Japanese-Korean Cultural Exchange in the Jomon Period

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Fig. 1. Map of South Korea and adjacent Japan showing Higashimyo and Bibongri Shell Middens. Image credit: Google Earth (Google, Landsat, Copernicus).

Background

This paper explores cultural exchange between southeastern Korea and northwestern Kyushu, Japan (fig. 1), during the Japanese Initial to Final Jomon and Korean Jeulmun (Chulmun)[1] to Early Mumun Periods (table 1). This includes certain items of trade such as composite fishhooks, shell bracelets, composite harpoons, shell masks, and obsidian. Also, Jomon pottery has been excavated in Korea, as has Korean pottery in Kyushu. In Japan, as in Korea, Neolithic is defined

[1] There are two systems of Korean romanization that exist in the literature. The first was devised by George M. McCune (1908-1948) and Edwin O. Reischauer (1910-1990) (McCune and Reischauer, 1939), and is phonetically based. The second was created by the Korean Ministry of Culture and Education and made public on July 7, 2000. For example, the well-known Neolithic site in southeast Korea is romanized Tongsamdong in the first system and Dongsamdong in the latter. This paper follows the revised system by the Korean government. For a list of terms, sites, and place names in both systems, see Lee (2017, pp. 454-6).

Table 1. Generalized chronology for Neolithic to Bronze Age Korea and Jomon Period Japan (after Hudson and Robbeets, 2020 and Fernandes et al., 2021).

Korea		Japan	
Paleolithic		Paleolithic	
		Incipient Jomon	14,520-10,550 BC
Incipient Neolithic	7500-5000 BC	Initial Jomon	10,550-5050
Early Neolithic	5000-3500	Early Jomon	5050-3520
Middle Neolithic	3500-2000	Middle Jomon	3520-2470
Late Neolithic	2000-1300	Late Jomon	2470-1250
Bronze Age	1300-400	Final Jomon (southwest Japan)	1250-970

by the appearance of pottery. The oldest pottery in Japan are undecorated potsherds excavated from Odai Yamamoto I Site AMS ^{14}C 13,780 ± 170 BP (17,180-16,170 cal BP) in Aomori Prefecture, northern Honshu (Nakamura et al., 2001). Kyushu Incipient Jomon pottery with linear relief is known from Fukui Cave Site AMS ^{14}C 12,700 ± 500 BP (15,610-14,190 cal BP), Senpukuji Cave Site AMS ^{14}C 12,220 ± 80 BP (14,520-13,820 cal BP), and Sikazegashira Site AMS ^{14}C 11,860 ± 50 BP (15,230-13,620 cal BP) (Keally et al., 2004; Kuzmin, 2013, 2017; and references therein). The oldest pottery in Korea comes from several sites on Jeju Island (73 km E-W × 31 km N-S), 90 km south of the Korean Peninsula. Termed Gosanri-type pottery after one of the sites, age determinations from the Gosanri Site suggest this pottery was manufactured and used AMS ^{14}C 9,610–9,490 cal BP (7,670–7,550 BC) (Kim et al., 2020).[2] Jeju Island is a shield volcano consisting primarily of basaltic to trachytic lava, over 360 monogenetic volcanoes, and Mt. Halla (1,950 m) at the summit (Kim et al., 2021a; and references therein). The lack of high viscous clay necessitated the use of herbaceous plants, especially species of *Miscanthus* (silvergrass), to make Gosanri-type pottery plant-fiber-tempered (Lee et al., 2019). Early sites with pottery on the Korean Peninsula first appeared with Osanri and Yunggimun-type pottery along the eastern and southern coast, respectively (ca. 8,200-7,000 cal BP) (Lee, 2017; Kim and Seong, 2022).

A glimpse into Neolithic life in the region comes from Higashimyo Shell Midden, Saga Prefecture, Kyushu. During the Initial Jomon Period, this site sat on an elevation near the mouth of a river that emptied into Ariake Sea. Occupation commenced ca. 8,000 cal BP (Nakamura et al., 2013) and was composed of six shell middens, 155 storage pits, burials, 167 burnt cobble clusters (stone ovens), late Initial Jomon Senokan pottery, bone, antler, wooden, and lithic artifacts (Saga City Board of Education, 2019; and references therein). Shell middens primarily contained wild boar (*Sus scrofa*), sika deer (*Cervus nippon*), Japanese basket clams (*Corbicula japonica*), razor clams (*Sinonovacula constricta*), blood cockles (*Tegillarea granosa*), oysters (*Crassostrea gigas*, *Crassostrea ariakesis*), Japanese sea bass (*Lateolabrax japonicus*), gray mullet (*Mugil cephalus*),

[2] Earlier radiocarbon dates obtained directly from the pottery yielded uncalibrated values of 10,180 ± 65 BP; 6,910 ± 60 BP; 6,230 ± 320 BP; and 4,480 ± 45 BP (Kuzmin, 2006; and references therein). These are considered conflicting and unreliable (Kuzmin, et al., 2009; So, 2017).

black sea bream (*Acanthopagrus schlegelii*), croaker (*Miichthys miiuy*), and walnuts (*Juglans mandshurica* var. *sachalinensis*). Soft-shell turtle (*Pelodiscus sinensi*) was also found in relatively large numbers. Dog bone remains are assumed to indicate their use in hunting.[3] Storage pits were found in and near the shell middens (especially shell midden no. 2), many of which contained baskets that included acorns of *Quercus gilva* and *Q*. subgen. *Lepidobalanus*. These nuts were foraged from the nearby broadleaf evergreen forest and were soaked in brackish water presumably for leaching weevils (a harmful beetle) (Noshiro et al., 2021; and references therein) and/or tannic acid (Kim, 2022). The baskets were classified into four categories based on size and shape and exhibit various weaving techniques. The larger baskets were made primarily with splints of *Sapindus mukorossi* (a deciduous tree) and *Ficus erecta* (a deciduous shrub). The smaller ones utilized mostly stems from *Sinomenium acutum* (a deciduous vine) and *Trachelospermum* (an evergreen vine) (Noshiro et al., 2019). An isolated human molar was subjected to genetic analysis, revealing the supposed male to be of mtDNA M7a1a and Y chromosome D1b haplogroups (Adachi et al., 2021).[4] Higashimyo was abandoned ca. 7,770-7,500 cal BP but reoccupied shortly thereafter when shell middens of oysters were formed. The site was permanently abandoned due to high sea-level during the Jomon Transgression,[5] with subsequent alluvial and clay deposits effectively sealing the remains for future investigation (Shimoyama et al., 2010).

Similarly, good preservation is seen at Bibongri Shell Midden in Changnyeong County, South Gyeongsang Province, South Korea. During the period of Neolithic occupation (strata 19-45 in fig. 2), Bibongri overlooked an inner bay environment of Paleo-Daesan Bay (Oh, 1994; Hwang et al., 2013: Lim et al., 2022). Six shell layers with intervening beds of silt and sand were uncovered along with 18 storage pits (many with acorns), dwelling remains, outdoor hearths, basketry from pit no. 9, Yunggimun and Yeongseondong pottery, lithic, wooden and bone artifacts. Terrestrial and marine resources include Korean wild boar (*Sus scrofa coreanus*), Dybowski's sika deer (*Cervus nippon hortulorum*), brown bear (*Ursus arctos*), raccoon dog (*Nyctereutes procyonoides*), wolf (*Canis lupus* ssp. *lupus*), Siberian tiger (*Panthera tigris* ssp. *tigris*), duck (*Anatidae* sp.), Korean ring-necked pheasant (*Phasianus colchicus* ssp. *karpowi*), redlip mullet (*Planiliza haematocheilus*), pacific oyster (*Magallana gigas*), Japanese sea bass (*Lateolabrax japonicus*), and blood cockle (*Tegillarca granosa*) (Kim, et al., 2021b; Kwak, et al., 2022). Dog bones (*Canis lupus* ssp. *familiaris*) from Shell Layer 1 dated AMS ^{14}C 5,640 ± 25 uncal BP (4,481 ± 23 cal BC) imply their domestication (Kim et al., 2015). Soil flotation yielded two grains of foxtail millet (*Setaria italica*) from Shell Layer 1 and outdoor hearth no. 10 (Kwak et al., 2022). This is in addition to four foxtail and three broomcorn millet (*Panicum miliaceum*) impressions from pottery of the same layer and House no. 2 (Obata and Manabe, 2014). Age determinations were obtained for foxtail millet grains

[3] The earliest known dog burials in Japan come from Natsushima Shell Midden (Kanagawa Prefecture) and Kamikuroiwa Rock Shelter Site (Ehime Prefecture). Both date to Initial Jomon Period (see Sato, 2018).
[4] Y-chromosome haplogroup D is frequent only among modern Japanese and Tibetans in East Asia, and has been detected in a Late Jomon male (D1b2b) from Rebun Island, Hokkaido (Watanabe et al., 2019; Kanazawa-Kiriyama, et al., 2019; and references therein). Divergence time for haplogroup D1b is estimated at ~19,400 YBP (Hammer et al., 2006). This suggests the sea isolated Japan from large-scale contact with the mainland, resulting in "unique genetic characteristics of the Jomon people" (Adachi et al., 2021, p. 20).
[5] For more on the Jomon Transgression, see Endo et al. (2022).

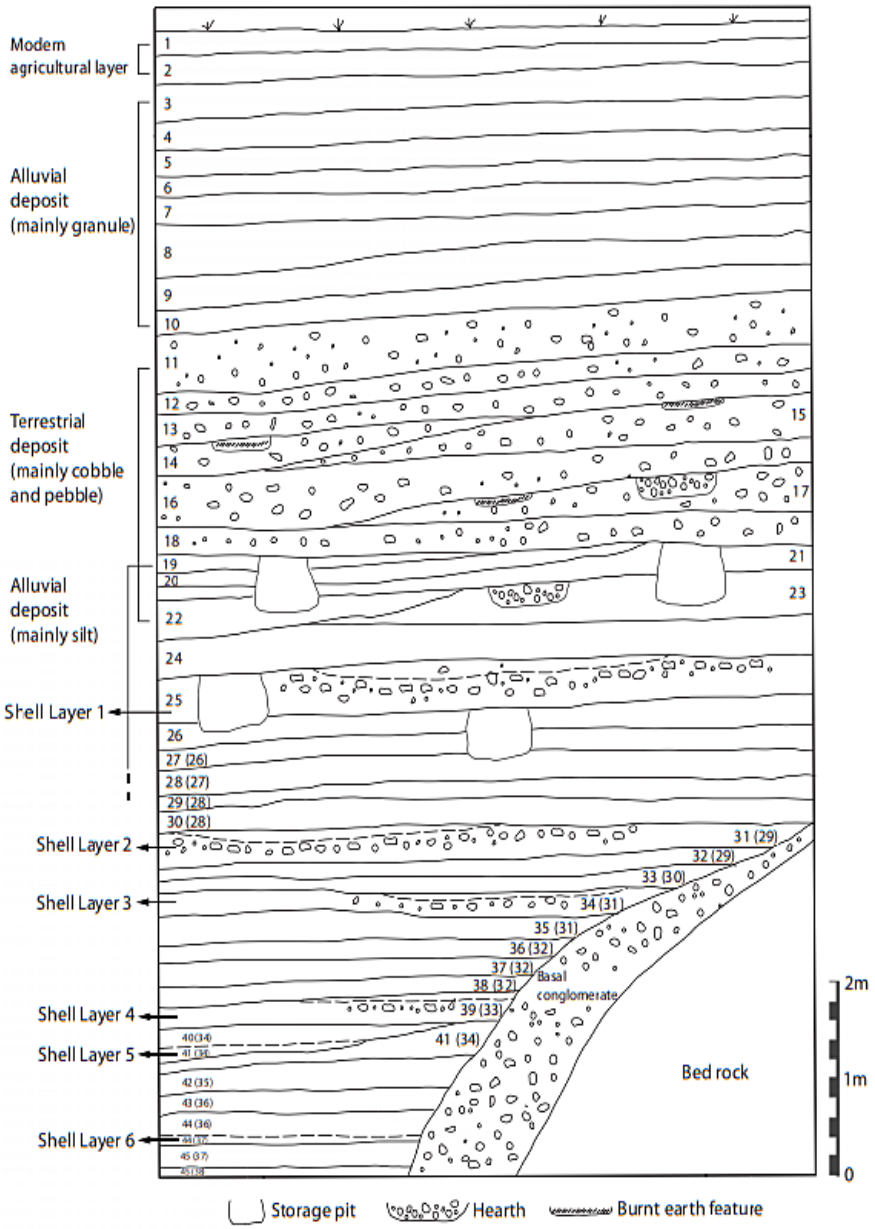

Fig. 2. Stratigraphical column of Bibongri Shell Midden given in Kim et al. (2021b), licensed under CC BY 4.0. Numbers without brackets based on Gimhae National Museum (2008), and those within brackets from Gimhae National Museum (2012).

from nearby Dongsamdong Shell Midden (AMS ^{14}C 3,360 cal BC; Crawford and Lee, 2003). A pine dugout canoe and a paddle were recovered from layer 45 (AMS ^{14}C 6,800 ± 25 uncal BP, 5,694± 34 cal BC; Park et al., 2010; Kim et al., 2015) and attest to maritime skills (Lee, 2014).[6] One wooden fragment of another canoe was found in Shell Layer 1, with an estimated date of ca. 6,100 BP (Lee, 2014). As the sea regressed, Bibongri became a wetland and was covered by sediment from nearby Chengdo River, a tributary of Nakdong River which empties into the Korea Strait.[7]

[6] The oldest known dugout canoe in Japan comes from Kaminarishita Site (Chiba Prefecture), dated 6,660 ± 35 BP (7,590-7,495 cal BP) (Kudo et al., 2014).
[7] This paper refers to the channel west of Tsushima Island as Korea Strait, and the east channel as Tsushima Strait.

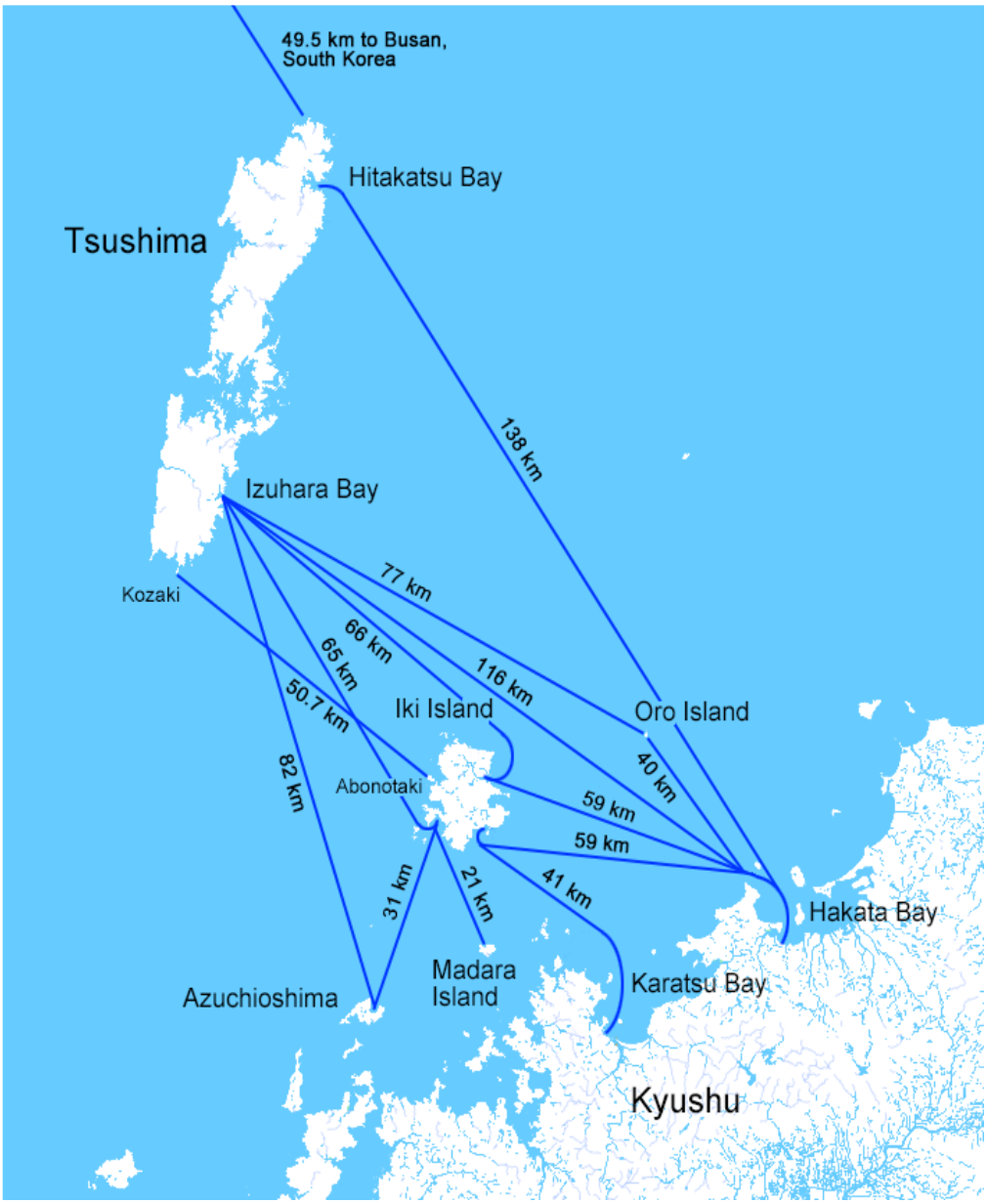

Fig. 3. Approximate distances between selected points in northwestern Kyushu. Base map from National Institute of Advanced Industrial Science and Technology (AIST) Geological Survey Center, 1:200,000 Seamless Geological Map of Japan V2 (Geological map updated: March 10, 2023), https://gbank.gsj.jp/seamless/. Distances were calculated using MDA Situational Indication Linkages (https://www.msil.go.jp/) (accessed on 2024/January/15).

Tsushima Island

Tsushima (82 km N-S × 18 km E-W) is an island between South Korea and Japan, 49.5 km from the Korean Peninsula, 50.7 km northwest of Iki Island, and 116 km to Hakata Bay (Fukuoka City, Fukuoka Prefecture) on the main Kyushu Island (figs. 3 and 4). It is an exposed portion of marine sediment and pyroclastic rocks (Taishu Group, >5,000 m) that filled Paleo-Tsushima Basin (>800 m) during the opening of the Japan Sea (East Sea) (Golozubov et al., 2017).[8] Subsequent folding resulted from compression as the Philippine Sea Plate rotated southwestern Japan clockwise

[8] The Republic of Korea refers to the Japan Sea, or Sea of Japan, as the East Sea.

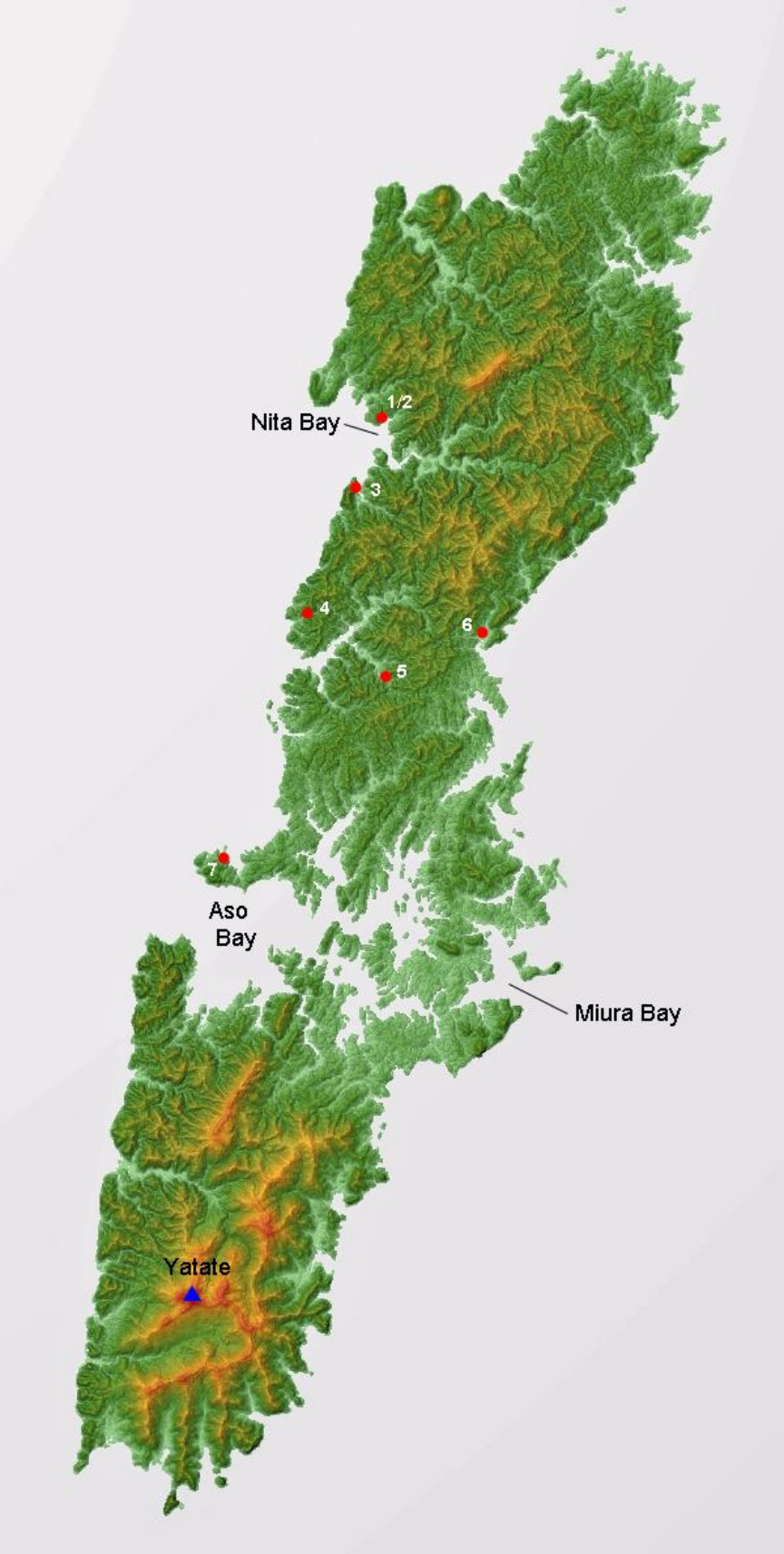

Fig. 4. Map of Tsushima Island showing locations and sites mentioned in the text. 1) Koshidaka; 2) Koshidakaozaki; 3) Meotoishi; 4) Kisakakaijinjinjya; 5) Yoshida; 6) Saka; 7) Nukashi. Numbers correspond to table 3, pp. 14-15. Image courtesy of Batholith and NASA's Shuttle Radar Topography Mission (Wikimedia Commons/Public Domain), with the addition of markers and labels only.

(Lee et al., 2022; and references therein).[9] Granite intrusion is seen in the southern part of the island (Shin et al., 2009). On the central west coast is Aso Bay (53.61 km^2), 4.18 km wide at its mouth, up to 80 m deep, with a ria-type coastline (Ministry of the Environment website, 2011). In the interior of the bay, Ofunakoshi Canal was cut in 1672 to allow passage of vessels to Tsushima Strait. Between 1895 and 1904 the Imperial Japanese Navy constructed Manzeki Canal, which connected Aso and Miura Bays. The cannels divide Tsushima Island into Kaminoshima in the north and Shimonoshima in the south, which have over 100 surrounding islets. Mount Yatate (649 m), the highest peak, is on Shimonoshima. In the East China Sea, Tsushima Warm Current branches from Kuroshio Current and approaches Tsushima Island from the southwest (fig. 5). It splits in two and presently passes through the Korea and Tsushima Straits at 0.5-1.0 and 1.0-3.0 knots, respectively (Nishida and Ikehara, 2013; and references therein). The northern branch continues as the East Korea Warm Current, with an offshoot entering the Sea of Japan (East Sea). The southern branch follows the northern coast of Honshu (Takikawa et al., 2005, and references therein; Korea Hydrographic and Oceanographic Agency).

Koshidaka and Koshidakaozaki are two sites located on the northwestern shore of Nita Bay, approximately 60 m apart. The first excavation at Koshidaka in 1976 unearthed lithic artifacts, two pit burials with human remains, Yunggimun pottery (2,641 sherds), and Initial Jomon Maebira pottery (7 sherds) from a single cultural bearing layer (Sakata, 1978). Lithic artifacts consisted of whole and partial arrowheads (4), scrapers (4), side-scrapers (23), end-scrapers (3), spearheads (17), axes (3), pebble tools (2), hammerstones (7), net sinker (1), cores (12), and flakes (148). Three arrowheads, seven side-scrapers, eight cores, and 63 flakes were made of obsidian, which originated from Koshidake (Saga Prefecture, Kyushu, 69 pieces), Iki Island (8), and Hariojima (Nagasaki Prefecture, Kyushu, 4). The remaining tools, cores, and flakes were shale and sandstone, procured from the island. The chief excavator, Sakata Kunihiro,[10] considered the pottery to resemble that of Dongsamdong cultural layer I (6,000-5,000 BC; Busan Metropolitan City Museum, 2007; Obata and Manabe, 2014, p. 117).

The 1978 excavation at Koshidakaozaki yielded six cultural layers, numbered 1 to 6 from youngest to oldest. Lithic artifacts were recovered from layers 1 to 5, which included scrapers, pebble tools, hammerstones, cores, and flakes. One fireplace was found in layer 4 and two fireplaces in layer 2. Pottery consisted of one Initial Jomon sherd with shell incised patterns, Yunggimun, Korean grooved line pattern pottery, Korean punctated pottery (layer 6), Yunggimun, Korean grooved line pattern pottery (layer 5), Senokan, Todoroki B, Yunggimun (layer 4), Todoroki B, Nishikaratsu (layer 3), Todoroki B, Nishikaratsu, Early Jomon Sobata, Yunggimun (layer 2), and Nishikaratsu, Sobata (layer 1) (Furusawa, 2014). The 1996 excavation combined the two sites under the name Koshidakahama, with Koshidakaozaki designated location A and Koshidaka location B. This was a salvation project, as marine erosion had caused damage to the site.

[9] An alternative view has folding in Tsushima the result of compression which accompanied buoyant subduction of the Philippine Plate under Kyushu (Yamaji et al., 2021).
[10] Names of Japanese individuals are given family name first followed by the given name, as is common practice in Japan.

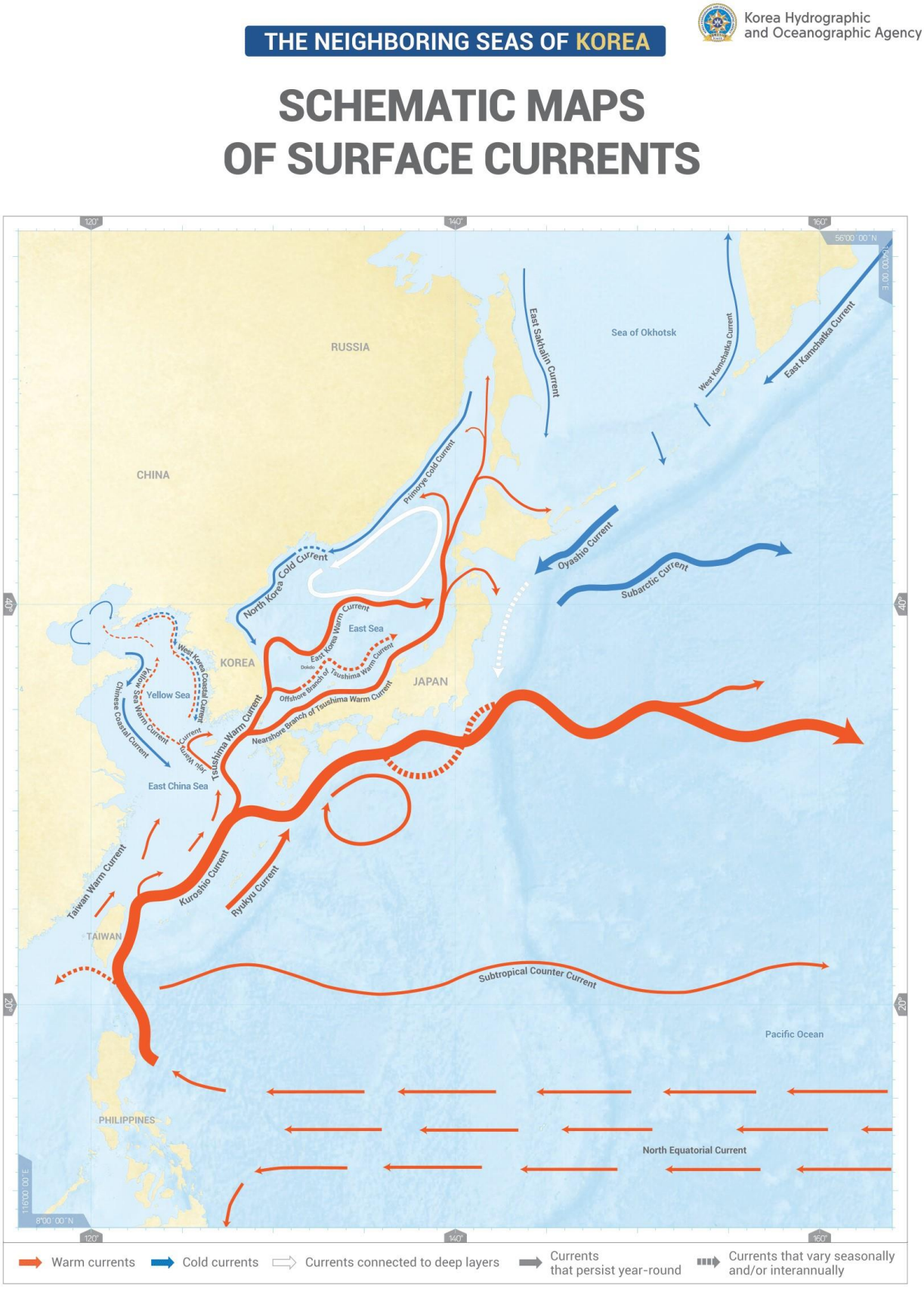

Fig. 5. Major ocean currents near Korea and Japan. Image used with permission of Korea Hydrographic and Oceanographic Agency.

Among the finds were Yunggimun and Korean grooved line pattern pottery, but nothing characteristic of Jomon pottery (Azuma and Fukuda, 1998). The site reverted to the name Koshitaka[11] to include both locations during the 2015 excavation. Location A yielded only 24 pottery sherds, one from a disturbed layer recognized as Yunggimun, and obsidian flakes. All of the pottery (93 sherds) from location B was Yunggimun, with most (69) coming from layer 6. Lithic tools consisted of six sanukite scrapers, one sandstone grindstone, one granite grindstone, and one stone mortar. Two fragments of carbonized wood from layer 6 were dated AMS ^{14}C 5,876 ± 23 cal BP and AMS ^{14}C 6,041 ± 22 cal BP (Department of Archaeology, Faculty of Letters, University of Kumamoto, 2016). The following excavations in 2016, 2017, and 2018 also recovered lithic tools and early Korean pottery, but Jomon pottery was again unidentified (Department of Archaeology, Faculty of Letters, University of Kumamoto, 2017; 2018; 2019).

The Early to Middle Jomon Meotoishi Site is located slightly south of Koshitaka, near the mouth of Shishimi Bay. During the 1988 excavation remains were found at locations B (cultural layer IIIa-d) and C (cultural layers VI and VII). The former yielded one Middle Jomon Adaka sherd, Korean Sugari I and II pottery, lithic tools, carbonized material, and burnt soil with ashes (presumed fireplace remains). One handle sherd from Sugari I jar shaped pottery resembles those from Akimatsukaigan Site and Ogawa Shell Midden in Saga Prefecture (Fukushima, 1992, p. 25). At location C, incised and undecorated sherds were recovered from cultural layer VII, and Sugari I pottery from cultural layer VI. Among the topsoil and surface collected artifacts were three Adaka sherds, Yeongseondong, Sugari I, and Sugari II pottery (Fukushima, 1992; Furusawa, 2014). In 1993 six test pits (designated TP1-TP6) were excavated, with Jomon pottery found in TP1, TP2, TP4, an TP5. Thirteen geological layers, ascending from layer 13, were recognized. In addition to lithic artifacts, pottery from TP2 consisted of Yeongseongdong, Sugari I, Sobata II (layer 13), Yunggimun, Yeongseongdong, Sugari I, Sugari II (layer 12), Yeongseongdong, Sugari I, Sugari II, Sobata, Adaka (layer 11), early and middle Late Jomon pottery (layer 8), and Kanegasaki (layer 7). At TP4, middle Late Jomon and Yayoi pottery were recovered from layer 4 (Furusawa, 2014). Korean pottery is also found at Saka, Yoshida, Nukashi, Kisakakaijinjinjya (Tsushima Island), Nokubi, Shirahama (Goto Islands), and Matsuzaki (Iki Island).

Southeast Korean Peninsula

Much of coastal southeast Korea (fig. 6, table 2) is composed of Late Cretaceous Yucheon Group (predominantly andesitic and rhyolitic rocks), Early Cretaceous Hayang Group (mudstone, shale, and conglomerates), and intrusive Cretaceous-Paleogene Bulguksa Granites. These are part of the Gyeongsang Volcanic Arc, which formed in a subduction zone environment (Chough and Sohn, 2010; Chough, 2013; Cheon et al., 2020). In the Korea Strait (continental shelf), seismic reflection profiles have revealed seven depositional sequences delineated by as many sequential boundaries. Each sequence represents one cycle of lowstand (fluvial deposits), transgression

[11] Site reports from 2016 to 2019 read the same Japanese characters as Koshitaka, rather than Koshidaka.

Fig. 6. Southern coast of the Korean Peninsula showing sites with Jomon pottery (after Ha, 2006). Numbers correspond with table 2. Image credit: Google Earth (Google, Landsat, Copernicus).

(estuarine facies), and highstand (mud deposits) sea levels commencing with the inferred Pliocene acoustic basement. The sequential boundaries are erosional unconformities formed during a lowstand, with the youngest interpreted as the Last Glacial Maximum (Yoo et al., 2017; Horozal al., 2021). Subsequent rise in sea level inundated the exposed shelf, leaving remnant sandy mud deposits at the bottom of the Korea Trough (Min and Park, 1997; Yoo et al., 2014a).[12] The mouth of paleo-Nakdong and Seomjin Rivers, which had emptied into the narrowed Korea Strait, retreated northwestward with the shoreline (Yoo et al., 2016). The transgression occurred ca. 15-6 ka (Yoo et al., 2014b; and references therein), filled incised valleys (e.g., Yoo et al., 2020; Lee et al., 2021), and flooded the lowland creating numerous embayments and offshore islands. The present-day Korea Strait is divided into an inner shelf (< 70 m depth) near the coast, mid-shelf (70-120 m depth), and outer shelf (> 120 m depth) inclusive of the Korea Trough (Park and Yoo, 1988; Yoo and Park, 1997).

Dongsamdong Shell Midden (no. 1 in table 2 and fig. 6) is one of the 24 known sites in Korea which contain Jomon pottery. It is located near the present shoreline of Yeongdo (13.97 km^2), an

[12] The Korea Trough (ca. 100 × 20 km NE-SW) is situated northwest of Tsushima Island, with a maximum depth of 230 m (Park et al., 1996; Yoo and Park, 2000; Yoo, et al., 2014b).

Table 2. Korean sites with Jomon Period pottery (after Ha, 2006). Numbers correspond with fig. 6.

	Romanized Korean	Chinese characters	Hangeul
1	Dongsamdong Shell Midden	東三洞貝塚	동삼동패총
2	Jodo Shell Midden	朝島貝塚	조도패총
3	Beombang Shell Midden	凡方貝塚	범방패총
4	Beombang Site	凡方遺蹟	범방유적
5	Sinamri Site	新巖里遺蹟	신암리유적
6	Sinamri III Site	新巖里 III 遺蹟	신암리 III 유적
7	Yeondaedo Shell Midden	煙臺島貝塚	연대도패총
8	Sangnodaedo Shell Midden	上老大島貝塚	상노대도패총
9	Yokjido Shell Midden	欲知島貝塚	욕지도패총
10	Heuksando Shell Midden	黑山島貝塚	흑산도패총
11	Hamokdong Site	花木洞遺蹟	하목동유적
12	Ando Shell Midden	安島貝塚	안도패총
13	Sugari Shell Midden	水佳里貝塚	수가리패총
14	Songdo Shell Midden	松島貝塚	송도패총
15	Dadaepo Shell Midden	多大浦貝塚	다대포패총
16	Daehang Shell Midden	大項貝塚	대항패총
17	Daechon Site	大村遺蹟	대촌유적
18	Ubongri Site	牛峰里遺蹟	우봉리유적
19	Sandeung Shell Midden	山登貝塚	산등패총
20	Gongsu C Site	公須 C 遺蹟	공수 C 유적
21	Bukjeong Shell Midden	北亭貝塚	북정패총
22	Sejukri Shell Midden	細竹里貝塚	세죽리패총
23	Daepo Shell Midden	大浦貝塚	대포패총
24	Geunpo (Cave) Site	芹浦遺蹟	근포유적

island comprising the western portion of Busan Harbor, Busan Metropolitan City. Numerous excavations have been undertaken since Dongsamdong was discovered in 1929 by Oikawa Tamijiro, a Japanese archaeologist and high school teacher (Yokoyama, 1933; Oikawa, 1933; Sample and Mohr, 1964; Sample, 1974; National Museum of Korea, 2004; Kyungsung University Museum, 2006; Busan Metropolitan City Museum, 2007). The stratigraphical profile obtained during the 1999 excavation recognized five cultural bearing layers (designated I-V) (Busan Metropolitan City Museum, 2007). The lowest cultural bearing layer I (strata 8 and 9) was predominately Yunggimun pottery. In stratum 9, one sherd was identified as Early Jomon Nishikawatsu pottery. Cultural bearing layer II (strata 6 and 7) was mostly Yeongseondong pottery, with stratum 6 covering dwelling no. 3. Middle Jomon Funamoto II pottery was found in cultural bearing layer III (strata 5-1 to 5-4) among Sugari I pottery. Cultural bearing layer IV (strata 3 and 4) consisted mainly of Korean Bonggaeri and Sugari II pottery. Nanpukuji, Sakanoshita, and Adaka Jomon pottery was recovered from cultural bearing layer V (stratum 2), which was mostly Korean Yulri pottery (Okada, 2008; Okada and Ha, 2010). Previous excavations at Dongsamdong have yielded Jomon Sobata, Todoroki B, and Kitakuneyama pottery (Furusawa, 2014). Jomon pottery from other Korean sites include Todoroki B, Takashima, Funamoto II (Beombang Shell Midden), Todoroki B, Sobata, Adaka (Sinamri Site), Tokoroki B, Kasuga (Yeondaedo Shell Midden), Todoroki B, Sobata, Nakatsu, Nanpukuji (Sangnodaedo Shell Midden), Funamoto II, Mitarai (Yokjido Shell Midden), and Todoroki B, Kasuga (Daepo Shell Midden) (Ha, 2001; 2006).

Northern Kyushu

On the northern side of Usuki-Yatsushiro tectonic line in Kyushu are Renge, Akiyoshi, Suo, Ryoke, and Higo metamorphic belts (Nishimura, 1998). These are pre-Paleogene accretionary complexes formed at the Eurasian continental margin in a subduction zone environment. They are part of the Southwest Japan Block that detached from the continent during backarc spreading and opening of the Japan Sea (East Sea) (Jolivet et al., 1994). As it drifted south, the block rotated clockwise about 45° and came to border the stable continent along the Ulleung and Tsushima-Goto fault systems (Hoshi, 2018; and references therein). While still part of the continental margin, the Cretaceous Kanmon Group (sedimentary rocks in northeast Kyushu), Renge, Suo, Ryoke, and Higo belts were intruded by Cretaceous plutonic rocks now widely distributed in the Sefuri Mountains (Suga and Yeh, 2020). In northwestern Kyushu, interplate basaltic volcanism is seen on Kita-Matsuura Peninsula and vicinity (ca. 10-6 Ma), Futagoyama (8.1-6.3 Ma), northern Nishisonogi Peninsula (7.1 Ma), Higashi-Matsuura Peninsula (3.58-2.1 Ma), and Taradake (3.2 Ma) (Mashima, 2009; and references therein). Quaternary volcanism includes Fukue Volcano Group, Sone, Ojika Jima Volcano Group, Ukujima (Goto Islands), Iki Volcano Group (Iki Island), Kakarashima, Kurose, Sasebo Volcano Group, Arita, Taradake, and still active Unzen (Nakano et al., 2013). As mountains and intervening valleys formed, Middle Pleistocene to Holocene deposits accumulated as coastal plains and lowlands. These include Fukuoka and Noogata Plains along the northern shoreline,

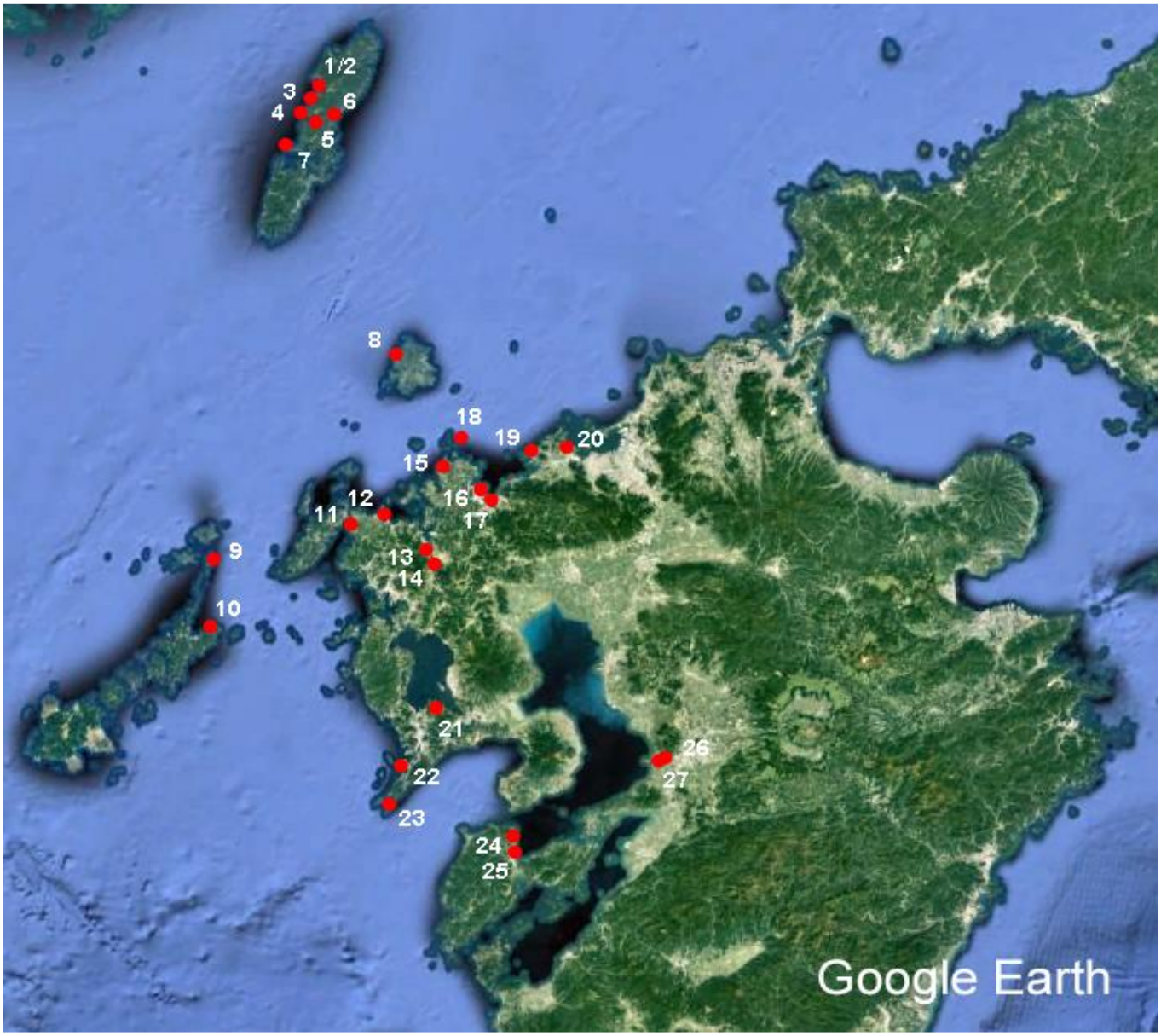

Fig. 7. Jomon Period sites in Kyushu with Korean pottery (after Ha, 2006). Numbers correspond with table 3. Image credit: Google Earth (Google, Landsat, Copernicus).

and Tsukushi Plain adjacent to Ariake Sea (Shimoyama, 1989; Shimoyama et al., 1994; Shimoyama, 2002). Arita (Imari Bay), Matsuura (Karatsu Bay), Tatara, Mikasa, Naka, Hii, Muromi, Zuibaiji (Hakata Bay), and Onga Rivers flow north into the Genkai and Hibiki (Open) Seas.[13] Chikugo River, with several inflowing tributaries, passes through Tsukushi Plain before emptying into Ariake Sea.

Shirahama Site (no. 10 in table 3 and fig. 7) is located in the Goto Islands (aligned NNE-SSW), which formed during continental rifting and opening of the Japan Sea (East Sea) (Kiyokawa et al., 2022; and references therein). It is on a small beach along the northern coast of Kashiragajima Island (1.88 km^2), one of the numerous islets which surround the five main islands of Nakadorishima,

[13] This is a translation from the Japanese “nada,” defined by Ohta et al., 2022 as “… an open sea where a strong ocean current, fast tidal current or severe wave makes marine navigation challenging.”

Table 3. Jomon Period sites in Kyushu with Korean pottery (after Ha, 2006). Numbers correspond with figs. 4 and 7.

	Romanized Japanese	**Japanese characters**	**Hiragana**
1	Koshidaka Site	越高遺跡	こしだかいせき
2	Koshidakaozaki Site	越高尾崎遺跡	こしだかおざきいせき
3	Meotoishi Site	夫婦石遺跡	めおといしいき
4	Kisakakaijinjinjya Site	木坂海神神社遺跡	きさかかいじんじんじゃ
5	Yoshida Site	吉田遺跡	よしだいせき
6	Saka Shell Midden	佐賀貝塚	さかかいづか
7	Nukashi Site	ヌカシ遺跡	ぬかしいせき
8	Matsuzaki Site	松崎遺跡	まつざきいせき
9	Nokubi Site	野首遺跡	のくびいせき
10	Shirahama Site	白浜遺跡	しらはまいせき
11	Tsugumenohana Site	つぐめのはな遺跡	つぐめのはないせき
12	Himejinjya Site	姫神社遺跡	ひめじんじゃいせき
13	Shirohebiyamaiwakage Site	白蛇山岩陰遺跡	しろへびやまいわかげいき
14	Nusudoiwa Site	盗人岩遺跡	ぬすどいわいき
15	Akamatsukaigan Site	赤松海岸遺跡	あかまつかいがんいせき
16	Nishikaratsukaitei Site	西唐津海底遺跡	にしからつかいていいせき
17	Nabatake Site	菜畑遺跡	なばたけいせき
18	Ogawajima Shell Midden	小川島貝塚	おがわじまかいずか
19	Tenjinyama Shell Midden	天神山貝塚	てんじんやまかいずか
20	Kuwabaruhigushi Shell Midden	桑原飛櫛貝塚	くわばるひぐしかいづか
21	Ikiriki Site	伊木力遺跡	いきりきいせき
22	Fukabori Site	深堀遺跡	ふかぼりいせき
23	Wakimisaki Site	脇岬遺跡	わきみさきいき

Table 3 (continued).

24	Futoo Shell Midden	一尾貝塚	ふとおかいづか
25	Oya Site	大矢遺跡	おおやいせき
26	Sobata Shell Midden	曾畑貝塚	そばたかいずか
27	Todoroki Shell Midden	轟貝塚	とどろきかいか

Fig. 8. Goto Islands showing location of Shirahama Site. Image courtesy of Batholith and NASA's Shuttle Radar Topography Mission (Wikimedia Commons/Public Domain), with the addition of markers and labels only.

Wakamatsujima, Narushima, Hisakajima, and Fukuejima (figs. 8 and 9). Most of the island is mountainous with steep cliffs, separated from Nakadorishima by Harami Strait (ca. 150 m wide). Test pits (designated TP1-11) conducted during the 1995 excavation revealed topsoil (strata 1-2), grayish-white sand (stratum 4; younger sand dunes), pebble layer (stratum 3),[14] yellowish sand formed after the Jomon Transgression (stratum 5; older sand dunes), brownish clay and sand (stratum 6), and brownish clayey soil (stratum 7). The Jomon Period component was predominantly from stratum 5, consisting of Early to Late Jomon pottery and lithic artifacts. Stratum 6 yielded cores (8), arrowhead (1), point-shaped tools (2), side-scrapers (5), scraper (1), notched

[14] This is the numbering order given in the site report.

Fig. 9. Shirahama Site and vicinity. Made based on image by Copyright © National Land Image Information (Color Aerial Photographs), Ministry of Land, Infrastructure, Transport and Tourism.

side-scraper (1), retouched flakes (4), utilized flakes (6), ground stone axes (2), pebble tools (3), waste material, and Todoroki B pottery associated with one Yunggimun sherd. Limited quantities of Jomon artifacts were also recovered from strata 4 and 7. The site was later used for burial, with 45 human skeletal remains estimated to date from the mid-eighteenth to first half of the nineteenth centuries (Furukado, 1996).

Obsidian

There are two main provenances of prehistoric obsidian procurement for the Korean Peninsula. The first is Baekdusan (Chinese: Changbaisan or Mount Changbai), situated in the Changbai Mountains on the border between China and North Korea. Several peaks surround the crater rim, with Tianchi (2,749 m), Namphothe (2,343 m), and Wangtiane (2,051 m) comprising the three main eruptive cones and Lake Tianchi (384 m depth) the crater lake. Tianchi is still active and developed through an initial basalt shield, middle trachyte composite cone, and ignimbrite-forming eruptions (Wei et al., 2013; and references therein). Three geochemical groups of obsidian associated with this area have been identified by analysis of the archaeological record and geological samples as PNK1 (Paektusan North Korea Type 1),[15] PNK2, and PNK3 (Popov et al., 2005). The first of these was preferred in lithic production as PNK2, unlike PNK1, will not produce conchoidal fractures and

[15] Paektusan is the McCune and Reischauer romanization of Baekdusan.

Fig. 10. Koshidake as seen from Imari Bay. Unchanged photo courtesy of Peka, licensed under CC BY-SA 4.0.

PNK3 is too pumiceous (Popov et al., 2019; and references therein). The second provenance is Koshidake (487.7 m, fig. 10) in southern Imari City, Saga Prefecture, Japan. It is less than 2 km east of Arita River, which empties into Imari Bay just a short distance downstream. Regional volcanism commenced about 2.7 Ma with basalt (Nishigatake Basalts) seen at the base of Koshidake, followed by rhyolite eruptions (Arita Rhyolites) present in the upper portion of the edifice. Although a stratovolcano, the summit lacks a clearly defined crater most likely due to weathering (Hamasaki et al., 2005; Sugihara, 2011). Prehistoric sites are known on and near Koshidake, notably Hirazora (Paleolithic Period) and Suzuoke (Late to Final Jomon) on the northern slope (Sugihara, 2011; Research Group of Obsidian Originating from Koshidake, 2014). Paleolithic sites with obsidian artifacts sourced from Kyushu have been identified in the southern coastal region of the Korean Peninsula. These include Sinbuk (Lee and Kim, 2015), Igeumdong, Shihwari, and Jiphyeon (Chang and Kim, 2019). However, most obsidian found in Korean Paleolithic sites was procured from Baekdusan. This is illustrated by the Upper Paleolithic site of Wolseongdong in Daegu Metropolitan City, approximately 700 km south of the source region. Laser Ablation - Inductive Coupled Plasma – Mass Spectrometry (LA-ICP-MS) showed all 100 obsidian artifacts examined at this site belong to the PNK1 geochemical group (Chang and Kim, 2018).

A general distinction between Baekdusan and Kyushu obsidian can be made based on microlite comparison of geological samples. Microlites occur as small crystals in the groundmass of rhyolitic glass (obsidian), and represent the first stages of crystal formation. They are preserved due to

rapid cooling and decompression of the silicate melt, which interrupts the crystallization process. As magma composition and change is a product of tectonic setting, microlites can differ in abundance, morphology, chemistry, and size. This is seen in discernible Fe-oxide, clinopyroxene, feldspar, and biotite microlites, matrix chemical composition, and rare earth element analysis of Baekdusan and Kyushu obsidian (Jwa et al., 2019; Uhm et al., 2020).

Beombang Shell Midden (no. 3 in table 2 and fig. 6) is one of the sites where artifacts made of obsidian from Kyushu have been found. During the Neolithic Period it was located along Paleo-Gimhae Bay, near the mouth of Nakdong River. Although the site has suffered damage, 16 unevenly distributed strata are recognized and numbered 1 to 16 from top to bottom. Of these, strata 7 to 13 (Initial Neolithic Period) yielded mostly Yunggimun pottery and a pit burial from stratum 12. Initial to Early Neolithic pottery of various types characterized the disturbed deposits of strata 4 to 6, and no artifacts were found in stratum 3. Terminal Neolithic double rimmed pottery was unearthed from stratum 2, and stratum 1 was cultivated topsoil. The undisturbed stratigraphy of pit H was designated strata I to IX in decending order, which consisted of alternating layers of shells and shells mixed with earth. In addition to other pottery types, strata IX, VIII, VI and IV contained Yunggimun pottery. Eight hearths, composite fishhooks, clay figurine fragments, shell bracelets, fish net sinkers, antler, bone, and stone tools were also recovered (Busan Metropolitan City Museum, 1993; 1997; Lee et al., 2014). Beombang Site is the adjoining residential area associated with the shell midden.

Seven obsidian flakes and one chipped arrowhead from Beombang Shell Midden were analyzed and assigned to Koshidake/Hariojima provenance (Chang and Kim, 2019; Kim and Chang, 2021).[16] Two of the flakes were from stratum 13, which also had axes (5), fishhooks (3), bone tools (3), arrowhead (1), hammerstone (1), shell bracelet (1), and fishnet sinker (1). One chipped arrowhead and four flakes came from stratum 6, as did axes (9), hammerstones (6), grinding pestles (3), saddle querns (2), fishhooks (5), arrowhead (1), stone sword (1), stone plowshare (1), and unspecified stone tools (6). The remaining flake was from stratum 5, as well as axes (11), hammerstones (3), whetstones (2), fishhook (1), saddle quern (1), shell bracelet (1), bone tool (1), and unspecified stone tools (2) (Busan Metropolitan City Museum, 1997). Other Neolithic sites in Korea with artifacts and/or by-products of obsidian originating from Koshidake/Hariojima include Hamokdong, Janghang, Neukdo Island, Beombang Site, Dongsamdong, Bibongri, Yokjido, Yeondaedo, Dongnae, and Dadaepo (Chang and Kim, 2019; Kim and Chang, 2021). Large quantities of obsidian from Kyushu were recovered from Dongsamdong Shell Midden and Beombang Site (Takahashi et al., 2003; Ha, 2006; Kawamichi et al., 2023), suggesting a trade mechanism. This would have been facilitated by intermarriage and possible linguistic affiliation (Robbeets et al., 2021).[17] In Japan, trade nextworks are known during the Jomon Period, as seen at Yokoo Shell Midden (Oita Prefecture, eastern Kyushu) and the distribution system of Himeshima

[16] The geochemical data used in this study could not distinguish between Koshidake and Hariojima (Nagasaki Prefecture, Kyushu) as obsidian sources. See Kim and Chang (2021), p. 4.
[17] Ancient DNA analysis of one individual from Yokjido Shell Midden (no. 9 in table 2 and fig. 6) showed 95% Jomon ancestry, indicating possible movement of people from Japan to Korea (Robbeets et al., 2021; p. 619; Supplementary Information 13, p. 7).

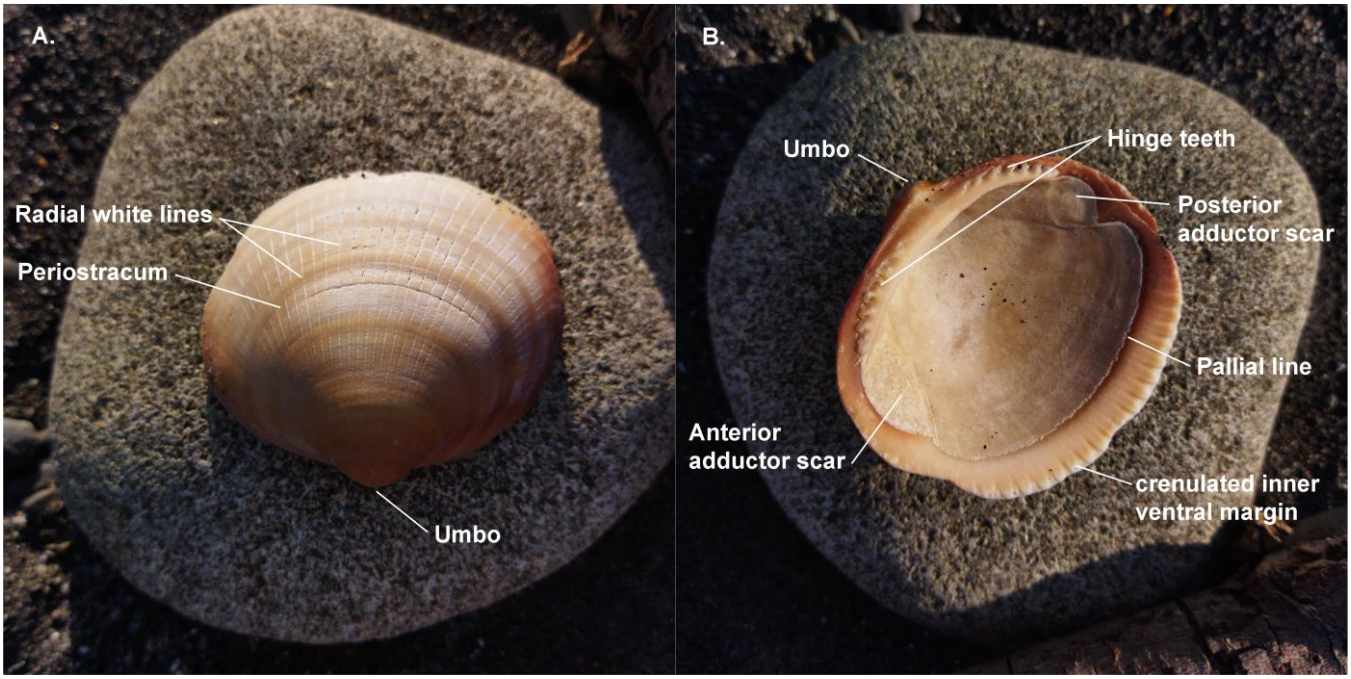

Fig. 11. Simplified external morphology of *Glycymeris albolineata* (white-lined bittersweet clam). A: Exterior of left valve. B: Interior of right valve. Image courtesy of taunagi, licensed under CC BY-NC, with addition of labels only.

obsidian (Furukawa, 2013, and references therein; Furukawa et al., 2021). Further south, obsidian from Koshidake is found in the Amami and Okinawa Islands (Obata et al., 2004; 2010).

Shell Bracelets

Neolithic shell bracelets in Korea were made primarily of *Glycymeris albolineata* (Lischke, 1872), an edible marine bivalve mollusk inhabiting a sand and sandy mud subtidal (3-50 m) zone environment (fig. 11). It is currently distributed in Korea from Gangwon Province (northeast South Korea) to Jeju Island, south from southern Hokkaido in Japan, East China Sea, and Taiwan (Lutaenko and Noseworthy, 2012; Lutaenko et al., 2019; and references therein). *Glycymeris albolineata* (white-lined bittersweet clam) is medium-sized, relatively thick, squarish with rounded corners (subquadrate), valves are the same shape and size (equivalve), fairly small umbones (singular umbo), has concentric grooves (striae), radial white lines regularly spaced, notched (crenulated) inner ventral margin, interior faint brown in adults, and a yellowish-brown outermost layer (periostracum) (Lee, 2013; Lutaenko et al., 2019). To manufacture the bracelet a hole was made near the umbo, presumably with a stone awl. This was done from the inside to avoid breaking the shell. The perforation was enlarged by detaching small pieces from the valve. Fabrication was completed by grinding the rough edges to obtain the final product (fig 12; Sample, 1974; Kim, 2003). Some shell bracelets were used as burial goods, such as at Ando Shell Midden (Ando Island, Yeosu City), Sangdeung Shell Midden (Sangnodaedo Island, Tongyeong City), and

Fig. 12. Reproduction of Jomon shell bracelets using *Glycymeris albolineata* (white-lined bittersweet clam). Image courtesy of Kasori Shell Mounds Museum.

Janghang Site cemetery (Gadeokdo Island, Busan Metropolitan City; Kim, 2011).[18] A total of approximately 1,500 shell bracelets were recovered during the 1999 excavation at Dongsamdong Shell Midden, many of which were broken or still in various stages of the production process. Such quantity implies dispersal within and/or without the Korean Peninsula (Ha, 2006).

On Tsushima Island, Saka Shell Midden (no. 6 in table 3 and fig. 7) is located on a small coastal plain near the mouth of Damichi River. In 1953 Middle Jomon Adaka pottery was discovered at the site, and a small excavation was undertaken the following year (New Tsushima Island Magazine Editorial Committee, 1964; Nagatome, 1965). The 1985 excavation uncovered Middle and Late Jomon shell middens, six human remains, three dwellings, Yayoi, and historical artifacts (Minecho Board of Education, 1986; 1989). The Middle Jomon shell midden yielded Namiki and Adaka pottery. Artifacts from the Late Jomon shell midden include 186 bone spearheads, 25 fishhooks, 113 shell bracelets, 312 stone axes and other lithic artifacts, Kanegasaki, Kitakuneyama, Miyashita, and shell incised pottery. The shell bracelets were primarily made of white-lined bittersweet clam (*Glycymeris albolineata*; 84%, n=95), followed by clothed bittersweet clam (*Glycymeris vestita*; 3.5%, n=4), half-crenate ark (*Scapharca subcrenata*; 3.5%, n=4), giant gugali limpet (*Tugali gigas*; 2.7%, n=3), snowy limpet (*Acmaea pallida*; 1.8%, n=2), black lined limpet (*Cellana nigrolineata*; 1.8%, n=2), purple Washington clam (*Saxidomus purpurata*; 0.9%, n=1), Korean hard clam (*Meretrix lamarckii*;

[18] One shell bracelet was recovered inland at Ojinri Rock Shelter Site (Unmun Township, Cheongdo County, southernmost North Gyeongsang Province), indicating distant procurement or exchange with coastal inhabitants (Lee et al., 2014).

Fig. 13. Double burial (SR01) at Kuwabaruhigushi Shell Midden consisting of one middle-aged female (left), and one juvenile male (right). Fukuoka Municipal Board of Education (1996).

0.9%, n=1), and common egg cowry (*Ovula ovum*; 0.9%, n=1).

Kuwabaruhigushi Shell Midden (no. 20 in table 3 and fig. 7) is located on a plateau along the northern coast of Kyushu, near Obaru River which empties into nearby Hakata Bay. Among the finds were five Late Jomon pit burials containing human skeletal remains (designated SR01-05) (Fukuoka Municipal Board of Education,1996). These consisted of a double burial (SR01), juvenile male (SR02), probable male (SR03), middle-aged male (SR04), and adult male (SR05).[19] The double burial interred one middle-aged female and one juvenile of undetermined gender (fig. 13), which does not necessarily mean a mother-child relationship.[20] The burial pit was oval (160 cm length × 65 cm width × 25 cm depth) with the skeletal remains aligned on an approximate north-south axis. Head orientation, however, was northeast for the female and southwest for the juvenile. The former was found in a supine and flexed position, while the latter was supine and extended. The deep bowl at the abdominal section of the female skeleton, with the upper portion missing, is seen as a later disturbance. On the female's left forearm were 14 shell bracelets, made of *Glycymeris albolineata* (white-lined bittersweet clam, 11) and unspecified family Arcidae (3)

[19] The site report does not numerically define age terminology. For more on age classification, see Buikstra and Ubelaker (2014) and Noxon (2017, p. 82).

[20] Mitochondrial genome sequencing was conducted on a Jomon double burial at Ikawazu Shell Midden, Tahara City, Aichi Prefecture. The results showed no mother-child relationship between the late middle-aged female (IK002) and estimated six-year-old child (IK001). However, the possibility of kinship still exists if the female is the mother of the child's father (Waku et al.; and references therein 2022).

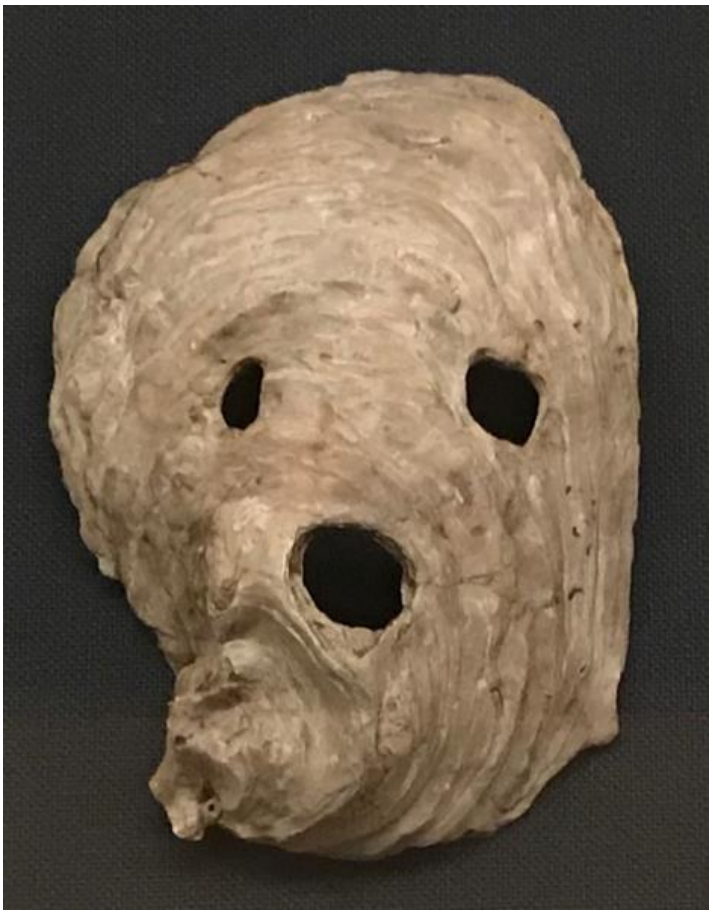

Fig. 14 (not to scale). Top: Shell mask from Adaka Shell Midden in Kumamoto City, Kumamoto Prefecture. Unchanged photo courtesy of Nanj2783, licensed under CC BY-SA 4.0. Bottom: Shell mask from Dongsamdong Shell Midden estimated to date between 2,500 and 2,000 B.C. (Ha, 2020). Unchanged photo courtesy of Professor Gary Lee Todd, licensed under GNU Free Documentation License and CC BY-SA 4.0. For species identification, see Kurozumi (2017).

(Kawazoe, 2013). None of the other skeletal remains had burial goods or body ornamentation. Shell masks, also recovered at Kuwabaruhigushi Shell Midden, are another cultural affinity which may have been involved in Japanese-Korean exchange (fig. 14). Found in fewer numbers than shell bracelets, they are generally regarded as spiritual objects used in communal rituals (Yamasaki, 2010; Ha, 2012a).

Fishhooks and Harpoons

The Korean Osanri-type composite fishhook is generally composed of a stone shank and barbed, bone point lashed together (fig. 15).[21] It is named after the Neolithic site in Yangyang County, Gangwon Province, where many shanks made of shale and hornfels have been recovered from cultural layer 1 dwellings (location A).[22] The head of the shank has a circumferential indentation where the line is attached. The bases of the shank and point have grooves for binding, and the barb (inner or outer) extends from the point tip. Points are usually polished and made of deer bone or wild boar tusk. Composite fishhooks were in use from ca. 5,000-2,000 BC and are classified according to shank size into large (>9 cm), medium (>5 cm to <9 cm), and small (<5 cm) (Ha, 2012b). One of the largest (>20 cm) was unearthed during excavation of Munamri Site in Goseong County, Gangwon Province. Although a few sites yielding composite fishhooks are on the east and west coast, most concentrate along the southern coastal region (Cheon, 2010). In Japan, Osanri-type composite fishhooks have been found at Saka Shell Midden (no. 6 in table 3 and fig. 7) on Tsushima Island, and in northwest Kyushu as far south as Futoo Shell Midden (no. 24 in table 3 and fig. 7) and Oya Site (no. 25 in table 3 and fig. 7) on Amakusashimo Island, Kumamoto Prefecture (Yamasaki, 2010).

The northwest Kyushu-type composite fishhooks are large (>7 cm), with the shank mostly made of deer antlers and points of wild boar tusk (fig. 16B).[23] The earliest examples come from Nabatake Site in Karatsu City, Saga Prefecture (no. 17 in table 3 and fig. 7). All four points from this site were made of wild boar tusk and found in association with Early Jomon Sobata pottery (stratum 14). The shanks were not recovered and only two points had an outer barb (Karatsu Municipal Board of Education, 1982).[24] Northwest Kyushu-type composite fishhooks continued to be used into the Yayoi Period, as seen at Nabatake Site, Kashiwazai and Kishiku Shell Middens (Watanabe, 1995). They have been found on the Korean Peninsula only at Sangnodaedo Shell Midden (no. 8 in table 2 and fig. 6). Some scholars suggest Osanri-type composite fishhooks acted as a model for the northwest Kyushu-type (Watanabe, 1985; Yamasaki, 2010), which would negate the necessity for trade to Korea if the former was considered adequate or superior.

Composite harpoons consist of a saw-tooth edged point and blades inserted at the end of the

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[21] Fragments of a bone shank and stone point were found at Yeondaedo Shell Midden (no. 7 in table 2 and fig. 6).
[22] Though not a direct correlation, a series of radiocarbon dates from location C ranged from 7,510 ± 40 cal. BP to 4,850 ± 70 cal. BP (Lee, 2017). See Lee et al., 2014, pp. 460-464.
[23] Other major classifications of composite fishhooks in Japan are Akamido, Obora, and Terawaki-types (Watanabe, 1966; 1985).
[24] This site is well known for its later transformation from Final Jomon to Initial Yayoi (e.g., Nasu, 2014).

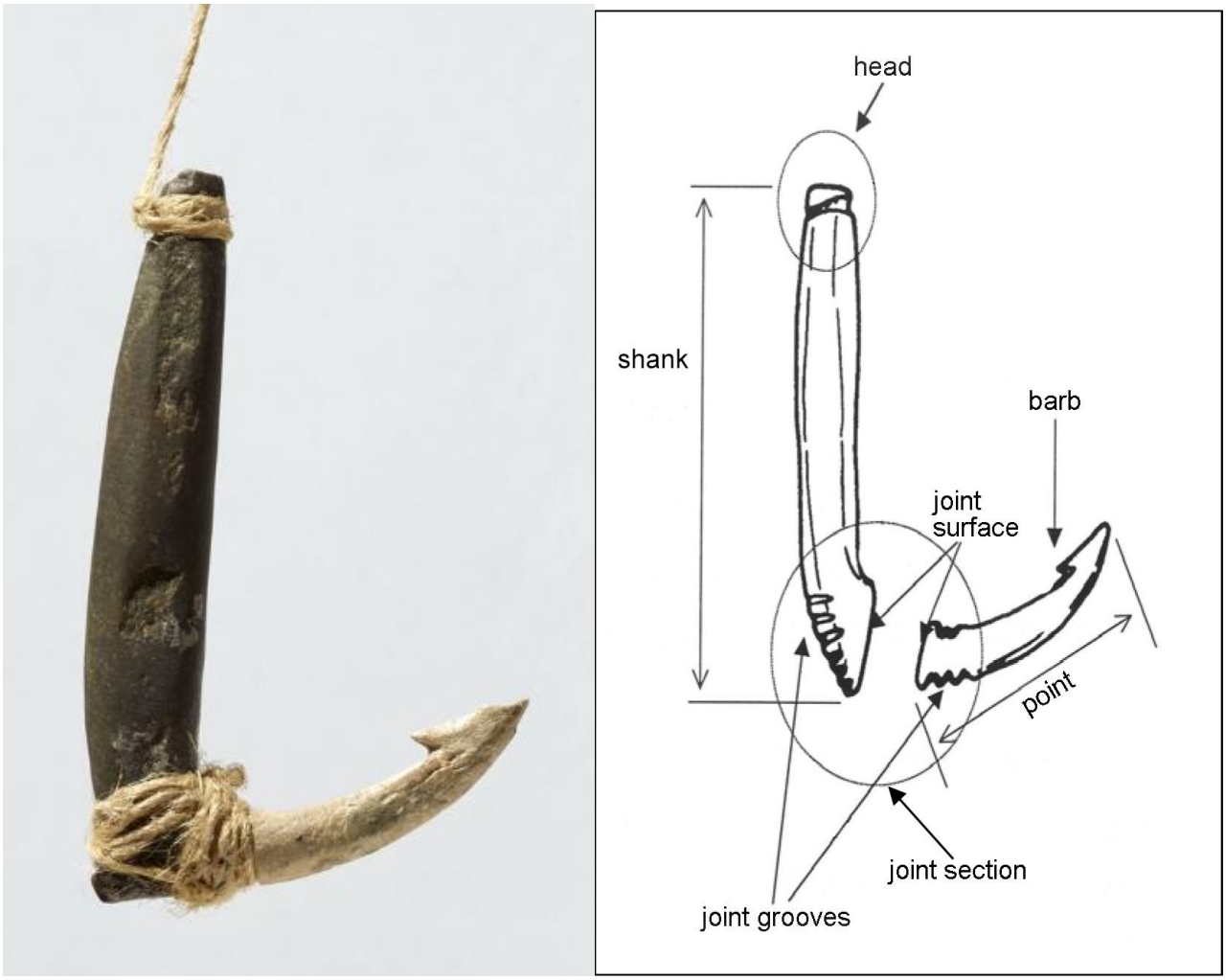

Fig. 15. Left: Osanri-type composite fishhook from Beombang Shell Midden. Photo used with permission of Busan Museum (ⓒBusan Museum). Right: Terminology for Osanri-type fishhook mentioned in the text. Illustration adapted from Cheon (2010).

shaft to form a composite head (fig. 16C).[25] They have been found at numerous sites in Kyushu and nearby islands, distributed as far south as Ichiki Shell Midden (Ichikikushikino City, Kagoshima Prefecture) and east to Yamaga Shell Midden (Ashiya Town, Fukuoka Prefecture) on the northeastern coast (Yamasaki, 2010). The majority can be classified into Tokuzodani, Shitadani, Fukahori, and Monzen types. The earliest type is named after Tokuzodani Site in Karatsu City, Saga Prefecture, and dates from early to middle Late Jomon Period. The remaining three derived from this type (Sugiyama, 1928; Tachibana, 1979; Yamasaki, 1988; Kugaya, 2016). Composite harpoons on the Korean Peninsula have been recovered only at Sangnodaedo Shell Midden (Monzen-type), Dongsamdong Shell Midden, Ando Shell Midden, and adjoining Ando Site (Shitadani-type) (Kugaya, 2016; and references therein).[26]

[25] Points are also found independently, and the addition of blades may have been to easily replace damaged parts and improve efficency (Kugaya, 2016).
[26] A composite harpoon was found on the east coast at Munamri Site (Goseong County, Gangwon Province). However, questions remain concerning its stratigraphical placement and relation to other composite harpoons in Korea and Kyushu (see Kugaya, 2016).

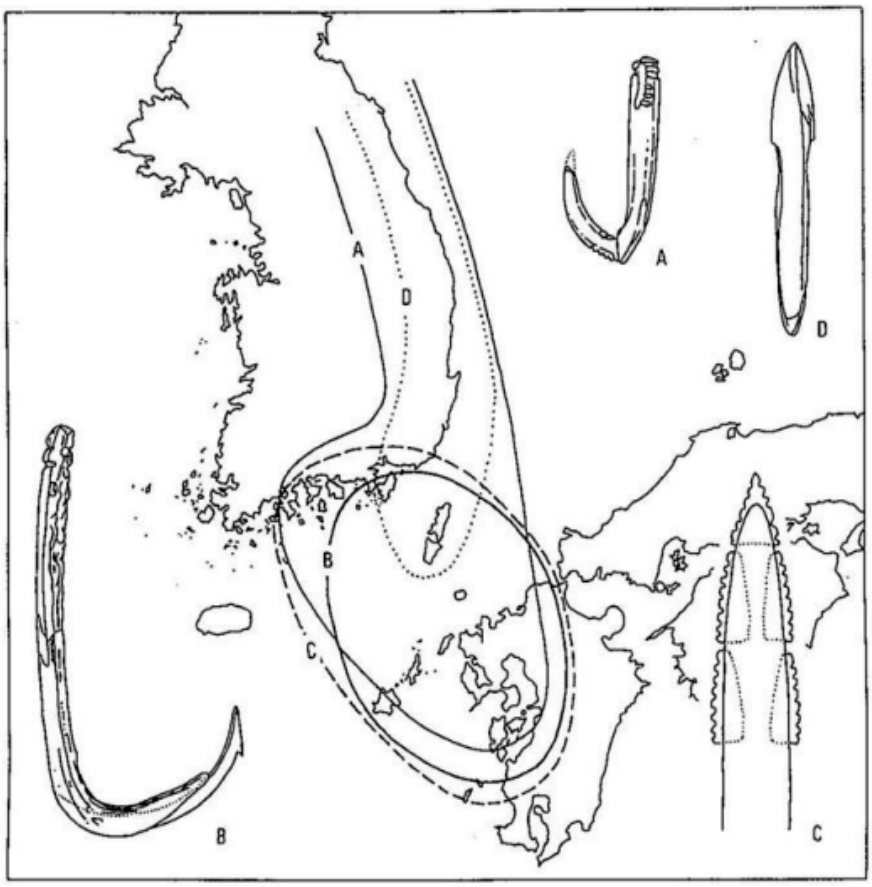

Fig. 16. Distribution of A: Osanri-type composite fishhook; B: northwest Kyushu-type fishhook; C: composite harpoon; and D: toggle-head harpoon (Watanabe, 1988).

Summary and Conclusions

One important aspect of Jomon Period cultural exchange between Japan and Korea is that it established the preconditions allowing movement of people across the sea during the ensuing Yayoi and Kofun Period migration. What Hanihara Kazuro envisioned as the dual structure hypothesis encompassed, in part, a substantial number of people crossing the sea and assimilating, to a greater or lesser degree, with native Jomon inhabitants (Hanihara, 1991). This process was facilitated by a preexisting knowledge of wind patterns, surface currents (coastal and open sea), weather (rainy season, monsoons, typhoons, etc.), tides, sailing routes (including smaller islands for provisions and safe havens), watercraft production, trade ports, and familiarity with coastal topography. The transportation of large amounts of obsidian to Dongsamdong Shell Midden and Beombang Site, and reciprocal commodities to Kyushu, requires such skills. Watercraft production capability is already evident at ca. 5,700 cal BC with the dugout canoe and paddle recovered from Bibongri Shell Midden. Composite harpoons, numerous in Kyushu, have been recovered at a few sites along the southern Korean coast. Osanri-type composite fishhooks, which may have acted as a model for the northwest Kyushu-type, are found in Kyushu. Other items presumably destined for Japan, but cannot be verified like obsidian, include shell bracelets and shell masks. Shell bracelets, in particular, were produced in large numbers at Dongsamdong Shell Midden. Similar subsistence strategies, discernible at Bibongri and Higashimyo Shell Middens, helped to create the environment

and desire for this trade.

The distribution of sites with overseas pottery helps define the scope of geographic interaction. In Korea, sites with Jomon pottery concentrate along the southeastern coast not far from Nakdong and Seomjin Rivers. Only Daechon Site is located inland and Heuksando Shell Midden on an island further west. Jomon Period sites in Kyushu with Korean pottery are in northwest Kyushu as far south as Oya Site (Amakusa Island, Kumamoto Prefecture), and north to Tsushima, Iki, and Goto Islands. As seen from pottery and obsidian procurement at Koshitaka Site on Tsushima Island, at least some degree of contact between the two regions was made as early as Initial Jomon Period. Interaction grew more frequent during Early Jomon Period (Todoroki B and Sobata type pottery), declined at the beginning of Middle Jomon Period, and increased since the end of Middle Jomon Period (Bausch, 2016). The decrease is possibly related to a reduction in population which occurred in northeast Asia and beyond after 3,000 BC (see Hudson and Robbeets, 2020, p. 9). Ancient DNA analysis for the female at the Korean Late Neolithic Yokjido Shell Midden, with a high proportion of Jomon ancestry, suggests movement of people from Japan to the southern coast of Korea and conceivably the reverse. This could have involved intangible exchanges such as social customs, food preparation, and perishable goods (meat, seafood, vegetables) now lost to the archaeological record. Advances in archaeology, linguistics, and genetics should deepen our understanding of this early period of cultural exchange between Japan and the Korean Peninsula.

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