especially in the central, western and southern parts of the Primor'e Region. Artifact assemblages from the sites indicate developed iron and bronze metalworking, elaborated military skills, jewelry craft and other productions and crafts. Horse- and cattle-breeding and agriculture were the main branches of the economy. The Mokhe tribes were an important ethnic component in the formation of the first state in Northeast Asia – the Bohai Kingdom (698–926). The cultural connections and contacts of the Mokhe tribes were very active and widespread, including in northern China and Central Asia.

Ceramic wares were common items in every Mokhe settlement of the Primor'e Region. Several local variants of pottery-making traditions differing in morphological and decorative standards can be distinguished, as well as technological standards (Piskareva 2005). Pottery assemblages from southwestern Primor'e sites show evidence of more accurate shaping, probably with the use of turn-table equipment, and higher-temperature firing in comparison with pottery from some other areas. A single kiln site was discovered on the margin of the southwestern seacoast, in Troitsa Bay (Fig. 11.1). The site, named Troitsa, was mostly destroyed. However, in the preserved part the remains of two kiln-like structures were detected and excavated in the early 1980s (Andreeva & Zhushchikhovskaya 1986; Zhushchikhovskaya & Nikitin 2014). According to the data from fieldwork, both structures can be reconstructed as two-leveled and of roundish horizontal plan. The furnace chamber (firebox) was embedded into the earth to a depth of about 0.80 m and had a fuel-loading hole at the side. The bottom diameter of the furnace chamber (firebox) of kiln N2 was about 1.50 m, and that of kiln N1 was 1.25 m. The bottoms and walls were formed of granitic slabs that had been burned intensely judging from the melting of quartz grains. The upper level of the kiln structure was the firing chamber, with a dome constructed of a clay-straw mixture, probably on a wooden frame. Multiple burnt pieces of the destroyed domes were scattered around the kiln remains. Some traces of a grate-like floor between the firebox and the firing chamber were detected at kiln N2. The floor was made of clay and small pebbles. Obviously, the direction of the hot air draft inside the kiln was vertical, from lower to upper level.

No samples of ceramic production were discovered inside the kilns but about 20,000 pottery fragments were found nearby. In some cases the evidence of firing damage was clearly visible on the fragments – surface cracks and deformation. Most of the pottery samples are of a light orange color on the surface and in the fracture, without a dark core. This indicates uniform oxidation of the clay body. In some cases the surfaces and fractures of ceramic samples are of a black color caused by smudging. Preliminary thin-section analysis executed after the excavations has shown that the pottery was produced from a clay paste containing calcite inclusions. In general, raw calcareous clays are not characteristic for the research area, and this case of calcite-tempered archeological ceramic paste is the only one known for the southern Russian Far East. Recent SEM-EDS analyses of several pottery samples conducted by the author confirm a high content of Ca in the ceramic body composition. In the elemental chemical spectra the Ca content varies from 3.0 to 40.0 percent.

The results of the Troitsa kiln site ceramics examination are interesting as regards suggestions about the firing temperature regime. Thin-section analysis revealed evidence of some degree of destruction, or decomposition, of the calcite matter occurring upon the heating. However, the decomposition process was not completed. Under SEM examination, evidence of initial vitrification of the clay matter was recognized in some cases (Fig. 11.2d) (Andreeva & Zhushchikhovskaya 1986; Zhushchikhovskaya & Nikitin 2014). Recent WA indexes measured for ceramic samples fired under an oxidizing regime varied mostly from 12.8 to 15.5 percent, indicating a relatively porous body. WA indexes for black, or smudged, samples were from 10.0 to 11.2 percent. However, the surface hardness index of the pottery samples is around 6.0–6.5, indicating a relatively high strength for the ceramic material.

Researchers note (Tite & Maniatis 1975; Leicht 1977; Shepard 1987: 22, 30; Bong et al. 2008; Palanivel & Meyvel 2010; Liu et al. 2013) that precise statements about firing temperature are far from always possible in the case of calcite or carbonate tempered pottery. The thermal behavior of calcareous ceramic paste differs significantly from that of a non-calcareous paste. The decomposition of calcite matter develops between 650°C and 898°C. After passing 898°C the fast and immediate decomposition of calcite occurs. If the firing is short and rapid no visible evidence of calcite matter changes may be noted before 750–800°C. The clay matrix vitrification process in calcareous pastes begins at about 30–60°C below the temperature of non-calcareous pastes. During thermal processing a calcite-containing clay body acquires a porous structure unaltered at high temperatures. The increase in firing temperature up to 850–900°C and above provokes the risk of ceramic body damage resulting from the "popping" of calcite particles. But if the firing schedule is conducted correctly, especially at temperatures above 750–800°C, the finished product is undamaged and of good quality, and in particular of relatively high surface hardness. In general, a crucial condition of successful firing of calcareous ceramic pastes is special attention to regulation of the temperature regime, which demands a high level of skill on the potter's part.

Considering these assumptions about the firing process of calcareous clays, the above analyses of the material from the Troitsa kiln suggest firing temperatures not higher than 800–850°C. Inside the fuel chamber the temperature was raised to more than 1000°C, judging from the melting of quartz grains in granite slabs of the chamber's facing walls. Based on the degree of oxidation of the ceramic

bodies, one can suggest a sufficient duration of firing time, providing an even thermal processing of the entire thickness of the ceramic pots' walls. The finished ceramic product had a relatively porous but strong body. Obviously, the technological cycle of calcite-containing-ceramics firing in Troitsa kilns was executed efficiently.

No analogues of Troitsa two-leveled kilns are known in the research area or the neighboring territory of the Korean peninsula. In China updraft firing kilns were used during the Shang period, later being replaced by long-type kilns in southern China and *mantou* type kilns in northern China (Gerritsen 2012; Kerr & Wood 2004: 314–34; Hein 2008). The geographically closest region for the use of vertical updraft round kilns with a furnace chamber dug into the earth, and with a grate separating fuel and firing chambers, is Central Asia, where these kilns were the basic firing structures for ceramic production from the Bronze Age to the Medieval period. The vertical kilns of Central Asia (Saiko 1982) shared a common line of development in firing structures with the kilns of the Near East, where this type was invented by 6000 BC (Simpson 1997a, 1997b; Saiko 1982). Theoretically, the idea of vertical updraft kiln construction might have been imported by the Mokhe people from those regions where this type of firing device was used. Most likely the region of origin was Central Asia. An indirect argument for this scenario may be the traditional high mobility of the Mokhe tribes and the close connections of some of them with populations in the Steppe Corridor. Obviously this idea needs further research. In particular, northeastern China is considered a prospective area for the search for probable evidence of kiln remains used in Mokhe pottery production.

11.4. Ancient States period: advanced kiln technology

11.4.1. Bohai Kingdom stage

This stage of the Ancient States period in the history of Primor'e corresponds to the temporal framework of AD 698–926, when a large part of the research area was included as an administrative periphery in the territorial boundaries of the Bohai Kingdom. The capitals of the Bohai state were located in Manchuria, in modern northeastern China. However, archeological records of the Primor'e Region show evidence of a relatively dense population and active economic and social life in this remote district. The kinds of local archeological sites attributed to the Bohai Kingdom period are the remains of walled settlements, village settlements and temples (Boldin et al. 2012; Dyakova 2014; Ivliev 2010). Two large groups of ceramic products are present – pottery for various functions and needs, mostly produced with the pottery-wheel, and architectural ceramics including roof tiles, roof ornaments and bricks. At present, two sites of the Bohai period containing the remains of kilns are known in the Primor'e territory.

A famous site containing ceramics kiln structures is the Kraskino walled settlement located in southwestern Primor'e, not far from the seacoast (Fig. 11.1) (Gel'man 2005, 2016). This was an important administrative, transportation and trading center that supposedly played a significant role in communication between the Bohai Kingdom and the Early States of Japan. The first evidence of Bohai period firing kilns was discovered at the Kraskino walled settlement in 1980. From 1980 to 2005 the remains of large ceramics kiln assemblages were excavated at this site (Boldin & Nikitin 1999). One kiln assemblage was situated on the margin of the northwestern part of the Kraskino site, quite close to the ancient town's wall. The assemblage of kilns was located around the remains of a small building interpreted as the pavilion of a Buddhist temple. The excavations discovered a square platform 3.8 m by 3.8 m formed of pebbles and soil, the remains of a collapsed tile roof, and some items connected with the Buddhist cult. An ancient well was also excavated in this area (Fig. 11.3).

The remains of several structures situated at some distance from one another were distinguished (N1, 2, 3, 11, 12), as well as a group, or cluster, of structures (N4–10) located quite close one to another, in some cases covering each other. This situation indicates that kilns were built and exploited not simultaneously but during some temporal interval. In some cases later kilns were built on the site of destroyed early ones. The nine excavated structures have been definitely identified as sloping tunnel-like firing kilns embedded in the ground (Fig. 11.4). Three objects (N3, 9, 10) in a poor state of preservation cannot be interpreted clearly.

The kiln floors were embedded in the earth 0.3–0.8 m and inclined artificially at an angle of 10–15 degrees. The walls of the tunnels are made from earth and were reinforced with stones. In the case of kiln N1, the lower parts of the tunnel walls were faced with broken tiles. Three functional parts of the kiln structure may be recognized: the fuel (furnace, firebox) section at the tunnel's lower end, the flue section at the tunnel's upper end, and the firing section (fire chamber) occupying the most space in the tunnel, between the fuel and flue sections. The flue section of most of the kilns contained a burnt soil layer and ash deposits. In some cases the spots of burnt soil could be traced to the floor of the firing section. In the cases of kilns N4, 6, 8, there was a partition between the fuel and firing sections constructed of pebbles and broken tiles. In most cases a round pit 0.3–0.5 m deep was located in front of the fuel section. At several kilns the remains of a tube-like chimney built of pebbles were discovered at the upper end of the tunnel. In the case of kiln N4, traces of two chimneys were unearthed. The length of the kilns, without the pit near the furnace, varied from 3.3 m to 5.1 m, and the maximal width varied between 1.6 m and 3.0 m.

The kilns' superstructures were totally destroyed. The large number of amorphous pieces of fired clay with the traces of burnt plant inclusions found around the kiln remains are interpreted as fragments of vault-like superstructures. The only excavated evidence of ceramics production

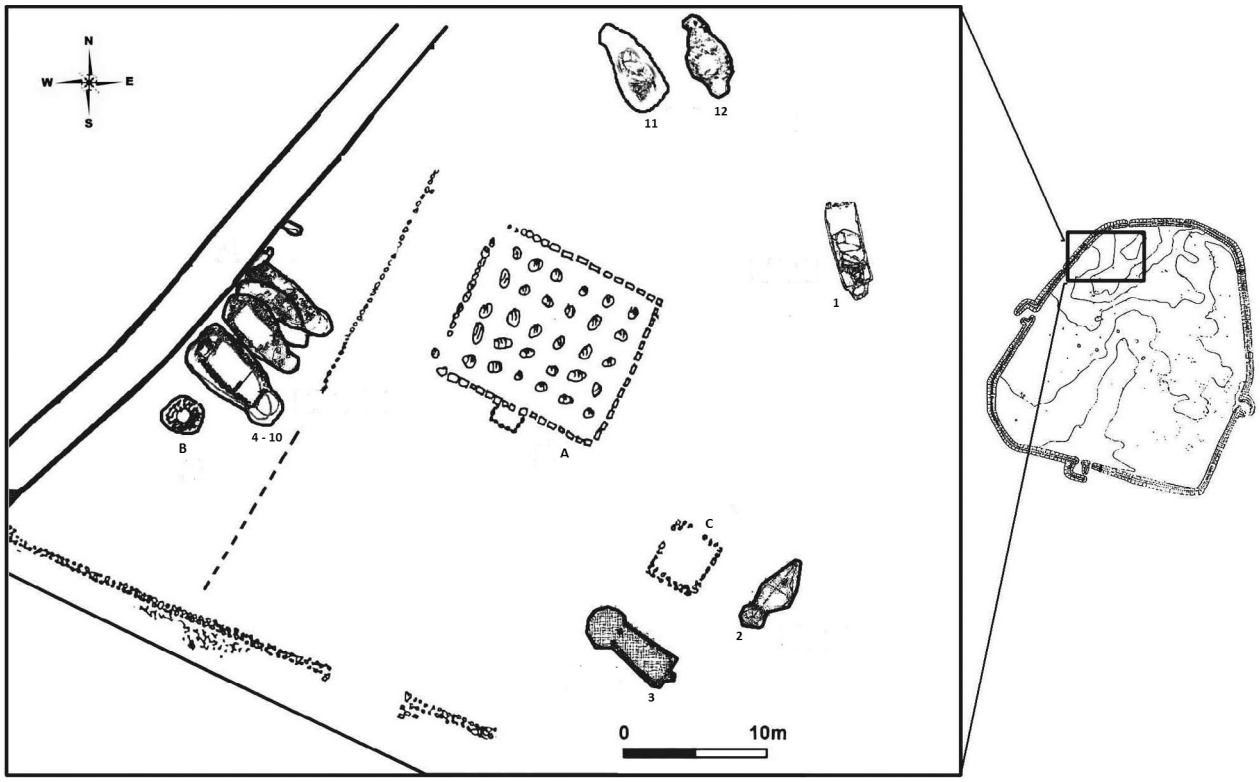

Figure 11.3. Kraskino walled settlement. Location of the kiln complex. 1–12: Kilns and kiln-like structures. A: Temple platform remains. B: Well. C: Remains of a small platform (from Zhushchikhovskaya & Nikitin 2014).

Figure 11.4. Kraskino walled settlement. Remains of kiln N4 in *situ* (from Zhushchikhovskaya & Nikitin 2015).

connected with the kiln remains are roof tiles. Samples of tiles – but not in large number – were found inside and outside kilns N1, 4, 5, 6, 8. A series of samples of ceramics spoilage were discovered. These are tiles with traces of deformation, cracking, swelling and surface melting. Tiles from the remains of the kilns are very similar in their morphological features to tiles unearthed in the area of the temple pavillion. The kilns were presumed to be destined first for serving the need for roof tiles for the construction and further restoration of temple buildings.

Some preliminary information about firing conditions in the Kraskino kilns, in particular the temperature regime, may be obtained from examination of the tile samples (Table 11.1). The correlation of data on WA testing, surface hardness measurement and SEM-EDS analysis will indicate temperature regimes applied in firing tiles. The highest temperatures are supposed for only a few samples – tile fragments of an even gray surface color and fracture, and with a relatively dense and hard body. The WA index of these samples is 6.2–6.5 percent. This is characteristic of a relatively low-porosity ceramic body produced by high-quality firing (Avgustinik 1975: 221–22). The surface hardness index of these samples is high – around 7.0. SEM-EDS analysis of a sample with a WA index of 6.2 percent indicated evidence of an extensively vitrified ceramic microstructure with a non-calcareous, low refractory clay matrix (Fig. 11.2e). Vitrification of this extent may be achieved in this kind of clay at temperatures of 900–50°C, or even somewhat above, under an oxidizing atmospheric regime. Under a reducing regime, vitrification processes occur at

Table 11.1. Summary of properties of kiln-fired ceramics in Primor'e region, southern Russian Far East described in the text. Stars (*) indicate sites with excavated kiln remains

Period-Date	Culture-Site-Date	Physical Properties of the Ceramic Bodies				
		Degree of ceramic body vitrification (under SEM analysis)	Water absorption index (Open porosity index) %			Surface hardness (Mohs scale)
			High	Moderate	Low	
PALEOMETAL period, IX-VIII c. BC-IV	YANKOVSKAYA culture Malaya Podushechka site*	–	no data	no data	no data	no data
	YANKOVSKAYA culture Novyi Mir, Solnechnyi Bereg, Cherepakha-7 sites	No vitrification Initially vitrified	16.0 – 18.9	9.2 – 15.6		3.0–4.0
	KROUNOVSKAYA culture Chernyatino-2 site* (ca. 3rd–4th century AD)	Initially vitrified and extensively vitrified		7.4–13.1		no data
PRE-STATE period, IV-VII c. AD	MOKHE culture Troitsa kiln site*	No vitrified and Initially vitrified		10.0–15.5		6.0–6.5
BOHAI STATE period 698–926	Kraskino walled settlement*	No vitrified and initially vitrified Extensively vitrified		9.2–12.0	6.2–6.5	5.0–6.0 6.5–7.0
JIN/DONG XIA STATES period 1115–1234	Sergeevka kiln site*	No vitrified Initially vitrified Extensively vitrified Almost totally vitrified	14.5–19.1	10.0–14.2	4.2–5.8 0.7–3.0	4.0–5.0 no data 7.0–8.0

temperatures of no less than 50°C lower (Day et al. 2006; Maniatis 2009). So, in the case considered the supposed firing temperature is between 850 and 900°C or slightly above.

More common are gray and sometimes yellowish tiles with a "softer," more porous body. The WA index of this series of samples ranges from 9.0 to 16.2 percent, that is, corresponding mostly to the moderate level. In most cases the surface hardness index is 5.0–6.0. SEM-EDS analysis of several samples with a WA index of 9.9 to 11.7 percent indicates that vitrification of a non-calcareous, low refractory clay matrix is in its initial stage (Fig. 11.2f), or not quite attested. The analyses show an initial vitrification in low refractory clays corresponding mainly to firing temperatures of 800–50°C under an oxidizing atmosphere, and a somewhat lower temperature under a reducing atmosphere. The absence of evidence of the vitrification process in the clay microstructure indicates firing temperatures under 800°C (Bjork 1995: 52–57; Day et al. 2006: 152–56; Maniatis 2009).

Thus, it may be supposed that the ceramics kilns of the Kraskino walled settlement worked mainly within the interval 800–900°C or a little above. This consideration is roughly confirmed by the examination of gray wheel-made pottery from the Kraskino site and some other Bohai sites of the research area (Zhushchikhovskaya 2017). Most common in pottery assemblages are samples with a WA index of 9.0–11.5 percent. Evidence of initial vitrification of a non-calcareous low refractory clay matrix is revealed by SEM-EDS analysis, indicating probable firing temperatures around 800°C or a little above under a reducing atmosphere. In rare cases pottery samples have a low WA index of 5.8–8.2 percent, indicating probable higher firing temperatures. Certain samples show extensive vitrification of the clay matrix probably caused by temperatures of 850–900°C under a reducing atmospheric regime (see Table 11.1).

Another set of remains of Bohai period firing kilns was detected in the mainland part of the southern Primor'e Region, in the Krounovka River valley (Fig. 11.1). The fragmented remains of five firing structures were excavated near the river, close to a settlement (Korsakovskoe-1 site) and to a neighboring Buddhist temple (Korsakovskoe-2 site). Radiocarbon dates for the kiln structures closest to the temple are: 1500±160, 1030±40, 1090±35 BP (Kuzmin et al. 2005). All kilns were substantially damaged, though the main structural features can be recognized. These are the elongated plan, the slightly sloped floor deepened into soft alluvial soil to 0.7–1.3 m, and the structural division into three parts – fuel section, firing section and flue section. The maximal length of a kiln's tunnel was about 4.0 m in one case. In other cases the length varied from 2.5 m to 3.5 m. The floors and walls were covered with a layer of dense, burned clay. In two cases traces of a tube-like chimney formed of clay and pebbles were unearthed. In three cases the remains of collapsed domes formed of burnt clay mixed with straw were discovered. The inside area of the excavated kilns showed no signs of ceramics

production. However, some fragmented tiles were found near the remains of the kilns.

Sloping tunnel-like ceramics-firing kilns unearthed at the Bohai sites in Primor'e, at the Kraskino walled settlement, seem at first to be very similar in main construction principles to sloping tunneled, or climbing, kilns that were invented on the neighboring Korean peninsula in the third to fourth centuries AD, during the Three Kingdoms period, and widely used from that time up to the recent past (Rha 2006: 111–12; Kim 2013; Lee 2007, 2015; Barnes 2001: 92–124). As some researchers suppose, the main construction idea of Korean tunneled kilns goes back to long, or dragon, kilns that originated in the Yangtze basin in the first millennium BC. Later, this kiln construction was adopted in many regions of East and Southeast Asia (Kerr & Wood 2004: 347–64; Hein 2008). Kilns at Bohai sites in Primor'e may be considered the northeastern-most case of the spread pattern of the sloping tunneled kiln type.

Comparing the kiln structures excavated at the Bohai sites of the southern Russian Far East with the neighboring Korean sloped tunneled kilns, one can note certain differences in their sizes and firing conditions. The kilns of the third to sixth centuries, which are somewhat older than the Bohai kilns of Primor'e, had a tunnel length of 6.0–10.0 m (Kim 2013; Lee 2015). That is certainly more than the tunnel lengths of the Primor'e kilns described above. Also, the stable firing temperatures achieved in tunneled kilns of the Korean peninsula during the Three Kingdoms period were 900–1000°C, and sometimes up to 1100–1200°C. These kilns produced high-quality gray ceramics, which are considered similar to stoneware (Barnes 2001: 117–24; Rha 2006: 33–35; Lee 2015).

Our SEM-EDS examination of a small series of pottery samples from Baekje, the Neungsanri-saji site, dated to the sixth/seventh centuries, confirms the opinion of an advanced technical and technological level of firing process in ceramics kilns of the Three Kingdoms period. The samples show different levels of structural transformation and vitrification of the fired clay matrix, indicating a wide range of temperature regimes – from 750–800°C to 1050°C and somewhat above (Fig. 11.2g). Accordingly, the Baekje kilns produced ceramics of a different quality – ordinary earthenware with porous body and a "hard" ware with highly vitrified body (Zhushchikhovskaya 2017).

It may be concluded that the kilns of the Bohai sites in the Primor'e territory belonged to the same type as or a type very similar to the Korean kilns of the first millennium AD but were characterized by smaller sizes and less technical potential. It may be supposed that this indicates a later appearance and slower development of advanced firing technologies in the area considered.

11.4.2. Jin/Dong Xia State stage

From 1115 to 1233 the Primor'e Region was, first, included in the Jin Empire (1115–1234) that was established by warlike Jurchen tribes as its northeastern peripheral boundary. Northern China, conquered by Jurchens, was the primary territory of the Jin Empire, where the political, administrative and economic centers were located. In the last stage of the Jin Empire a separate state formation named Dong Xia existed in Manchuria and the Primor'e territories from 1215 to 1233. In the research area the Jin/Dong Xia period is represented by numerous archeological sites reflecting various aspects of life in the Jurchen population. The remains of walled settlements, fortified settlements and temples belonging to the Jin/Dong Xia stage have been discovered and excavated throughout the research area. The remains of high-status courtyards, column-type buildings, metalworking workshops and commoners' houses were discovered in the walled settlements of Krasnyi Yar, Shaiga, Nikolaevka, Anan'evka and others. In a few cases the remains of isolated architectural complexes located outside the walled settlements and settlements were unearthed and recognized preliminary as Buddhist temple sites. Features of Jurchen town planning, building and architectural standards and technologies were influenced greatly by Chinese cultural traditions. Artifact assemblages from Jurchen sites are rich in various kinds of metal tools, weaponry, ornaments, household utensils, coins, imported glazed stoneware and porcelains (Artemieva and Usuki 2010; Ivliev 2010; Li et al. 2018).

Ceramics artifacts of two main groups are common at Jurchen sites. The first group is day-to-day pottery mostly made on a potter's wheel: storage vessels, kitchen needs, table service and objects with technical functions. The second group is architectural ceramics that include roof tiles, bricks and sculpted objects for roof decoration. The concentrations of architectural ceramics are connected mainly with the remains of high-status buildings such as palaces, administrative offices and temples. Most of the ceramics of both groups are gray on the surfaces and in the fractures, indicating firing in special kiln devices under a reducing atmospheric regime. Obviously, the large amounts and qualities of day-to-day pottery and architectural ceramics from Jurchen sites indicate workshop production. Although archeological evidence for ceramics workshops has not been detected within the excavated walled settlements, single cases of ceramics kiln remains are known. The most interesting case is the Sergeevka site on the southeastern mainland of the Primor'e Region, in the valley of the Partizanskaya River, not so far from the two large Jurchen walled settlements of Shaiga and Nikolaevka (Fig. 11.1). The remains of several kilns were detected on the bank of Sergeevka Creek in the vicinity of the modern village of the same name and at a distance of about 2 km from deposits of high-quality potter's clay (Vasil'ev 2009; Zhushchikhovskaya & Nikitin 2017).

The remains of two fragmentarily preserved kilns (N1 and N2) situated at a distance of a little more than 6.0 m apart were excavated. Both are of the same construction type: a single firing chamber built of bricks with a "horseshoe"

horizontal floor plan. In the case of the better-preserved kiln N1, the brick walls of the firing chamber were traced to a height of up to 1.5 m. The firing chamber floors were formed of very densely packed earth. According to excavation data, the firing chamber floor of kiln N1 had a length of 1.97 m and maximal width of 1.67 m. The firing chamber floor of kiln N2 was partially preserved, with a length of 2.4 m. The maximal width of the firing chamber floor was 2.24 m. The inner surfaces of the brick walls were of a dark gray color probably indicating a carbon-saturated reducing atmosphere. No traces of melting activated by the long-term impact of high temperatures on the inner surfaces of the brick walls were detected. The yellowish and light orange outer surfaces were oxidized in the open air.

In the case of kiln N1, traces of a furnace chamber located at the narrowest side of the firing chamber below floor level were revealed. In the cases of both kilns, evidence of flue channels was unearthed at the bottom of the firing chamber's back wall. They were probably joined to a chimney tube at the back of the kiln. However, the areas behind the back walls of both kilns had been destroyed, and no traces of chimneys could be detected. In the case of kiln N2 the lower part of the back wall was better preserved. Six standard flue channels of 0.08 m in height and 0.16–0.17 m in width had been constructed under the floor. In the case of both kilns, several rows of the bricks were located longitudinally on the floor from the furnace chamber to the back wall of the firing chamber. The superstructures of both kilns had been completely destroyed. An accumulation of burnt clay pieces, fragmented tiles and bricks was unearthed at the level of the upper part of the firing chamber walls of kiln N1. Obviously, these were the remains of the kiln's superstructure, which may be supposed to be some kind of dome formed of bricks, tiles and clay.

The firing chamber of kiln N1 was completely filled with fired tiles arranged in piles situated on rows of bricks on the floor. These rows obviously served as supports for the piles of tiles during the firing process. The total number of tiles inside the firing chamber of kiln N1 was 1840. The tiles had not been unloaded, and it may be supposed that the firing process in this kiln had not been completed.

Along with the tiles found inside kiln N1, a large series of broken and sometimes whole tiles was collected in the vicinity of the kilns. The tiles from the Sergeevka site are similar in their morphological standards to tiles common for the Jin/Dong Xia walled settlements in the research area. The characteristic features are: semi-cylindrical shape, a length of 30–31.5 cm, a width of 20–21 cm, and in some cases one arc-curved end decorated by finger-stamped roundish and oval impressions.

An examination of the tile samples from kiln N1 and the tiles collected nearby provides data on temperature and the atmospheric regimes of firing (Zhushchikhovskaya & Nikitin 2017). Most of the tiles from kiln N1 are of a yellowish and pale orange color on the surface and in the fracture, indicating an oxidizing firing regime. The WA index has high values of 14.5–19.1 percent, and the surface hardness index is 4.0–5.0. SEM-EDS analysis was applied to four samples. It was revealed that the microstructure of the ceramic body has an amorphous pattern without any evidence of a vitrified clay matrix (Fig. 11.2h). These data allow the supposition that the temperature during the last firing in this kiln was not above 800°C.

The tiles collected in the area of the kilns are mostly of a gray or dark gray color, sometimes of a light orange color and differing in their quality. Some of them have traces of firing damage, deformation, cracking and surface melting. Some samples have a very dense body with an even gray or bluish-gray color, looking like "stoneware." The WA indexes of these samples are 0.7–3.0 percent, and the index of surface hardness is 7.0–8.0, indicating a high firing temperature. SEM-EDS analysis of four samples with WA indexes of 0.7–2.7 percent reveals microstructures with a highly, or continuously, vitrified non-calcareous clay matrix (Fig. 11.2i). Taking into account a reducing atmosphere for the firing, which accelerates the vitrification process, it seems correct to determine a firing temperature of around 950°C or somewhat above.

Two gray-colored samples with WA indexes of 4.2 and 5.8 percent indicate microstructures with an extensively vitrified non-calcareous clay matrix (Fig. 11.2j). The estimated firing temperature for low refractory clays under a reducing regime is around 900°C. Microstructures with an initially vitrified clay matrix were detected for series of samples with WA indexes of 10.0–14.2 percent (Fig. 11.2k). The supposed firing temperature in this case is 800–850°C or slightly above.

In general, the approximate interval for working temperatures in the Sergeevka kilns is thought to be from 800–850°C to 950°C or somewhat above. It seems likely that two atmospheric regimes – oxidizing and reducing – were applied to the firing process. The case of kiln N1 indicates that an oxidizing atmosphere was initially conducted for a certain amount of time during firing. However, in the final stage of the firing the oxidizing regime might have been changed to a reducing regime. This conclusion is based on the dark gray color of the inner surfaces of the brick walls in the firing chambers of kilns N1 and N2, like the gray and dark gray color of most of the tiles found in the vicinity of the kilns.

Data on the examination of wheeled pottery from various Jin/Dong Xia sites (Zhushchikhovskaya 2017) roughly confirm the above conclusions on firing temperature and atmospheric regimes. In only a few cases can one note samples of a relatively low WA index of 6.0–8.3 percent. The WA index for most is within the limits of 10.0–14.0 percent. For some samples with a WA of 10.0–11.5 percent, SEM analysis indicates initial vitrification of the clay matrix. Based on these data it may be supposed that

the potteries were usually fired at temperatures of 800–900°C, though in rare cases at higher temperatures. The gray color of most of the pottery samples at each Jurchen site indicates firing in a reducing atmosphere, at least in the final stage.

The results of excavations at the Sergeevka site and recent field observations in this area (Zhushchikhovskaya & Nikitin 2017) allow the supposition that a tile-making workshop, including an assemblage of firing kilns, was located in this place. An important factor favorable for the ceramics and tile-making is the close availability of good-quality clay raw material resources and coal deposits that can be considered as fuel resources for the firing process. This area of the Partizanskaya River valley is rich in coal deposits. In particular, these deposits are known in the vicinity of Sergeevka village, a distance of 3–5 km from the kiln site (Anert 1928; Zonn et al. 2016: 115). The Sergeevka kilns are quite similar in their structural features (Fig. 11.5) to the well-known brick-built *mantou* kilns first invented in northern China around the middle of the first millennium AD (Guo 2000; Kerr & Wood 2004: 314–34, 428–43). The *mantou* kiln type is characterized by a single firing chamber with a high dome-like roof and "horseshoe" horizontal plan. The firing chamber had a floor area of up to 10 m² and more. Hot air came in from the furnace chamber located beneath the floor level at the front of the kiln, then moved up and down to the flue channels located in the bottom part of the back wall. The flue channels were joined to the chimney or pair of chimneys behind the back wall. Chinese *mantou* kilns operated at high temperature regimes of more than 1000°C, up to 1100°C for stoneware production, and up to 1300°C for porcelain production. Over the course of time this kiln type became widespread in the ceramic production of northern China, and was also adopted in southern China. According to archeological investigations in northern China, *mantou* kilns were located in clusters in areas with available potter's clay resources. After about the tenth century coal replaced wood as fuel for firing ceramics, and the vicinity of this resource became a very important factor in the location of tile- and brick-making kilns.

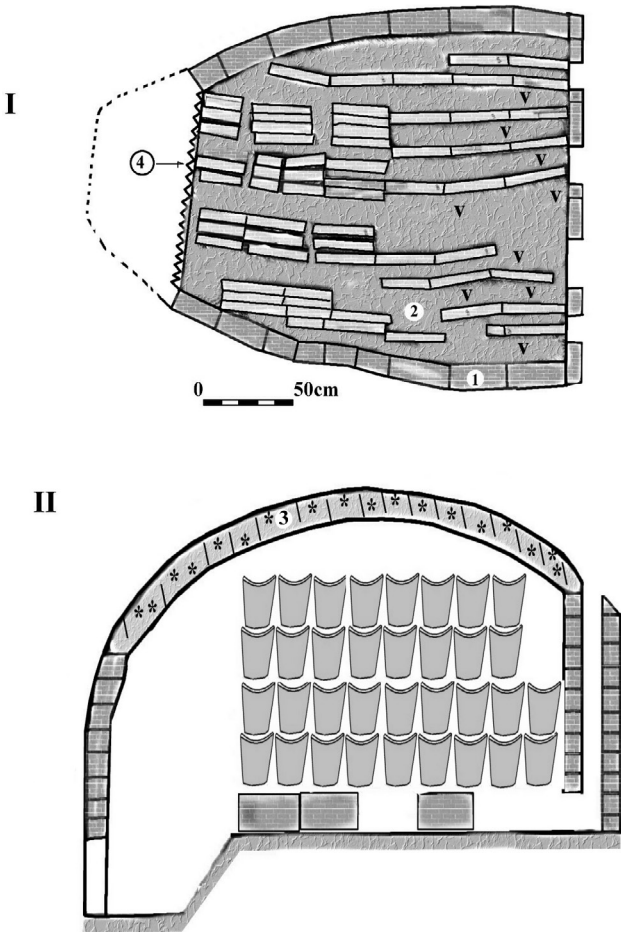

Figure 11.5. Sergeevka kilns site. I: Plan of the floor area of kiln N2. II: Graphical reconstruction of the profile section of kiln N2 (from Zhushchikhovskaya & Nikitin 2015).

Earlier, researchers noted that Haicheng in the Liaoning Province was the northeastern point of production by *mantou* kilns (Kerr & Wood 2004: 330). From this perspective, the Sergeevka site may be interpreted as the northeastern-most appearance of a *mantou* kiln. It may be supposed that firing kilns of *mantou* construction appeared in the Primor'e Region during the Jin Empire period (1115–1234) through influence from a northern Chinese culture of ceramics production. At present, the Sergeevka site is the only known evidence of a *mantou* production complex of kilns in the territory of Primor'e. Obviously, the combination of factors such as water, clay and fuel resources, and the proximity of large Jurchen walled settlements determined the choice of this place for the location of kilns for firing ceramics.

Evidence of structures that may theoretically be interpreted as firing devices was discovered at the Jurchen site of the Lazovskoe walled settlement located about 50 km north of the Sergeevka kiln site (Fig. 11.1) (Len'kov & Artemieva 2003). The remains of a probable workshop area were excavated inside the ancient town, on the hill slope. The workshop was a clearly demarcated 50 m by 50 m square area surrounded by an earthen wall with a gate-like break on one side. The remains of nine kiln-like structures were compactly located in the eastern part of the workshop area, near the remains of some subsidiary structures resembling a shed and a storehouse along with several pits. In the western part of the workshop area the remains of a habitation structure were recorded. All of the kiln remains are recognized as elongated trenches 6.0–7.0 m in length and 0.8–1.0 m in width, embedded in the ground to a depth of 0.5–0.6 m. At one end of each trench there was a furnace pit reinforced with stones, and a roundish pit for holding kiln waste products was joined to the furnace pit. Furnace pits and pits near them were filled with charcoal. The firing chambers had a length of 5.5–6.5 m and compact floors covered with a burnt clay layer 0.002 m thick. The flue section at the rear of each trench appeared as a pit 0.4–0.5 m in diameter and 0.6 m in depth; flues were clearly of a tube-like type. The floors of some kilns were slightly sloped, with the flue section at the upper level and the furnace section at the lower level. Other kilns

had horizontal floors. The kilns' superstructures had been destroyed, but, judging from the fragmentary remains, they were built of clay on a wooden framework.

No ceramic production pieces or spoilage samples were found inside or outside the kiln-like structures. However, the burnt clay layer on the floor of the trenches and the presence of charcoal in the furnaces and pits in the furnace area indicate that the kilns were actually used for the thermal processing of certain products, probably ceramic items.

11.5. Concluding remarks

Archeological records of the history of kilns for firing ceramics in the southern Russian Far East date roughly to the period from the mid first millennium BC into the first half of the second millennium AD. In general, the development of the technique and technology of kilns was part of the cultural, social and economic history of the region. The dynamics of ceramics kilns are presented through their construction and technological features (Table 11.2, Fig. 11.6). It is important to note that the history of kilns presents not a gradual development of a certain construction type, or model, but rather the changing of various construction types.

Initially, kiln-like devices were invented and exploited in this area during the Paleometal period, which covered the first millennium BC and first centuries AD. The appearance and adoption of the earliest pottery-firing kilns were supposedly closely connected with the introduction of the first metal artifacts and some knowledge and skills in metalworking and thermal processing in the southern Russian Far East and neighboring areas of East Asia. The simplest tunnel-like construction of a pottery-firing kiln excavated in the western Primor'e Region (Chernyatino 2 site) may be considered as evidence of some kind of cultural interaction with the population of the Korean peninsula, where tunnel-like firing kilns were exploited from the first half of the first millennium AD.

Further history of ceramics kilns demonstrates an abrupt change in the construction type of the firing device. Two-level updraft kilns discovered at the Troitsa site, attributed to the Pre-State period of the fourth to seventh centuries, belong to a construction model unusual in East Asian territory in the first millennium AD. A preliminary explanation for the appearance of this kiln type in the research area may be cultural impulses from remote territories of Central Asia, where this firing construction is a traditional one from the distant past.

The wide distribution of kiln-fired ceramics in the southern Russian Far East is connected with the Ancient States epoch, seventh to thirteenth centuries, when well-developed firing kilns with a reducing atmospheric regime and temperature regime of up to 900–1000°C were exploited. Two construction types of firing kilns are distinguished for the Ancient States epoch in the southern Russian Far East. The tunneled, or climbing, kiln was characteristic for the Bohai State period, then the *mantou* kiln appeared in the Jin/Dong Xia period. Both types may be interpreted as derivates of firing-kiln constructions used in the ceramics production of the Korean peninsula and northern China in the first millennium AD. The processes of Ancient States formation and development in East Asia and the Far East also brought about some technological and technical innovations and inventions in peripheral areas. It may be noted that the kilns of the Bohai and Jin/Dong Xia periods in the study area were characterized by relatively small sizes in comparison with the kilns of

Table 11.2. Types of old ceramics-firing structures from the southern Russian Far East

Chronology - Cultural Context	Type of Firing Structure - Building Materials	Temperature - Atmospheric Regimes
Paleometal period – Yankovskaya culture – 9th/8th – 3rd/2nd centuries BC	Oven-like single-chambered, ground-level crossdraft kiln – clay on plant framework	approx. 700–850°C – oxidizing
Paleometal period – Krounovskaya culture – ca. 4th/5th centuries BC – 4th/5th centuries AD	Most simple variant of tunnel-like sloping crossdraft kiln – clay on wooden framework	approx. 750–900°C – oxidizing – smudging
Pre-State period – Mokhe culture – ca. 4th – 7th centuries AD	Two-level updraft kiln with underground fuel chamber and dome-like firing chamber – stone, clay	approx. 800–850°C – mostly oxidizing – smudging
Ancient States period – Bohai Kingdom – 698–926	Tunnel-like, sloping crossdraft kiln – stone, clay	approx. 800–900°C – reducing – oxidizing – smudging
Ancient states period – Jin/Dong Xia state – 1115–1234	Mantou type downdraft kiln – bricks	approx. 800–950°C – mostly reducing – oxidizing

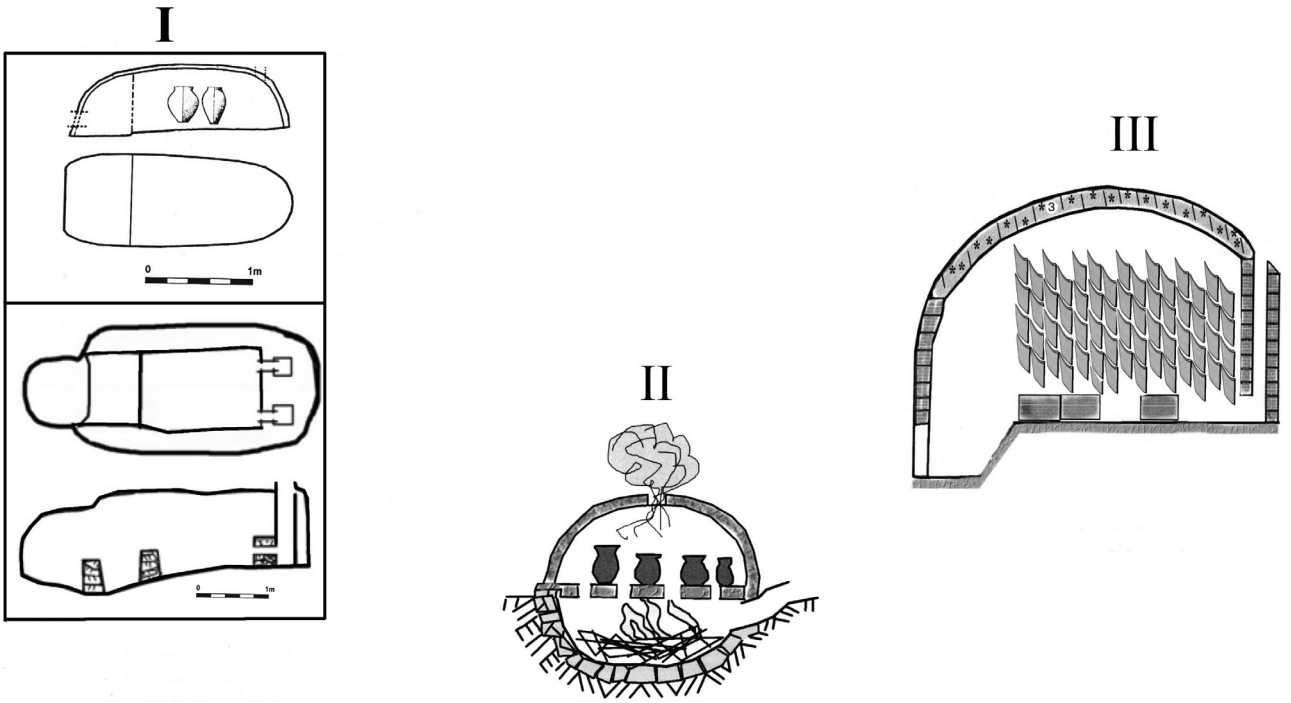

Figure 11.6. Construction types of ceramics-firing kilns in the southern Russian Far East. I: Tunnel-like cross-draft kiln. II: Two-level vertical updraft kiln. III: *mantou* type down-draft kiln (from Zhushchikhovskaya & Nikitin 2015).

the Korean peninsula and northern China. The technical potential indicated by the firing temperature regimes of tunnel kilns and *mantou* kilns in the territory of Primor'e seem to be inferior to that of kilns with a sloping tunnel of the Korean peninsula and the Chinese *mantou* kilns.

All known cases of ceramics kilns dated to the Ancient States epoch in the territory of Primor'e are represented by the remains of kiln clusters, or workshops. The excavated kilns were directly related to the firing of roof tiles. It may be supposed that the primary reason for the development of firing kilns on the periphery of the Bohai Kingdom and later in the Jin Empire was the need for architectural ceramics (tiles, bricks and decorative features) for high-status buildings (administration offices, palaces and temples). It is likely that the ceramic ware serving various needs in daily life was produced locally and fired in the same or very similar kilns. Firing technology, including atmospheric and temperature regimes, was the same for architectural ceramics and pottery. The finished products – tiles and pottery – were similar in such characteristics as water absorption, density and hardness. It is to be expected that in the future direct evidence of kiln firing of pottery will be discovered.

Archeological records of the post-Ancient States period in the Primor'e Region are very poor and infrequent because of the desolation and depopulation caused by the Mongol conquest in 1234. The remains of large settlements attributed to the fourteenth to fifteenth centuries and later times are not known. Accordingly, there is no evidence of ceramics production and firing kilns for the periods following the fall of the Jin and Dong Xia states.

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12

Pottery Kilns of the Khitans in Mongolia

Katsuhiko Kiyama

Abstract: After the Xiongnu Empire, new style kiln-fired ceramics were found from the Göktürks (552–744 AD) and the Uyghur Khaganate (744–840 AD). These may have been produced using kilns, but no production site has yet been discovered. It is possible that kilns were also used in other eras, but excavated items have thus far failed to confirm this possibility. For these reasons, it is difficult to conduct a diachronic study on pottery production in Mongolia at present. This essay provides an overview of our investigations of pottery kiln ruins at the site of the Chintolgoi Castle, built by Khitans, and discusses how this example should be placed within the wider context. Based on a detailed examination of the pottery, it is presumed that the pottery production at Chintolgoi Castle was an amalgamation of pottery traditions of different origins, such as those of the Bohai and Uyghur. It can be said that the relics of the material culture of the Khitan people reflected the state of "imperial" rule by which the Khitan people commandeered and reorganized the groups and technologies of other ethnic groups in the region as they expanded their territory.

Keywords: Mongolia, Khitans, Chintolgoi Castle, Bohai, Uyghur

12.1. Introduction

The ruins of only three types of pottery kilns have been found in Mongolia to date: those of the Xiongnu, the Khitans and the Northern Yuan dynasty. Since earthenware and stoneware were also found from the Göktürks (AD 552–744) and the Uyghur Khaganate (AD 744–840), these may have been produced using kilns, but no such ruins have yet been discovered. It is possible that kilns were also used in other eras, but excavated items have thus far failed to confirm this possibility. For these reasons, it is difficult to conduct a diachronic study on pottery production in Mongolia at present. This paper will provide an overview of pottery kiln ruins at the site of the Khitan Chintolgoi Castle, which we investigated, and discuss how we may position this example within the wider context.

Archeological research on the Khitans has concentrated on the study of the tombs of nobles and the city walls, and not on other products. The research on pottery has mainly focused on the chronology of pottery excavated from the tombs of nobles. The pottery of the Khitans is known to consist of soft earthenware, kiln-fired stoneware and porcelain. However, there has been no survey of the production sites of any of these pottery types, and an analysis of production techniques and a distribution have not yet been carried out. Therefore, the examination of the kilns at Chintolgoi Castle is of significance to the history of the Khitans. In addition, the kilns of the Khitans were more developed than those of the Xiongnu and Bohai, which is also meaningful when considering the changes in kilns in North Asia.

12.2. The advance of the Khitans into the Mongolian Plateau

In Chinese history books, the Khitans emerged around the fourth century AD. They were nomadic people inhabiting the basin of the Xar Moron and Laoha rivers, tributaries of the Liao River. The Khitan people had been divided into various groups, but Taizu (AD 872–926), also known as Abaoji, unified those groups and founded the Liao Dynasty (AD 916–1125). After assuming power, he extended his influence eastward, destroyed the Bohai (AD 926), and advanced southwards, eventually gaining control of the Sixteen Prefectures. He then advanced into the Mongolian Plateau. Because the Hexi Corridor (also known as the Oasis Route, or the Gansu Corridor) was controlled by the Western Xia (also known as the Tangut Empire), Taizu sought to establish a trade route with the countries to the west via the Steppe Route extending from the Mongolian Plateau. There was no unified Mongolian nation during this period, and the region was controlled by nomadic groups such as the Zubu and Yujue; the Khitans had to suppress these nomadic groups in order to establish the Steppe Route. To this end, in 1004, Emperor Shengzong of Liao established the Zhenzhou Military Base in what is now Bulgan Province, Mongolia, as well as three provinces, namely Zhenzhou (supervised by a military commissioner), Fangzhou and Weizhou (supervised by a provincial governor). He stationed 20,000 cavalries in the area, and placed 700 Han Chinese, Jurchens and Bohai settler households in the region to govern the Mongolian Plateau.

In the process of expanding his territory, the emperor settled groups from different cultural and social backgrounds,

such as the Han Chinese, Bohai people and Jurchens, in the newly conquered areas, and created a system which combined the traditions of the Liao Dynasty with cultures and systems of different origins. This system incorporated Buddhism, the Khitan script and dual apparatuses to govern nomads and settled agriculturists under different systems. The establishment of the governance and transportation structures under the five-capital system, prefectural and provincial systems was one of these features, and these provinces and prefectures have been preserved as the castle sites.

12.3. The site of Chintolgoi Castle as a colonial city

More than a dozen Khitan castle sites have been found on the Mongolian Plateau (Fig. 12.1). One of them, the site of Chintolgoi Castle, is located in Dashingchilen Aimag, Bulgan Province, Mongolia. Researchers assume that this was the most prestigious castle in Zhenzhou, functioning as the governmental center of the plateau. This assumption is based on the fact that the castle was named after the hill called Chintolgoi, located north of the castle ruins. "Tolgoi" means "hill" in Mongolian, and "chin" is similar in sound to "zhen." Another basis for this assumption is that it is the largest of the Khitan castles on the Mongolian Plateau, with a circumference of 3840 m. Studies have determined that the size of Khitan provincial castles in China is proportional to their rank. The ruins of Khar bukh Castle and Ulaan kherem Castle, both in Dashinchilen Aimag, Mongolia, which were designated as provincial capitals supervised by a provincial governor, have circumferences of 2780 m and 2040 m, respectively. It is likely that Chinese standards were maintained in the castles of the Mongolian Plateau.

If the Chintolgoi Castle site was Zhenzhou Castle, then it would have been built in 1006. The year it was ruined is unknown. Nevertheless, Qiu Chuji, who visited the area in 1188, confirmed that the castle of Khitan was in ruins at that time. Perhaps it lost importance when the Mongol Jin Dynasty exterminated the Khitans in 1125. Therefore, artifacts from the ruins of Chintolgoi Castle are considered to be from the early eleventh to twelfth century, mainly from the eleventh century.

The castle site is a flat rectangle with a north–south length of approximately 1260 m and an east–west length of approximately 660 m. An inner wall extends east to west near the middle of the interior, dividing the structure into north and south (Fig. 12.2a). This multi-layer structure is one of the characteristics of Khitan castles, and has also been found at Shangjing, Zuzhou Castle and Raozhou Castle.

The height of the castle wall is, currently, about 3 m. A moat between 10 and 12 m wide encircles the castle wall. Five spurs on the north–south side and nine spurs on the east–west side are attached to the walls at intervals of 65 to 70 m. The dimensions of the castle reveal that it was designed, measured and constructed based on grid partitions using the Tang chi (*shaku*) measuring unit (Usuki and Enkhtur 2009).

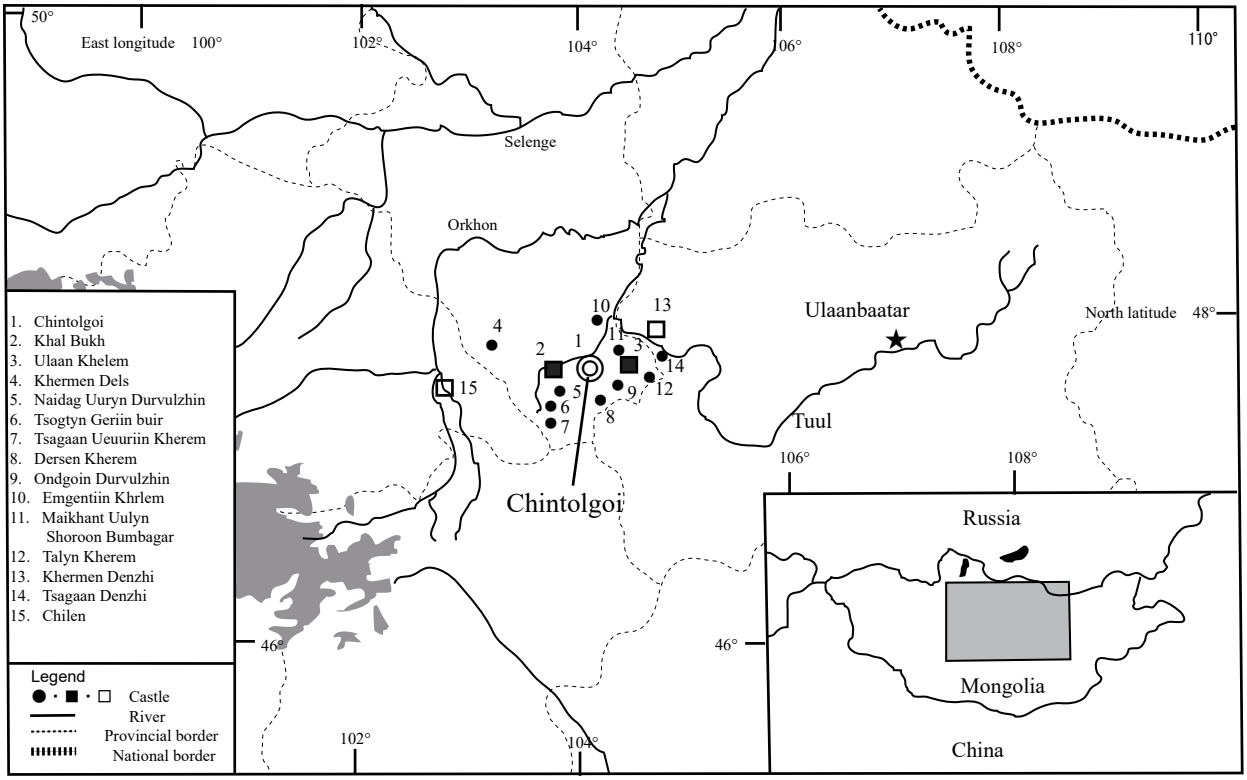

Figure 12.1. Khitan castle sites in the central part of the Mongolian Plateau (based on Ochir et al. 2005).

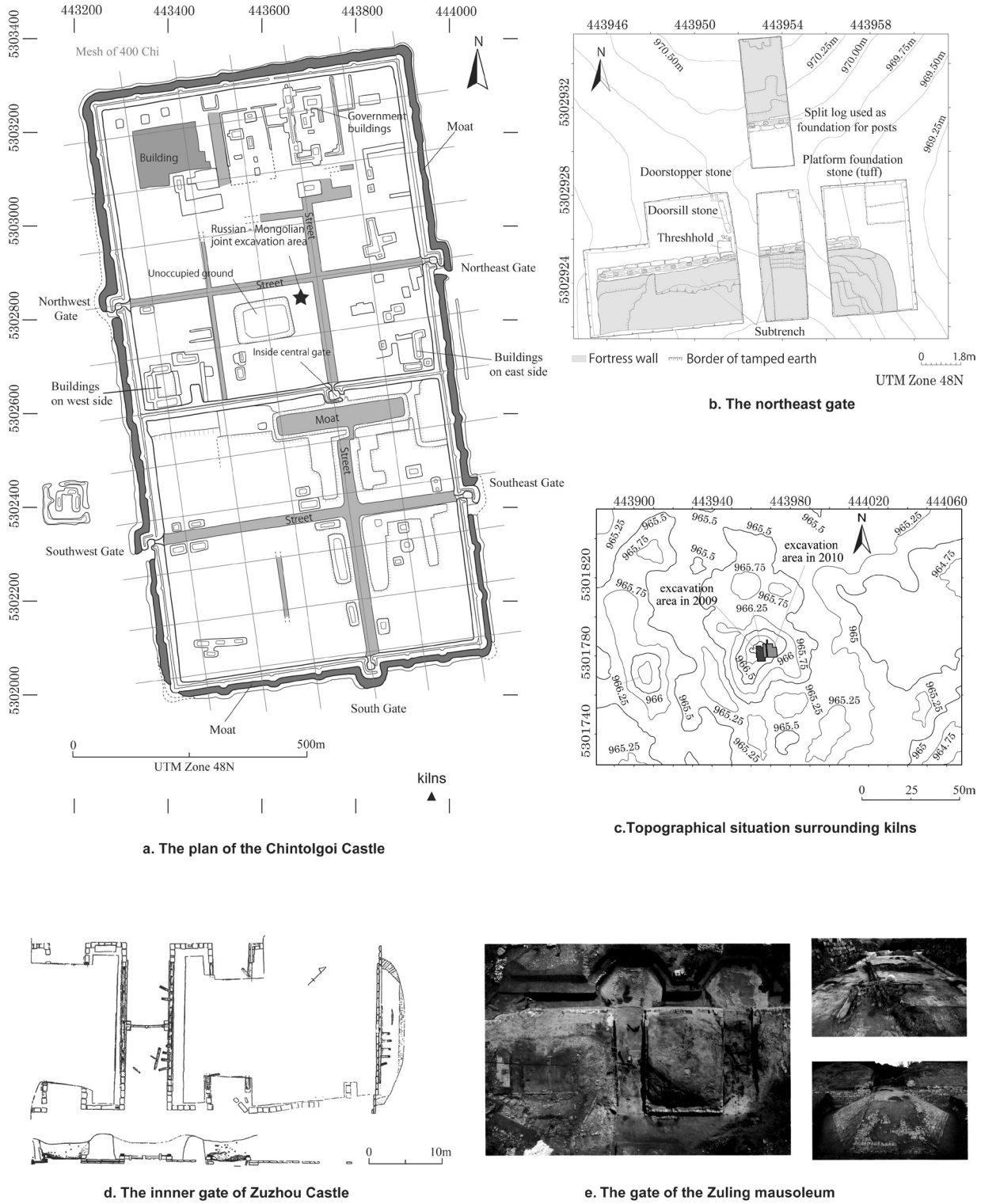

Figure 12.2. Chintolgoi Castle site (a–c: courtesy of Kiyama Katsuhiko, d: Shimada 1955, e: SIMAT, IACAA et al. 2011).

Both the north and south castles have gates in the south, east and west walls. These gates have a barbican, comprised of an L-shaped auxiliary castle wall projecting toward the outside. The northeast gate of the north castle has been excavated to examine its structure (Senda and Enkhtur 2011, 2015; Fig. 12.2b).

The gate path would have been about 11 m long and 5.8 m wide, cutting through the castle wall. The road was paved with sandy white soil rather than stone or brick. On both sides of the gate path, excavators found a row of granite blocks surmounted by wood. In the center of the path were the gatepost foundation stones, as well as the stones that served as a threshold and the standing stone as a door stopper. The wood placed on the row of stones was a piece of square-edged timber with a width of about 25 cm, cut from a single tree with a solid, unbroken length of about 11 m. About every 70 cm, 15 square mortises were drilled

to support the insertion of upright pillars, while bars were piled in the soil below the castle wall to construct the body of the gate. Wave-shaped traces found in the soil suggest that hemispherical logs were used as bars. The side walls of the gate path were made of pine and stood vertically. Radiocarbon dating of debris from the exterior parts of the castle indicates the eleventh century, which is approximately consistent with the establishment date of Zhenzhou.

No remains of the gate ceiling and gate tower shed have been found, but since flagstones, tiles and bricks were excavated from the survey site, the gate tower was probably made of these materials. Many large flat tiles and pieces of antefix with gargoyles were also excavated, indicating that this was most probably an important, high-class structure.

The ruins of Zuzhou Castle and the Zuling mausoleum of Bairin Left Banner in the Inner Mongolia Autonomous Region of China are currently the only excavated examples of Khitan castle gates. The mausoleum is the tomb of the first Emperor Taizu of Liao, and the Zuzhou Castle was established in 927 as a castle site to protect the tomb. The inner gate of Zuzhou Castle (called the Xingsheng Gate according to *The History of Liao*) has three gate paths. The central path was excavated by Masao Shimada and others in 1943 (Shimada 1955; Fig. 12.2d). It measures 4.95 m in width and about 20 m in length, and in structure is similar to the ruins of Chintolgoi Castle. The Heilong Gate, the entrance to the Zuling mausoleum, was excavated and studied in 2010 by the Institute of Archaeology, Chinese Academy of Social Sciences and the Inner Mongolia Institute of Cultural Relics and Archaeology. The study revealed that the gate structure was also similar to that of Chintolgoi Castle (Second Inner Mongolian archeological teams, IA, CAA et al. 2011; Fig. 12.2e). This gate also has three paths but was more carefully constructed than the ruins of Chintolgoi Castle, with masonry side walls and the brick-paved roads. However, the Heilong and Chintolgoi gates have width in common, both being approximately 5 m wide. Since this type of castle gate is not in evidence at the Tang Dynasty Daming Palace or Shangjing Longquanfu in Bohai, it may have been standardized by the Khitans.

Based on the above survey results, Chintolgoi Castle seems to have been a colonial city designed and constructed with techniques and workers already established in the area when the Khitans advanced into the Mongolian Plateau.

12.4. Excavation of the pottery kilns at the ruins of Chintolgoi Castle

The urban ruins of Chintolgoi Castle have been associated with numerous production activities. The containers and tiles used in the castle were manufactured using the Chintolgoi kilns, which are located about 300 m south of the castle site on slightly elevated ground near the old river channel, which runs from the west to the south of the castle ruins (Fig. 12.2c). Analysis of materials collected from the surface and the magnetic survey in the area has revealed that there were several kilns. One of the excavations, that of Kiln 1, was carried out between 2008 and 2009 (Senda and Enkhtur 2010; Fig. 12.3).

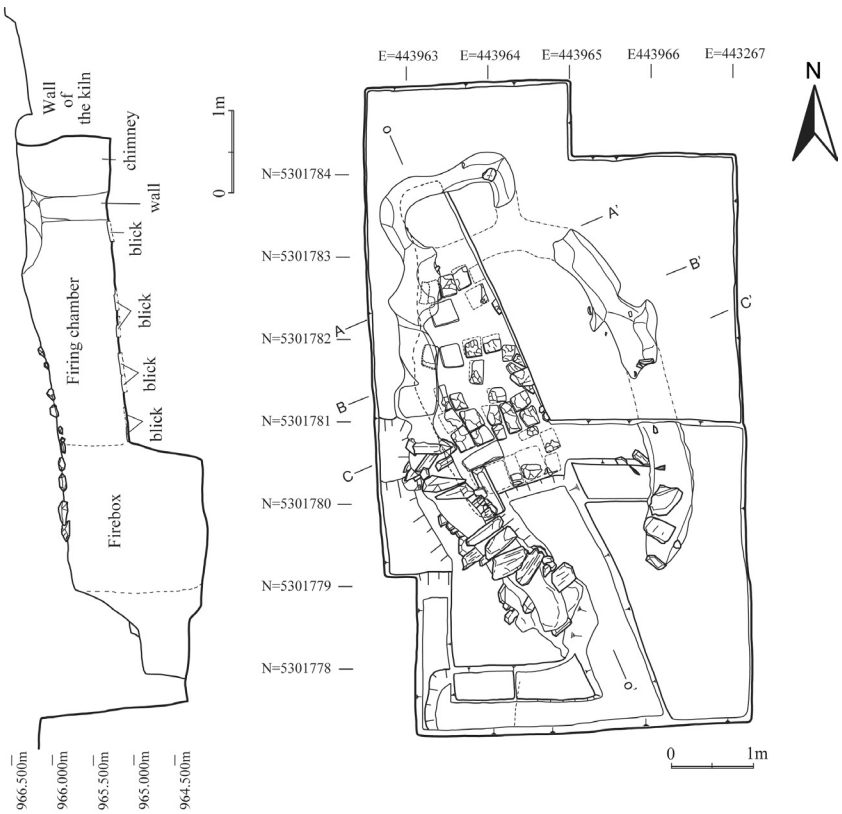

Figure 12.3. Pottery Kiln 1 at the Chintolgoi Castle.

As part of the research, the western kilns were excavated to understand their structure, while the eastern kilns were left unexcavated to preserve the remains. After excavation, the remains such as walls and floors were preserved and backfilled.

The kilns are flat and semi-subterranean, with a major axis length of about 5.2 m and a width of about 2.6 m. The ceiling is a semicircular dome. An oval pit approximately 1 m deep was dug in the raised part of the slightly elevated area along the river, and then the inclined part was also dug to set up a chimney and a firing chamber. The south side of the firing chamber was dug to a depth of about 1 m to construct the combustion chamber. The major axis runs in a north–south direction. There is a single chimney, and there is a clay partition between the wall and the firing chamber. The northern half of the firing chamber is made of sun-dried bricks, while the southern half of the firing chamber and the combustion chamber are made of clay and flagstones stacked to form a wall. Eave-end round tiles with gargoyles and unfired pot-shaped pottery were embedded in the southeastern part of the outer wall. The floor of the firing chamber is paved with brick. A square vestibule, which served as a working space, was dug into the front of the firebox of the kiln. The masonry on the wall seems to have been restacked, and the floor was definitely expanded. It was evident that a major renovation had been carried out. After the repair, the ash was not removed; the kilns appear to have been used at least 10 times after the repair. Since the kilns were buried once the products were removed following the final firing, only fragments of the walls and products had accumulated inside. On the east side of the kiln ruins, investigators found traces of pits and topographic alterations they considered to be related to kiln construction.

Unglazed pottery was produced in this site (Fig. 12.4a). The main types of production include storage vessels and tableware such as jars, bowls and large pots, but boiling tools including fringed kettles with tripod and deep bowls were also found. The principal products are jars, which account for about 40 percent of the total, while bowls make up about 20 percent. Although it is difficult to specify the period, it is assumed to have been operated in the early to mid-eleventh century, not long after the construction of Zhenzhou Castle.

From 2004 to 2008, a Russian–Mongolian joint excavation was conducted in the southwestern section of the site, near the intersection of the north–south central road and east–west central road in the north part of the Chintolgoi Castle (Kradin et al. 2011). In the excavation area, houses and storage cellars of various periods were discovered. Since the homes discovered were not particularly large, the area was considered to have been an ordinary residential quarter. A comparison between the material excavated in the castle (Figure 12.4b) and the material excavated from Kiln 1 indicates that the basic composition of the pottery remains is very similar. However, some types of vessels not produced using this kiln, such as short-necked long bottles, vessel stands and inkwells, were also discovered (Fig. 12.4b: 23–25). In addition, a relatively large number of bowls and plates have been excavated in the castle, but most of these were not produced in kilns at Chintolgoi Castle. These items were also slightly different in shape.

What the compositions of the excavated pottery of Kiln 1 and the castle have in common is that Kiln 1 was a production site for daily utensils supplied to the castle. However, while bottles account for 40 percent of the pottery produced at Kiln 1, a certain number of bowls and plates were excavated in the castle. It is possible that the main types of vessels produced were different at each kiln.

A certain number of pottery have been excavated in the castle, and it is also possible to collect the surface soil. Compared to ordinary Khitan pottery identified at other sites, the long-necked jars share similar features. However, not all types of pottery are earthenware and stoneware. These found does not include the most distinctive ornamental varieties, such as "Jiguan" ("cockscomb") jars and "Jitui" ("chicken thigh") bottles. No dishes (plates) have been found to date. By contrast, the pots, bowls, fringed kettles and deep bowls were not produced in porcelain. Some types of products were made of earthenware, while others were usually stoneware.

White porcelain is the main type of ceramics found inside the castle ruins, while black glazed wares, bluish-white porcelain and celadon were also discovered. Most of these ceramics were small bowls. Earthenware, stoneware, and porcelain may have been used in a complementary manner in the ruins of Chintolgoi Castle, but there are far fewer of the latter than the former two. There are kilns other than Kiln 1 that produced bowls and dishes as a mainstay or in relatively large numbers, and most of the castle's daily utensils are thought to have been made of earthenware and stoneware.

The above suggests that the earthenware and stoneware used in the castle was produced in the nearby kilns, but that a small number of porcelains were imported from distant locations. Porcelains seem to have been a luxury item. Up until recently, the year of production for Khitan pottery was calculated based mainly on the materials excavated from aristocratic tombs, most of which were porcelains (Imano 2002, Peng 2003). Moreover, as the proportion of porcelains increased over time, the earthenware and stoneware production features, which served as daily utensils in each period, were unknown. Therefore, the results of kiln 1, the first survey on the pottery production site, become essential for future reference material.

12.5. Material culture artifacts indicating the "imperial" characteristics of the Khitans

After destroying the area around the Bohai in 926, the Khitans dispersed a large number of Bohai people to various locations within their territory. The geographic

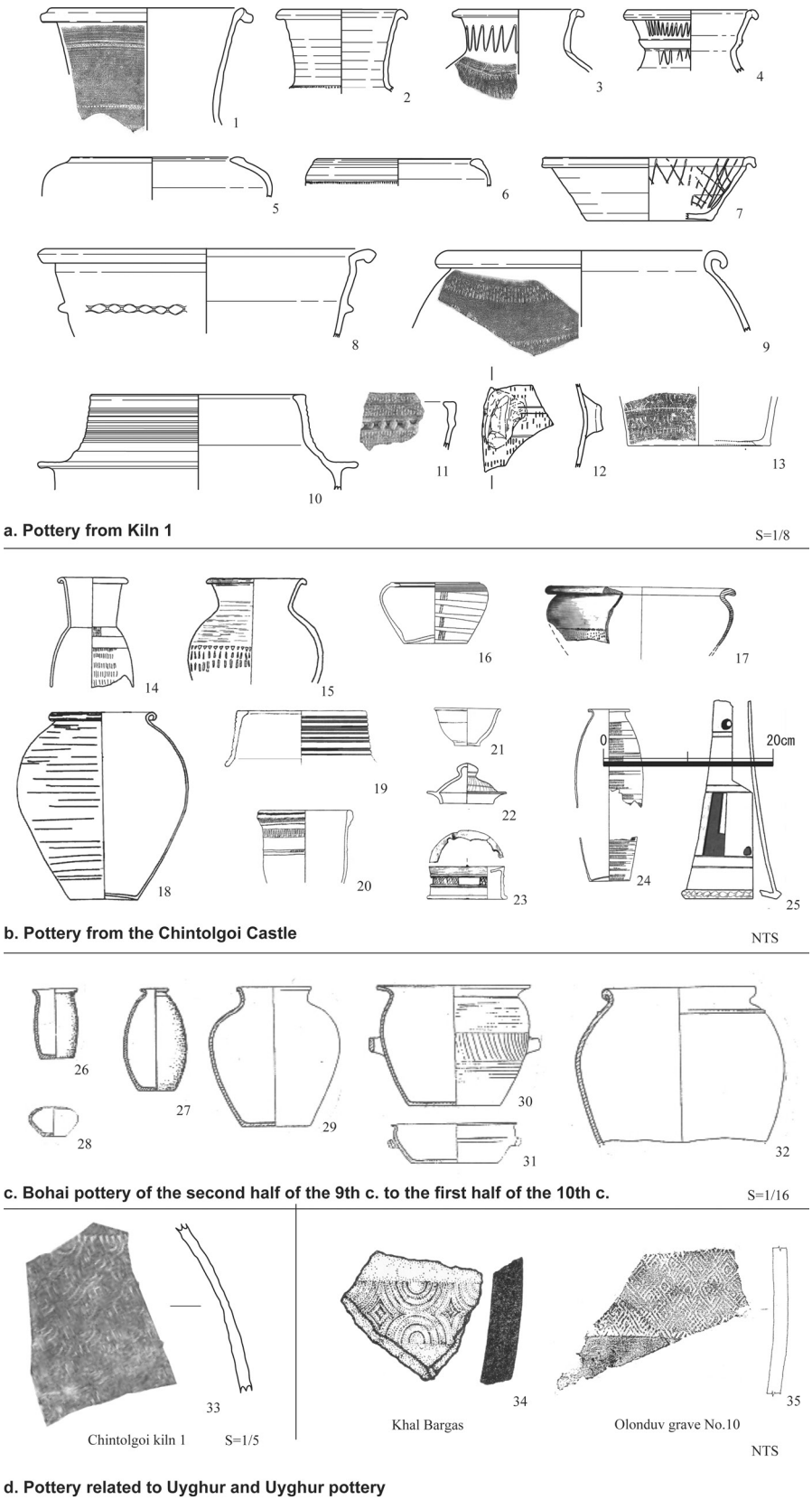

Figure 12.4. Pottery from the Chintolgoi Castle and related pottery (Usuki 2012, Kradin et al. 2011, Kiyama 2007, Khudyakov 1982, Erdenebat et al. 2011).

description in *The History of Liao* also mentions that some Bohai people were brought to Chintolgoi Castle. Russian troops excavating the inside of the Chintolgoi Castle ruins determined that Bohai workers had been transferred to the Chintolgoi Castle based on the similarities between the pottery excavated inside the castle and Bohai pottery (Kradin et al. 2011: 116–18; Ivliev 2020).

The shapes of long-necked jars and deep bowls which characterize the Khitan pottery are different to Bohai pottery. The frequently used pressed patterns are also different, but the shape of the rims of bowls (Fig. 12.4a: 1; b: 17; c: 30, 31), pots (Fig. 12.4a: 9; c: 32) and neckless jars (Fig. 12.4b: 16; c: 28) is similar. At the same time, the bridge-shaped handle as shown in Fig. 12.4a: 12 has an embossed pattern unique to Khitan pottery, but this kind of handle is common in Bohai pottery (Fig. 12.4c: 30, 31).

Although it is necessary to review this after becoming more familiar with the characteristics and composition of Khitan daily utensils manufactured before their advance into the Mongolian Plateau, the similarities they share with Bohai pottery at the ruins of Chintolgoi Castle are probably due to the fact that Bohai craftsmen were involved in their production. Tiles with the design of the Bohai Sea have been excavated at Zuzhou Castle, Liaoyang Castle and Raozhou Castle, which are locations to which Bohai people are known to have immigrated. This suggests a high possibility that Bohai immigrants were engaged in production activities at such locations (Shimada 1993: 140, Mukai 2011).

Khitan pottery kilns appear to have been discovered in Shangjing, but their details are unknown, and thus comparative studies cannot be conducted. Nevertheless, as discussed above, the design and construction of Chintolgoi Castle are assumed to have been directly transferred from the Khitan homelands, and since many of the items produced using the kilns are assumed to have been general daily utensils used by the Khitans, the techniques and systems of the production of pottery were probably established among the Khitans before they advanced into the Mongolian Plateau. Despite the involvement of Bohai craftsmen, perhaps those techniques and systems had already been incorporated into pottery production before their relocation to the area.

However, some cases cannot simply be explained by the transfer of techniques and systems from the Khitan homeland. The patterns on the pottery found at the Chintolgoi Castle ruins are mainly pressed patterns, cryptograms and ridges on the neck and the lower half of the body. Many pressed patterns feature long and short triangles and squares. There are also pressed patterns of overlapping half-arcs by the stamp, as shown in Fig. 12.4a: 13 and Fig. 12.4d: 33. These items were probably produced in a manner similar to that used to produce other artifacts on the site, as many were excavated at the site and they exhibit the same patterns as the other artifacts. However, these patterns were not found on the pottery in other Khitan territories. This type of pressed pattern is similar to a class of pattern variations found in Uyghur pottery (Fig. 12.4d: 34, 35). Although there is a gap of about 200 years between the downfall of the Uyghur Khaganate and the advancement of the Khitans into Mongolia – thus allowing room for further investigation – the similarity in the patterns suggests that earthenware and stoneware production workers from Chintolgoi Castle remained in the region and associated with those who were involved in the production of Uyghur pottery.

To summarize the above aspects, the pottery production at the Chintolgoi Castle appears to be a fusion of pottery traditions of different origins. Artifacts of the material culture of the Khitans may reflect the state of "imperial" governance by the Khitans, requisitioning and reorganizing groups and techniques of other peoples in the area along with the extension of their territory.

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13

The Production System of Kiln-Fired Pottery in the Korean Peninsula

Sungjoo Lee

Abstract: This essay examines how the technology of the kiln and potter's wheel introduced in the early Proto-Three Kingdoms period replaced the long-term continuous ceramic technology tradition, and how the process of the replacement was different in each regional part of South Korea. Unlike in the Han River basin, where kilns were introduced late and different types of pottery were produced by different organizations, the Nakdong River basin integrated production of Wajil ware (gray-colored and kiln-fired earthenware) mainly for offering in burials, and Yeonjil pottery (orange-colored and mostly open-fired earthenware) for daily use at an early stage. This is the background to the regional differences in ceramic production during the Korean Three Kingdoms period.

Keywords: Proto-Three Kingdoms period, Han River basin, Nakdong River basin, Wajil ware, Dojil ware

13.1. Introduction

It was at the beginning of the Proto-Three Kingdoms period (P-TKP, 100 BC–AD300) that kiln firing was, for the first time, applied to the pottery production in ancient Korea. According to the Records of the Three Kingdoms (*Sanguozhi*), a Chinese historical record of the same period, during the P-TKP, 78 *Guk* (small-scale polities) were distributed in the southern part of the Korean peninsula and the Lelang commandery, which was established by the Han Empire, was located in the northwest. In this period, the polities of South Korea were able to participate in a network of close interaction with Chinese civilization through the commandery. Through this Northeast Asian network, the technologies of ceramic and iron production were introduced to Southern Korea and the new technology triggered the process of technological innovation in the indigenous society (Barnes 2015: 317–22). During the Korean Three Kingdoms Period (KTKP, AD 300–676), the early states, such as Baekje, Silla and the Gaya polity group rose in Southern Korea. Along with the sociopolitical development, the central workshops of some polities turned to large-scale industry; the ceramic production systems were hierarchically organized within both early states, Baekje and Silla. In this chapter, the process of technological innovation in pottery-making and the transformation of the production system will be discussed in the two regions, where Baekje and Silla rose up. It will be described how the kiln firing and potters' wheel techniques were adopted and connected to technological innovation and how this organized ceramic production in two different sociocultural contexts.

13.2. The pottery production system in Korea

Research on the organization of pottery production has been of interest to archeologists for quite a long time. This usually started with the question of how it relates to social complexity, focusing basically on the economic aspects of pottery production. At first, archeologists interested in the organizations of production took the approach of classifying them into several types, taking into account the economic, social and political attributes of craft production. Since the early 1990s, Korean archeologists have also been discussing the organization of ceramic production, and attempts have been made to distinguish the types of production system according to the level of specialization, the degree of production and the scope of distribution (Lee S.1991; Choi G. 2000; Cho S. 2014).

The recent research on the organization of ceramic production has changed considerably. The problem with the formal approach has been pointed out: that by categorizing the production systems into several types in advance and fitting the various ancient organizations into them, one could ignore the various characteristics that appear in ethnological and archeological data (Costin 2001). Recently, from the perspective of relational ontology, the organization of ceramic production has been not seen only as a product of social processes. Instead, by understanding the organization of production as a result of the interaction of people, tools, artifacts, materials and animals, a new approach to it is required (Duistermaat 2017).

The pottery-firing features of the Jeulmun (8000–1400 BC) and Mumun periods (1400–100 BC) remain basically in the form of shallow, simple burnt pits that have mostly been found near villages (Kim H. 2002; Bae S. 2007). No research has yet been conducted on what quantity of vessels was produced from those open firing features near the villages and how widely the products were distributed. However, it is not too difficult to conclude that the products

of such firing features were not widely consumed, nor can it be admitted that there were specialized potters who were exclusively engaged in pottery production, because of their simple, rough forming skill and badly unstandardized shapes. However, in the KTKP, large-scale nucleated workshops (Peacock 1982) found near the capital and main settlements of Baekje, Silla and Gaya were composed of a number of tunnel-type climbing kilns (GNRICH 2004; Lee J. 2008).

It is, therefore, hard to deny that in the KTKP, a specialized mass-production organization emerged along with the development of a complex society, while the Jeulmun and Mumun period pottery production could be characterized by a low level of specialization. The most meaningful time in the process of the organizational development of pottery production is the P-TKP. At this time, the kiln of which the heating chamber was separated from the firebox was introduced from Northeast China, and technological innovation was carried out in the process of selecting raw materials, preparing bodies and forming vessels. In addition to these technological innovations, fundamental changes had also begun in the organization of production (Lee S. 2014).

Some studies focus on the development of production organization according to the sociopolitical changes, but others pay attention to the coexistence of different production systems in a society. In Baekje, the various organizations, which were divided depending on the function of the vessel, the social status of the consumer, the *chaîne opératoire* and the spatial range of distribution, coexisted and were closely related to each other. Choi Gyeonghwan classified the organization of production, analyzing the kiln remains of Baekje, into "small-scale," "regional" and "governmental" workshops according to the scope of consumption and whether the government was involved (2000). The small-scale workshop equipped with one or two kilns was operated inside a village of dozens of households, where four to five types of vessels that commoners used in their homes were formed and fired at a relatively low temperature. The regional workshop had limited types of vessels, but with highly developed skill, produced in large quantities and supplied for a wide range of consumption. On the other hand, the governmental workshop operated directly by the central or local government was specialized in producing the vessels necessary for official activities and consumed by the ruling class (Choi G. 2000).

13.3. The development of kiln firing

Until the Mumun period, pottery had been produced by open firing methods. The firing process had been carried out in an oxidation atmosphere within shallow round pits or long trench-shaped features of which the floors were occasionally pebbled (Kim H. 2002, Bae S. 2007). The prehistoric open firing facilities had a structure that could not control the air, so the pottery fired in them was red or brown. The type of kiln which can control the flow of air by separating the firebox and the heating chamber began to be used in the early P-TKP. Considering the emergence of the gray vessels produced in a reducing atmosphere in the settlement and pit-burials in the Han River and the Nakdong River basins from the first century BC, it can be said that pottery was already made in a workshop equipped with kilns. However, although in some archeological sites kiln remains have been reported, there are few well-preserved examples of the feature.

It seems that trench-type and round-pit-type open firing facilities were still in use for brownish-red, low-fired pottery until the P-TKP. In addition, there were other types of structures where grayish pottery was fired in a reducing atmosphere, but well-preserved kiln structures have never been identified. It is highly likely that various firing structures including kilns coexisted during the P-TKP (Kim J. 2007). Among them, there was the Ga-13 Kiln of a very interesting structure in Hwangseongdong settlement, Gyeongju. The settlement has been recognized for its importance as a large-scale iron production site of the P-TKP. The kiln was found in the middle of the settlement, where furnaces, smelting facilities and waste dumps were densely distributed along with a lot of pit-houses. The narrow and long firebox was built somewhat deep underground, but the heating chamber has a wide square plane. There is a study that points out that the structure of this kiln is similar to that of the semi-down-drift (*Bandaoyan*) type domical cover kiln (*Mantouyao*, Liu Z. 1982) that had been popular since the Warring States period in northern China (Nagatomo 2019). In the early P-TKP, the type of vessel fired in a reducing atmosphere which first appeared in southern Korea is a round pot formed by the paddle and anvil technique (Lee S. 2008). The form and paddling procedure of this pot originated from the technological tradition that had spread in Northeast China since the Yan State occupied the region. Therefore, it can be assumed that this kiln structure and firing technology, which had settled in Manchuria during the period from the end of the Warring States period to the Early Han Empire (the third and second centuries BC), was introduced to Southern Korea in the first century BC.

The firing structures of the KTKP in Baekje, Silla and Gaya belong to the category of the long, oval-shaped, tunnel-like climbing kiln. These structures were usually constructed on slopes and quite similar to the structure of the dragon kiln in China. This type of kiln is thought to have appeared at the end of the P-TKP (late third century AD). But in fact, there is no climbing kiln which actually belongs to the P-TKP, and a kiln dated to the early fourth century is the earliest example. In general, the climbing kiln of the KTKP consists of an underground or semi-underground long tunnel-type heating chamber and a short firebox attached to the front. All climbing kilns structurally belong to the horizontal-draft type and basically share common attributes, but each of them differs in plane shape, total length, degree of slope and the volume of the heating chamber.

There are two important examples of climbing kilns of the early fourth century, one of which was found in the Sansuri ceramic production site of Baekje, Jincheon (Choi B. et al. 2006) and the other in the Ugeori workshop cluster of Ara-Gaya, Haman (Lee J. 2007). Both started production in the early fourth century and are of the semi-underground style. The former, Sansuri type is characterized by a subterranean firebox installed much deeper than the heating chamber, while the latter, Ugeori type is constructed so that the floor of the firebox and heating chamber can be connected naturally without any difference in height. When fueling the former's firebox, the fuel would have been thrown from top to bottom, but in the latter, it would have been pushed in from the side. While the heating chamber of the Sansuri type is wide and short, the Ugeori type is long and narrow. The products of the Ugeori-type kiln were sufficiently heated up to 1200°C to cover their surface with natural glaze (Lee J. 2007), but those of the Sansuri type seem to have completed their firing process at much lower temperatures. In the fourth and fifth centuries, kilns in the Baekje area belonged to the Sansuri type, while the Ugeori type represented the structural features of Silla and Gaya's kilns. However, in the fifth century, workshops in Baekje also employed Ugeori-type kilns; this seems to have been for the production of hard-fired Dojil ware. Baekje built various types of kilns, even accepting Chinese kiln structures, but Silla and Gaya improved and developed only the Ugeori-type kiln.

The origin of the kilns in southern Korea can eventually be found in ancient kilns in China. Chinese ceramic researchers classify ancient kilns by two criteria: the way the flow of heat is guided and the shape of the plane. In the development of ancient Chinese kilns, researchers attach great significance to the emergence of the semi-down-draft, round kiln or domical cover kiln in North China and the invention of the horizontal-draft dragon kiln in South China (Liu Z. 1982; Xiong H. 2014: 49–74). Since more direct interaction between Korea and China began from the end of the Warring States period, it is possible that the firing technology and the kiln construction method of the Korean peninsula could have been influenced by the round kilns in North China and dragon kilns in South China. Some researchers say that the round kiln and its firing technology were introduced in the early P-TKP, leading to the production of soft gray pottery, Wajil ware (Lee S. 1992; Barnes 2001: 106; Nagatomo 2017). It is also claimed that at the end of the P-TKP, some groups in the southeast coastal area accepted the dragon kiln from South China and began producing hard-fired Dojil ware (Choi J. 1994; Shin G. 2012; Nagatomo 2017). However, there are also archeologists who think that the Dojil-ware kiln was not directly affected by the dragon kiln because it was quite different from that of South China at the same time and the paste and shape of the Dojil vessels were completely different from those of the Chinese products. They argue that the long oval-shaped climbing kiln of the KTKP was completed by improving China's round kiln, introduced in the early P-TKP, and constructing it on the slopes of hills (Lee S. 1992; Kim J. 2007; Gu Y. 2009).

13.4. The technological innovation in different contexts

In the early P-TKP, technological innovation begins in this region, as the *chaîne opératoire* of kiln-fired pottery was introduced to the communities of Southern Korea. It is thought that the role of potters who visited from Northeast China or Lelang was important for the introduction of technology. However, it would be indigenous potters who physically acquired it through learning and practice and applied it to the production of various vessels in practice to lead the innovation (Lee S. 2014: 243–48). The ceramic assemblages which illustrate the process of technological innovation, starting relatively early and slowly replacing the Mumun pottery group with the kiln-fired one, are found in the settlements of the Han River basin in the central part of the Korean peninsula and in villages and burials in the Nakdong River basin in the southeastern part.

In the early stages of technological innovation of both regions, the vessels related to the new technologies are limited to only one class of vessel, the round pot, which had not previously been seen in Mumun societies. For manufacturing the round pot, fine clay mixed with silt was prepared, and it was fired in a kiln that, though imperfect, could control the inflow of air under a low-temperature, reducing condition. So, the kiln-fired pottery of the P-TKP is basically characterized by a soft and gray fabric. Although the potter's wheel was used in the forming process, the turning method was applied to adjust the symmetry, reduce the variations in wall thickness and finish the surface of the vessel rather than to throw it. In the P-TKP, there was a tendency to make the bottom of a vessel round; the method used to complete a round-shaped vessel was the paddling and anvil technique. In the early stage of innovation, all these new technological elements can be identified only in round pots, and other vessel types used in every utilitarian and ritual context were all made with traditional Mumun techniques. However, the *chaîne opératoire* of the new technology was gradually extended to other traditional types of vessels. It can therefore be said that the new techniques did not quickly replace the traditional ones and that the technological innovation was made possible by the traditional Mumun potter who acquired the embodied skill of the kiln-fired pottery technology.

The process of technological innovation in communities in Southern Korea during the P-TKP shows very interesting regional differences. The communities in the Han River basin rarely built tombs, and therefore had no burial food offerings in which ceramic vessels were used. Thus, to explain the technological innovation of pottery production in this region, it is necessary to rely on the ceramic assemblages found in the settlement sites. Within each house, a considerable number of different kinds of pottery were used for the storage, transportation, cooking and daily meals in a household. Among the various utilitarian vessels, the new technology was limited to the production of only two types: the round pot and small flat-base jar. The

other various utilitarian wares were all produced based on traditional forming and firing methods. Therefore, they were brownish red and hardly standardized, and they were completely different from the round pot formed by the turning and paddling technique and fired in the kiln. It is difficult not to acknowledge that the two vessel groups, which were clearly distinguished in technological tradition, would have had a different organization of production. Until at least the early fourth century, the organization of ceramic production had been separated in two. Even though traditional potters had sometimes tried making round pots or small jars, it is hard to find any attempt to make traditional vessels with the new technologies during the separated period (Lee S. 2011). From the late fourth century, turning and paddling techniques began to be applied to the production of the most common utilitarian vessel types, i.e. the bowl, long egg-shaped jar and large storage jar, which had been produced with the traditional Mumun techniques. As the new technology is applied, the shape and size of each type of vessel is almost perfectly standardized (Lee S. 2011).

In contrast, in the Nakdong River basin the construction of tombs seems to have been very important sociopolitically. Inside a pit-burial, using funeral facilities, such as a wooden coffin or wooden chamber, a considerable number of ritual vessels was dedicated in various ways. In particular, depending on the social rank of the deceased, the size of the burial structure and the dedication of the grave goods, including ceramic vessels, were greatly variable. So, in the elite burials of the late P-TKP, a large quantity of the elaborately manufactured Wajil vessels was consumed to differentiate them from other tombs. On the one hand, Wajil ware was originally used to refer to the low-fired gray pottery tradition before the emergence of hard-fired Dojil ware, but on the other hand, it is also a concept used to refer to the elaborately made pottery group for burials.

In the early stage of technological innovation, the vessels manufactured on the basis of new technology in the Nakdong River basin, like in the Han River basin, were limited to round pots. However, the new *chaîne opératoire* of round-pot production, unlike in the Han River basin, was rapidly expanded to the production of traditional Mumun vessel types. In the first century BC, all of the utilitarian and ritual vessels, except round pots, were made with traditional Mumun techniques. However, after about a hundred years, new forming and firing techniques were widely applied to the production of traditional vessel types, the small carinated bowl, long-necked jar, bowl and long egg-shaped jar. In the Nakdong River basin, the traditional organizations of production and the new technology-based one were not separated, unlike the circumstances in the Han River basin. As soon as some indigenous potters learned the *chaîne opératoire* through the practice of round-pot production, the number of potters who acquired embodied skill increased and they began to produce traditional Mumun-ware vessels with new technologies. Especially in the southeastern part of Korea, the production system, which was organized based on new technology, produced various vessels for consumption in the burial rituals as well as daily practice (Lee Sungjoo 2014: 243–54).

13.5. Regional variation of ceramic production systems in the Three-Kingdom period

So few ceramic production remains have been archeologically discovered that the production systems of the P-TKP must unavoidably be approached through sherds and vessels excavated from the consumption sites. As mentioned earlier, even within Southern Korea, there were differences in the date of new technology introduction, the limit of application, the products, consumption and organization of production regionally. It can be assumed that this difference was caused by the different economic and sociopolitical contexts of each region (Nagatomo Tomoko 2008, Lee Sungjoo 2014: 173–211). The processes by which the organizations of the production and distribution of P-TKP were formed had great differences from region to region.

During the KTKP, the early states such as Baekje and Silla rose in Southern Korea. The Gaya, located between the two states, was divided into dozens of small-scale polities the social complexity of which reached a considerable level despite their being small political entities. In organizing ceramic production, the small polity (*Guk*) was very important as a political and social background from the P-TKP (Lee S. 2014: 248–58). No matter how ceramic production was organized, it resulted from the sociopolitical engagement of the social agents of *Guk*. However, after Baekje and Silla achieved a wide political integration, the ceramic production systems were organized in different ways in the central and local areas of the two early states (Lee S. 2012).

The beginning of production using the Ugeori-type kiln is estimated to have been in the late third century. There is no kiln, as an archeological finding, of which the date has been determined back to the late third century. But since the burials where Dojil round pots produced in Ugeori-type kilns have been found belong to the late third century, the date of the Dojil-ware kiln can be estimated. Because those early Dojil round pots are almost exclusively found in the burials of Haman and Gimhae, it seems that the Dojil-ware kilns were first operated only in those two regions (Lee S. 2008). First of all, the products of Haman and Gimhae were not only fired at high temperatures that induced natural glaze. In addition, the forming procedure based on the distinctive methods of potter's wheel and paddle usage, being a *chaîne opératoire* that had not been seen so far, was very effective in the mass production of round pots (Lee S. 2014: 311–24). These early Dojil-ware workshops produced only one type of vessel, the round pot. The surfaces of the vessels had the mark of a Haman product because the dried vessels were piled up in a specific way inside the heating chamber to be fired (Lee J. 2007, Jung J. 2009). Tracing the vessels bearing the Haman marks allows us to recognize that the

Haman products were distributed in a fairly wide range of Nakdong River Valley.

The earliest Dojil-ware workshops operated only in a limited area of the southeastern coast of the Korean peninsula. However, the round pots of the Haman workshop were mass-produced for wide-ranging consumption. The potter who produced a limited type of vessel in large quantity was able to keep the level of his/her embodied skill fairly high and produce standardized vessels. By the middle of the fourth century, Dojil-ware workshops produced other types of vessels besides the round pot. They expanded their production list to include the mounted dish, cup, large jar, mounted jar, pot stand etc. previously produced by other organizations of production (Jung Juhee 2009, 2019). Although the number of vessel items increased, each type was highly standardized because the programmed forming process of each vessel type was carried out elaborately by full-time specialists (Lee Sungjoo 2012). It is also correct that the Dojil vessels were used in everyday life, but most of them were excavated from burials, and a large number were actually consumed in the burial rituals. In particular, some types of vessels, such as pottery stands and mounted jars, are rarely found in common people's houses, so they may not be related to their daily lives. They may have been produced because of burial ceremonies or demand from higher classes.

Although most of the defective products deposited at the dump in the kiln site are hard-fired Dojil ware vessels, a small amount of Yeonjil ware (soft-fired potteries) and utilitarian vessels are also included. The firing of utilitarian vessels seems to have been finished in an oxidizing atmosphere and at a low temperature, injecting relatively small amounts of fuel, because a perfect vitrification or very high hardness is not required for storage and cooking vessels. Since the utilitarian ware was generally low-fired, it had less frequent defects due to over-firing. Thus, the fact that a small number of Yeonjil utilitarian vessels has been unearthed from the Ugeori-type kiln's dump does not mean that its production was also low. In short, the Dojil-ware kiln of Silla and Gaya produced all the vessels consumed by the upper classes as well as ordinary people, and used in rituals as well as daily life. In a small-scale polity, only one kiln was operated within its area at any one period. This was different from Baekje, where a workshop equipped with one or two kilns operated in each large village. In an early state like Silla, a number of kilns are distributed within its territory, but they are concentrated in both state capital and local centers. Although Silla and Gaya also have small-scale ceramic production sites equipped with one or two kilns, they are usually found in locations unrelated to the village (Kim J. 2016), so they were not workshops for the village community. Judging from their products, they worked with greater emphasis on production for the demand of burial rites and the consumption for the upper class than for utilitarian usage in commoners' village life. Considering the distribution of the kiln remains, as mentioned so far, it is highly likely that political power intervened in the whole organization of ceramic production in Silla and Gaya.

During the P-TKP, the utilitarian wares based on the traditional Mumun pottery techniques and the round pot and small flat-base jars, which were made with new technology, were produced by separate organizations. However, the firing structure in which the utilitarian vessels were produced in the settlement sites is not known until the early fourth century. Although it has not been confirmed through archeological excavations, it is assumed that the firing facilities of the Proto-Three Kingdom period villages would be open firing, similar to those of the Mumun period. As the potter's houses in which the clay body prepared for forming and carbonized wooden turn-tables are found have no differences from those of ordinary people in the village, it can therefore be said that the process of forming and drying was also carried out at a low level of specialization.

It was in the early fourth century that the climbing kiln appeared in the Baekje area and began to produce, almost exclusively, round pots. However, it was a little later that the climbing kiln was introduced into the village workshop and that the wheel-turning and paddling methods began to be applied to the forming of various utilitarian vessels. Unlike in the Silla and Gaya area, where the unified production systems which produced all the vessels to serve the demand of each polity were operated, this ceramic production, organized around several villages, continued in the Baekje area until the sixth century.

In Baekje, the workshops were organized separately by political power for the production of vessels different from the products of village kilns. The upper classes of Baekje imported and used various Chinese celadon items from the fourth century on. From the late fourth century, potters of the official workshop produced imitations of Chinese imported vessels of an earthenware quality. There are production organizations that manufactured and supplied the well-made vessels of fine workmanship and those needed by the central and local governments of Baekje. Hence, it seems that in Baekje, the production for commoners and that for the upper classes' needs were separated and organized hierarchically.

13.6. Conclusion

The technology of kiln and potter's wheel introduced in the early P-TKP replaced the long-term continuous ceramic technology tradition. The process of replacement was different in each regional part of South Korea. In this chapter, without explaining all the regional variations, the process in the Han River basin and that in the Nakdong River have been compared and discussed. At the settlement sites in the Han River basin, where more artisans, including potters, visited from the Lelang commandery, the new technology failed to spread rapidly to the production of traditional utilitarian vessels and was delayed for more than 300 years. The production organization of round pots

based on new technology had long been separated from that of the utilitarian-ware tradition. The Sansuri kiln cluster, which worked in the fourth and fifth centuries to produce a single type of vessel, the round pot, succeeded the tradition of the previous round pot production. However, in the Baekje area, there was another organization that produced the various vessels and the other ceramic products, which was controlled by the early state. In the Nakdong River basin, on the contrary, the indigenous Mumun potter who had acquired new technology from the immigrant potter applied his/her embodied skill in a relatively short time to the traditional types of utilitarian vessels. In the innovation process of Dojil ware, the production of the Wajil ware consumed for burial rites and that of the Yeonjil-ware vessels for domestic use were integrated by the potters who had acquired the technology of the climbing kiln and rapid wheel-turning.

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14

Social Background to the Kilns and Pottery Production Systems of the Ancient Korean Peninsula

Takafumi Yamamoto

Abstract: Following the Proto-Three Kingdoms period, when pottery production based on kiln firing took root, pottery differing with each regional polity or state came to be used at the stage when ancient states were established throughout the Korean peninsula. In light of that situation, this essay shows that regional differences between pottery styles and the borders of the kingdoms overlapped in the Korean Three Kingdoms period, based on the political situation. The system of pottery production between these entities might have differed as well. Baekje adopted a dispersed production/urban accumulation system, while Silla adopted a centralized production/regional distribution system. It can be concluded that this distinction between the two states originated from such differences as the social characteristics, political systems, and differences in ritual customs, including burial practice. This regionality of the pottery production continued for a while during the Unified Silla period as well, but the "cultural rivalry" synthesized by the division into separate states vanished, and state involvement in the production of articles of daily use such as pottery faded.

Keywords: Korean Three Kingdoms period, Baekje, Silla, pottery production system, government management

14.1. Introduction

For pottery of the ancient Korean peninsula, in addition to conspicuous regional idiosyncrasies in vessel types, forms and so forth, variety can be seen in the shaping and trimming, and in the firing technology as well. Looking at the degree of standardization, and at the distribution and scale of the clusters of kilns, it can be supposed that even the systems for producing and distributing ceramics differed from region to region. Taking such a situation as its premise, the current contribution outlines relations between the polities of the Korean peninsula and pottery production for the Proto-Three Kingdoms, Korean Three Kingdoms and Unified Silla periods, and in addition to perspectives on the numbers of kiln groups and their compositions, based on the quality, distribution and consumption of pottery as a product, I endeavor to look at how social background influenced the manufacture of pottery, or conversely how the society of those times can be reconstructed based on ceramic production. In particular, each region was producing stoneware independently during the Korean Three Kingdoms period, and by comparing the various pottery styles and ceramic industries it is possible to elucidate the characteristics of handicraft production for each polity.

Regarding pottery kilns of the ancient Korean peninsula, for which striking increases in data have been seen, as compilations, investigations and reviews of the history of research have been published in Japanese as well (Ueno 2009, 2013, 2015), with advances made in assessing their lines of derivation and examining relationships with kilns in Japan, those results have been heavily consulted in the current undertaking (Ueno 2017; Nagatomo 2018, 2019).

14.2. Archeological characteristics of the Three Kingdoms period of the Korean peninsula

Simultaneously with the Kofun period of Japan, in Korea it was a time when various states and forces were arrayed across the peninsula. In particular the states of Goguryeo, Baekje and Silla were in a powerful three-way contest, and because their rivalry is detailed in historical texts this time is called the Three Kingdoms period. In actuality it is known that in addition to these three states there were various other forces in coexistence, such as Fuyu (Buyeo), Woju (Okjeo), Hui (Ye), Gaya and polities in the Yeongsan River basin. According to the *Samguksagi* (History of the Three Kingdoms), the founding of the Three Kingdoms was in the first century BC, and in texts such as the *Weishu* (Book of Wei) of the *Sanguozhi* (Records of the Three Kingdoms), in the Han (Korea) section of the chapter "Dong Yi" (Eastern Barbarians), the "Han" groups of Mahan, Jinhan and Byeonhan are depicted as divided into small polities holding their separate territories in the southern part of the Korean peninsula until about the third century AD. This era, from around the start of the Common Era until the Three Kingdoms were firmly established, is called the Proto-Three Kingdoms or Samhan period.

In terms of archeology, over the span from the Proto-Three Kingdoms to the Three Kingdoms periods multiple

changes occurred, such as the construction of fortresses, the appearance of kingly tombs with large-scale mounds, the emergence of new pottery styles and the spread of metal prestige goods. There is a tendency to regard this time as the period of ancient state formation on the Korean peninsula, which dates to around the third to fourth centuries chronologically. The Three Kingdoms period continued until the latter half of the seventh century, when Silla unified the three states.

In the same manner as for the Kofun period of Japan, the Three Kingdoms period was when the largest mounded tombs were built in the history of the Korean peninsula, a period of great vigor in rendering authority visible. Also, walled capitals serving as bases from which to rule were built in various regions, and many upland fortresses were constructed in the border zones and at geographically strategic locations. During this time much handicraft production was organized under systems of specialization, and the manufacture of metal ornaments, armor and weapons, equestrian gear, pottery and so forth took on political overtones. As one basis for this observation, materials having differences from one polity to the next in their form and structure are recovered from Three Kingdoms period sites, and these are thought to have served as part of those states' political and cultural identities.

Among such artifacts, ceramics are particularly amenable to sensitive expression and possess forms fully reflecting the intent of those who made them, but behind such acts were the social demands about form as noted above. Variations seen in Three Kingdoms period pottery cannot be dismissed as insignificant regional flavors, but are comprehensive differences in style extending from individual vessel shapes to the composition of vessel types in the assemblage, and from their biased distributions are referred to as the pottery of Goguryeo, Baekje, Silla, Gaya, the Yeongsan River basin and so forth. It was characteristic for each region to have unique vessel types and shapes, as seen in the *ammun* pottery (having patterns of lines made by pressing the surface with a hard tool) of Goguryeo, three-legged vessels of Baekje, representational pottery of Silla and Gaya, and so forth. In Gaya, there were further minute differences in pottery styles from one subregion to another.

Now, why should differences for each region have emerged so clearly even in handicraft items such as pottery? While of course it must be taken as a major premise that the Korean peninsula of the Three Kingdoms period was divided into at least three states plus several regional powers, each with its unique culture, and that those distinctions would be reflected in material culture as well, there are in addition three main factors that can be cited here.

First, the production and consumption of pottery in this era were not self-sufficient, occurring completely within a single household or settlement, as manufacture had already become specialized, and there were extensive networks of distribution. What is vital is that these spheres of distribution were likely contained within the separate territories, making them clearly distinct from the spread of pottery over mere cultural regions. As background, it is thought that politically motivated regulation of distribution was at work.

Second, these differences between pottery styles were not simply superficial distinctions or variations in outward form, but differences in the very organization of technology and systems of production used in their manufacture. In other words, the existence of differences from one region to the next in the systems for manufacture and the technology of handicraft production were the conditions behind the emergence of differences in material culture. As will be touched upon in this contribution, with regard to the technology and system of production for pottery, in the Silla and Gaya regions the technology of manufacturing tile-clay ceramics was the foundation, and due among other things to a need for mass-producing pottery for use as grave goods, the intensive production of highly standardized, refined pottery is thought to have become established from early on. In contrast, in the Baekje region large-scale kiln groups that would indicate intensive production have not been found, but rather a condition can be discerned in which pottery fired in dispersed fashion in various regions was collected at consumption sites such as the capital. As a result, Baekje pottery is thick-walled and low in standardization, giving an impression of lower skill at pottery-making itself in comparison with Silla and elsewhere. The degree of control and management over pottery production was probably weaker than in places like Silla. The same can be said for the pottery of Goguryeo. Thus, the fact that intensive production was not carried out in Baekje is regarded as one factor rendering the typological chronology of its pottery difficult.

Third, as the most significant premise for explaining the above, it is possible that in each state or region these mutual differences in culture were regarded as part of their identities. As seen in modern society as well, the distinctive cultures of separate countries serve as an element that increases their political and social autonomy. Even for polities within the same general region, the Korean peninsula, the maintenance of different cultures for such a long time can only be due to a notion at work that one's own culture differed from those of others.

Especially in the Three Kingdoms period of the Korean peninsula, utensils were used to assert one's own country's uniqueness, but this was closely related to the practice of importing differing foreign utensils as trade items from an early stage and using these as prestige goods. For example, Baekje expressed a Chinese-style aristocratic culture through the importation of high-fired ceramics from the Chinese mainland, while Silla asserted north Asian connections that it considered linked to its own origins by importing glassware and utensils of gold and silver via the Steppe Route. Powerful groups in Japan imported mirrors to emphasize their connections

with China, using them within their own territories as ritual prestige goods and as a means of control, but in addition to the internal and ideational conditions of the Japanese archipelago, this can also be interpreted as including an intent to make distinctions with other regions. This type of situation likely led to attributing to pottery, along with other handicraft products made within one's own region, the role of medium for making distinctions from others.

Let me introduce a representative example regarding differences in pottery styles among the three Korean kingdoms and powerful groups in their environs, and the political conditions existing within them. It involves a trend in archeological materials attending the expansion of Silla's might and the unification of the three kingdoms from the middle part of the sixth century. From the first half to the middle part of the century, the pottery style of Silla changed gradually, and a style called late Silla became established in which short-legged pedestaled dishes and pedestaled long-necked jars with wide, flared mouths comprised a set. These bear characteristics that clearly differentiate them from the straight-mouthed long-necked jars and pedestaled dishes with long legs seen until the first half of the sixth century. From the middle part of the sixth century on, the distributional sphere of this style broadened greatly to extend as far as the Wonsan Bay area in the northeast part of the peninsula, and from Chungju in North Chungcheong Province down the Namhan River to the modern city of Seoul in the Gyeonggi Province region. This was not only a trend in ceramics, but conforms with the acceptance and spread of horizontal stone burial chambers in Silla, telling of the expansion to the north and west of Silla's cultural sphere, which had been limited to the east of the Sobaek Mountains, and the policy of territorial expansion under King Jineung of Silla seen in historic documents has been pointed out as background.

As Silla's 24th monarch, King Jineung (r. 540–76 AD) changed the title of the country's ruler from the native term *maripkan* to the Chinese word for king (*wang*), and, building upon the base of his predecessors in the first half of the sixth century, Kings Jijeung and Bopheung, who promoted various reforms such as the adoption of Buddhism and the introduction of Chinese-style formal legal codes, he is regarded as a monarch who furthered the policies of centralization of authority and territorial expansion, pushing his territory beyond the Sobaek Mountains, establishing the capital of Chungwon-sogyeong, and taking control of the Hanseong region, thereby extending Silla's presence to the western coast of the Korean peninsula and making direct connections with China possible. Through such bold encroachments into the regions of Goguryeo and Baekje, this period set the stage for the subsequent unification of the three kingdoms. Stone monuments commemorating tours of inspection by King Jineung give the most prominent witness to this situation, with four such stelae remaining at Maeunryeong, Hwangchoryeong, Bukhansan and Changnyeong. The locations where these were erected and their ages correlate with the distributions of Silla tombs and pottery, and make visible Silla's aim for regions incorporated into its territory to be assimilated culturally as well.

From this it is also seen that during the Three Kingdoms period there were examples in which political trends and cultural tendencies were definitely in agreement, with culture likely serving as a means to distinguish clearly self from other, and the existence of some form of cultural policy can be surmised. This stands in contrast to the situation of the Japanese archipelago of the Kofun period, when clear regional differences are not seen in Sue ware, which was fired with newly introduced technology.

14.3. Pottery transitions and ceramic industries of the Korean peninsula

In this section, the author briefly traces out the history of pottery manufacture in the ancient Korean peninsula, ascertaining at what stage a technological change occurred to firing with the use of kilns. Soft, reddish-brown types of pottery were long made in Japan until the Early Kofun period, but with the transmission of technology from the Korean peninsula there was a transition to a stage where the production of a hard, bluish-grey pottery (Sue ware) was added. But on the Korean peninsula the change from the former to the latter type was rather complicated, with "transitional period pottery" made in forms that were idiosyncratic to each region.

In the Korean peninsula the manufacture and use of pottery began in the Neolithic period, represented by Yunggimun (raised design) pottery and Jeulmun (comb-pattern) pottery. These were all soft reddish-brown wares made by oxidation firing, and while they had a small degree of local color they shared common shapes and patterns over wide regions. These lines of pottery continued to the Mumun and Jeomtodae (clay-band rim) pottery of the Bronze and Early Iron Ages, and the Yeonjil (soft-fired) earthenware of the Proto-Three Kingdoms and Three Kingdoms periods, although theories positing the influx of culture from the outside for the changes in form in each period are persistent. Further, Mumun pottery of the Korean peninsula also influenced the Yayoi pottery of Japan, but this was related to cultural transmissions that included wet-rice agriculture as well.

Pottery of differing materials was produced in various regions in the Proto-Three Kingdoms period, with undecorated earthenware that, even while presenting a reddish-brown color, was relatively hard and high-fired (Gyeongjil earthenware, also called Jungdosik), or pottery decorated with paddle marks (Tanalmun) made in the central region of the peninsula, while in the southeast there was soft grayish earthenware known as Wajil ware, and so forth. Both open-air and kiln firing are posited for undecorated Gyeongjil, but Tanalmun pottery and Wajil wares are regarded as kiln-fired. At the Samryongri/Sansuri kiln site group in Jincheon in the central region, approximately 20 kilns where pottery was

fired from the latter half of the Proto-Three Kingdoms into the Three Kingdoms period (Baekje period) have been investigated, and represent valuable data for considering the specialization of pottery production in one region of the Korean peninsula. At the same time, the operation of groups of kilns with standardized forms has been empirically demonstrated for this period, although their derivation and the occasion of their introduction are uncertain.

On the other hand, as yet no kiln sites have been definitely confirmed relating to the Wajil ware of the same period in the southeastern region, for which standardization was advanced. But as the provision of large amounts of pottery as grave goods in mounded tombs progressed in this region from the Three Kingdoms period on, it is thought that the creation of a system of organized pottery production advanced at this time.

Although shapes and patterns of pottery were shared over broad regions of the southern part of the Korean peninsula until the Early Iron period, the beginning of diversification of pottery was in the Proto-Three Kingdoms period. As background for that, it is considered that small states and regional groups having the nature of confederations began to emerge in the central and southern parts of the peninsula, where moderate cultural integration had previously been maintained. In particular, the situation of the various states of the Mahan, Jinhan and Byeonhan confederacies recorded in Chinese historic texts starting to manufacture their separate potteries is evaluated as a turning point leading to the subsequent production of pottery along strict lines of regional polities. Further, the Chinese commandery of Lelang was established in the northern part of the Korean peninsula in 108 BC, and the influx of Han culture also had a great influence on changes in pottery and pottery manufacturing technology.

Passing through the Proto-Three Kingdoms period, when transitional pottery was made of various materials region by region, in the Three Kingdoms period the technology for making hard, reduction-fired pottery became established in the southern part of the peninsula. As noted above, material culture differed in the Three Kingdoms period for each state or wide region, but pottery provides data that most strikingly reflect this situation. That the distributions of pottery styles for each country are seen to expand or contract, in keeping with historical phenomena such as Goguryeo's southward advance or Silla's territorial expansion, shows prominently how the "regional political attribute of pottery" was clearly evident. This manner of regional difference in pottery styles was particularly great in stoneware. This is a manifestation of pottery production being managed on the basis of each state or polity, and that the pottery styles of Gaya, in comparison with Baekje or Silla, varied with each subregion indicates that no system had been devised for Gaya to unify pottery production on the scale of the region as a whole. That archeological materials have nomenclatures starting with the names of states or regions, such as "Baekje pottery," "Silla pottery," or "Gaya pottery," is an indication that researchers tacitly share the above premise. However, as will be touched upon below, even while speaking of the management of pottery production on the part of states or monarchies, this does not always indicate large-scale operation of centralized kilns. The management is inferred to have assumed a variety of forms on a regional basis.

Historically, of the three kingdoms, Silla unified the Korean peninsula in the latter half of the seventh century by absorbing Gaya and annihilating Baekje and Goguryeo. While the representative ceramic of the Unified Silla period, stamped-design pottery, is thought to have appeared at the start of the seventh century, it permeated the former Baekje territory and elsewhere from mid-century at the latest. At this time all of the Korean peninsula was unified as a single ceramic cultural sphere, but whether there were changes in the production and distribution of pottery due to the regional expansion of political control has not been clarified. It is thought that the productive system for Silla pottery up to that time would not have been sufficient to supply pottery to the widened area of control. Judging from the standard of production of stamped-design pottery recovered from the former Baekje territory, the possibility that Baekje's ceramic production system was maintained while being utilized to fire stamped-design pottery should also be considered.

In Baekje and Silla around the time of the seventh century, green-glazed stoneware was being made in some locations. Many of these green-glazed items share vessel shapes in common with conventional pottery, and as the absolute numbers are not many, rather than there having been separate specialized kilns, it is surmised they came from kilns that doubled as ones for ordinary pottery or roof tiles.

After the stage of stamped-design pottery, a style of pottery known from the end of the Unified Silla to the start of the Goryeo period, and comprised of a variety of stoneware vessel types with various vases and bottles as the main component, permeated the Korean peninsula in its entirety, and at this time kilns operating on a large scale were seen in the regional areas as well.

14.4. Traits of pottery kilns on the ancient Korean peninsula

Following the stage of open firing of pottery, it is not clear under what conditions kilns as built structures were introduced in the Korean peninsula of the Proto-Three Kingdoms period. The earliest pottery thought to have been made by reduction firing is regarded as deriving from China or Lelang, and the kilns and technology for firing itself could very likely have been introduced through any region. There is the view that kilns of different types, such as those with level floors as well as climbing kilns, and of different lines of derivation diffused outward from multiple regions of China or Lelang, and considering the variability in materials and styles of the time this is a

reasonable opinion (Nagatomo 2019), and the discovery and investigation of verifiable examples of level-floor kilns are awaited.

Traces of pottery production through the operation of fully constructed kilns are seen at the Jincheon Samryongri/Sansuri kiln site group of the latter half of the Proto-Three Kingdoms to the start of the Three Kingdoms periods, where over 20 kilns have been investigated. The operation of this kiln group divides into five phases, for which a chronological spread of over 100 years is assessed, from the first half of the third to the middle of the fourth century, and all were built on the slopes of low hills. The structures were for the most part climbing kilns partly dug into the slope, with those from the oldest phase being small in scale, with a maximum width of 1.5 m for the kiln body and a length of 4 m (Samryongri No. 88-2), then growing larger in scale with the passing of time, with some reaching 2.5 m in width and 8 m in length (Samryongri No. 90-4). The slope inside the kilns at 13–16 degrees did not show regularity, but the horizontal plan had a common structure with the firebox greatest in width, then narrowing gradually from the combustion chamber to the smoke hole. Also, the firebox was in the form of a vertical pit one level below the stoke hole, so that fuel was fed into it in a downward manner. The trend toward kilns becoming larger at this time is thought to have been due to a need for mass production and distribution, rather than any advancement in firing technology. According to the site report, the circulation of products from these kilns is assessed as dividing into three stages, with their distribution expanding over time, and it is suggested that in the final stage they reached as far as Pungnap-toseong in Seoul, the base fortress where Baekje located its early-period capital, and were provided to the Seokchondong tomb group, which is thought to include the graves of kings (Choi et al. 2006).

In addition, kiln features of an initial stage have been investigated for the Proto-Three Kingdoms period at the sites of Gajaeri in Hwaseong, Yongwonri in Cheonan, Yonggyedong in Daejeon and Gwisanri in Gongju, and elsewhere in the region that would later become Baekje, and at Gundong in Yeonggwang and Gungokri in Haenam in the environs of the Yeongsan River basin (Fig. 14.1). Kilns for firing large thick-walled jars have been discovered at Gajaeri and elsewhere, so it is evident that kilns of this period could maintain temperatures sufficient for firing pottery. If all of these kilns that have been identified over a wide area were of the Proto-Three Kingdoms period, then kilns were introduced sporadically across broad areas of the western coastal region, but relations among the lines of derivation of these kilns are unclear.

Kilns for Baekje ceramics of the Three Kingdoms period are probably successors of Proto-Three Kingdoms kilns of the same region, and are scattered everywhere in Baekje territory, but no kiln group has been found where large-scale operation can be recognized. Examples where only a few kilns have been identified are common, and their productive capacities are insufficient for distribution over wide areas. They are climbing kilns with subterranean or semi-subterranean kiln bodies that are elliptical to elongated oval in horizontal plan, and built following the slopes of hills. Many of the kilns on the northern periphery of Baekje in particular follow the form of the Samryongri kilns, and as a characteristic they have fireboxes that are clearly in the shape of vertical pits, as for example at the Maeseongri No. 1 kiln in Cheonan. This feature is called a "vertical firebox" or "vertically fed firebox," and is regarded as a common form of kilns in the western coastal region (Fig. 14.2). By digging the firebox as a vertical pit, the difference in height with the smoke hole is increased, and this was probably intended to raise the temperature within the kiln. At the same time, kilns having only a gentle incline from the stoke hole to the firebox were seen from an early stage in Baekje, so having a vertical pit was not necessarily an essential characteristic of kilns of the Mahan and Baekje regions.

Baekje kilns changed greatly around the end of the sixth to the start of the seventh century. In addition to the climbing kilns with long elliptical forms in horizontal plan seen up to that time, there are kilns having rather wide, level fireboxes and sloping firing chambers raised one level above. There are also examples in which the firing chamber is stepped in form. These are dual-operation kilns that fired roof tiles and pottery simultaneously, and the Jeongamri kiln group site in Buyeo operated on a large scale in order to supply roof tiles for the temples that were starting to be built in great numbers from this period.

Many pottery kilns have been also been identified in the Three Kingdoms period region of Jeolla Province, which included the Yeongsan River basin, and their characteristics are inherited from those of the Proto-Three Kingdoms period. Many have kiln structures not differing greatly from those of the Baekje region, but in the products and conditions of production there are two major distinctions. First, in connection with the mortuary customs of the area, as it became necessary from around the fifth century to produce in quantity very large jars for use exclusively as coffins, groups of kilns were operated in order to fire these jar coffins (Fig. 14.3). The Oryangdong kiln site in Naju, where the remains of more than 60 kilns and workshops have been identified, is the representative example, and in comparison with kilns that fired general wares for daily use of the same period, many were at least twice as large in terms of firing chamber area, and they were characteristically built with a large forecourt at the kiln's front. Second, in the Yeongsan River basin of this time a number of huge settlements formed which had between several hundred and more than 1,000 dwelling sites, and kilns were needed to supply pottery for these as well. A pottery kiln belonging to the settlement was built at the Sanjeongdong site in Gwanju, and at the Haengamdong kiln site in Gwanju, where more than 20 kilns have been investigated, from the degree of concentration and placement of the kilns, it can be seen that mass production was carried out in planned fashion and the products were supplied to large

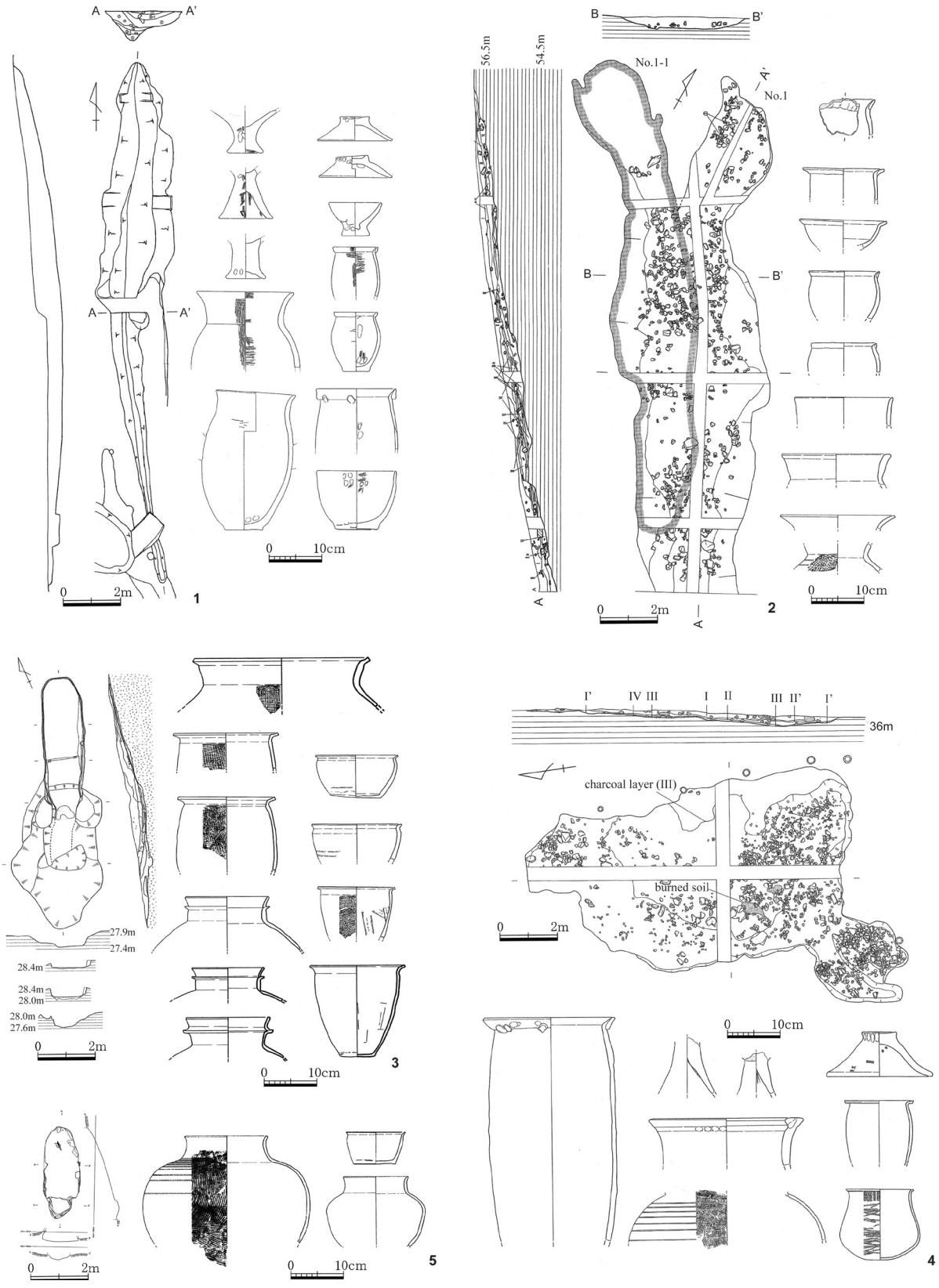

Figure 14.1. Kilns and potteries of the Proto-Three Kingdoms period (after Kim Jaecheol 2007). 1. Shinchangri site, Gwangju; 2. Bonggyeri site, Sacheon; 3. Gundong site, Yeonggwang; 4. Daeseongdong, Gimhae; 5. Samryongri site, Jincheon.

settlements in the environs. At the same, from the mid-sixth century on, Baekje pottery came to be made in the Yeongsan River basin as well, and at the Dangga kiln site in Naju, which is representative for this period, the firing chamber floors characteristically have a stepped form. As this characteristic was also found at the Haengamdong kiln of the previous stage, this change in kiln structure is seen to have occurred within this region, and these local kilns were used to make the newly introduced Baekje pottery.

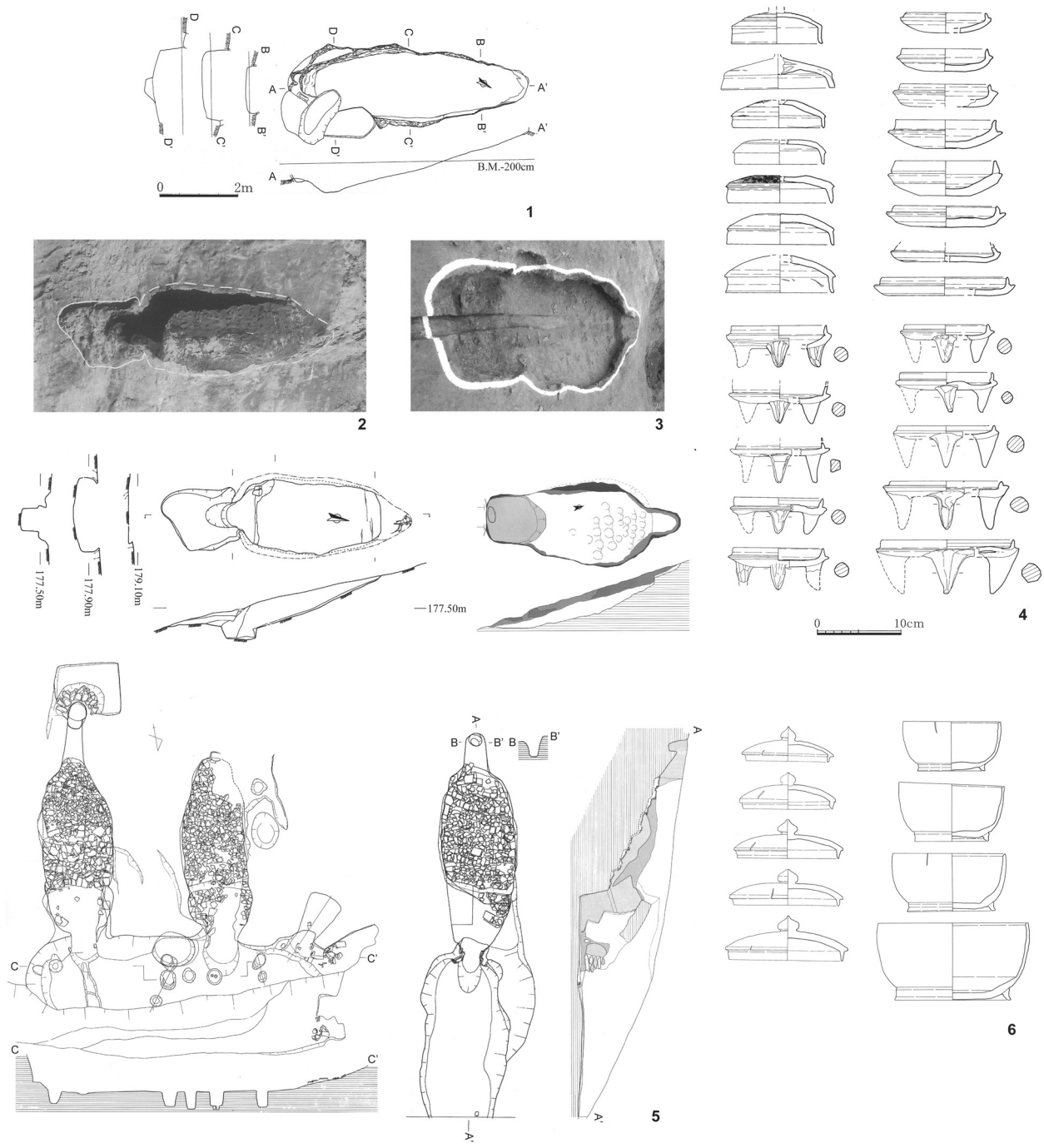

Figure 14.2. Kilns and potteries of Baekje (Choi Byeonghyeon et al. 2006, CICH 2005, CIHC 2006, BNM1992). 1. Samryongri site, Jincheon; 2. Maeseongri site, Cheonan; 3. Hagamri site, Cheongyang; 4. Various forms of the early type of Baekje pottery; 5. Jeongamri site, Buyeo; 6. Standardized late type of Baekje pottery.

The initial appearance of kilns in the Gyeongsang Province region is not clear, and while features related to firing from the Proto-Three Kingdoms period at Daeseongdong in Gimhae, Bonggyeri in Sacheon and Hwangseongdong in Gyeongju and others are named as candidates (Kim 2007; Nagatomo 2019), their structures cannot be said to have been standardized, and the lines of derivation are uncertain. At the same time, tile-clay vessels of this period have fixed shapes and styles, and as they are clearly reduction fired there is no doubt that kilns were in existence (Nagatomo 2019). The reason why standardized kiln groups are not recognized when compared with the western coastal region of the same period is not clear, but it is necessary to consider differences in kiln structure and the relative cultural and geographical distances from China.

Subsequently, at the Hwasanri kiln site in Gyeongju and elsewhere kilns made pottery in the transitional period of the differentiation between Silla and Gaya pottery, while at the Yeochori kiln site in Changnyeong and elsewhere climbing kilns were operated that also manufactured early stoneware, and these had relatively long kiln bodies in

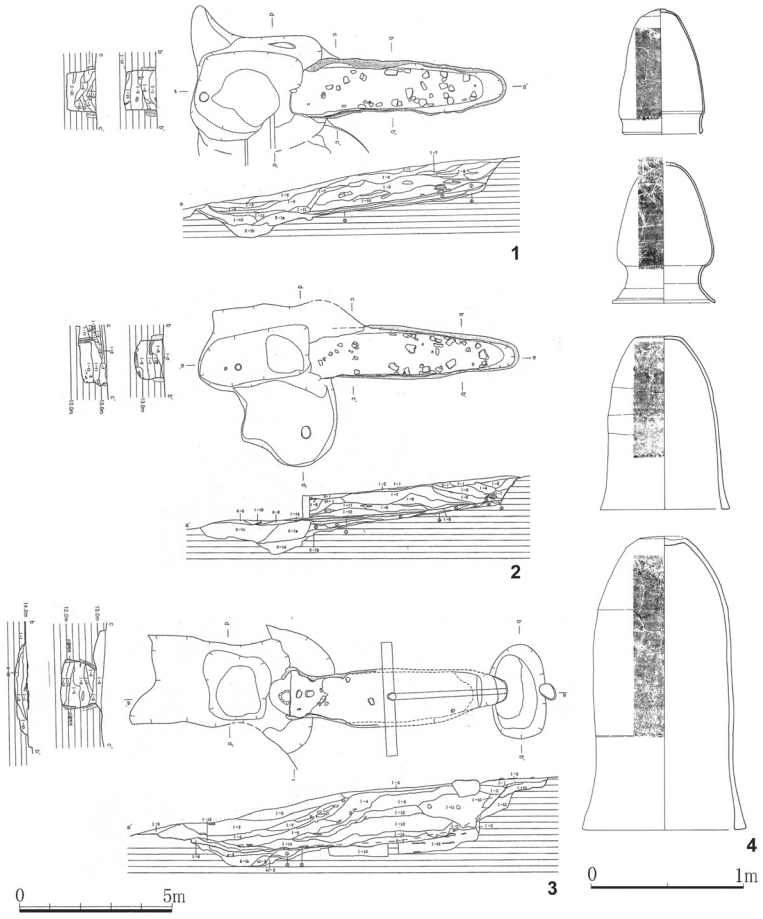

Figure 14.3. Kilns and jar coffins of the Yeongsan River basin (Yeon Ong et al 2011, Yamamoto 2016). 1–3. Oryangdong site, Naju; 4. Various forms of jar coffin.

horizontal plan, with the boundary between the firebox and firing chamber being characteristically indistinct.

From the fifth century on, when huge tombs with high mounds came to be made in Silla, large-scale production sites encompassing several tens or more kilns and workshops, as represented by the Songokdong/Mulcheonri kiln site in Gyeongju, came to be operated in Silla (Fig. 14.4). This was a system of production propelled by demands for supply to a permanent capital (one not subject to frequent relocations) and the custom of providing large amounts of pottery as grave goods for the mounded tombs, differing greatly from Baekje, where the capital was repeatedly moved, and the provision of pottery as grave goods to mounded tombs was not very lavish. This type of situation was seen in other regions of Silla as well, and has been confirmed for example at Uksudong in Daegu and Oksandong in Gyeongsan. The kilns of Silla were not greatly different from those of the western coastal region in terms of the size of individual kilns, so they probably managed mass production by the numbers of kilns in simultaneous operation.

In the Gaya region, kilns producing early stoneware have been investigated at Myosari and Ugeori in Haman and elsewhere, and in the same manner as for the western coastal region it can be seen that small-scale kilns became established at an early stage of the Three Kingdoms period. In structure these were climbing kilns that were oval in horizontal plan, and with consolidated kiln bodies having no difference in height at the boundary between the firebox and firing chamber. Subsequently, separate styles developed in the various subregions of Gaya in the Three Kingdoms period, with each locality using distinctive pottery, but the kilns that made these various Gaya potteries have not yet been investigated. Considering the amounts provided as grave goods for tombs and the standardization of pottery, it is thought highly likely that kiln groups will be found in various locations which made products in bulk numbers.

Historically speaking, from the mid-sixth century on, Silla absorbed the Gaya confederacies, and further advanced into the western coastal region in a manner that split the border between Goguryeo and Baekje. At this time, the style of Silla pottery changed slightly, and the ceramic set comprised of short-legged pedestaled dishes and pedestaled long-necked jars diffused to the regions into which Silla advanced. Kilns that produced pottery of this period have been confirmed in various regions, such as Gimhae and Daegu, so in response to changes in pottery styles of the center and the expansion of state territory, small-scale kilns are seen to have been operated in like manner in each region.

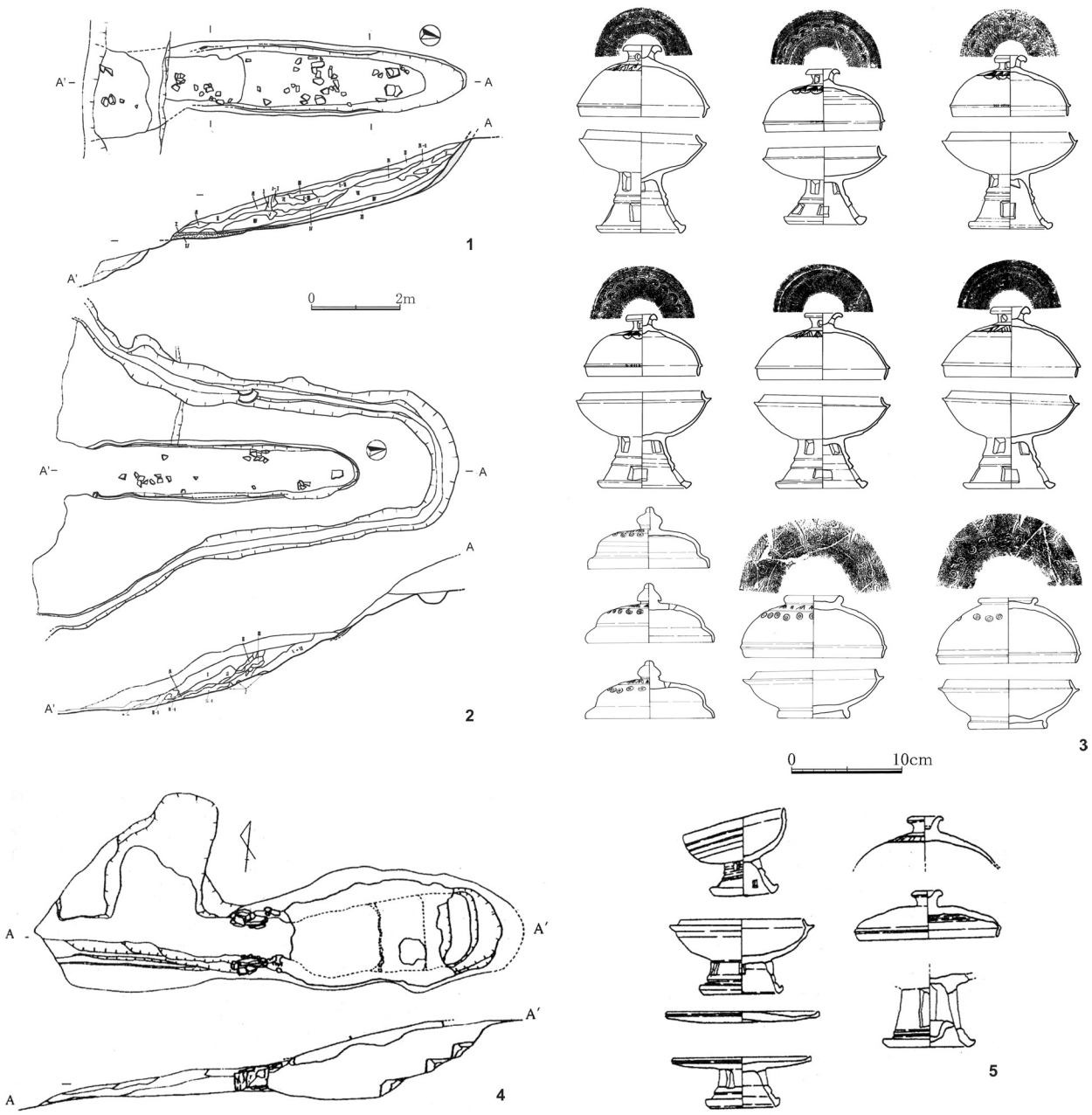

Figure 14.4. Kilns and potteries of Silla (GNRICH 2004). 1–2. Songokdong site, Gyeongju; 3. Highly standardized Silla pottery; 4. Mulcheonri site, Gyeongju.

Subsequently, around the start of the seventh century, Silla pottery which had undergone a large-scale transformation (stamped-design pottery) spread across all of the peninsula about the time of unification under Silla. Stamped-design pottery was made in large-scale kiln groups at sites such as Hwagokri and Mangseongri in the environs of Gyeongju, from where it continued to be supplied to the capital and palace, but it is known to have been produced at regional kilns such as Samgyedong in Gimhae as well. As noted previously, looking at the stamped-design pottery recovered from the former Baekje region, there are examples which are notably crude in their firing or decoration, and it is possible that pottery production was being carried out for a time using the previously existing kilns and artisans of local regions. By contrast, regional differences for kilns are not seen from around the eighth century on.

This situation changes further with the stage of pottery from the end of the Unified Silla to the start of the Goryeo period, as kilns firing massive amounts of products such as the Jinjukri kiln site group in Boryeong are operated in the regions, and take on new roles of supplying and producing pottery. The structure of the kilns does not differ greatly from those of the Three Kingdoms period.

As seen above, from the Three Kingdoms period on, state or monarchy control took effect over the manufacture and distribution of the products of civilization throughout the Korean peninsula. Pottery and roof tiles were no exception,

and as their production has a tendency to change and develop in response to trends in political strength or social currents, investigations into the workshops and kilns which produced them need to keep in mind their connections to political conditions of the time, such as relations between states, when making interpretations of these materials.

Based on this perspective, I wish next to proceed with an examination of the relations between state and social orders and the system of pottery production.

14.5. Systems of production and distribution seen through products and kiln operations

As different styles of pottery were used by each state or region in the Three Kingdoms period, it is difficult to discern whether the lines of craft technology including kiln operations in each region were mutually connected, or whether each developed independently. At the same time, even though the shaping of vessels and the level of manufacture differ, as stoneware began to be manufactured at closely matched periods in the various regions, and as marked differences in the structure of the kilns themselves are lacking, it is observable that on the whole there were no great discrepancies in the technology of firing pottery. What then may have caused the great differences in pottery styles of each region? In checking the numbers and distributions of kilns, and the distributions of the products, it is necessary to take cognizance anew of the underlying differences in the social systems and systems for the supply of materials in each state and region. In order to compare the pottery production systems of each state in the Three Kingdoms period, I would like to take the pottery recovered from the consumption sites (capitals) of Baekje and Silla as objects for examination as manufactured products.

The pottery style typical for Baekje was established during the Hanseong era (to 475) at its capital, which was then located in the vicinity of modern Seoul, and subsequently spread to Gyeonggi Province, Chungcheong Province, Jeolla Province and elsewhere over the western coastal region of the Korean peninsula. Three-legged vessels were the most characteristic type, and kiln-fired items consisted mainly of dishes such as lidded or pedestaled examples, or jars such as those with short or wide mouths. Baekje pottery was also provided among the grave goods of mounds, although the amounts are small, and amounted to the burial of sets of small and medium-sized vessel types that were used in daily life.

As one of the greatest characteristics of Baekje pottery, there are large differences between individual examples even among items of the same vessel type. These are not differences in size, but indicate that various techniques were being employed even while making vessels with a common perception of their type. For example, among three-legged vessels of the same period, the lip rising from the seat for the lid may be made as a single piece with the body or may be a separate attachment, while the legs of those vessels may be shaped and adjusted by manual kneading or they may be fashioned by cutting away. These differences do not always permit clear distinctions as to the period or region, but may be seen mixed together within items recovered from a single site, and from their commonalities in terms of size and conditions of recovery, they cannot considered as having been made for different uses either.

Another characteristic of Baekje pottery is that in comparison with other regions the vessel walls are thick, and many of the items are crudely made. This is clear when it is compared with the earthenware or Sue ware of Silla and Gaya of the same period, and even mid- and small-sized vessel types have a heavy feel. Taken together with the aspects of variability in shape noted above, Baekje pottery is relatively poor in standardization, giving the impression that regular styles had not become established.

As background to these unique characteristics of Baekje pottery, although there would naturally have been the individual circumstances of the producers, as there are no great differences with other regions in the structure of individual kilns or in the firing itself, these distinctions may be regarded as differences in the systems of production. To date pottery kilns have been investigated at about 30 locations in the Baekje region, and excluding from these the items of the Proto-Three Kingdoms period the total number of kilns for the Baekje period is not very great. Until about the mid-sixth century, there are no traces of production concentrated at a single location which supplied multiple regions, and from the existence of small-scale groups of kilns in each locale, it can be surmised that there were self-contained production and distribution networks for each local area. In Baekje, which lacked a custom of consuming massive amounts of pottery as grave goods in mounded tombs, there was probably no need for large-scale production. This situation continued from the Hanseong to the Eungjin era (475–538), a period of small-scale capitals at which large populations are not seen to have resided.

This tendency changed starting in the subsequent Sabi era (538–660), when planned moves of the capital were made, and in the first half of the sixth century during this period residential districts were set up at the capital based on a regular checkerboard-like grid of streets, with the surrounding population made to live there in concentrated fashion. At the capital where this populace gathered the volume of pottery consumption greatly increased, but the local system of production and distribution for Baekje pottery prior to that time, which could be termed a “regionally dispersed” or “small-area self-contained” model, could not meet the new demand, so pottery from kilns of the various regions gathered at the capital. In other words, as one reason why examples of the same types of products were mixed together in a variety of shapes, a situation can be supposed in which pottery made in different production sites was assembled at the center. Whether this phenomenon was limited to the capital, or whether similar

situations can be seen for other settlements or tombs etc., will require further examination in the future.

This situation changed in the latter half of the Sabi period (seventh century), when Baekje pottery transformed into a different style, with pedestaled bowls and plates as the main forms. This is called the late Baekje style. The regularization of form proceeded from this period, becoming highly standardized, and production was undertaken at the Jeongamri kiln group in Buyeo adjacent to the capital, where it can be seen that standardized kilns were operated in dense formations. Upon reaching this period, which was the final stage of Baekje, pottery production is seen to have finally come under centralized management of the state or the monarchy.

In contrast to the pottery of Baekje, with its heavy feel and heterogeneity, the thin-walled pottery of Silla and Gaya had the characteristics of being standardized and regular in form, from which the existence of a refined technology of mass production can be surmised. While there is a small amount of stylistic variation from region to region, on the whole a technological homogeneity encompassing multiple regions is visible.

Pedestaled dishes and jar-shaped vessels are the types representative of Silla pottery, and for pedestaled dishes in particular there are several forms, with changes in each vessel form clearly reflecting the age of production. For each vessel type of Silla pottery, products with almost no individual variation were made in great volumes. That the chronology for Silla pottery is detailed and clear-cut in comparison with the pottery of Baekje is due to its regularity of form and universality that were supported by a uniform productive technology. As background for this, the early establishment of a system of mass production in order to satisfy the custom of providing large amounts of grave goods to mounded tombs, and the possibility for continuous management of production and circulation in the outskirts of the political center, since the capital never left Gyeongju, are thought to have been conditions. This form of an organized system for the production of pottery is regarded as lasting from the stage of the fourth and fifth centuries until the seventh century and beyond.

Looking at pottery kilns that have been investigated, it may be seen that large-scale kiln groups were operated in Silla at an early stage in the vicinity of the capital Gyeongju. Kiln site groups at Songokdong/Mulcheonri, Hwagokri, Hwasanri and elsewhere are representative of these, and as more than 80 kilns and related features such as workshops have been confirmed at Songokdong, this is seen to have served as a production site over a long period. Pottery made at these large production sites is thought to have been distributed not only at the capital and large-scale tombs at the center of Silla but throughout the territory, and it is supposed there was also a system by which pottery was produced through imitation in the regions as well. More than 40 kilns have also been identified at the Uksudong/Oksandong kiln site in adjacent parts of Daegu and Gyeongsan, substantiating the regional existence of such core production sites.

Looking at kiln structure, in comparison with those of Baekje the Silla kilns are standardized in terms of their shapes and scales. There is not much difference with regard to kiln body length between the two regions, and while the slightly narrower kilns of Silla appear inferior in productive capacity per kiln, Silla's mass production is evidenced by the exceedingly greater numbers of kilns in operation.

In this manner the pottery production of Silla and Baekje differed not only in the structure of their kilns but in matters such as the system of production as well. The productive system for Gaya pottery supplied spheres that were narrowly focused in individual subregions, but from the element of centralized production seen in the regularity of vessel form it is regarded as approaching that of Silla.

Let me summarize here the content above concerning the technology of pottery manufacture and the system of production of the Three Kingdoms period. In the Silla and Gaya regions, due to demands for large amounts of pottery as grave goods, systems of pottery manufacture intensively producing refined wares at a high degree of standardization with little individual variation became established from early on. Kilns clustered together in the outskirts of capitals or at core regions, and they mass-produced wares that were distributed everywhere. This type of production and distribution can be labeled the "centralized production/regional distribution system."

In contrast, Baekje pottery has great variation among items of the same vessel type, even though the numbers recovered from single sites are small. No kiln sites have been discovered giving evidence that intensive production was undertaken, and a situation can be surmised in which pottery that was fired everywhere in dispersed fashion to supply separate locations of consumption was brought together at sites such as the capital. As a result, the pottery is low in its degree of regularity, and gives the impression of not having been produced with very experienced skill in comparison with the pottery of Silla and elsewhere. The level of management for pottery production appears to have been weak when compared for example to Silla. This can be called a "dispersed production/urban accumulation system" (Fig. 14.5). This situation changed in the mid-sixth century to a centralized production system, with the pottery style completely changing at the same time, which indicates that the making of pottery in Baekje transformed to a system of production under government management. It should be noted that it was carried out simultaneously with the production of roof tiles in kilns that doubled as ones for firing pottery and tiles.

14.6. Pottery kilns and tile kilns

The use of roof tiles took hold in the Korean peninsula starting from the Three Kingdoms period. While buildings

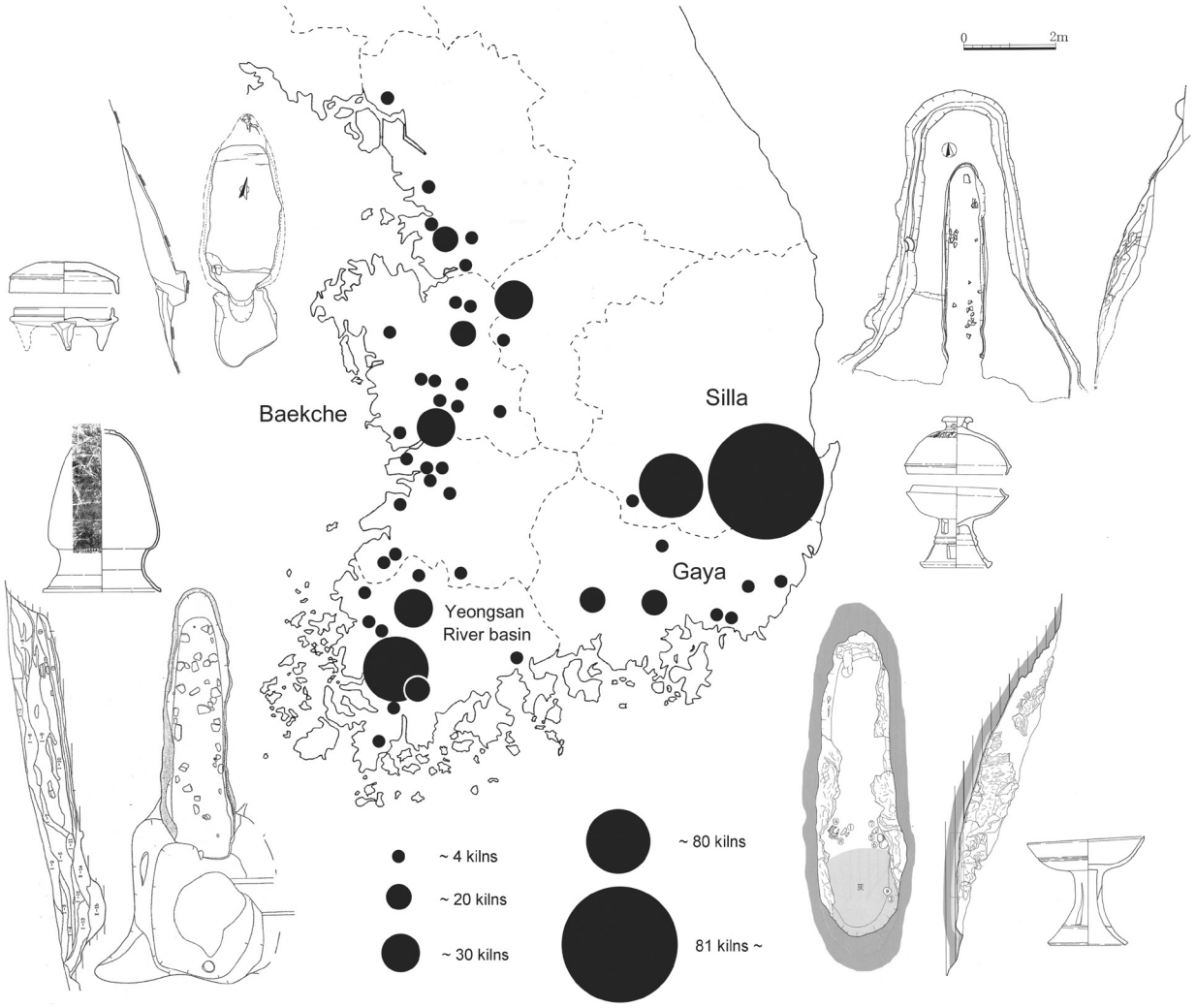

Figure 14.5. Distribution and number of kilns in the Three Kingdoms period.

associated with fortresses and piled-stone mounded tombs are known to have been roofed with tiles from an early period in Goguryeo, there is no information regarding the kilns which produced them. In Baekje as well, tiles are recovered at sites such as Pungnap-toseong, which was a fortress, but the kilns which fired them have not been discovered. These early-period tiles are not associated with temples, and are thought to have probably been used at royal palaces inhabited by the ruling class and similar sites.

The increase in tile production in Baekje came with the full-blown spread of Buddhism, attended by the active construction of temples. Following the introduction of temple construction in the Eungjin era, projects for building temples flourished within and around Sabi Fortress after the move of the capital to Buyeo. Further, with the introduction of a Chinese-style capital, buildings using large numbers of tiles were adopted in palace construction. Starting with state-sponsored temples and those of comparable status (such as the temple sites of Jeongrimsa, Gunsurisa, Wangheungsa, Neungsanrisa, Miruksa and Jaeseoksa), with the adoption of the use of tiles for a variety of buildings, large-scale tile kilns such as the Jeongamri kiln group were operated in the vicinity of the capital and came to supply various locations, and at those sites not only tiles but pottery was fired as well, and was supplied to core facilities of Baekje centering on the capital from the latter half of the seventh century. At this time a major changeover in pottery style was occurring in Baekje, from the traditional dishes to bowls as the main forms, with the material for firing pottery being close to the clay used for tiles, and regularization in form was progressing. In other words, in Baekje the centralized production of tiles was linked with the stylistic transformation and formal regularization of pottery, and further the system for production of tiles and pottery was changing over from the previous dispersed pattern to a centralized one.

As the kiln structure of this time differed from that of kilns used until then exclusively for pottery, it is necessary to include in examining its line of derivation the influences coming from the outside in tandem with the development of tile production, but there is no doubt that this change was intimately linked with political trends of this period aimed at advancing the centralization of authority. Inkstones that have also been recovered from

the Jeongamri kiln site are impressive artifacts telling of the penetration of document-based administration, and are a vessel type not previously seen (Yamamoto 2017). However, tiles were used not only at the capital and other core establishments but also at regional upland fortresses, and there were probably kilns supplying such individual facilities. Regarding the derivation of Baekje tile kilns, comprehensive investigations including those based on the situation of kilns for bricks are needed in the future.

In Silla as well, kilns where tiles are recovered appear around the time temple construction becomes active, but this does not indicate the creation of a new system of production as in Baekje, as initially tile kilns were built adjacent to the large-scale pottery kiln groups noted above. In other words, tile production in Silla began by building upon the already existing large-scale production of pottery, and no change can be seen therein regarding the systems of production or distribution. At the same time, around the time when regional temples of Unified Silla were being built, the operation of regional kilns for tiles became common, and it is thought that networks for the production and distribution of both pottery and tiles were established to encompass the vast territory that had been acquired.

As the nature and targets for supply of the products differ for pottery and tiles, when considering the lines of derivation for each regarding kiln operation technology and kiln structure, it is necessary to make examinations after assessing relations between the aims of production and state policy, the manner of social role carried out by the products, and so forth.

14.7. Conclusion

Following the Proto-Three Kingdoms period, when pottery production based on kiln firing took root, pottery differing with each regional polity or state came to be used at the stage when ancient states were established throughout the Korean peninsula. It must be considered that if aspects of state policies are reflected in this situation, political conditions are reflected in the operations of kilns that fired the pottery as well, and that the mode of management varied from state to state. Baekje and Silla, which have been predominantly investigated in this contribution, make a good contrast, and their systems have herein been labeled as a "dispersed production/urban accumulation system" and a "centralized production/regional distribution system." Differences between the two states in their social characteristics and political systems, and in their ritual customs including burial practices and so forth, serve as the background to this contrast, and differences are thought to have appeared as well in the bases of their handicraft production. While preserving the kiln industry that had developed regionally, Baekje sought to maintain uniformity in vessel form by making specifications as to product shape. As background, there was no stable capital or grave goods custom that consumed large amounts of pottery. In Silla on the other hand, it may be said that mass production of pottery at a high standard was achieved by having state management of pottery production from the start. As background for this there was a high volume of consumption at the capital, which did not relocate, and the custom of providing large amounts of pottery as grave goods in mounded tombs. This situation continued for a while during the Unified Silla period as well, but as the "cultural rivalry" synthesized by the division into separate states vanished, state involvement in the production of articles of daily use such as pottery faded. The need for distinctions in material culture on a country-by-country basis disappeared, and a unified culture came to spread across the entire Korean peninsula. This situation should also be discernible in the kilns that produced pottery and tiles.

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Part IV

Developments on the islands of the eastern periphery