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**Long-term Marine Resource Use in Hokkaido, Northern Japan:
New insights into Sea Mammal Hunting and Fishing**

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Long-term Marine Resource Use in Hokkaido, Northern Japan: New insights into Sea Mammal Hunting and Fishing

Based on examinations of archaeofaunal remains from 153 components from 122 sites in Hokkaido, Northern Japan, this study highlights that northern fur seals were the most important game for sea mammal hunting from the early Early Jomon (7000 calBP) and proposes a hypothesis that offshore hunting technology for hunting adult fur seals was established prior to the late Early Jomon (5800 calBP). This study also reveals that the importance of fishing for subsistence rapidly increased during the very end of the Final Jomon (2600 calBP) and the Early Epi-Jomon (2400 calBP–1800 calBP). Fishing focusing on bastard halibut and swordfish was actively conducted for status-building by Early Epi-Jomon fishers in some areas. Mortuary analyses indicate that ritual leaders were not necessarily capable fishers and/or hunters in the Jomon communities. However, during the Early Epi-Jomon, only successful fishers and/or hunters had the power to control rituals and the long-distance trade.

Keywords: sea mammal hunting; fishing; Jomon; Epi-Jomon; Hokkaido

Introduction

Hokkaido is located around the southern border of a sub-arctic environment in the Northwestern Pacific; its fauna includes brown bear, sea otter, salmon, halibut, and herring. Otariids seasonally migrate between Hokkaido and the neighbouring areas of the Kuril Islands, Sakhalin, and Kamchatka. Phocids such as ringed seal and harbour seal also inhabit the area, along with whales, dolphins, and killer whales. According to carbon and nitrogen isotope analysis of human bones and food crust on the ceramic surfaces, people in Hokkaido have highly depended on marine resources throughout the Holocene (Yoneda *et al.* 2002; Naito *et al.* 2010; Tsutaya *et al.* 2013; Kunikita *et al.* 2018). However, the trajectory of development in hunting and fishing and the social

meaning of marine resource use remain poorly understood in this region. This study presents comprehensive new insights into these features through examinations of archaeofaunal remains, implements for hunting and fishing, and grave goods.

Materials and method

The analyses in this study are mainly based on a database of archaeofaunal remains, which contains information on animal bones collected thus far from 153 components of 122 archaeological sites in Hokkaido. Figure 1 shows the location of the representative sites examined in this study and six sub-regions based on geomorphological features and marine currents. The sequence of archaeological cultures is shown in Figure 2. Although paddy rice cultivation was introduced in Western and Central Japan in the first millennium BCE, hunter-gatherer society persisted well into the Epi-Jomon cultures (fourth century BCE–sixth century CE) in Hokkaido. The Okhotsk culture, which contains artefacts similar to those of Sakhalin and the Lower Amur Basin, is regarded as somewhat exotic; its main bearers generally have been regarded as immigrants to Hokkaido, although they were eventually assimilated into the Satsumon culture, a direct ancestral culture of the Ainu. Currently, the Ainu culture is archaeologically recognized by the extinction of pit houses and clay vessels, and the beginning of the culture is dated to a period between the twelfth–thirteenth centuries CE.

This study examines spatio-temporal changes in the occurrence, species, sex, and age of excavated faunal remains. In addition, quantitative and qualitative data on hunting/fishing implements and grave goods were used to estimate the social meanings of food acquisition.

Results

Sea mammal hunting

More than 2800 harpoon heads have been discovered from mainly shell midden sites in the study area. Figure 3 shows the relationship between the number of harpoon heads and the ratio of sea mammal bones to terrestrial mammal bones in each region. A close relationship between these items indicates that sea mammals were hunted using harpoons, which might also have been used for catching large fishes. Although the oldest harpoon head in Hokkaido dates to the late Initial Jomon (7800 calBP), there is virtually no data on mammal remains from this period. However, sea mammal bones from the beginning of the Early Jomon (7000 calBP) have been found from midden sites.

Figure 4 shows the species composition of sea mammal bones excavated from Hokkaido. Notably, the number of specimens for the Ainu culture period remains small, and most of the Satsumon specimens are from a single site, namely, the Aonae shell midden site on the Sea of Japan coast. As such, Japanese sea lion accounts for a considerable proportion of the archaeofaunal remains. Results relating to these two periods may be biased by the scarceness of data across sub-regions, but it appears evident that northern fur seal was the most important game for sea mammal hunting in the Jomon, the Epi-Jomon, and the Okhotsk cultures.

Figure 5 shows sex and age data of excavated northern fur seal remains in Hokkaido. Pups account for one-third to three-quarters of northern fur seal in the Southwestern Pacific. Currently, Funka Bay is one of the wintering places for northern fur seal pups, and archaeofaunal evidence indicates that they have migrated to this bay since at least the Middle Holocene. Killing them with a simple stick has been documented in modern examples in the Bering Sea (Elliot 1881; Scheffer 1970). This

practice also has been postulated for ancient Hokkaido because northern fur seal pups occasionally land due to underdeveloped physical strength (Niimi 1990; Nishimoto 1993; Kami 2001; Takahashi 2008).

In contrast, adult and juvenile fur seals were the main targets of hunting in other areas. Surprisingly, adults and juveniles account for nearly all northern fur seal remains at the late Early Jomon (5800 calBP) shell middens at the Tenneru and Higashikushiro sites. Female remains tend to exceed those of males at sites in the Eastern Pacific and Tsugaru Strait, whereas males far exceed females in the Okhotsk Sea and Sea of Japan. Although fur seal's migration behaviour in the Middle and Late Holocene should be examined using archaeological materials in future studies, it remains unclear if such disparities were caused by sex-based differences in migration routes due to limited information on the life history.

Fishing

Archaeofaunal remains suggest that the importance of fish greatly increased from the very end of the Final Jomon (2600 calBP) and the Early Epi-Jomon (2400 calBP–1800 calBP) in the entire region. Figure 6 shows the occurrence rates of mammals, fish, birds, and shellfish at archaeological sites in Hokkaido with results from Central Hokkaido (a) and other areas (b) shown separately. With the use of water-flotation, even tiny bone fragments have been identified in Central Hokkaido site reports, in which the bone quantities are reported according to weight as opposed to the number of identified specimens (NISP), as is done in other areas. Mammal bone is dominant during the Late and Final Jomon in Central Hokkaido, whereas the proportion of fish rapidly increased from the very end of the Final Jomon and the Epi-Jomon, and this tendency continued in the Satsumon culture (Figure 6a). Notably, nearly all fish bones in this region are identified as chum salmon (*Oncorhynchus keta*), and mammal remains mostly consisted

of sika deer (*Cervus nippon yesoensis*). Fishing of chum salmon appears to have significantly increased at the very end of the Final Jomon and the Epi-Jomon, and the weight of fish bone accounts for about 40–70 % of the entire faunal remains from this period. For example, in Central Hokkaido, 3867.516 g of faunal remains have been collected from sites of the very end of the Final Jomon and the Early Epi-Jomon, and weight of fish bone is 1507.848 g (39 %). In the Satsumon culture, total weight of collected archaeofaunal remains is 1700.251 g. Among this, the weight of fish bone is 1160.199 g (68%).

In other areas, northern fur seals and sika deer were the dominant mammal species, and Clupeidae (mostly herring), Salmonidae (salmon), Gadidae (mostly cod), Scorpaenidae (scorpionfish), Hexagrammidae (greenling), and flatfish were the major fish species. As in Central Hokkaido, the importance of fish rapidly increased at the very end of the Final Jomon and the Epi-Jomon; fish bones account for over 70 % of faunal remains from this period (Figure 6b). Fish were also a significant part of the diets of the Okhotsk, the Satsumon, and the Ainu cultures.

Discussion

Development of sea mammal hunting in Hokkaido

Northern fur seals were the most significant sea mammal game in Hokkaido during the Jomon and Epi-Jomon cultures. Although this idea was proposed based on limited information collected from midden sites in the 1980s (Nishimoto 1984), it is supported by the quantitative examination on current archaeofaunal remains. Fur seal utilization focusing on pups was established in the Southwestern Pacific during the early phase of the Early Jomon (7000 calBP), whereas adult and juvenile fur seal hunting emerged in the late Early Jomon (5800 calBP) in the Eastern Pacific and possibly the Southwestern

Pacific and Sea of Okhotsk. Technology for hunting adult and juvenile sea mammals expanded from the Pacific side to the Sea of Japan during the end of the Middle Jomon and the beginning of the Late Jomon (4500 calBP). These periods mark a formative stage in the development of sea mammal hunting in Hokkaido (Niimi 1990; Takahashi 2008).

There is no doubt that adult and juvenile fur seals were hunted using harpoons at least from the Early Jomon in Eastern Hokkaido. Kaneko (1973) classified Jomon toggle harpoon heads into two types: Type 1 is characterized by a pointed bone tip without a slit for a stone point (Figure 7.4, 5, 7–10, 13, 14), whereas Type 2 has a slit for inserting a point (Figure 7.1–3, 6, 11, 12, 15–16). These two types of harpoon heads coexisted from the Early Jomon to the Ainu culture, thus indicating that they were used for different purposes. Since Type 2 harpoon head has heavier body and stronger penetration than Type 1, this tool was likely developed mainly for hunting large sea mammals such as adult fur seals, Steller sea lions, Japanese sea lions, and dolphins (Takahashi 2008). Thus, Type 2 harpoon heads in the Early Jomon, as well as archaeofaunal remains demonstrate the existence of adult fur seal hunting from this period.

Two hypotheses can be proposed concerning Early Jomon hunting areas: first, adult and juvenile fur seals were hunted offshore. This notion is supported by behavioural and ecological patterns whereby modern adult and juvenile fur seals stay in open ocean preying on capelins, pollocks, mackerels, and squids during winter (Wada 1969, 1971; Gentry 1998). If the first hypothesis is true, then open sea hunting technology for adult fur seal had been established as early as the late Early Jomon. Alternatively, adult and juvenile may have been hunted in inlets formed during sea level rises associated with the climatic optimum, as Takahashi (2008:42) speculated.

However, adult and juvenile fur seals are generally do not land during wintering (Gentry 1998), and they stay offshore around Northern Japan as well (Wada 1969, 1971). Considering modern fur seal behaviours, this hypothesis is highly improbable; however, it is worth using archaeological records to verify past life history patterns of northern fur seals from the viewpoint of historical ecology. For example, if currently unknown fur seal breeding and wintering spots previously existed in Hokkaido as argued in California (e.g., Burton *et al.* 2002; Newsome *et al.* 2007), or if they came into inlets chasing fishes into narrow gaps in rock reefs, then prehistoric people might have been able to hunt them in inlets. Thus, both hypotheses should be closely examined in future studies.

However, the author supports the former hypothesis for the following reason: the late Early Jomon coincides with a marine regression period when the coastline moved back to the present location in Funka Bay. Some lagoons formed by the climatic optimum remained in the Eastern Pacific as late as the Middle and Late Jomon; however, Old Kushiro Bay was already a narrow lagoon in the late Early Jomon, with an estimated length of less than 25 km and a width of less than 5 km. Thus, it is unlikely that many adult fur seals came to stay in the inlet. Manila clam (*Ruditapes philippinarum*) accounts for a considerable proportion (86.2 %) of shells at the Higashikushiro midden located at the mouth of the lagoon, whereas Pacific oyster (*Crassostrea gigas*) comprises less than 1.2 % of such remains (Takahashi 2010). Myida (*Myoida Goldfuss*) are dominant among shells at the Tenneru site located 5–6 km inland from the mouth of the lagoon. Thus, although a salt-water environment was still preserved in this inlet in the late Early Jomon, the bottom of the lagoon was likely sandy and the inlet was not very deep, representing a less hospitable environment for adult fur seals. Moreover, only a small number of fur seal remains at the Tenneru site

are associated with the Early Jomon, whereas they are relatively abundant at the Higashikushiro shell midden site. The scarcity of fur seal bones at the former site implies that they were brought from other places rather than hunted in the lagoon. Notably, fur seal bones are numerous at Tenneru even among Late and Final Jomon assemblages, when the inlet was less than 5 km in length and less than 2 km in width (Kushiro City Archives of Local History 2008) and thus, too small and shallow to hunt adult fur seals. Abundant limb bones and the scarceness of trunk bones also support the likelihood that northern fur seals were not hunted near Tenneru during the Early and Final Jomon.

Therefore, the present study preliminarily supports a hypothesis that offshore hunting technology using harpoons was established in the late Early Jomon. Even in Southwestern Hokkaido, where pups were actively caught, adults and juveniles account for one-quarter to two-thirds of fur seal assemblages, indicating that offshore hunting was also conducted in the region (Figure 5). Northern fur seal was a familiar species for Jomon people on the Pacific side of Hokkaido because pups had been actively used from the early Early Jomon. Hunting technique for large sea mammals was also developed on the Pacific coast for hunting adult northern fur seals. During the late Middle Jomon and early Late Jomon, technology for hunting adult otariids diffused to the Sea of Japan. Archaeofaunal remains demonstrate that the population size of Steller and Japanese sea lions in the Sea of Japan was larger than the Pacific Ocean, indicating that offshore hunting of various large sea mammals was actively performed in the entirety of Hokkaido from this period. However, the lack of any significant change in species composition suggests that there were no new major innovations in hunting technology itself (Figure 4). Although minor improvements of harpoon heads can be seen during the Middle and Late Holocene, a major technological advance in sea

mammal hunting was not achieved until the Satsumon culture, when metal points for toggle harpoon heads were introduced.

Understanding the development of sea mammal hunting in Hokkaido has a significant meaning for revealing its diffusion process in Northeast Asia. Yamaura (1996) proposed that sea mammal hunting technology diffused from the Amur River Basin to Hokkaido via Sakhalin. Although there are no ancient harpoon materials in the Amur River basin and Sakhalin, Yamaura focuses on the Blade-arrowhead culture (8400 calBP to 7800 calBP, Kunikita 2016) which spread from these regions and ultimately settled in Hokkaido. The oldest harpoon material in Hokkaido is an unfinished harpoon head from the Abashirikotei site, which may date as far back as 7800 calBP. In Hokkaido, harpoon heads of the Blade-arrowhead culture are poorly understood due to the lack of contemporary shell midden and bog sites; however, the presence of numerous stone net sinkers suggests that this culture was closely related to the exploitation of aquatic resources. Carbon and nitrogen stable isotope analysis of food crust on the ceramic surfaces indicates a higher dependence on marine resources for the Blade-arrowhead culture than for other cultures in the Initial Jomon (Kunikita 2015).

On the other hand, seasonal whale hunting was actively conducted from the end of the sixth millennium BCE in Western Japan (Kawamichi 2007). The Boisman culture, which is the earliest archaeological culture in the Primor'e exhibiting evidence of maritime adaptation, has been dated to ca.8300 calBP, well before the occurrence of active marine resource use in the Japanese Islands (Brodianski and Rakov 1992; Popov and Tabarev 2008; Popov *et al.* 2014). Although the relationship between the Boisman culture and marine resource use in Western Japan remains unclear, the earliest convincing data for maritime adaptation in the Northwest Pacific dates to between 9000

calBP and 7000 calBP (Fitzhugh 2016). In Hokkaido, sea mammal utilization emerged during this period, and, as indicated in this study, open ocean hunting technology was established in 5800 calBP. In future studies, examinations in the Lower Amur Basin and Sakhalin will be important to exploring the origin and expansion of sea mammal utilization in the Northwest Pacific. Sea mammal hunting was possibly conducted in these regions because there are breeding areas of otariids in these regions and it was easier to hunt them than in Hokkaido. However, if no strong evidence emerges of ancient sea mammal hunting in these regions, we must consider the hypothesis that it originated in Hokkaido.

Changes in fishing strategies over time

The importance of fishing in subsistence rapidly increased in Hokkaido between the end of the Final Jomon and the Epi-Jomon (Figure 6). Figures 8 and 9 show the species composition of fish remains in each region. In Central Hokkaido, salmon was consistently the main fishing game from the Jomon to the Ainu periods, and site distributions suggest that its importance to subsistence increased between 2600 and 2400 calBP in accordance with a higher dependence on fish resources. For example, Jomon sites in Sapporo were mainly situated in hilly areas or on terraces, whereas Epi-Jomon sites tended to be located on the natural levees in the alluvial lowlands where salmon spawning beds concentrate. Salmon was also a significant resource for the Jomon cultures in the Southwestern Pacific; however, this was a local tendency only observed in the Chitose River Basin (Figure 1), and its importance was much less in coastal areas. This micro-regionality and the small size of the Satsumon culture assemblage are reflected in the inconsistency between Figures 8 and 9. In Sea of Okhotsk, Clupeidae and salmon appear to have been important in almost all of the

archaeological cultures. However, it is too early to conclude because the sample size is small in the Jomon, Epi-Jomon, and Satsumon cultures: it is still difficult to understand the trajectory of fish use in this region. Therefore, ethnographic reports on the importance of salmon resources in the Ainu culture (e.g., Watanabe 1973a) align with archaeological data from the Central and Chitose River Basin areas in the Southwestern Pacific.

However, Clupeidae, cod, scorpionfish, greenling, and flatfish were more important than salmon at some Jomon sites in the Sea of Japan and Eastern Pacific. Significant differences between Figures 8 and 9 in the Tsugaru strait suggest that the main fishing game differed from site to site, indicating that salmon was not significant for all Jomon settlements in this region. Although studies of Jomon subsistence patterns tend to emphasize the importance of salmon, particularly in Eastern Japan (Yamanouchi 1964; Okamura 2018), it was not necessarily the primary fishing game in all areas, even in Hokkaido. Salmon is also the main food resources for the indigenous peoples in the Northwest coast. However, it is not always the most important fish in all areas; herring, flatfish, scorpionfish, and cod are more important than salmon in some areas (McKechnie and Moss 2016). In Southeast Alaska, the importance of salmon rapidly increased from 1100 CE, while herring and cod had critical significance between 1900 BCE and 800 CE (Ames and Maschner 1999). Archaeological evidence from the North Pacific indicates that ethnographically documented indigenous economies highly dependent on salmon cannot necessarily be extended to the Early and Middle Holocene.

Patterns of Early Epi-Jomon fishing also raise an issue regarding the social meanings of this activity. Swordfish (*Xiphias gladius*) is among the top-ranked species associated with the Early Epi-Jomon in the Eastern Pacific (Figure 9); however, such fishing is not seen at Jomon sites. Bastard halibut (*Paralichthys olivaceus*) accounts

for two-thirds of fish bones at Early Epi-Jomon sites in the Tsugaru strait, and reconstructed body sizes from 60 to 100 cm (Figure 10) suggest a focus on larger fish because the maximum size of this species is approximately 100 cm.

Large bastard halibuts were likely caught using a fish-shaped stone object, a short-life tool with composite fishhook shank, sinker, and lure functions that emerged and vanished during the Early Epi-Jomon (Takase 1996). The length of this tool ranges from 10 to 30 cm; thus, as shown in Figure 7.19, composite fishhooks using this implement can be very large. This tool was made using various kinds of stone materials such as shale, tuff, mudstone, sandstone, and schist, and its wide morphological range indicates that fishers experimented to find the ideal material, shape, and size to catch larger bastard halibuts. This evidence suggests that catching large bastard halibuts was an important means for status-building in the society (Takase 2014), and similar significance can be attributed to swordfish fishing in the Eastern Pacific. Competitive relations among fishers encouraged the improvement of fishing gear for catching large bastard halibut.

It is still unknown why bastard halibut became an increased centre of focus in Early Epi-Jomon economy. It is not a dangerous fish to catch along the coast during the egg-laying season in spring and summer. There is no clear evidence showing that this fish was exported to Honshu Island. If fish were used as trade goods in these earlier periods, salmon, not bastard halibut, would have been the more desirable resource, as we see in later periods. Around Hokkaido, other large flatfish such as barfin flounder (*Verasper moseri*) and Pacific halibut (*Hippoglossus stenolepis*) are also available. However, Epi-Jomon people did not show any interest in these species, focusing instead on technologically specialized fishing of large halibut.

Similarly, elaborately decorated large harpoon heads indicate that hunting sea mammals using luxury gears also works as a strategy to gain social prestige for hunters (Figure 7.17 and 18). Certainly, decorated and oversized harpoons must have been used to gain social prestige for hunters, or perhaps even as display of earned status. This highly decorative gear was not just for display, but was also used as attested by the presence of broken decorated and large harpoon heads in shell midden sites. It is notable that the utilization of large and elaborately ornamented harpoons in the Epi-Jomon culture was not associated with an increased proportion of adult and juvenile fur seals (Figures 5, 7.17, and 18). Thus, the emergence of luxury harpoon heads was not necessarily related to a significant advance in hunting technology, but rather, can be regarded as a result of status-building among hunters/fishers.

Nevertheless, fishing based on salmon and Clupeidae replaced an emphasis on bastard halibut near the beginning of the Late Epi-Jomon (1800 calBP-1350 calBP). As such, these specialized fishing activities in the early Epi-Jomon were short-lived. Resource decline of large bastard halibut due to overexploitation is not conceivable because there is no evidence for a decrease in body-size over time. Another possible reason for the decline in the procurement of this species is the increased importance of trade in the Late Epi-Jomon. During this period, artefacts and graves of the Epi-Jomon can be also seen in northeastern Honshu, indicating that Epi-Jomon people often visited northeastern Honshu and some of them lived there to get iron tools through trade. Archaeofaunal remains from Central Hokkaido strongly suggest that salmon was one of the most important resources for trade as well as hide indicated by a number of obsidian end scrapers. In the Late Epi-Jomon, catching and processing sites of salmon have been also excavated (Ishii 1998, Takase 2014). Thus, it is notable that completely different fish use can be seen in a wide area of Hokkaido between the Early and Late Epi-Jomon.

Therefore, it seems likely that salmon replaced bastard halibut because the importance of iron tools was rapidly increasing and salmon was useful in both subsistence and trade. As such, fishing activities during the Epi-Jomon are unique compared to other Jomon cultures.

Social implications of specialized fishing strategies

Fishing and hunting skills provided a means to evaluate the abilities of community members. Successful fishers and hunters could obtain high status and had access to luxury goods introduced by long-distance trade. Representative exotic elements of the Early Epi-Jomon include shell beads and bracelets produced more than 2000 km from Hokkaido in the Southwestern Islands, as well as tube beads produced in the early agrarian society of Western and Central Japan. Imported prestige goods were commonly interred in graves at the Usu-moshiri cemetery site as Figure 11 shows, along with many hunting and fishing implements (arrowheads, harpoon heads, stone points for harpoons, fish-shaped stone objects, fishhooks, etc.) and processing tools (stone adzes, various scrapers and knives, etc.). In contrast, few fishing and hunting tools are present in graves that lack prestige goods at this site.

The mechanism to attain access to luxury goods and long-distance trade through fishing has not been thoroughly revealed. The scarceness of bastard halibut bone in Honshu indicates low demand on this fish, thus the author expects that bastard halibut was not exported from Hokkaido as mentioned above. In addition, fish processing stations have not yet been discovered in the Early Epi-Jomon. Instead, we should pay attention to lithic raw material such as greenschist and obsidian exported from Hokkaido. In northeastern Honshu, considerable proportion of stone axes and adzes were made of greenschist collected in Central Hokkaido (Sato 2016: Sato *et al.* 2016).

Chemical analysis suggests that obsidian brought from Eastern Hokkaido was used in northeastern Honshu (e.g., Takase ed. 2012). Although bastard halibut was not necessarily trade goods for exporting to Honshu, capable fishers gained high status through fishing and could take control of short-distance trade in Hokkaido, and then gain access to exotic elements through long-distance trade. Power for controlling long-distance trade was competitively exploited among the most successful fishers.

Figure 11 also presents examples of graves in the Late and Final Jomon. During this period, prestige goods included ceremonial maces and ornaments such as lacquer products and stone beads, thus suggesting the conferring of ritual power upon associated individuals. The relationship between graves with prestige goods and hunting/fishing tools is not very close at Jomon sites, while hunting/fishing tools can be frequently seen in graves without prestige goods. Processing tools, mostly stone axes/adzes, were commonly associated with prestige goods; however, these were not necessarily special grave goods because they were also associated with graves lacking prestige goods. A t-test of the occurrence of hunting and fishing tools per grave pit derived from data provided in Figure 11 indicates that there is a correlation between the existence of prestige goods and hunting/fishing tools in the Early Epi-Jomon ($p=0.023$), while there is not such a correlation in the Late and Final Jomon ($p=0.774$).

It is reasonable to conclude that people interred with prestige goods likely played important roles in rituals during the Late and Final Jomon because they have buried with ceremonial goods. However, there is no clear evidence showing that they were also capable fishers and/or hunters since hunting and fishing tools were not necessarily special grave goods for them. In contrast, successful fishers and hunters controlled wider aspects of the society during the Early Epi-Jomon in the Southwestern and Eastern Pacific areas of Hokkaido. In addition to numerous exotic goods imported

from Southwestern and Central Japan, the interments of such individuals included ritual objects such as bone spoons with bear and whale decorations, bear sculptures (probably used for head belts), and long, ornamented needles (likely used for binding hair). These grave goods are regarded as the property of buried individuals, with the increasing number of grave goods in the Early Epi-Jomon suggesting the development of individual ownership (Aono 1999). This opinion is supported by human bones wearing shell ornaments imported from the furthestmost areas. Moreover, a wide variety in morphological features of fish-shaped stone objects suggests that they were also produced and owned by each fisher. Possibly, they never gave and distributed this tool to other fishers because they personally took a process of trial and error to make an effective fishing implements for catching large bastard halibuts. Not only ornaments but other kinds of grave goods were owned by buried people. Therefore, individuals with abundant hunting and fishing gears, ornaments, and ritual implements are both successful fishers and/or hunters and considered qualified to control rituals and trades. Contrastingly, the gap of grave goods in the Late Epi-Jomon is much smaller than that of the Early Epi-Jomon; fishing focusing on salmon in this period is not closely related to status building. Although trade increased during this time, it seems like that competitive relationships between fishers declined. This suggests that catching salmon for trade was a communal activity, while hunting bastard halibut was an individual enterprise.

Ethnographic models of Melanesia as well as the Northwest have been often used for interpretations of inequality in Jomon societies (e.g., Takahashi 2005). Compared to models on social complexity in Melanesia, important persons of the Epi-Jomon have similar features to big-men (Sahlins 1963) because they are characterized by the accumulation of wealth through controlling trade and exchange as well as special

abilities regarding subsistence and rituals. On the other hand, important persons of the Jomon seem to correspond to great men (Godelier 1982) because they played significant role as ritual leaders which is one of the categories of occupation for great men, but they were not necessarily capable hunters/fishers and did not tend to accumulated personal property. However, further studies are needed as there is a large difference in the social situation, such as the existence of war, assassination, livestock, and farming between prehistoric Hokkaido and the modern societies in Melanesia. Moreover, the redistribution in the Epi-Jomon has not yet been clarified, although it may have had a critical meaning for the status of big-men in that society.

Nevertheless, the evolving social implications of hunting and fishing activities could provide an effective perspective for understanding the development of the prehistoric society in the Northwestern Pacific. Ethnographic evidences suggest that the social roles of catching large fishes and sea mammals encompass both food acquisition and status-building (Watanabe, H. 1990; Anzai 2002; Takahashi 2008). However, this is not a general truth across all maritime hunter-gatherer societies because major shifts in the social meaning of fishing and hunting activities appear to have occurred between the Jomon and Epi-Jomon periods in Hokkaido. Furthermore, there is no large change in graves and grave goods at cemetery sites of the Early Jomon when technology for hunting sea mammal was established. Thus, it is difficult to determine if there was an increase in the power of hunters and fishers in accordance with the emergence of sea mammal hunting in Hokkaido. Hunting and fishing mastery was not required to enforce rituals in Jomon societies, whereas it represented an essential qualification for controlling both rituals and trade in Early Epi-Jomon communities.

In Hokkaido, some researchers have concluded that the social stratification can be seen in the Late Jomon based on examinations of cemetery sites (Inui 1981; Yabuki

1985; Segawa 1983, 2007; Kimura 2003; Sakaguchi 2011; Uwaya and Kimura 2016). They have noted the earthwork burial circles, communal cemeteries with a circular embankment, emerged in the late Late Jomon. The maximum diameter of an embankment is approximately 80 m, suggesting a large-scale cooperative activity in the community. Although some archaeologists do not regard them as an evidence of the social stratification (Harunari 1983; Hayashi 1983; Fujiwara 2007), researchers have estimated that chiefs were buried in the centre and inside of these cemeteries, and based on the quantitative and qualitative differentiation in grave goods, it seems likely that a stratified society continue to the Early Epi-Jomon. However, the scarceness of excavations and the lack of human bones from these cemeteries has made it difficult to ascertain the social role of the important people buried within them. Thus, this study is significant in terms of clarifying the foundation for and benefits of status-building within Jomon and Epi-Jomon cultures, and serves as a starting point for future studies on the social roles of important people in these societies.

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Declaration of interest

No potential conflict of interest was reported by the authors.

Note on contributor

Katsunori Takase is an associate professor at the Graduate School of Humanities and Human Sciences, Hokkaido University. His research focuses on prehistoric resource use in the North Pacific using methods of the lithic use-wear analysis, archaeobotany, and zooarchaeology. He is heading an international research project on the history of the Kuril Ainu and paleoecology of the western North Pacific.

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