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Chronology and Age Determination of Pottery from the Southern Kamchatka and Northern Kuril Islands, Russia

Katsunori TAKASE

Abstract: This study aims to establish a chronological system of pottery with inner lugs, known as *Naiji* pottery, which is found in the southern Kamchatka Peninsula and the Northern Kuril Islands. Through examination of the typology, *Naiji* pottery can be divided into four subtypes: types Ia, Ib, II and III. Radiocarbon dating using Accelerator Mass Spectrometry (AMS) demonstrates that type Ia should be dated from the second half of the 15th century to the first half of the 17th century, and that date of type II falls after the second half of the 17th century. Although there is still no radiocarbon date for it, type Ib likely can be assigned to the 17th century because it is an intermediate type between types Ia and II. Type III is the last phase of this pottery that is influenced by the Russian iron pan, suggesting that its date belongs to a period during the latter half of the 18th century to the beginning of the 19th century. The occurrence and distribution of this pottery indicate that the mid-15th century and mid-17th century are significant epochs of human activity in this region.

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1. Introduction

Naiji pottery is characterized by lugs that are attached to the inner rim of a clay vessel for hanging. This pottery is a simulant of an iron pan that was originally produced in medieval and early modern Japan. This kind of pottery has a wide distribution in the eastern region of the Japanese Islands, southern Sakhalin Island, the Kuril Islands, and the southern Kamchatka Peninsula. In the last two areas, *Naiji* pottery has been recognized as an important clue for examining the activity of people such as the "Kurile" and the Kuril Ainu (e.g., Dikova 1983, Maeda 1985, 1989, Yamaura 1989). However, the age of this pottery has not been thoroughly revealed yet, and this has been a great obstacle for archaeological discussions on the history of the latter half of the 2nd millennium C.E. in this region. This study examines the chronology of the pottery using new materials that we excavated in the southern Kamchatka.

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Katsunori TAKASE: takase@let.hokudai.ac.jp

2. Study History of the Age of *Naiji* Pottery from Kamchatka

(1) Early expeditions and recognition of *Naiji* pottery

In the southern part of the Kamchatka Peninsula, pottery is not a universal artifact throughout prehistory. This is because wooden/bark bowls and heated stones were the main instruments for cooking, as ethnographic documents demonstrate (e.g., Krasheninnikov 1754, Steller 1774, Bogoras 1904–1909, Schnell 1932, Rudenko 1948). Therefore, *Naiji* pottery is an exceptional artifact in this region; it is the first and last pottery stably used there[1].

In 1852, Ditmar (1901 [2009: 186]) found a "broken clay cup" in Bichevinskaya Bay, on the east coast of the central Kamchatka. This is probably the first instance of *Naiji* pottery from Kamchatka that is recorded as an archaeological artifact because other types of pottery, for example, the Old Koryak culture pottery have little possibility of existing in this region. In the first half of the last century, numerous artifacts, including *Naiji* pottery, were collected by two large-scale expeditions. Artifacts restored by the Swedish Kamchatka Expedition during the period between 1920 and 1922 are an early but content-rich collection (Schnell 1932). However, there is no doubt that a full-fledged archaeological study in this region was pioneered by Waldemar Jochelson (1928). From 1909 to 1911, he conducted an archaeological and ethnographical expedition in Kamchatka and estimated that *Naiji* pottery should be assigned to a period between the 11th and the 19th centuries on the basis of the production age of Japanese coppers found to be associated with the pottery. Quimby (1947) also supported this idea.

Jochelson reported that the date of the Japanese coppers was provided by Yoshikiyo Koganei, an anthropologist at the Imperial University of Tokyo (Jochelson 1928: 37). However, Kogainei later stated that he had never seen the coppers, and had not told Jochelson their production age (Baba 1940: 73). While examining Jochelson's collection, which is housed in the State Historical Museum in Moscow, we did not observe any Japanese coppers. However, the coppers found by Jochelson must be Japanaese *Kan'ei-Tsuho* produced between 1636 and the latter half of the 19th century because almost all of Japanese coppers found in Kamchatka are this type of coin, as later excavations have revealed. Nevertheless, Jochelson pointed out that the age of *Naiji* pottery also extends as back as the 11th century. This error was corrected by Oswalt in 1953.

The chronology in the Northern Kuril Islands was first established by Baba (1937b, 1939, 1940). This framework has strongly influenced the dating of *Naiji* pottery from Kamchatka because this pottery shares common typological characteristics in both areas (Figures 1 and 2). In the Northern Kurils, Baba established three stages on the basis of excavations conducted on Shumshu and Paramushir Islands from 1933 to 1938 (Baba 1934, 1936, 1937a, 1937c, 1937d, 1938). The oldest stage is the Okhotsk culture phase (ca. the 5th to 10th century in Hokkaido)[2], and the succeeding period is the era of *Naiji* pottery. The youngest phase represents a material culture complex that belongs to the Kuril Ainu. In this scheme, the date of *Naiji* pottery is assigned at least after the end of the Okhotsk culture, which is dated about the 10th century. Although some archaeologists believe that *Naiji* pottery has a chronological connection with the Epi-Jomon culture ceramics or the Okhotsk culture ceramics (Niioka 1937, 1970, Hayashi 1943), many scholars have supported Baba's framework (e.g., Ito 1942, Chard 1956, Petei and Fukuda 1974,

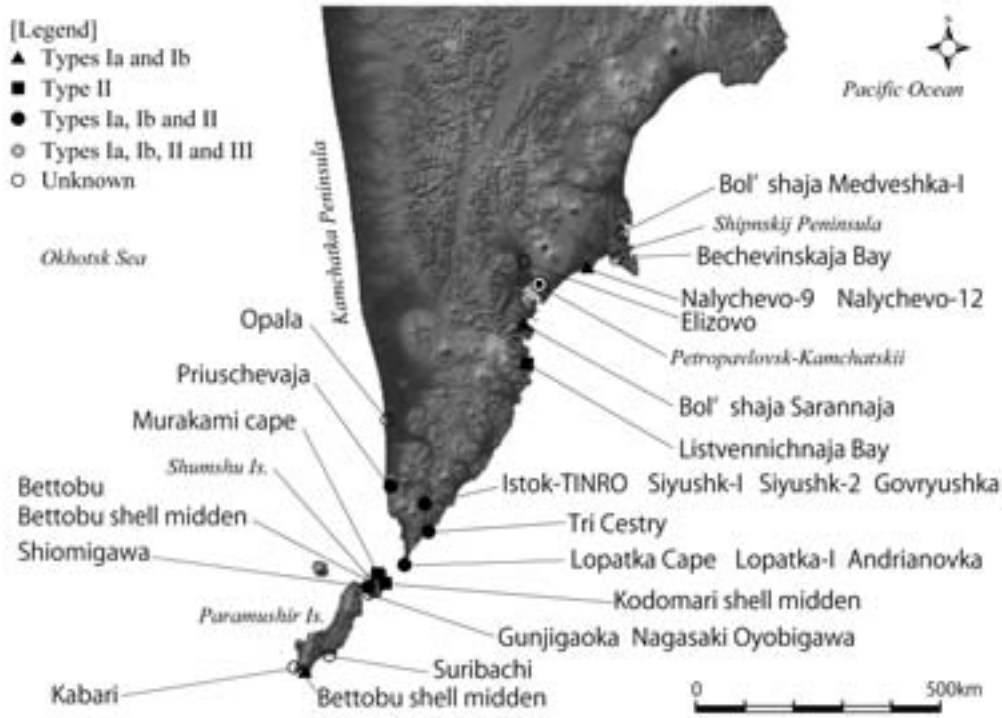

Figure 1 Distribution of *Naiji* pottery in the Northern Kuril Islands and the Kamchatka Peninsula

Utagawa 1989).

(2) Studies after WWII utilizing ethnographic documents and ^{14}C dating

After 1945, discoveries of *Naiji* pottery that had the same ornaments as Satsumon pottery in Hokkaido demonstrated that the oldest phase of *Naiji* pottery has a relationship with the terminal Satsumon culture that is dated to the 12th or 13th century (e.g., Utagawa 1977, 1988, Matsushita 1996a, 1996b). However, the date of the extinction of *Naiji* pottery still remains obscure. Rudenko (1948) classified pottery from Kamchatka into three types as follows: 1) pottery with textile-like ornamentation, 2) the coarse pottery with embossed clay ropes, and 3) *Naiji* pottery. To estimate the age of *Naiji* pottery, he referred to documents recorded by Japanese ethnographers, such as Rinzo Mamiya and Ryuzo Torii. However, we must pay attention to the fact that the information in these documents is not necessarily reliable evidence for the final stage of the pottery.

The reports of Mamiya's exploration of Sakhalin Island, conducted from 1808 to 1809, and with titles such as "*Todatsu Chiho Kiko*", "*Hokui Bunkai Yowa*" and "*Kitaezo Zusetsu*" (Mamiya 1811, 1857), were prepared by Teisuke Murakami on the basis of Mamiya's dictation. In these reports, the method for using *Naiji* pottery is concretely explained, but there remain some doubts about whether he actually observed the pottery in Sakhalin. First, in those documents, pottery with four inner lugs is illustrated. However, there is no such pottery in Sakhalin; the number of inner lugs is always two in this region. There is a possibility that the illustrated example is a local type of Hokkaido (Hayashi 1943 [1984: 228–231]). Second, information

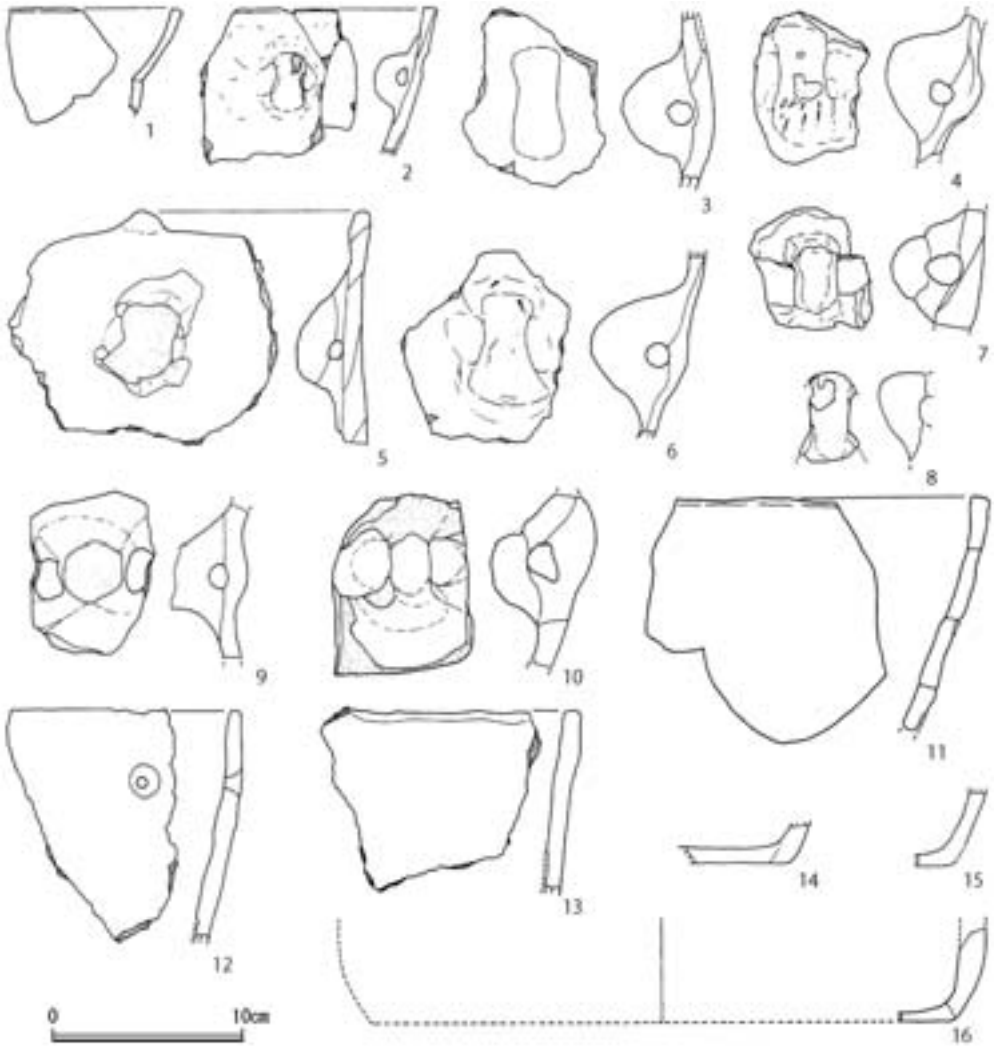

Figure 2 ***Naiji*** **pottery from the Northern Kuril Islands** [**Kumaki** ***et al.*** **2010**]

source on *Naiji* pottery is not explicitly stated. Therefore, it is difficult to determine whether the description about the pottery is based on Rinzo's own observation or solely on an oral story of the indigenous people. These reports may offer indirect evidence showing the utilization of pottery in the beginning of the 19th century, but they are not necessarily exact information on the utilization and production of the pottery.

Although Rudenko (1948) did not determine the date of *Naiji* pottery, he did cite the pottery-making technology reported by Torii (1903, 1919). These ethnographies has attracted positive attention by archaeologists as critical evidence showing the production of pottery in the 19th century in the Northern Kurils (e.g., Jochelson 1928, Kobayashi 1959, Ino 1962, Petei and Fukuda 1974, Maeda 1989, Osada 2008). Torii introduced the statement of an old Kuril Ainu woman who had been forced to move to Shikotan Island in 1884 owing to the Japanese/Hokkaido government's forced migration policy. Pottery had already been out of use by that time, but she certainly knew well how to make pottery and was familiar with the words related

to its production. However, Torii did not clearly describe whether the woman had made pottery by herself or witnessed pottery-making. Therefore, the precise date of the last pottery in the Northern Kuril Islands is not revealed by his investigations. When we interpret ethnographic documents, these problems should be taken into consideration.

Along with Jochelson, Dikova (1983) greatly contributed to the increase in the number of specimens of *Naiji* pottery from Kamchatka. She estimated that the age of the pottery to be pre-17th century on the basis of the results of her excavations in the southern Kamchatka (*ibid.*: 48). To determine the age of *Naiji* pottery, she emphasizes the date of harpoons and radiocarbon dates of charcoal collected from the same cultural layer as pottery. Ponkratova (2006) also seems to support this age estimation, while Ponomarenko (1985: 104) assumes that *Naiji* pottery from the Shipnskij Peninsula, which is the northern limit of its distribution in Kamchatka, should be dated between the 16th and the 18th centuries. However, these earlier arguments are difficult to justify because there is only one radiocarbon date of the charcoal collected from an archaeological feature at the Andrianovka site. Moreover, as mentioned below, the ^{14}C date is not consistent with the age estimations of harpoons, coppers and ceramics. Therefore, it is not easy to determine whether the present radiocarbon date reliably shows the age of the pottery.

(3) Attribute analysis and comparison with other artifacts

Among Japanese researches, attribute analysis has been a basic method for studying of this pottery. Niioka (1937, 1940) classified *Naiji* pottery using morphological features and the number of inner lugs as early as the 1930s, and discovered macro-scale regionality such as the Hokkaido-type, Sakhalin-type and Kuril-type. Adopting the same criteria for classification, Niioka and Utagawa (1992) examined new specimens from Sakhalin. Petei and Fukuda (1974) also examined *Naiji* pottery using rim morphology and the number of inner lugs. They set up three temporal stages: 1) the period of the terminal Satsumon culture (ca. the 12th and the 13th century), 2) from the mid-17th century to the 18th century, and 3) the 19th century. Recently, Osada (2008) examines the correlations among the morphological attributes of inner lug, rim, and the shape of vessels.

The main contribution of these attribute analyses is to clarify the spatial variety of *Naiji* pottery. For instance, the dominant number of inner lug in Sakhalin is two, while that in Kamchatka and the Northern Kurils is three or four. However, these prior studies have been inconclusive for the chronology of *Naiji* pottery because they offer no effective method to distinguish temporal variety from regional variety. Moreover, a common limitation of attribute analysis is ignoring the assemblage of artifacts. If researchers focus on not only individual pottery, but also the association of pottery that are excavated from an archaeological feature or in a cultural layer, it may be easier to recognize the unit of chronology.

Kikuchi (1989, 1990, 1995) discussed the chronological stages of this pottery by introducing a comparative viewpoint with the iron pan. According to the study of the iron pan in Hokkaido (Koshida 1984), inner lugs were rapidly replaced by projection-like iron plates placed onto the rim of the pan (*Tsurimimi* iron pan) in the 17th century. Kikuchi (1989, 1995) pointed out that *Naiji* pottery with projections on the rim from the Kamchatka Peninsula should be dated after the latter half of the 17th century because it was made on the basis of the influence of *Tsurimimi* iron

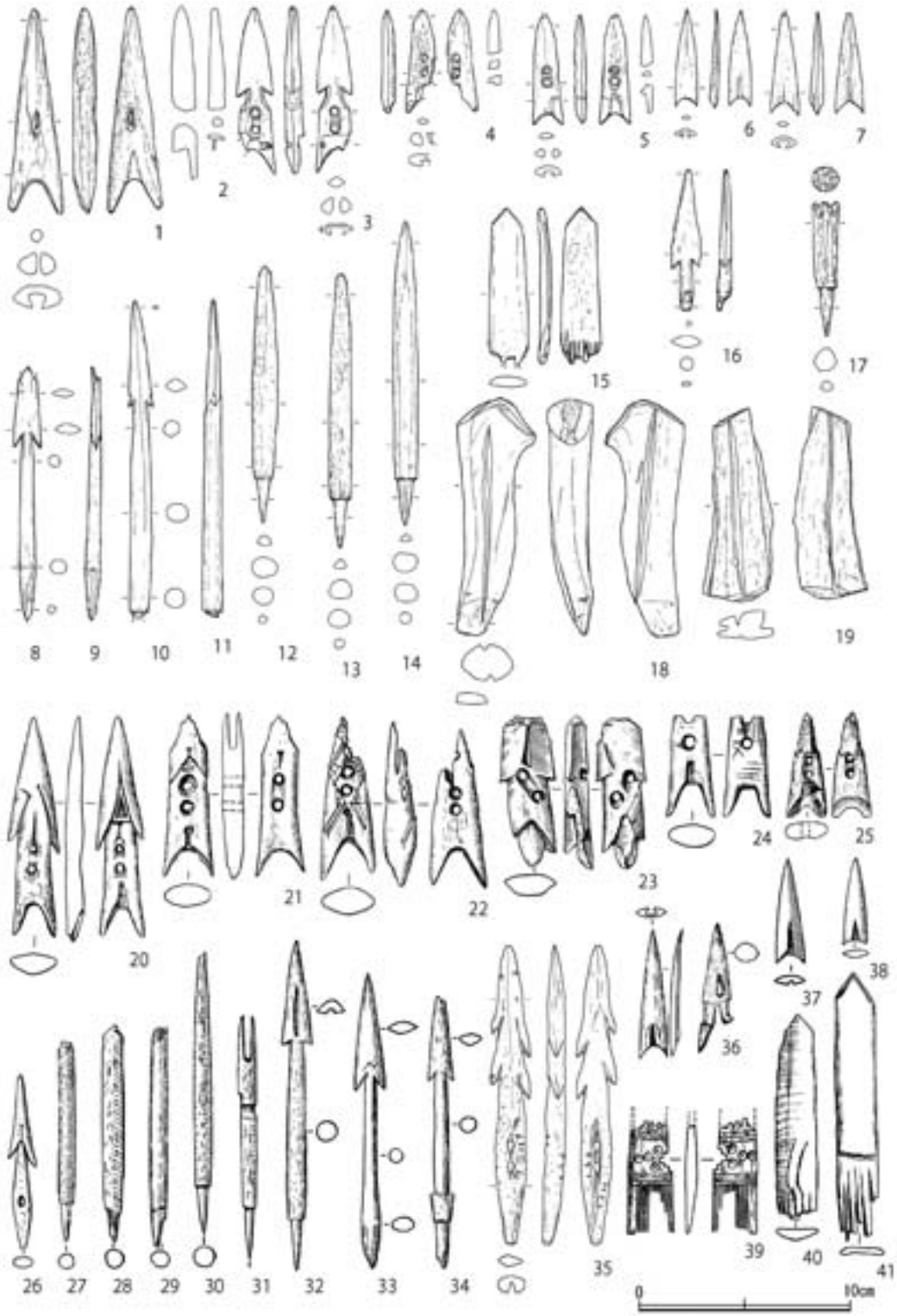

Figure 3 Bone/antler tools from the Northern Kuril Islands and the southern Kamchatka Peninsula [1–19: Kumaki *et al*. 2010, 20–34, 36–41: Dikova (1983), 35: Yavino-10]

pan. In contrast, *Naiji* pottery with a flat rim can be a part of an older group, before the occurrence of *Tsurimimi* iron pan. He assumes that its date is between the 15th and the 16th centuries.

This suggestion is the most sophisticated chronology of *Naiji* pottery from Kamchatka. It is also applicable to the specimens from the Northern Kuril Islands. However, there is no archaeological evidence to support these two chronological stages and their dates. As Kikuchi (1989, 1995) stated, the first cultural layer in the Andrianovka site is an important example for the age determination of *Naiji* pottery. However, the radiocarbon age of the cultural layer, the date of harpoons, and the date of the pottery are not necessarily consistent. In this site, the radiocarbon date is reported as 570±40BP (Dikova 1983: 63), and its calibrated age based on IntCal09 (Reimer *et al.* 2009) is from 1298calAD to 1429calAD (2σ). On the other hand, a harpoon (Figure 3: 21) similar to the "type b" of Utagawa's classification (Figure 4) should be dated to the 15th century. In addition, two harpoons (Figure 3: 22, 23) are classified as "type d" (Figure 4) which is dated to the 15th or 16th century. However, *Naiji* pottery from this site has projections on the rim, and they are assigned to a period after the 17th century. At present, Kikuchi's pottery chronology is overwhelmingly dependent on the typology of the iron pan in Hokkaido, and it is still remains a hypothesis. Therefore, in this study, radiocarbon dating is positively applied to back up typological classification.

However, charred material adhered to the surface of *Naiji* pottery cannot be used for radiocarbon dating bacause it is distinctly influenced by the marine reservoir effect. The author once attempted to measure a ^{14}C date of carbides collected from the exterior surface of *Naiji* pottery found at the Nalychevo-15 site (Takase 2009, 2010). The result is 1030±30BP (IAAA-83379); it is clearly too old. $\delta^{13}C$ (−24.5‰) and $\delta^{15}N$ (−12.0‰) values measured by mass spectrometry indicate that this specimen originated from a mixed material of marine resources and herbivorous animals or C_3 plants. Therefore, to use radiocarbon dating as a means for determin-

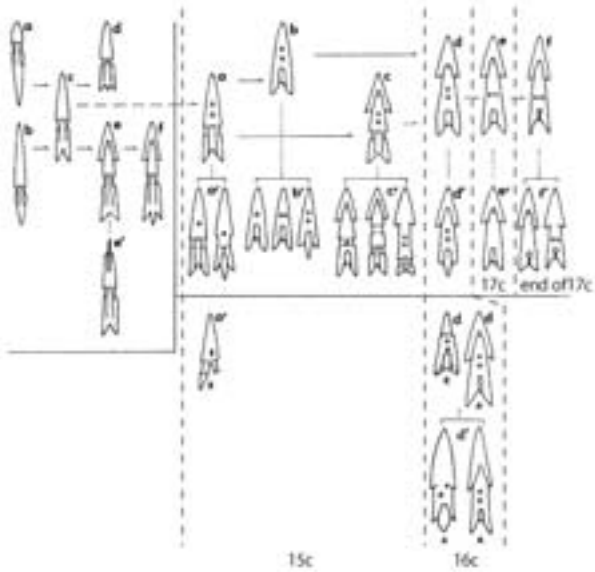

Figure 4 Chronology of harpoon in Hokkaido Island (Utagawa 1989)

ing the age of *Naiji* pottery, we need to conduct new excavations to collect charcoal that is associated with the pottery. This approach will be also effective to find out favorable assemblages of artifacts associating with the pottery. This is the reason why we performed some excavations in the southern Kamchatka in September 2011.

3. Archaeological Investigations at the Kuril Lake Sites

(1) Siyushk-1 site

The caldera-forming eruption in 7600BP is the largest Holocene eruption not only in the Kuril-Kamchatka volcanic arc, but also in the Earth of the Holocene (Braitseva *et al.* 1995, Zaretskaia *et al.* 2001, Ponomareva *et al.* 2004, Ponomareva *et al*. 2007). The estimated tephra volume is 140–170km^3 and the KO fall deposits reach the southern part of Magadan Oblast', more than 1000km northwest of Kurile Lake, across the Sea of Okhotsk (Melekestsev *et al.* 1998, Ponomareva *et al.* 2004). At present, most of a 7-km-wide caldera produced by the eruption is filled by Kuril Lake (Figure 5).

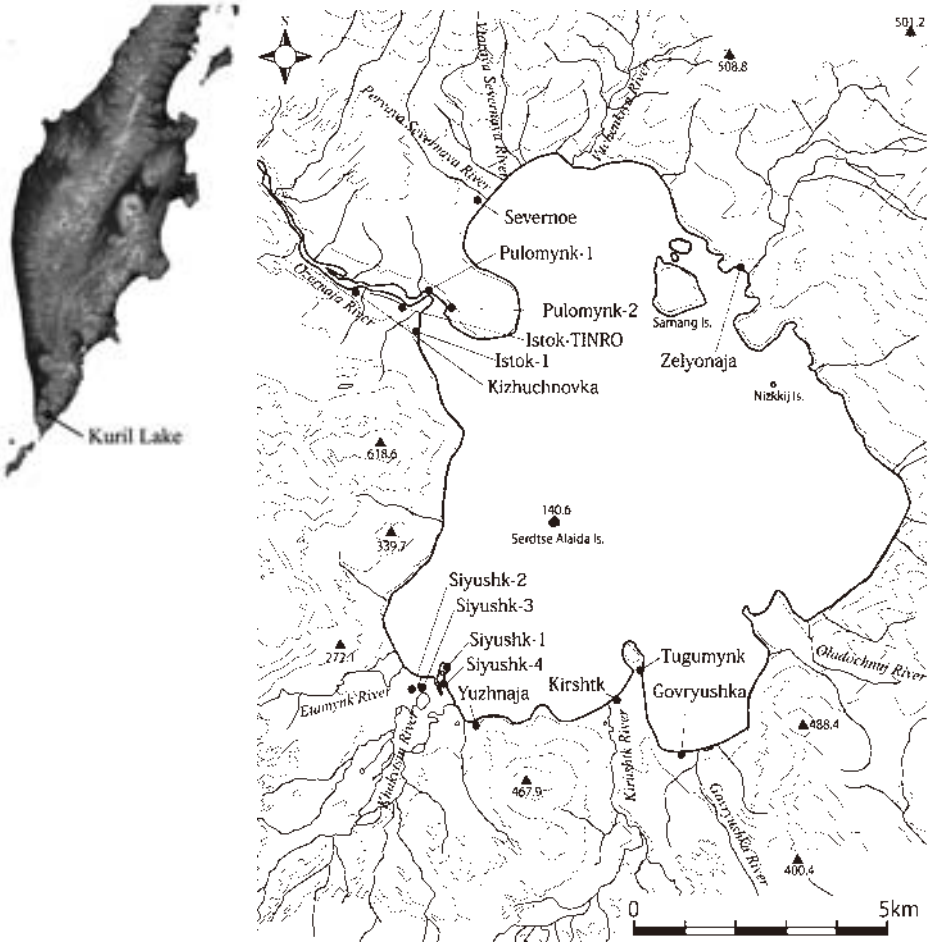

Figure 5 Map showing location of archaeological sites around the Kuril Lake

This lake is the origin of the Ozernaja River that is connected to the Okhotsk Sea, and nowadays, it is renowned as one of the areas with the world's highest density of brown bear population. Excavations by Jochelson (1928) and Dikova (1983) demonstrated that there are many archaeological sites containing *Naiji* pottery around this lake. According to general surveys conducted so far, about 10 sites have been identified there (Jochelson 1928, Dikova 1983); we are also aware of at least six new sites: the Kizhuchinovka, Yuzhnaja, Kirshtk, Govryushka, Zelyonaja, and Severnoe (Figure 5). Around this lake, sites have a tendency to concentrate especially in the beginning of the Ozernaja River and the Siyushk cape, there are several dozen of pit dwellings in each area. The Siyushk sites can be divided into four subsites, and a large number of *Naiji* pottery fragments have been recovered by excavating two semi-subterranean residences in the Siyushk-1 site (Dikova 1983).

The Siyushk-1 site is situated on the small hilly peninsula jutting out from the southern coast of the lake (Figures 5 and 6). The distribution of depressions on the surface ground suggests that this peninsula is entirely an archaeological site. On the basis of our general survey, we found six pottery fragments that came from a weathered coastal cliff (Figure 7: 1 to 6). Local people also had found artifacts around this cape before our investigation (Figure 7: 11 to 19). We can consider the projection on the rim, thick walls, and puncture ornaments as characteristic features of the pottery from this site (Figure 7: 11 to 14). It is also notable that there is a fragment with a distinct unevenness on the rim surface and a thin wall (Figure 7: 15). Obsidian is frequently used for chipped stone tools (Figure 7: 7 and 8); andesite and andesitic pumice are the main stones for making adzes and stone weights (Figure 7: 9 and 10). An end scraper made of basalt with heavy abrasive wear on the edge is an important object for examining the hide-processing technology in this area (Figure 7: 19) (Takase 2012).

We excavated in a small trench (ca. 3.5×1.5m) on the northern slope of the peninsula (Figures 6 and 8). Semi-subterranean residence No.1 destroyed pit No.1, and semi-subterranean residence No.2 was constructed after pit No.2 had been buried (Figure 8). Table 1 describes the

Figure 6 Side view of the Siyuhsk Peninsula on which the Siyushk-1 site is located

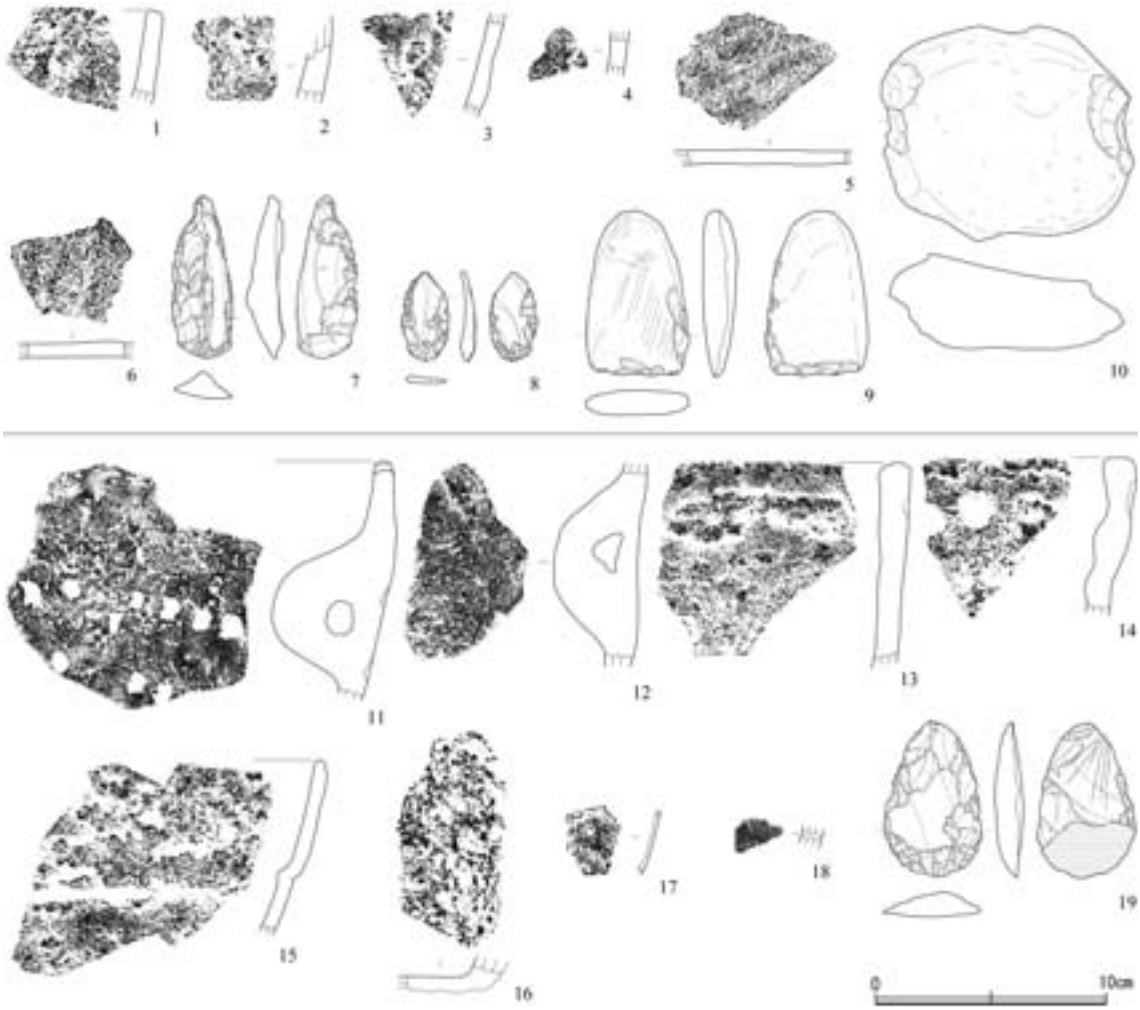

Figure 7 Artifacts collected at the Siyushk-1 site [1–10: surface collection from coastal cliff and pit burrowed by a brown bear on the top of hill, 11–19: surface collection, 1–6, 11–18: *Naiji* pottery, 7: end scraper, obsidian, 8: scraper, obsidian, 9: adze, andesite, 10: stone weight, andesitic pumice, 19: end scraper, basalt]

soil characteristics of all layers on the wall of this trench.

In semi-subterranean residences Nos.1 and 2, we discovered two pieces of *Naiji* pottery. A rim fragment with a large inner lug was excavated from the Layer-3 of semi-subterranean residence No.1 (Figure 8: 1). The thickness of the wall is about 1.2 to 1.5cm; a large embossment is made on the opposite side of the inner lug. Another fragment was found in the Layer-1 of semi-subterranean residence No.2 (Figure 8: 2). The thickness of the wall is 1.2cm. It is notable that on the exterior surface, coarse punctured ornaments arranged in two lines can be seen. Similar fragments have been reported in both the Northern Kurils and southern Kamchatka (Jochelson 1928, Baba 1940). Baba (1940: 35) stated that each punctured ornament exhibits oval shape in plan view, and it is likely to have been formed by the pressing of a fingertip. In the case of the Siyushk-1 site, a plan view of the ornament is half-moon-shaped or C-shaped (Figure 9), and we

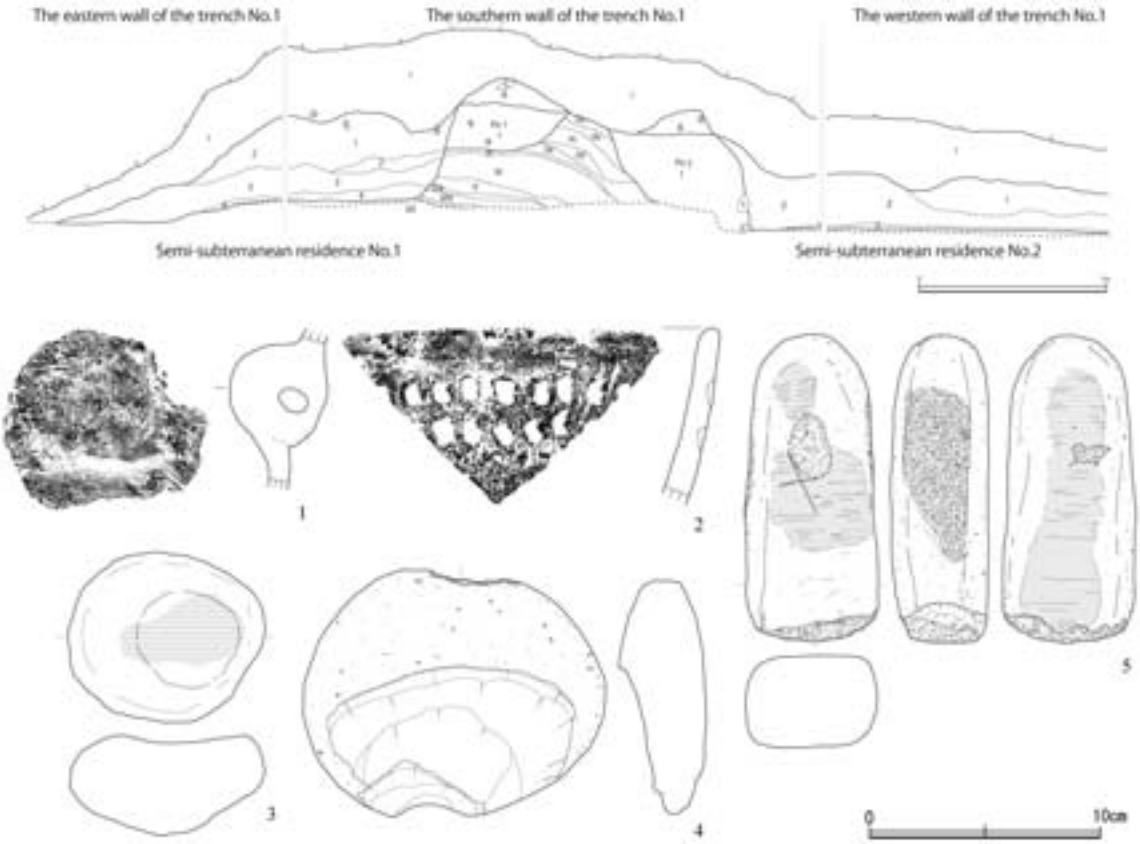

Figure 8 Cross section of the trench No.1 at the Siyushk-1 site and artifacts from the site [1–2: *Naiji* pottery, semi-subterranean residence No.1, Layer-3 (1), semi-subterranean residence No.2, Layer-1 (2) 3: stone lamp, andesitic pumice, Layer-I, 4: stone weight, andesite, Layer-I, 5: hummer stone, andesite, Layer-I]

can find no trace of a fingertip indentation inside it. The inner surface of the ornament is covered with tiny wart-like projections, indicating that it is formed by the pressing of the tip of a wooden or a grass stick (Figure 9: 2b).

All stone tools are excavated from the surface soil (Layer-I). In Figure 8, No.3 is a stone lamp made of andesitic pumice, and Nos.4 and 5 are both made of andesite; the former is a stone weight, and the latter is a hummer/musher.

(2) Siyushk-2 site

The Siyushk-2 site, named by Dikova (1983), is situated on the left bank of a small river (name unknown) between the Khakytsin and Etamynk Rivers, about 500m from the base of the Siyushk Peninsula. In this site, more than 20 square- or rectangular-shaped pit dwellings with an entrance can be seen, and a pit is located besides the entrance of almost all the pit dwellings.

Jochelson (1928: 61) stated that he could find more artifacts in smaller pits than larger pits. Through our excavations at the Nalychevo-9 site in 2005–2007, we also confirmed that the number of artifacts from large pit dwellings is extremely small. In particular, for the study of pottery, the

Table 1 Soil characteristics at the Siyushk-1 site

[**Natural sediments**]	
Layer-I	Grayish yellow brown (10YR 4/2) sandy silt with extremely small amount of charred material which has a diameter from 5mm to 1cm, firm, no stickiness, iron and plastic artifacts are found, surface ground.
Layers-IIa, IIb, IIc, IId, IIe	Alternate layers of yellow brown (10YR 5/6), dull yellow orange (10YR 6/3) and brownish black (10YR 2/2) volcanic ash.
Layer-III	Grayish brown (5YR 6/2) fine sand with small amount of charred material 5mm in diameter, no firmness, no stickiness, tephra.
Layer-IV	Dark reddish brown (5YR 3/2) sandy silt with large amount of charred material about 5mm in diameter, firm, slightly sticky.
Layer-V	Dull reddish brown (2.5YR 4/4) fine sand with large amount of charred material ca. 5mm in diameter, no firmness, no stickiness, tephra.
Layer-VIa	Black (7.5YR 1.7/1) sandy silt, tephra.
Layer-VIb	Reddish brown (5YR 4/6) coarse sand and gravel, pumice, slightly firm, no stickiness, tephra.
Layer-VII	Dull reddish brown (5YR 4/4) midium and coarse sand with small amount of pumice ca. 1cm diameter, very firm, slightly sticky, tephra.
[**Semi-subterranean residence No.1**]	
Layer-1	Dull brown (7.5YR 5/3) sandy silt with small amount of charred material which has a diameter from 5mm to 1cm, firm, no stickiness, stone flakes are found. Many large gravels ca. 10cm in diameter are involved.
Layer-2	Brownish gray (10YR 4/1) fine sand with small amount of charred material 5mm to 3cm in diameter, slightly firm, slightly sticky, stone flakes are found.
Layer-3	Brownish black (10YR 3/1) fine sand with large amount of charred material which has a diameter from 1cm to 3cm, very firm, sticky, stone flakes and a fragment of pottery are found.
Layer-4	Black (7.5YR 2/1) fine sand with extremely large amount of charred material which has a diameter from 1cm to 3cm, very firm, sticky, stone flakes are found.
Layer-A	Brownish black (7.5YR 2/2) fine sand with large amount of charred material 5mm to 2cm in diameter and gravel ca. 10cm in diameter, firm, moderately sticky, moved soil to constract the semi-subbterranean residence No.1.
[**Semi-subterranean residence No.2**]	
Layer-1	Grayish yellow brown (10YR 4/2) fine sand with relatively large amount of gravel which has a diameter from 1mm to 1cm, moderately firm, no stickiness, a fragment of pottery is found.
Layer-2	Grayish brown (7.5YR 5/2) fine sand with large amount of gravel which has a diameter from 1cm to 5cm, slightly firm, no stickiness.
Layer-3	Black (7.5YR 2/1) fine sand with relatively large amount of charred material which has a diameter about 1cm, firm, sticky.
Layer-B	Brownish black (10YR 3/1) fine sand with large amount of charred material which has a diameter between 1mm to 1cm, moderately firm, no stickiness, moved soil to constract the semi-subbterranean residence No.2.
[**Pit No.1**]	
Layer-1	Grayish brown (5YR 4/2) fine sand with small amount of gravel whchi has a diamter from 3cm to 5cm, firm, moderately sticky.
[**Pit No.2**]	
Layer-1	Browish black (5YR 3/1) fine sand with extremely large amount of lump of dull reddish brown (2.5YR 5/4) fine sand and brownish gray (5YR 6/1) fine sand, artificially buried soil.

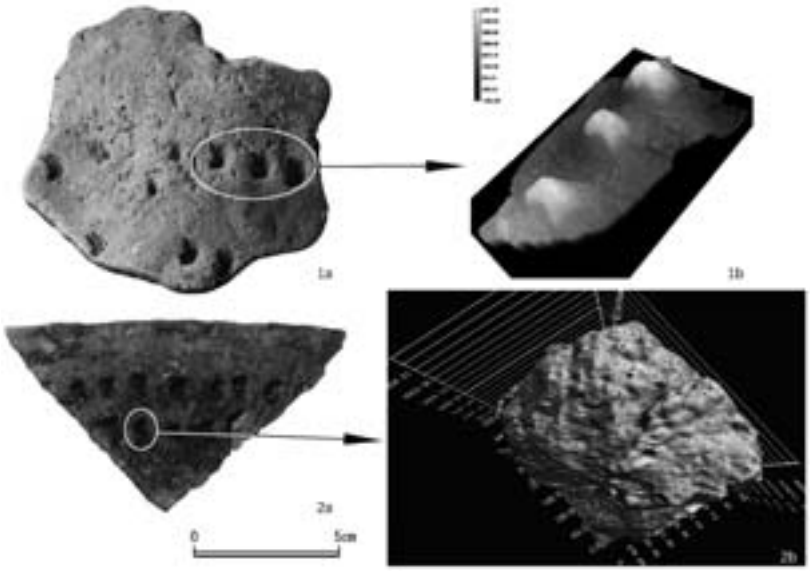

Figure 9 3D view of inner surface of a punctured ornament restored by laser micrometer (1b, Keyence LK-G80 and LK-3000V) and SEM (2b, Keyence VE-8800). Replication method using silicone rubber was applied to make molds of ornaments.

excavation of a pit dwelling is not necessarily effective for collecting new material. Therefore, at the Siyushk-2 site, we excavated a small pit (named as pit No.1) beside an entrance of a relatively large semi-subterranean residence No.10 (ca. 8m×8m, Ptashinski 2012). The plan view of the pit is estimated to be an informal circular or pear shape (Figure 10). Its depth is about only 30cm. The filled soil is divided into three layers (Table 2).

From the lower part of the filled soil (Layer-2 and the bottom surface) of this pit, two fragments of *Naiji* pottery that are refitted together are found (Figure 10: 1c). A thick carbide is adhered on the exterior surface. Although the inner lug does not exist, an elaborately made shallow and wide groove can be seen on the inner surface of the rim (Figure 10: 1b). Corresponding to the groove, there is an uneven face on the exterior side (Figure 10: 1a and 1c). The thickness of the wall on the upper part is less than 1.0cm. There is a line on the lowest part of the exterior surface.

(3) Siyushk-3 and -4 sites

On the right bank of the small river, four depressions of pit dwellings can be seen; this site seems to be the Siyushk-3, which Dikova (1983) identified (Figure 5). We collected a small adze made of green tuff (Figure 10: 2). The Siyushk-4 site is located at the base of the Siyushk cape. This site consists of six semi-subterranean residences including a large dwelling (ca. 10m×9m) as Dikova (1983) reported. In this site, we found only an obsidian scraper (Figure 10: 3).

(4) Govryushka site

The Govryushka site is located on the lower terrace, which is situated about 0.5km east of the base of the Tugumynk Peninsula (Figure 5). Seven pit dwellings are distributed along the

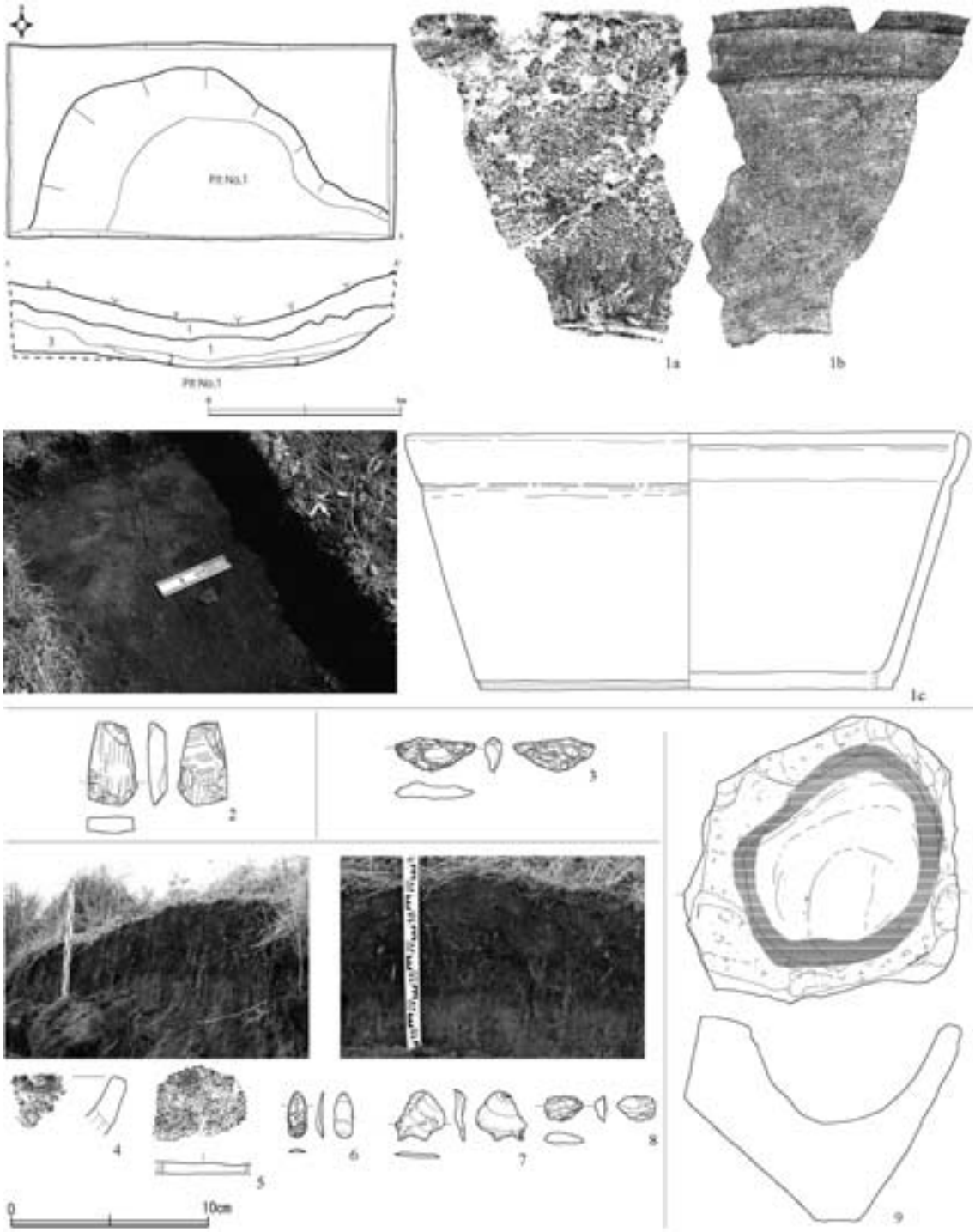

Figure 10 Artifacts from the Siyushk-2, Siyushk-3, Siyushk-4 and Kirshtk site [1: Siyushk-2, Pit No.1, Layer-2 and bottom surface, 2: Siyushk-3, 3: Siyushk-4, 4-8: Govryushka, 9: Kirshtk, 1, 4, 5: *Naiji* pottery, 2: adze, green tuff, 3: scraper, obsidian, 6: arrowhead, obsidian, 7: flake, obsidian, 9: retouched flake, agate]

Table 2 Soil characteristics at the Siyushk-2 site

[**Pit No.1**]	
Layer-I	Dark brown (7.5YR 3/3) sandy silt, surface ground.
Layer-1	Brownish black (10YR 2/2) fine sand involving extremely small amount of charred material which has a diameter less than 5mm, slightly firm, sticky.
Layer-2	Very dark reddish brown (5YR2/4) coarse sand and gravel, pumice, slightly firm, no stickiness.
Layer-3	Black (2.5Y 2/1) fine sand with extremely small amount of charred material which has a diameter less than 5mm, slightly firm, very sticky.

Table 3 Soil characteristics at the Govryushka site

[**Semi-subttarenean residence No.1**]	
Layer-I	Brownish black (10YR 3/2) sandy silt, firm, very sticky, surface ground.
Layer-1	Grayish brown (7.5YR 4/2) sandy silt with extremely small amount of charred amaterial which has a diameter less than 5mm, slightly firm, slightly sticky.
Layer-2	Brownish black (7.5YR 2/2) fine sand with large amount of charred material which has a diameter less than 1cm, slightly soft, slightly sticky.
Layer-3	Bwownish gray (10YR 4/1) fine sand with small amount of charred material which has a diamter less than 1cm, slightly soft, slightly sticky. A fragment of pottery and stone tools are found.
Layer-4	Brownish gray (7.5YR 4/2) fine sand with large amount of charred material which has a diamter less than 2cm, slightly firm, slightly sticky. A fragment of pottery and stone tools are found.

margin of the terrace. Some dwellings have been partially destroyed by the water of the lake, therefore, a cross section of semi-subterranean residences can be observed on a vertical exposure of the terrace (Figure 10). In the western part of the site, we closely examined cross section of the semi-subterranean residence No.1. The depth of this residence is about 40cm below the ground surface. Although small particles of burned soil and charcoal are distributed on the floor surface, no hearth can be detected in the cross section (Table 3).

Figure 10: 4 and 5 are fragments of *Naiji* pottery that were collected from the lower part of the filled soil (Layers-3 and 4) of the pit dwelling. Figure 10: 4 is an elaborately made rim fragment with a plain surface. Thickness is less than 1.2cm. Figure 10: 5 is part of a thin bottom. An obsidian arrowhead (Figure 10: 6), an obsidian flake (Figure 10: 7) and a retouched flake made of agate (Figure 10: 8) were unearthed from the same layers as pottery.

(5) Kirshtk and other sites

The Kirshtuk site is situated at the base of the Tugumynk Peninsula, on the southern coast of Kuril Lake (Figure 5). On the terrace of the west coast of the peninsula, six semi-subterranean residences are distributed. A stone lamp made of andesite was collected from one of the residences (Figure 10: 9). The upper part of the exterior surface is formed by rough knapping. A black band can be seen on the rim part of the interior surface. There is no other artifact from this site.

We found a few pit dwellings at the Yuzhnaja, Severnoe, Zelyonaja and Kizhuchnovka sites (Ptashinski 2012). They are new sites that have not been recorded in prior studies. However, their detailed dates are unknown owing to a lack of artifacts collected from there.

4. Discussion

(1) Typology of *Naiji* Pottery

Fragments of potsherd from the Siyushk-2 site exhibit a flat rim, outward flection on the upper part of the body, distinct unevenness on the exterior surface along the border between the rim and the body, an exterior surface of the rim without an ornament, and a relatively thin wall (approximately less than 1.0cm)(Figure 11: 1). Elaborate shallow grooves on the inner surface indicate that this pottery was made with great care. Similar specimens can be seen in Jochelson's collection from the Nalychevo sites (Jochelson 1928: 74 [Figure 80]), and artifacts from the Nalychevo-15 (Figure 11: 5) and the Siyushk-1 (Figure 11: 4). It is notable that a fragment also has small and horizontally-long inner lugs (Figure 11: 5). The author classifies *Naiji* pottery with these typological features as type Ia. The angle and thickness of the rim fragment suggest that specimens from the Govryushka site are also classified as this type (Figure 10: 4, 5). Typologically, type Ia should be assigned to the oldest phase of *Naiji* pottery in this area because it preserves the morphological features of the iron pan the best.

In contrast, fragments of clay vessels from the Siyushk-1 have the following characteristics: they do not have a flection on the upper part of the body, have projections on the rim, have punctated ornaments arranged in several lines, and have relatively thick walls (approximately more than 1.0cm) (Figure 8: 1, 2). On the inner surface, large and vertically-long lugs are attached under the projection on the rim. No elaborately made shallow and wide groove can be seen. Pottery with these characteristics, classified as type II, can also be seen in the surface collection at the Siyushk-1 site (Figures 7: 11–14, 11: 11–16). Figure 12 shows the shape features of inner lugs based on the morphometric value of pieces from Kamchatka and the Northern Kurils, demonstrating that inner lugs of type II are much greater than those of other types.

Type Ib is an intermediate category between types Ia and II. For example, there are some instances that exhibit the characteristics of type Ia such as relatively thin walls and small inner lugs (Figure 11: 6, 7). At the same time, they have a clay rope on the outer side that originated from the uneven rim surface of type Ia. The two concave lines on the inner side are also likely originated from the shallow and wide groove of their predecessor (Figure 11: 6). In other specimens, this groove has been transformed into two lines of thin clay rope in relief (Figure 11: 8 to 10). Both the small inner lug (Figure 11: 6, 8 and 10) and the large one (Figure 11: 9) can be seen in this type, and some have small projections on the rim (Figure 11: 9, 10). Such a transformation and mixture of attributes of types Ia and II are significant criteria for type Ib.

Naiji pottery from Shumshu and Paramushir Islands also exhibits identical features. However, there seems to be another type of pottery in the Northern Kurils (Figure 11: 17). Its size is very small, 14cm in diameter, 8.5cm in height, and the body shape is a cylindrical form like the Russian metal pan (Baba 1940: 35). There is no ornament on both surfaces, and no projection is made on the rim either. It has only two inner lugs, although the number of lugs is usually three or four in this region. At present, there is only one specimen of this type from Shumshu Island; this pottery is obviously an outlier. However, this might provide a significant clue to the last phase of *Naiji* pottery as mentioned below; therefore, we classify this pottery as type III in this study.

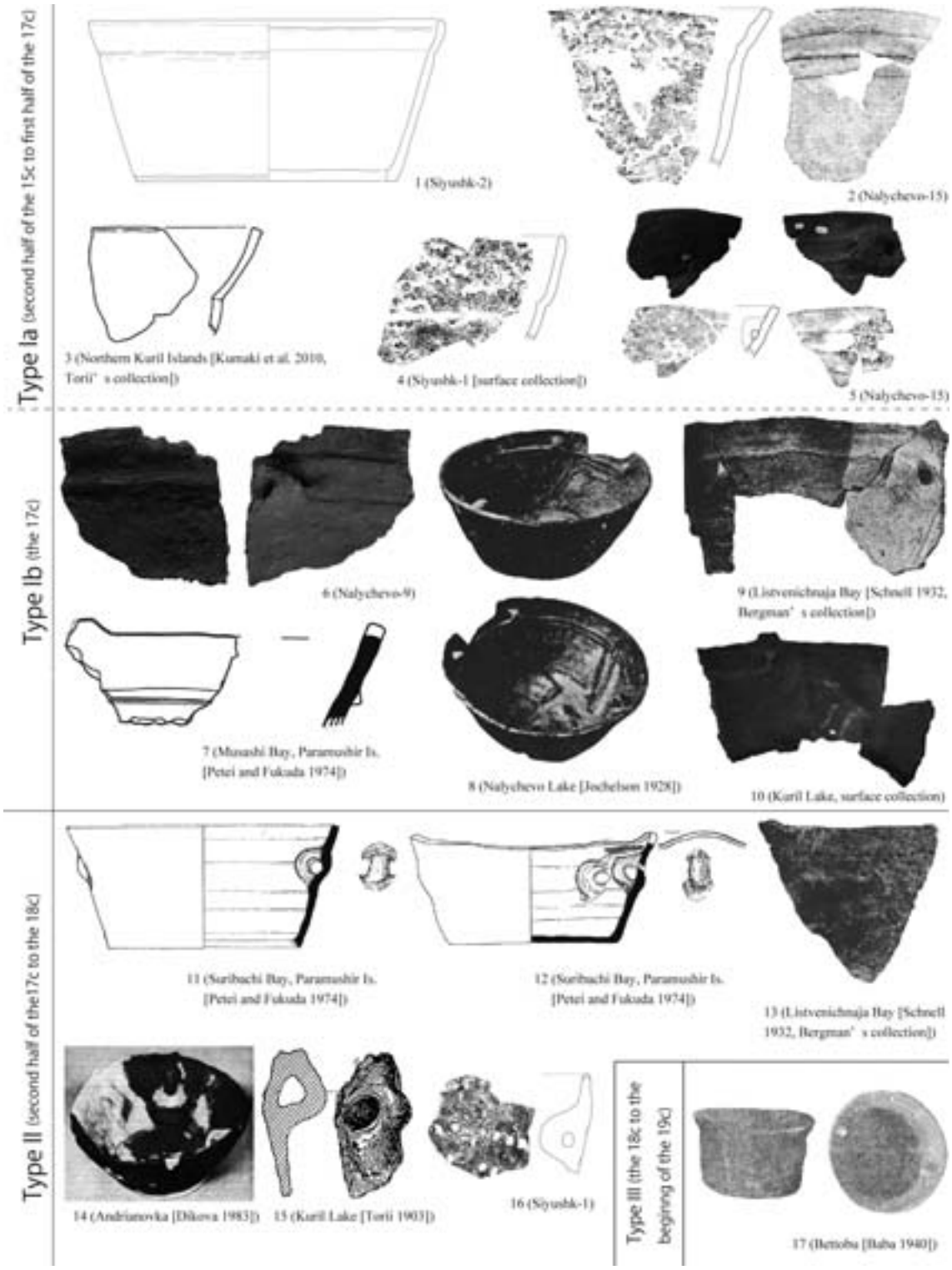

Figure 11 Classification of *Naiji* pottery (Scale variety)

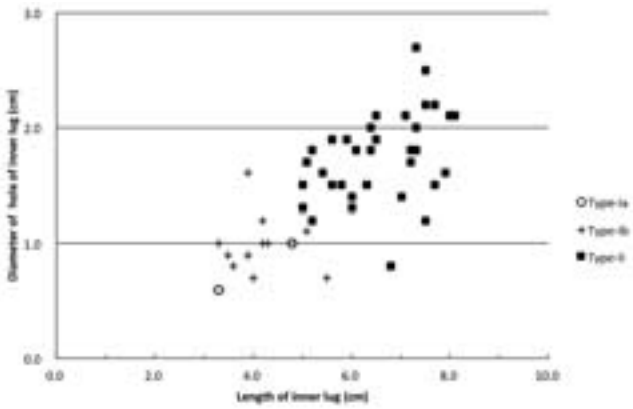

Figure 12 Size of inner lugs of *Naiji* pottery from the Kamchatka Peninsula and the Northern Kuril Islands [Source: Twenty-two specimens from Kuril Lake and Nalychevo in W. Jochelson's collection housed in the State Historical Museum; 3 specimens from the Kuril Lake and Nalychevo sites in A. V. Ptashinski's collection; 8 specimens from Shumshu Island in Torii's collection (Kumaki *et al.* 2010); 2 specimens from Shumshu Island in Kono's collection housed in Asahikawa City Museum, 18 specimens in Baba's collection housed in Hakodate City Museum; metric data of other specimens is based on Ponomarenko (1985, 1993) and Petei and Fukuda (1974)]

(2) Age and Distribution of Each Type

As mentioned above, radiocarbon dating of carbides on the surface of *Naiji* pottery is not an effective means to estimate its date due to the marine reservoir effect. For ^{14}C dating, we use charcoal collected from the same layers in archaeological features as the pottery in this study. Table 4 shows the provenance of 15 specimens and the results of AMS analysis. Judging from the $\delta^{13}C$ value ranging from −25‰ to −30‰, there is little doubt of the marine reservoir effect in all specimens. Although the $\delta^{13}C$ value of a sample labeled as "2011-3" is −23.60±0.45, it is within the acceptable range considering the accidental error of accelerator mass spectrometry.

Figure 13 shows the calendar year as calibrated by OxCal v.4.1.5. program which is based on the calibration curve Intcal09 (Reimer *et al.* 2009). Radiocarbon dates of the Siyushk-2 and Govryushka sites fall into a period from the second half of the 15th century to the first half of the 17th century. This range is exactly the same as the Nalychevo-9 site that we excavated from 2005 to 2007 (Ptashinski and Takase 2008). Although no pottery was found in two semi-subterranean residences in the Nalychevo-9, some fragments of types Ia and Ib were collected at defferent places in this site cluster (Figure 11: 2, 5 and 6). We believe that this period is a reliable age of the use of the pit dwellings and *Naiji* pottery from these sites. These results suggest that type Ia is dated from the second half of the 15th century to the first half of the 17th century.

The calibrated ages of the Siyushk-1 site are divided into two groups. The older ("2011-4" and "2011-6") ranges between the second half of the 12th century and the 13th century. This age is earlier than or same as the age the oldest iron pan with inner lugs and the oldest *Naiji* pottery in Hokkaido (ca. the 12th or 13th century). Therefore, "2011-4" and "2011-6" are contaminated charcoal, and their radiocarbon ages should be rejected. On the other hand, the younger ages are likely an adequate date of *Naiji* pottery. Type II is dated to a period ranging from the second half of the 17th century to the middle of the 20th century.

Table 4 Radiocarbon dates of charcoal colleted from the Siyushk-1, Siyushk-2 and Govryushka sites

Specimen ID	Provenance	Material type	Pretreatment	^{14}C Age (yrBP)	δ13C (‰) (AMS)	Lab number
2011-2	Siyushk-1 site Semi-sub. residence No.1 Floor surface	charred wood	AAA	130 ± 20	−29.15 ± 0.36	IAAA-111136
2011-3	Siyushk-1 site Pit No.1 Layer 1	charred wood	AaA	150 ± 20	−23.60 ± 0.45	IAAA-113366
2011-4	Siyushk-1 site Semi-sub. residence No.1 Floor surface	charred wood	AAA	850 ± 20	−26.27 ± 0.42	IAAA-113367
2011-6	Siyushk-1 site Semi-sub. residence No.1 Floor surface	charred wood	AAA	830 ± 20	−26.33 ± 0.40	IAAA-113368
2011-8	Siyushk-1 site Pit No.1, Layer 1	charred wood	AAA	160 ± 20	−26.96 ± 0.46	IAAA-113369
2011-9	Siyushk-1 site Semi-sub. residence No.1 Layer 1	charred wood	AAA	170 ± 20	−26.64 ± 0.42	IAAA-113370
2011-10	Govryushka-2 Site Semi-sub. residence No.1 Filled soil	charred wood	AAA	380 ± 20	−26.97 ± 0.43	IAAA-113371
2011-11	Govryushka-2 Site Semi-sub. residence No.1 Floor surface	charred wood	AAA	310 ± 20	−27.75 ± 0.38	IAAA-113372
2011-12	Govryushka-2 Site Semi-sub. residence No.1 Floor surface	charred wood	AAA	350 ± 20	−27.20 ± 0.38	IAAA-113373
2011-14	Govryushka-2 Site Semi-sub. residence No.1 Floor surface	charred wood	AAA	310 ± 20	−25.74 ± 0.35	IAAA-113374
2011-17	Siyushk-2 site Pit No.1 Layer 1	charred wood	AAA	310 ± 20	−27.23 ± 0.37	IAAA-113375
2011-18	Siyushk-2 site Pit No.1 Layer 2	charred wood	AAA	320 ± 20	−25.79 ± 0.37	IAAA-113376
2011-19	Siyushk-2 site Pit No.1 Bottom surface	charred wood	AaA	320 ± 20	−28.69 ± 0.37	IAAA-111137
2011-20	Siyushk-2 site Pit No.1, Bottom surface	charred wood	AAA	280 ± 20	−25.93 ± 0.37	IAAA-113377
2011-21	Siyushk-2 site Pit No.1 Layer 1	charred wood	AAA	320 ± 20	−26.10 ± 0.37	IAAA-113378

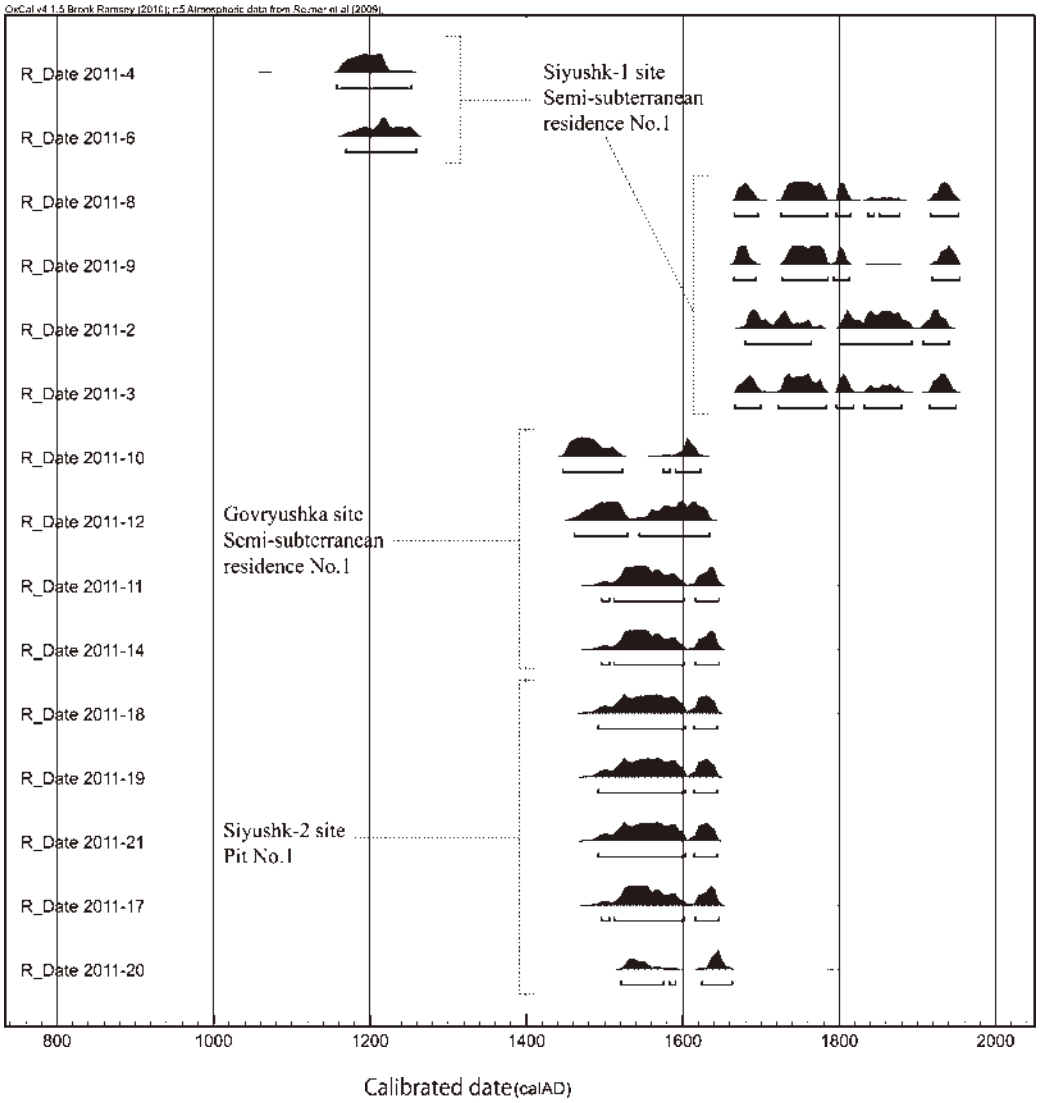

Figure 13 Calibrated ages of charcoal collected from the Siyushk-1, Siyuhsk-2 and Govryushka sites

However, it is difficult to specify the age of the demise of pottery in this region. In a book first published at the end of the 17th century, Nicolaas Witsen (1692: 673), a politician and cartographer from the Netherlands, mentioned the use of pottery in Kamchatka on the basis of hearsay evidence from the Cossacks. Vladimir Atlasov also reported on pottery in his statements made in 1700 and 1701 (Olgoblin 1891, Kato 1970). He stated that the indigenous people in the southern Kamchatka made clay vessels by mixing animal hair into clay. Witsen's description is second- or third-information, whereas Atlasov's statements are contemporary historical documents based on his stay in Kamchatka. However, we are not certain whether Atlasov actually saw pottery because there is little or no *Naiji* pottery in the area where he visited, for example, in the Kamchatka River basin and on the west coast of the peninsula, north of the Gorugina River mouth. Probably, other Cossacks of his follower or the indigenous people brought the informa-

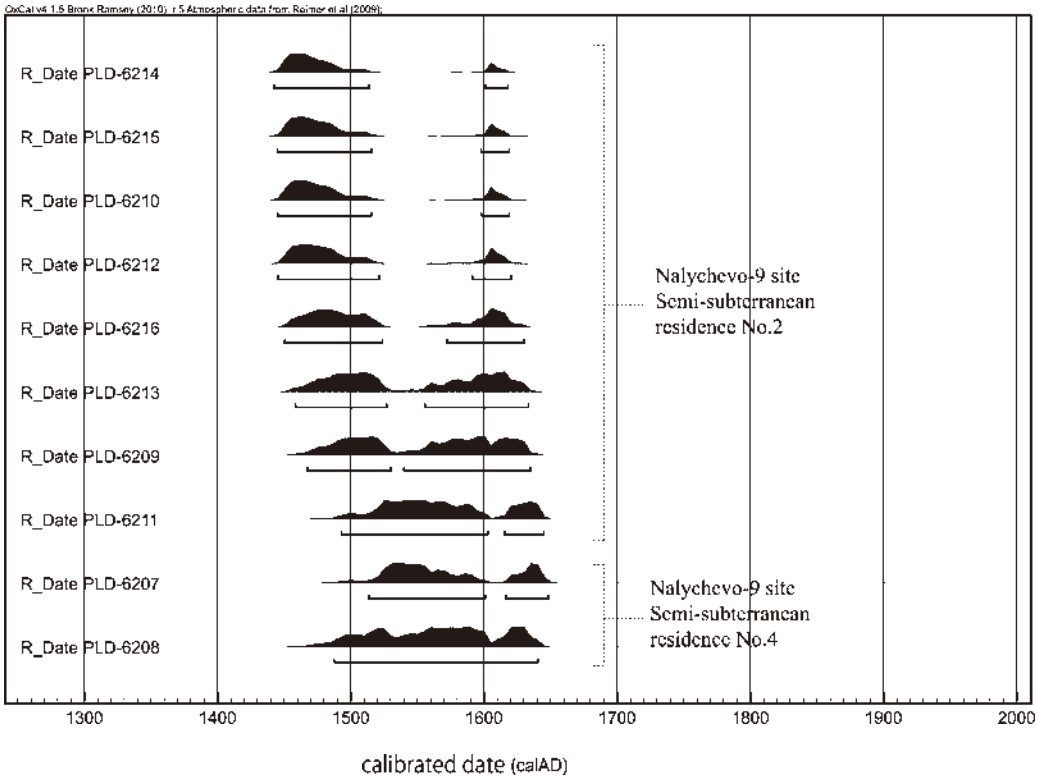

Figure 14 Calibrated ages of charcoal collected from the semi-subterranean residence Nos.2 and 4 at the Nalychevo-9 site

tion about pottery to him. If this is the case, it may explain how misunderstandings are generated, such as a mixture of animal hair and clay being used to make vessels. Based on observations of *Naiji* pottery excavated in the Kuril-Kamchatka arc region, plant fiber is often tempered with clay as Torii (1903) reported, but animal hair is not used for pottery production. Despite such a problem, Atlasov's statements are significant evidences of pottery use at the end of the 17th century in Kamchatka. In contrast, there is no information on pottery in Russian documents after the 18th century, although the number of document is much larger in this period. The possibility exists that the number of pottery began to decline during the 18th century.

In the Northern Kurils, the most recent stage of the artifact complex is characterized by semi-subterranean residences that combine square shape pits, European porcelain and bottles, and iron pans that come mainly from Russia (Baba 1938, 1939). However, *Naiji* pottery is sometimes found in pit dwellings of this phase, as in the 2nd and 3rd residences at the Bettobu site, Shumshu Island (Baba 1940: 35 [1979: 197]). From the floor surface of the 1st room of the 2nd residence, a pottery fragment of type II was excavated. Baba (1939: 120) also found an unbroken *Naiji* pottery of type III from the floor surface of the 3rd residence. A number of Russian and European products and copper cross indicates that these residences should be dated from the second half of the 18th to the beginning of the 19th century. These instances demonstrate that the date of the youngest stage and demise of *Naiji* pottery is also assigned to this period[3].

The age of *Naiji* pottery in Kamchatka and the Northern Kuril Islands is summarized in Figure 15. Such a chronological system raises a problem related to the human occupation in the Kuril-Kamchatka arc region. According to recent interdisciplinary projects on the Kuril Islands, some archaeologists believe that people did not live there or that the human population was very small between the 13th and 17th centuries (e.g., Fitzhugh *et al.* 2002, Tezuka 2007). However, *Naiji* pottery indicates an active cultural interaction across the Kuril chain, at least after the second half of the 15th century; this area was not necessarily a "no man's land." Recently, a study of Yukar Ainu sagas has also suggested that the Ainu diffused to the central and northern Kurils starting in the 15th century (Segawa 2012).

In Kamchatka, types Ia and Ib pottery were distributed from the Lopatka cape to as far as the Nalychevo cape on the east coast of the peninsula and to the mouth of the Opala River on the west coast (Figure 1). There is a possibility that area on the east coast might expand to the northern coast of the Shipunskij Peninsula as the Bal'shaja Medveshka-I site indicates (Ponomarenko 1985). In contrast, type II can be seen in a smaller area from the Lopatka cape to the Listvennichnaja Bay on the east coast, while distribution on the west coast is the same as types Ia and Ib. In the newer phase, the distribution of *Naiji* pottery becomes smaller than that in the older phase.

However, the number of materials of type II shows an explosive growth. The mid-17th century is probably a significant epoch for the distribution and number of pieces of this pottery. This may correlates with changes in human activity or relationships. In Hokkaido, we can find charred millet seeds, cultivated fields, and iron implements for farming including hoes and harrows before the mid-17th century. However, the number of these materials drops sharply after the second half of the 17th century. There must be a close relationship between a thoroughgoing limited supply and the confiscation of iron tools by the Japanese-Matsumae authority after the Shakushain's Revolt between 1669 and 1672 (Yamada 1998, 2008). The number of iron pan supplied in Hokkaido also decreased at that time, and this had a serious impact on people in the Kuril Islands and southern Kamchatka. Such a shortage of iron tools in Hokkaido is likely to be relevant to the active production of type II *Naiji* pottery in the Kuril-Kamchatka arc region, because we believe that pottery was produced simply to compensate for a shortage of iron pans, as Baba (1939: 143) assumed.

Type III is distributed only in the Northern Kurils, and the number of specimens is extremely small. This type of pottery seems to have an association with a large number of fragments of Russian iron pans (Baba 1939, 1940). The cylindrical body shape and the number of inner lugs are also relevant to the influx of Russian metal pans. The increase in the number of iron pans brought by the Russians led to a decrease in *Naiji* pottery, and this resulted in the real demise of

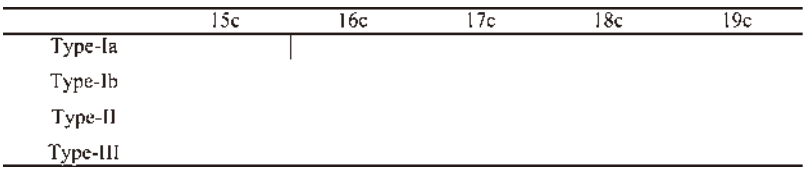

Figure 15 Time span of each type of *Naiji* pottery

this pottery. Kawakami (1996, 1997, 2011) pointed out that the Kuril trade route was perfectlly closed after 1807. According to historical documents on Japanese castaways who drifted to Kharimkotan Island in 1813, the Ainu people on Onekotan Island were hard up for Japanese iron pans at that point of time. In the first half of the 19th century, the main production area of iron pans must have changed from Japan to Russia in the middle and northern Kurils and Kamchatka. At the same time, *Naiji* pottery was no longer made and used in this region.

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Notes

1) Watson (1965: Plate 100) introduced a fragment of a younger type of the Okhotsk culture pottery from Kamchatka that is housed in the British Museum. However, prior investigations have revealed that pottery of the Okhotsk culture was not distributed in Kamchatka; the spot in which it was found may have been incorrectly recorded for this material.
2) Some scholars have offered dissenting opinions about the involving assemblage of the Northern Kurils into the typical Okhotsk culture (e.g., Kikuchi 1972, 1995). Moreover, recent investigations have demonstrated that the oldest culture in the northern Middle Kurils surely goes back to the Epi-Jomon culture (Osaka 2010).
3) Osada (2008) assigned the type III specimen to the oldest stage (ca. the 12th to 15th century) of *Naiji* pottery. However, the archaeological context reported by Baba (1939, 1940) explicitly indicates that this is one of the examples of the latest *Naiji* pottery in the Kuril-Kamchatka arc region.

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