Chapter 12

Seafaring and the Development of Cultural Complexity in Northeast Asia: Evidence from the Japanese Archipelago

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Situated at the eastern edge of Asia, the Japanese islands are surrounded by the sea. Except during the Late Pleistocene, when parts of the Japanese archipelago were intermittently connected to the continents via land-bridges (Keally 2005), interaction with continental Asia always implied the use of watercraft. Historical records depict the difficulties and dangers of seafaring that confronted early travellers between continental Asia and Japan. School children today all learn about the tragedy of an eighth-century AD poet and administrator Abe-no-Nakamaro, who was sent to China as a member of *kentoshi* (the Japanese delegations to the Tang Dynasty), and whose attempt to return to Japan failed when his ship was washed ashore in Annam (present-day Vietnam). Unable to return to his homeland, Abe-no-Nakamaro eventually died in the Tang capital Changan after 54 years' absence from his home (Kodansha 1993, 3–4). Another well-known anecdote is that of an eighth-century Chinese priest Ganjin (Jianzhen), the founder of the Ritsu Sect in Japanese Buddhism. To help propagate Buddhism in Japan, Ganjin attempted to visit Japan five times from AD 743 to 748, but none of them was successful. With his sixth attempt in AD 754, Ganjin finally arrived in Japan, and helped Emperor Shomu establish Buddhism in the capital of Nara (Kodansaha 1993, 440–41). These anecdotes provide us with the impression that, as late as the eighth century, crossing the ocean was a sporadic and unusual event.

Contrary to such an impression, rich archaeological data from this region demonstrate that the ocean was never a cultural barrier even during the prehistoric period. Indirect evidence of ocean-going watercraft in this region goes back to the 'Late' Palaeolithic period (*c.* 30,000–14,000 BC). For the subsequent Jomon (*c.* 14,000–400 BC) and Yayoi (*c.* 800 BC–AD 250) periods, ample evidence for the movement of people, goods and information across the ocean is available. In particular, discoveries of dugout canoes provide direct proof of watercraft technologies during these periods. Depictions of boats on Kofun (*c.* AD 250–800) period pottery and other such representations inform us about the high level of watercraft technology at that time. Despite the importance of seafaring and water transportation technologies in Japanese prehistory and early history, however, information sources in the English language are extremely limited.

The purpose of this paper is to evaluate the roles of watercraft and seafaring in relation to the development of emergent cultural complexity on the Japanese islands. In particular, I am interested in how the size and abundance of boats, as well as new technologies to manufacture boats, were related to other aspects of past peoples' lifeways, including subsistence, settlement, trade and rituals.

Examining the development of watercraft technologies is particularly important for understanding changes through time in subsistence, settlement, and social practices. For example, the development of water transportation in Jomon hunter-gatherer societies should be considered as one of the key elements in understanding long-term changes and regional variability in the Jomon culture (e.g. Habu 2004, 236–7). Deciphering the ritual and symbolic meanings of boats through archaeological depictions has been one of the research foci in Yayoi and Kofun period archaeology (e.g. Harunari 1997a,b).

Watercraft, subsistence-settlement systems and social inequality

The importance of early watercraft in the development of subsistence, settlement and social inequality has been discussed by such scholars as Kenneth Ames (2002) and Jeanne Arnold (1995). In his seminal article, Ames proposes that 'the availability of efficient (or effective) transportation can have a significant positive impact on the net productivity of aquatic envi-

ronments' (Ames 2002, 22). Using ethnographic and archaeological data from North America, his study shows how the use of boats affects key elements of hunter-gatherer subsistence-settlement systems. These include the daily foraging radius, distance and length of multi-day logistical forays, transport decisions for meat and bones, and the frequency of residential moves. In his conclusion, Ames states that the theoretical importance of boats rests

> on the capacity to move and process large amounts of resources even across small distances, thus easing potential problems in intensification of production and simultaneously opening possibilities for intensification which would otherwise not be economical (Ames 2002, 47).

Arnold's (1995; 2001) discussion on boats among the Chumash of California and the Nuuchahnulth (Nootkans) of the Northwest Coast highlights the role of advanced watercraft among maritime hunter-gatherers in 'facilitating practical as well as symbolic exchanges' (Arnold 1995, 733). She suggests that

> as tools representing wealth and high standing within a community, sophisticated forms of watercraft could become part of the strategy of aspiring elites to dominate others

and that

> control over all or selected uses of advanced watercraft … represented one path by which social inequality could emerge, heralding organizational changes involving unequal control over products or labor (Arnold 1995, 733).

A focus of her paper is on the role of the development of the Chumash plank canoe, or *tomol*, in the emergence of elites during the AD 1150–1300 period. Measuring from 5 to 8 m in length, the *tomol* provided significantly more reliable water transportation than the simple tule reed balsa, the estimated length of which is only about 2.5 m (Arnold 1995, 737). Citing also ethnographic examples of the Nuuchahnulth people, among whom dugout canoes played critical roles in subsistence intensification, social interaction and warfare, Arnold argues for the importance of seafaring craft for stimulating increased sociopolitical complexity.

Both of these works argue that watercraft played key roles in the development of cultural complexity in small-scale societies. However, archaeological data of boats themselves from the Northwest Coast and California are extremely limited, and thus their arguments are heavily based on ethnographic information. On the other hand, the rich Japanese archaeological data provide an opportunity to conduct a systematic analysis of changes in prehistoric and early historic watercraft using both direct and indirect lines of evidence.

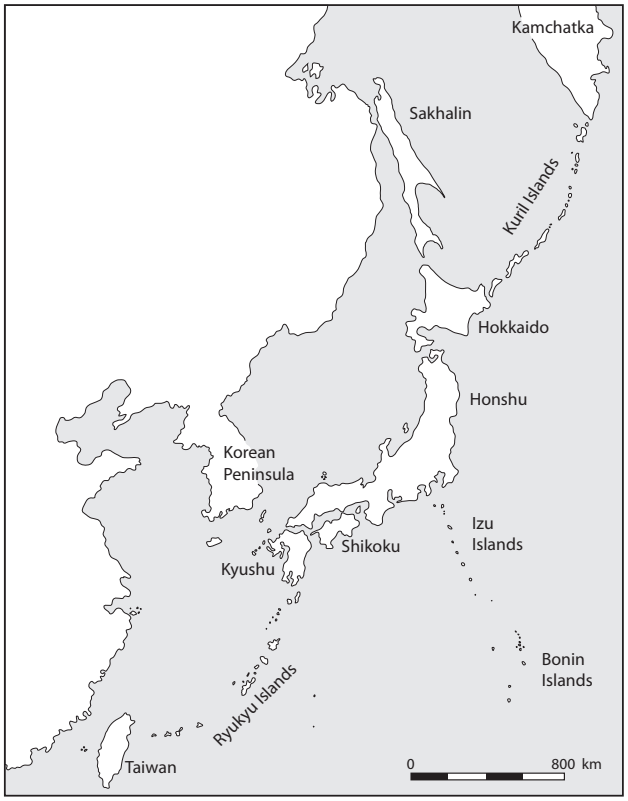

Figure 12.1. *Map of Japan in east Asia.*

As Arnold (1995, 743) states, 'the mere presence of boats' does not cause specific changes in social or cultural complexity. Thus, in evaluating the importance of watercraft in long-term cultural change, this paper examines the boat data along with evidence for changes in subsistence, settlement and society. For each period, I first outline major cultural changes, and then examine evidence of watercraft to find meaningful patterns.

Geographic setting

Before examining archaeological data, a brief overview of geographic characteristics of the Japanese archipelago will be helpful. The archipelago today consists of the four main islands (Hokkaido, Honshu, Shikoku and Kyushu) and smaller islands, including the Izu and Bonin (Ogasawara) Islands (a chain of islands stretching southeast from the Tokyo Bay-Izu Peninsula area of Honshu to the Marianas), and the Ryukyu Islands (a chain of islands that extends from the southern end of Kyushu to Taiwan) (Fig. 12.1).

Historically, major contacts with continental Asia occurred most frequently via a limited number of routes. These include:

1. the northern route to the present-day Khabarovsk Krai (Russia) via Sakhalin Island;

Table 12.1. *Summary of debates over possible land-bridges during the Late Palaeolithic period.*

Possible land-bridges	Status of the debate
Northeast China–Sakhalin–Hokkaido	Connected during most of the Late Pleistocene (100,000–10,000 years ago) (Keally 2005).
Hokkaido–Honshu (over the Tsugaru Strait)	On the basis of palaeofauna, Takahashi *et al.* (2004) indicate the presence of a land-bridge during part of the last glacial maximum. Possibly intermittent 'ice-bridge' during the Late Palaeolithic period.
Kyushu–Ryukyu–Taiwan	Opinions vary. Until the mid-1990s, it was commonly assumed that there was no land-bridge after 1,500,000 years ago (Okinawa-ken & Komonjo-kan 1998, 46), and many archaeologists and physical anthropologists today still support this interpretation. Kawamura (1998) also supports this based on Late Pleistocene fauna. However, Kimura (1996) suggests a land-bridge as late as 20,000 yrs ago. Ujiie (1998), Ujiie & Ujiie (1999) and Ujiie *et al.* (2003) support the latter interpretation based on planktonic $\delta^{18}O$ values and the frequency of the cold-water group of planktonic foraminifera.
Northwestern Kyushu–Southern Korea (over the Tsushima and Korean Straits)	Still under debate. Harunari's (1998) summary states no land-bridge after 125,000 years ago (cf. Matsui *et al.* 1998).

2. the northeastern route to Kamchatka via the Kuril Islands;
3. the northwestern Kyushu route to the Korean Peninsula via Tsushima and Iki Islands; and
4. the southern route to Taiwan and south China via the Ryukyu Islands.

Even during the Edo period (AD seventeenth to mid-nineteenth centuries), when Nagasaki in Kyushu was the only official port for international interaction designated by the Tokugawa Shogunate, trade goods continue to come in and out, both officially and unofficially, through these four routes. Three of these routes, (1), (3) and (4), coincide with the location of possible land-bridges during the late Pleistocene (see below).

Palaeolithic voyagers

Currently, the oldest firm evidence of human occupation on the Japanese archipelago goes back to about 35,000–30,000 years ago, which marks the beginning of the 'Late' Palaeolithic period in Japan. Lithic assemblages from 'Late' Palaeolithic sites are characterized by various types of flake tools, including 'knife-shaped' tools, blades, and micro-blades. Core tools such as pebble tools and partially polished stone axes have also been reported (e.g. Inada 2001).

As early as the Late Palaeolithic period, occupants in this region had a seafaring technology that enabled them to navigate around the Japanese archipelago. Some of the obsidian tools excavated from Palaeolithic sites in central Honshu, dated to as early as 30,000–32,000 years ago, were made of obsidian from Kozu Island (one of the Izu Islands) (Imamura 1996, 34; Oda 1990; 2000). Since the island could have been reached only by boats, it is evident that Palaeolithic residents of the Japanese archipelago had already established sea routes (Keally 2005).

To further discuss the possibility of Palaeolithic water transportation, we need to know the debates over Pleistocene land-bridges. Table 12.1 summarizes the current status of these debates. Among these, the debate over the land-bridge to the Ryukyu Islands has a particularly serious implication in our understanding of Palaeolithic seafaring (Pearson pers. comm.). This is because the majority of Palaeolithic skeletal remains found in Japan so far are from the Ryukyu Islands (Keally 2003; Okinawa-ken & Kobunsho-kan 1998; Watanabe 1980). They include relatively complete skeletal remains of several individuals from Minatogawa (Baba & Narasaki 1991; Suzuki & Hanihara 1982), as well as a femur and tibia of a child from Yamashita-cho Cave (Okinawa-ken & Komonjo-kan 1998; Takamiya *et al.* 1975). Both of these sites are located on the main island of Okinawa. The Minatogawa remains are associated with pieces of charcoal dated to 16, 600 and 18,250 uncal. bp (Suzuki & Hanihara 1982, 3–4), and the Yamashita-cho remains were associated with charcoal dated to 32,100 uncal. bp (Kobayashi *et al.* 1971). If, as traditionally suggested, the main island of Okinawa was not connected to the continent during the Late Pleistocene, it is likely that these individuals or their ancestors used watercraft to arrive in Okinawa. The idea that the ancestors of the Minatogawa Man arrived in Okinawa at around 20,000 years ago using some kinds of watercraft has been adopted by some popular archaeology books (e.g. NHK Special 'Nihonjin' Project 2001).

In summary, evidence from Kozu Island indicates that Palaeolithic people in the region had a watercraft technology sufficient enough to cross the ocean. While evidence from other parts of the Japanese islands is inconclusive, many scholars today assume that the use of watercraft was not uncommon. Because no direct evidence of watercraft is available, our knowledge of Palaeolithic watercraft-production technology is limited. Scholars have suggested either rafts or dug-out canoes must have been used (e.g. Oda 2001, 140). Both techniques would have required wood-working

tools with sharp blades for cutting-down trees and/or hollowing out the logs. In this regard, possible woodworking tools, such as partially polished stone axes/adzes that have been reported from Japanese Palaeolithic sites, should be systematically examined.

The issue of Palaeolithic watercraft is also related to the question of the degree of maritime adaptation during this period. For example, based on osteological observations, Baba (2001) raises the possibility that the ancestors of the Minatogawa Man, and at least partial ancestors of the Jomon people, could have been maritime adapted voyagers, who originally came from the Sundaland, the amalgamation of the present-day Malay Peninsula, Indonesia and smaller islands. Thus, while most Japanese archaeologists assume that Palaeolithic people focused heavily on large land mammal hunting, the different Palaeolithic cultural traditions within the Japanese islands may have affected the later development of regionally distinct subsistence activities, some of which focused on marine resources.

Watercraft and Jomon cultural complexity

The Jomon period of hunter-gatherers lasted for over 10,000 years. It was associated with some of the oldest pottery in the world (see Habu 2004, 28–32). It is also known that the Jomon culture shared a number of characteristics with so-called 'affluent' (e.g. Arnold 2001; Koyama & Thomas 1981) or 'complex' (Price & Brown 1985) hunter-gatherers in other parts of the world. It should be kept in mind, however, that temporal variability of the six Jomon sub-periods (Incipient, Initial, Early, Middle, Late and Final) is quite diverse (Aikens & Higuchi 1981; Habu 2004; 2008; Imamura 1996; Kobayashi 2004).

Looking at the long-term trajectory of the Jomon culture, several epoch-making changes are notable. One of these changes is the active incorporation of marine resources into Jomon subsistence. The appearance of shell-middens during the Initial Jomon period (*c.* 9000–5000 BC) is commonly referred to as evidence for this change. A representative site from this phase is the Natsushima shell-midden (9450±400 uncal. bp) in Kanagawa Prefecture near Tokyo. Because Natsushima is associated with open-sea fish remains such as tuna, it is assumed that Initial Jomon people must have routinely used boats for their open-sea fishing. This represents early evidence of systematic marine resource exploitation in the world (Habu 2004, 248–9; cf. O'Connor this volume).

Another major change occurred during the Early Jomon period (*c.* 5000–3300 BC), when archaeological indicators of 'affluent' or 'complex' hunter-gatherer cultures began to be prominent. These include large settlements, evidence of food storage and ritual elaboration. Scholars assume that these changes were closely related to reorganization in subsistence-settlement systems, with a stronger focus on plant food, including nuts. Subsistence and settlement data show evidence of logistical subsistence strategies: i.e. sending a special-purpose task group to procure a specific type of resource located far away from the residential base. In short, this is the period when classic 'collector' systems (Binford 1980) were established in many parts of the Japanese islands.

The collector end of subsistence-settlement systems flourished during the following Middle Jomon period (*c.* 3300–2300 BC). In eastern Japan, average site size and site density reached their maximum (e.g. Habu 2004; 2008; Imamura 1996; Koyama 1978). Large, horseshoe-shaped shell-middens began to be constructed in the Tokyo Bay Area.

From the Middle to Late Jomon, organizational complexity in subsistence and settlement seems to have decreased, at least in eastern Japan. Average site size and site density became lower during the Late and Final Jomon periods (*c.* 2300–400 BC). Nevertheless, an increase in the types and numbers of ritual artefacts and features, as well as ample evidence for long-distance trade and possible craft specialization, characterizes these two sub-periods (Habu 2004, chap. 7).

How does the evidence of watercraft correspond to these changes? Discoveries of dugout canoes from waterlogged sites provide direct evidence to examine the importance of Jomon water transportation and its changes through time. One of the earliest discoveries of Jomon canoes was from the Early Jomon Kamo site in Chiba Prefecture (Matsumoto *et al.* 1952). Later in the late 1970s, excavation of the Early Jomon Torihama shell-midden (Fukui Prefecture) revealed the presence of an even older example (Fig. 12.2; Torihama Kaizuka Kenkyu Group 1983). Detailed examination of this canoe indicates that stone adzes and/or axes were the primary tools used to make the canoe. Burn marks suggest that burning was used to facilitate the production of the canoe (Morikawa 1994).

Table 12.2 lists representative examples of Jomon canoes with their measurements. Dugout canoes from Jomon sites typically measure 5–7 m in length, 0.3–0.7 m in width, and 0.2–0.4 m in height. Late and Final Jomon canoes are not necessarily larger than the Early and Middle Jomon ones.

The relatively small size of Jomon canoes does not mean that these were typical ocean-going boats at that time. Apart from a few cases, such as the Nakazato site in Tokyo (Nakazato Iseki Chosa-dan 1985), which is on the beach, many of the Jomon sites with canoes

Table 12.2. *Representative examples of Jomon dugouts with measurements (Compiled from Amitani 2007; Matsumoto* et al. *1952; Morikawa 1994; Nakazato Iseki Chosa-dan 1985; Uno* et al. *2002; Yamada 2002).*

Site/Canoe no.	Prefecture	Period	Length, Width & Height (m)*	Material	Note
Kamo	Chiba	Early Jomon	[4.80], [0.60], [0.15]	*Aphananthe aspera*	
Torihama No. 1	Fukui	Early Jomon	[6.08], 0.63, [0.21]	*Criptomeria japonica*	estimated length 6.5 m, estimated height 0.26–0.30 m
Uranyu	Kyoto	Early Jomon	[4.6], 0.85, 0.20	*Criptomeria japonica*	estimated length 8–10 m
Nakazato	Tokyo	Middle Jomon	5.79, 0.72, 0.42	*Aphananthe aspera*	
Yuri No. 1	Fukui	Late Jomon	5.22, 0.56, 0.10	*Criptomeria japonica*	
Yuri No. 3	Fukui	Late Jomon	[5.80], [0.30], ?	*Criptomeria japonica*	
Katsurami	Tottori	Late Jomon	7.24, 0.74, 0.35	*Criptomeria japonica*	possibly ocean-going boat
Aota	Niigata	Final Jomon	[5.4], 0.8, 0.13	*Aesculus turbinata*	
Yuri No. 2	Fukui	Final Jomon	[4.90], [0.48], [0.08]	*Criptomeria japonica*	
Yuri No. 4	Fukui	Final Jomon	[5.87], 0.57, ?	*Criptomeria japonica*	estimated length 6.5 m

* Square brackets indicate remaining dimensions.

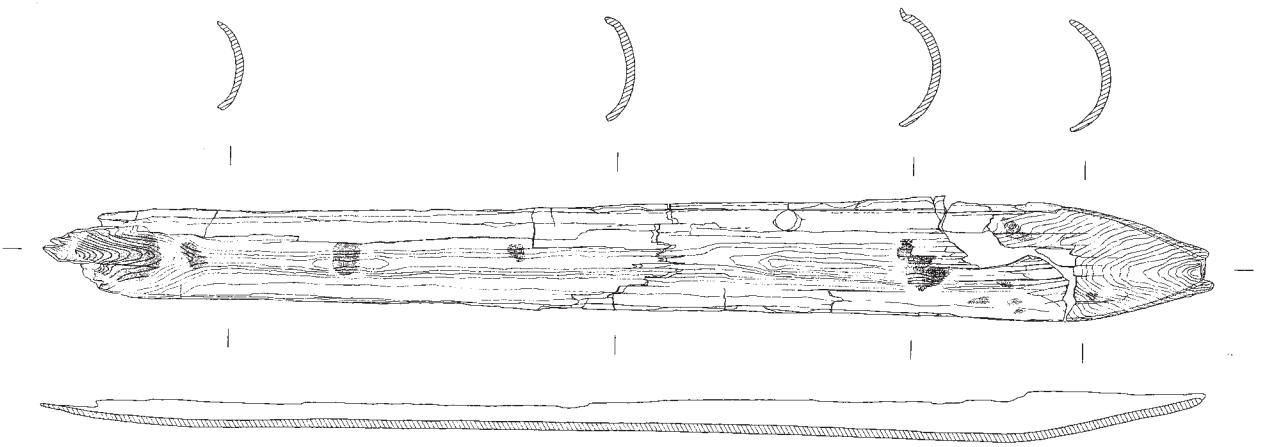

Figure 12.2. *Dugout canoe excavated from the Torihama shell-midden (Canoe No. 1). The shading represents burnt areas. (Diagram by courtesy of Fukui-ken ritsu Wakasa Rekishi Minzoku Shiryo-kan [Wakasa History and Folklore Museum].)*

are lowland sites facing rivers and/or marshlands. Thus, most Jomon canoes that have been reported might be the ones used for rivers and lakes.

One recently recovered canoe is larger than the other examples: the dugout recovered from the Early Jomon Uranyu site in Kyoto Prefecture (Asahi Shinbun-sha 1998). This measures 0.9 m wide, and the estimated length of the canoe is 8–10 m. Unfortunately, the bow and stern were not preserved. Like the Torihama example, this canoe is made of Japanese cedar with a number of burn marks inside.

Indirect lines of evidence also suggest that Jomon ocean-going boats might have been fairly large and stable. Excavations of several Jomon sites in the Izu islands, including the Early and Middle Jomon Kurawa site on Hachijo Island, are associated with boar bones (Yamamura 2006). These boars are considered to have been brought by Jomon people from the Honshu Island. Ample evidence for long-distance movements of exotic goods within the archipelago and over the Sea of Japan, including obsidian, jade, and exotic shells such as Conidae, also suggests active open-sea navigation (Habu 2004, 221–34).

Table 12.3 shows a summary of 74 Jomon canoes reported from 45 sites listed by Uno *et al.* (2002) and others. The total number is a conservative estimate, as there are other canoes that are listed by Uno and colleagues as possibly Jomon. Some scholars suggest that a more realistic estimate would be over 100 to 200 (e.g. Amitani 2007).

Several characteristics are apparent from this table. First, all of these examples are dated to the Early Jomon period or later. This is significant given that the Early Jomon was the time when the collector type of subsistence-settlement systems with large settlements and multi-day logistical forays became common. As Ames (2002) demonstrated, an active use of boats would have helped not only to facilitate bulk trans-

Table 12.3. *Number of dugout canoes excavated from Jomon period sites (compiled from Uno* et al. *2002. Data from the Uranyu (Asahi Shinbun-sha 1998), Aota (Yamada 2002) and Yuri (Fukui-ken Maizo Bunkazai Chosa Center 2007) sites are added).*

Region		Prefecture	Early	Middle	Late	Final	Unknown	Total
Eastern Japan	Kanto	Tochigi				1		1
		Chiba	1		7	15		23
		Saitama			1	1	2	4
		Tokyo		1			1	2
		Kanagawa	1					1
	Tokai	Aichi				1		1
	Hokuriku	Niigata				1		1
		Fukui	2	2	5	1	1	11
Western Japan	Kinki	Shiga			9	13		22
		Kyoto	1		1	1		3
	Chugoku	Tottori			2		2	4
	Kyushu	Saga	1*					1
Total			**6 (8.1%)**	**3 (4.1%)**	**25 (33.8%)**	**34 (45.9%)**	**6 (8.1%)**	**74 (100.0%)**

* According to Uno *et al.* (2002), this canoe could go back to the Initial Jomon period.

portation but also to expand both daily foraging zones and multi-day logistical zones. Although I assume that boats had been continuously used from the Palaeolithic period onward, I propose that the Early Jomon period was the time when canoe production became more common and systematic. The common choice of *Criptomeria japonica* (Japanese cedar) and several other species as the raw material, as well as the frequent use of burning, suggest that the manufacturing procedure of dugout canoes were shared among the Early Jomon people.

Second, the table indicates that about 80 per cent of Jomon canoes found so far are dated to the Late and Final Jomon periods. As described above, these are the periods when we see further developments in long-distance trade and the possibility of craft specialization. The latter includes more centralized pottery production, as well as the emergence of lacquerware/woodworking specialists (see Habu 2004, chap. 6). Canoe remains from several waterlogged Late and Final Jomon sites, such as the Aota site in Niigata Prefecture (Yamada 2002), were found together with unfinished wooden tools and evidence of lacquerware production. Thus, one explanation for the observed patterns is that the development of woodwork specialization, including canoe production, resulted in a significant increase in the supply of dugout canoes, which then helped develop more complex trade and distribution networks. In this regard, it is worth noting that quite a few canoes have been reported from Late and Final Jomon sites in Chiba Prefecture, where a high site density and an abundance of large shell-middens are noted, at least during the Late Jomon period (see Habu 2004, 238–9).

Was this increase in the number of canoes associated with emergent social inequality? Child burial data presented by Nakamura (1999) indicate the possibility of hereditary social stratification during the Late and Final Jomon (Habu 2004, 176–9), but the evidence is inconclusive. Even if the Late and Final Jomon society was stratified, it was not comparable with contemporary state level societies in China: the Erlitou Culture (early second millennium BC), Shang (mid–late second millennium BC), and Western Zhou (1027–771 BC). The marked contrast between the Japanese islands and the continent is clear even when the Late and Final Jomon is compared with the preceding Middle to Late Chinese Neolithic cultures (*c.* 5000–2000 BC), for which differences in burial goods clearly demonstrate marked social stratification (Chang 1986, Underhill & Habu 2006). Given these lines of evidence, it is unlikely that control over watercraft and long-distance trade during the Late and Final Jomon was at the level of that in China, nor of the late prehistoric Chumash case described by Arnold (1995; 2001). This may reflect the fact that, in production technology, canoes of the Late and Final Jomon periods were no different from those of the Early and Middle Jomon.

The Yayoi and Kofun periods: semi-composite boats, sailing and rituals

At the end of the Jomon period, wet-rice agriculture was introduced from the continent to the Japanese islands via the Korean Peninsula. This marked the beginning of the Yayoi period. Traditionally, it was assumed that the transition occurred at around 500 BC in Kyushu and 300 BC in eastern Japan. More recently, radiocarbon accelerator mass spectrometry (AMS) dates for Initial Yayoi sites in Kyushu indicate that the transition occurred as early as 900 or 1000 BC (Nishimoto 2006). Not all researchers have accepted

Table 12.4. *Number of boats excavated from Yayoi and Kofun period sites (compiled from Uno* et al. *2002. Data from the Okite (Shimane-ken Kyoikucho Maizo Bunkazai Center 2008), Akanoihama (Shiga-ken Maizo Bunkazai Center 2004), and Shitomiya-kita (Osaka-fu Kyoiku Iinkai 2006) sites are added).*

Region		Prefecture	Yayoi	Kofun	Yayoi or Kofun	Total
Eastern Japan	Kanto	Ibaraki		5		5
		Chiba	2	1		3
		Saitama		1		1
	Tokai	Shizukoa	5		3	8
	Hokuriku	Niigata	2			2
		Ishikawa		1		1
Western Japan	Kinki	Shiga	2	1		3
		Kyoto	1		1	2
		Osaka	2	15	1	18
		Hyogo		2		2
	Shikoku	Kochi		1		1
		Ehime	1			1
	Chugoku	Tottori		1		1
		Shimane	1	1		2
	Kyushu	Fukuoka	1			1
		Kumamoto	1			1
		Miyazaki		1		1
Total			**18 (34.0%)**	**30 (56.6%)**	**5 (9.4%)**	**53 (100.0%)**

this new chronological framework, however. Along with wet-rice cultivation and irrigation systems, new technologies, including metal tools, came to the Japanese archipelago. The Yayoi period was followed by the Kofun period (*c.* AD 250–710), the period of early state formation when large mound tombs were constructed. It was succeeded by the historic Nara period (AD 710–792), from which early written accounts of travellers between China and Japan are available.

There is no doubt that these changes required a series of interactions between the Japanese islands and continental Asia. Both archaeological and early historic data indicate that the traffic between the southern Korean Peninsula and northwestern Kyushu via Tsushima and Iki Islands was at the centre of this interaction. The big question here is whether the interaction involved a large number of migrants. Most scholars agree that migration occurred to a certain extent, but opinions vary regarding its scale and timing. Using population-simulation models on the basis of population growth rates and morphological changes in skeletal remains, Hanihara (1987) suggests that between 1.3 and 3 million immigrants must have come to the Japanese islands from the beginning of the Yayoi period up to the seventh century AD. While this is only a simulation based on many assumptions, his study raised further questions regarding the timings, motivations, and means of migration and information flow between the Japanese islands and the continent.

A full-scale analysis of Japan–Continent interaction during these periods is beyond the scope of this chapter. Here, I will briefly discuss three issues that are particularly relevant in the context of this volume: (1) the antiquity and development of semi-composite boats (dugouts with vertically attached planking on each side for protection against waves: Kodansha 1993, 1393), (2) the use of sail, and (3) symbolic meanings of boats.

Table 12.4 shows a summary of 53 boat remains found from 40 Yayoi and Kofun period sites. Some of these remains are dugout canoes, the average size of which is not larger than Jomon dugouts. For example, a Yayoi dugout that was recently excavated at the Okite site in Shimane Prefecture measures 5.3 m long, 0.5 m wide and 0.12 m high (Shimane-ken Kyoikucho Maizo Bunkazai Chosa Center 2008). Others are remains of semi-composite boats, although many of them are only fragments.

A boat fragment excavated from the Akanoihama site (Shiga Prefecture) is currently considered to be the oldest remains of a semi-composite boat. Excavation of this Early to Middle Yayoi site revealed a bow fragment with evidence of planking (Shiga-ken Maizo Bunkazai Center 2004). In addition, two sites from the Late Yayoi period (or possibly transitional to the Kofun period) have yielded fragments of semi-composite boats: the Kyuhoji-Minami site in Osaka Prefecture and the Sena site in Shizuoka Prefecture (Uno *et al.* 2002). For the Kofun period, discoveries of semi-composite boat remains are more common.

Figure 12.3. *Boat-shaped haniwa from the Nagahara Takamawari No. 2 Kofun. (Photograph by courtesy of Osaka-shi Bunkazai Kyokai [Osaka City Cultural Properties Association].)*

These include bottom fragments of a semi-composite boat excavated from the Shitomiya-kita site in Osaka Prefecture, which were reused for frames of several wells (Osaka-fu Kyoiku Iinkai 2006).

For the Yayoi period, an important source of information is the images of boats depicted on pottery and bronzes. One of these examples is the incised drawing of a boat on Middle Yayoi pottery excavated from the Karako-kagi site in Nara Prefecture (Harunari 1997a). The drawing depicts a boat with three individuals and five oars. Another example, the drawing on Yayoi pottery from the Arao-Minami site in Gifu Prefecture (*c.* AD second century), is particularly informative. At the centre of the drawing is a long boat that is placed upside down, with 81 oars and possible banners (Sahara 1997). This would make the actual length of the boat greater than 30 m (Uno *et al.* 2002). At each end of this large boat is a depiction of a small boat with a sail. Other boat drawings on Yayoi pottery include those from the Shimizukaze site in Nara Prefecture, and the Jo site in Okayama Prefecture (Harunari 1997a, 87–8). A boat image is also found on a Yayoi bronze bell excavated from the Imukai site in Fukui Prefecture (*c.* second century BC) (Sahara & Harunari 1997, 18–19).

For the Kofun period, incised drawings on *haniwa* (clay funerary objects), as well as boat-shaped *haniwa*, provide insights into the way boats were structured. A cylinder-shaped *haniwa* excavated from the Higashi-Tonozuka Kofun (AD fourth century) in Nara Prefecture has incised drawings of three semi-composite boats. Each drawing depicts oars, a lookout, and a banner or possibly a sail (Harunari 1997b, 98–9). Further insights into boat structure can be obtained from boat-shaped *haniwa*. Uno *et al.* (2002) report a total of 21 boat *haniwa,* most of which represent semi-composite boats. They suggest that the majority of these boat representations can be classified into two types: Type A: a boat with two separate features — upper and lower — at the stern and the bow; and Type B: a gondola-shaped boat. Examples of Type A boat-shaped *haniwa* include the one from the Nagahara Takamawari No. 2 Kofun (fourth or fifth century AD; Fig. 12.3) in Osaka Prefecture (Bunkacho 2008; Takahashi 1996, 26–7). This represents a boat made up of a short-sided dugout canoe to which a large upper structure almost as long as the dugout had been attached. Examples of Type B boat *haniwa* include those from the Nagahara Takamawari No. 1 Kofun (fifth century AD; Fig. 12.4) and the Saitobaru No. 169/170 Kofun (fifth century AD) in Miyazaki Prefecture (Nakamura 2005; Uno *et al.* 2002). The presence of two types of boat *haniwa* suggests the possibility

Figure 12.4. *Boat-shaped haniwa from the Nagahara Takamawari No.1 Kofun. (Photograph by courtesy of Osaka-shi Bunkazai Kyokai [Osaka City Cultural Properties Association].)*

that the origins of semi-composite boats could be traced back to more than one tradition. In addition, over 100 boat images have been reported as part of murals in burial chambers (Harunari 1997b; Uno *et al.* 2002). The majority of them are from Kyushu, and over 90 per cent of them represent gondola-shaped boats (Uno *et al.* 2002).

The importance of sailing during these periods is still controversial. The common depiction of oars on many of the boat drawings suggests that rowing was the main source of propulsion. The drawing from Arato-minami (Sahara 1997) seems to indicate the use of sail boats as early as the AD second century. However, Uno *et al.* (2002, 39–40) suggest that sailing was not necessarily a better technology than rowing in terms of both speed and mobility, and that the former was used only supplementarily throughout the Yayoi and Kofun periods.

Finally, both Harunari (1997a,b) and Uno *et al.* (2002) point out that drawings and representations of boats tell us not only about the structure of boats, but also the ritual significance of boats during the Yayoi and Kofun periods. Images of boats on pottery and *haniwa* tend to be accompanied with bird figures. Harunari (1997a, 77–80) suggests that the bird figures on pottery from Karako-kagi represent cranes or herons, which had symbolic roles in rice agriculture rituals. Boat images on murals sometimes are associated with the drawings of the sun, the stars, dragons, horses and coffins. These drawings have been interpreted as the representation of the journey of the deceased to the other world (Harunari 1997b, 97–9). Uno *et al.* (2002) argue that, in both ancient China and Japan, dragons and phoenixes were believed to carry the souls of the deceased to the other world.

These lines of evidence suggest that semi-composite boats were used as early as during the Early or Middle Yayoi period, and that they were common ocean-going boats by the Kofun period. The adoption and spread of metal tools from the onset of the Yayoi period must have played a pivotal role in the change in boat structure and production technology. Uno *et al.* (2002, 38) suggest that, by the Middle Yayoi period, a major technological innovation occurred in boat manufacture, which forced the Japanese islands to be actively integrated into the east Asian economic and political spheres. While the previous change in watercraft from the Early/Middle Jomon to

the Late/Final Jomon was that of quantity, this new change represented a significant departure from the previous stage in terms of production technology. Since the core of this new technology must have come from the continent, initial access to the knowledge of the technology was likely to have been limited to a small number of people or groups. Those who had access to this knowledge had a significant advantage over the others in obtaining goods, information and political allies from overseas. The goods consisted of both practical and prestige items, such as bronze tools and iron, while the information included new technological skills, religions, and political situations. Thus, the timing of rapid economic, social and political developments during the Yayoi period and the emergence of the Yamato State during the Kofun period cannot be explained without understanding the importance of control over water transportation technologies.

Concluding remarks

Evidence from the Japanese archipelago indicates that there were at least four epoch-making changes in the development of water transportation:

1. the initial use of watercraft during the Palaeolithic period;
2. common use of dugout canoes during the Early Jomon period;
3. an increase in the number of canoes during the Late and Final Jomon periods; and
4. the development of semi-composite boats during the Yayoi and Kofun periods.

Each of these changes was inextricably related to major changes in subsistence, settlement and society of the prehistoric and protohistoric Japanese islands. It is worth noting that, despite evidence of contacts with the continent, changes during the Jomon period did not result in the direct incorporation of the Japanese islands into the world systems that centred on China. Increasing interaction with the continent through the Jomon period, notably but not necessarily exclusively via the Korean Peninsula, is evident, but residents of the Japanese islands were able to maintain and further develop their lifeways with a focus on hunting-gathering-fishing. It is no coincidence that the active integration of the Japanese islands into the East Asian economic and political spheres occurred together with the evidence of semi-composite boats during the Yayoi and Kofun periods.

To further investigate the mechanisms of these changes, it is critical to compare the Japanese watercraft data with those from other parts of east Asia. Because of the rapid economic growth and resulting rescue excavation booms from the 1970s to 1990s, the number of excavated prehistoric and protohistoric boats in Japan is much larger than that in China and Korea. With the recent development of archaeology in those countries, it is expected that more boat remains will be reported from continental Asia.[1] At the same time, parallels as well as differences in technological developments with other parts of the world should be more systematically examined.

Boat technology is a cultural element that has been largely under-represented in the archaeological study of prehistoric east Asia. While the data and analysis presented here are still preliminary, I hope that this chapter will help archaeologists recognize the importance of this line of evidence.

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Note

1. In China, the oldest canoe in an archaeological context is that from the Neolithic Kuahuqiao site in Zejiang Province, South China, dated to about 6000 BC. (Zhejiang Provincial Institute of Cultural Relics and Archaeology & Xiaoshan Museum 2004). An oar or a paddle from the Hemudu site (Zejiang Province, *c.* 5000 BC) is more widely cited (Museum of the Hemudu Site 2002). Uno *et al.* (2002) say that the oldest semi-composite boat excavated from China is dated to the Spring–Autumn period. According to UPI (2005), the oldest dugout canoe in Korea was recently excavated from South Kyongsang Province, and is dated to approximately 8000 years ago.

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