

ANCIENT SHIPS OF JAPAN

A Thesis

by

HIROAKI MIYASHITA

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF ARTS

August 2006

Major Subject: Anthropology

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Approved by

Chair of Committee, Filipe Vieira de Castro

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ABSTRACT

Ancient Ships of Japan. (August 2006)

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Ancient ships of Japan, which are little known outside of Japan, are presented based on the studies of past researchers, as well as a comprehensive analysis of archaeological remains. The process of development from logboats to extended logboats or semibuilt-up ships, and finally to built-up ships is traced. This study covers evidence from the Early Jomon period (4000 – 3000 B.C.E.) through the Kofun period (300 – 700 C.E.). A large number of logboat remains date to the Jomon period, and it is these logboats which become the foundation of later Japanese ships. The number of ship remains from the Yayoi period diminishes. Therefore, iconographic evidence, mainly clay ship figures and drawings, are used in order to reconstruct the ships from that time. This thesis is an account of what is presently known about the ancient watercraft of Japan, based on the existing ethnographic literature, the archaeological record, and iconographic sources.

ACKNOWLEDGMENTS

I would like to thank my committee chair, Dr. Castro, and my committee members, Dr. Alvard and Dr. Furuta, for their guidance and support throughout the course of this research. Thanks also to my friends and colleagues and the department faculty and staff for making my time at Texas A&M University a great experience. Especially I would like to thank my friends, Heather Brown and Mark E. Polzer, who proofread my thesis, and Randall Sasaki, who suggested several ideas. Finally, thanks to my mother and father for their encouragement.

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INTRODUCTION

The principal objective of this thesis is to clarify the evolution of the main structural and technical aspects of ancient ships of Japan. A comprehensive analysis of shipbuilding technology will be conducted based on the examination of archaeological remains such as logboats, clay ship figures, and ship depictions. Additionally the development of ancient ships in Japan will be compared with instances from other countries of East Asia, because contact with the continent has had a significant effect on Japan.

Japan is an island country from where it is impossible to cross over to the continent without ships (fig. 1). This has been taken for granted and therefore, until the mid-twentieth century, little attention has been focused on ships and their history. However, the concern with nautical history has been growing recently. A considerable number of studies have been conducted on this subject, and have brought about substantial results.

Logboats have been broadly used since the prehistoric times and are generally the same from Europe to China. The earliest example of a logboat was found near Pesse in the Netherlands, and dated to about 6300 B.C.E.¹ Although it is clear that more complex ships developed from logboats, the process of development from the primitive stage to a more sophisticated form is different in different areas. Ships in Northern Europe or in the Mediterranean developed first into shell-first or plank-built

This thesis follows the style of *American Journal of Archaeology*.

¹ Ellmers 1996, 15.

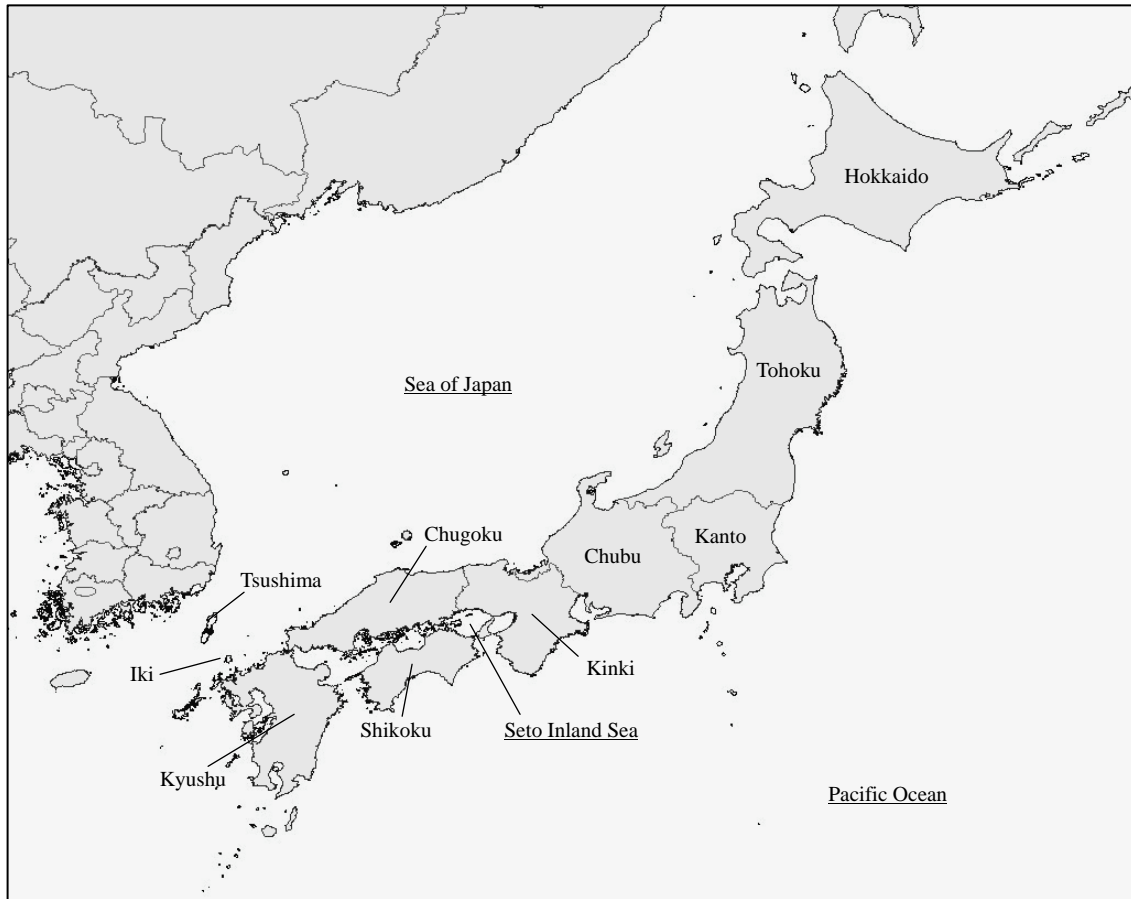


Fig. 1. Map of Japan.

ships, then to skeleton-first or frame-first ships. Meanwhile, ships in China seem to have developed from logboats to extended logboats, and after that to junks, which were characterized by their structural bulkheads.²

Ships in Japan developed differently from those in other countries. Abundant archaeological evidence has been found from ancient times, unlike the medieval period (1167 – 1568 C.E.) and later, for which there is no evidence as yet. Studies of ancient

² Kokubu 1982, 199-210. Wooden or bamboo rafts also seem to be one of the primitive watercraft in China.

ships in Japan have been earnestly undertaken by Japanese archaeologists, historians, and folklorists since the second quarter of the twentieth century. The development process of Japanese ships has been roughly explained.

It is generally said that ships in Japan evolved in the following order: logboat,

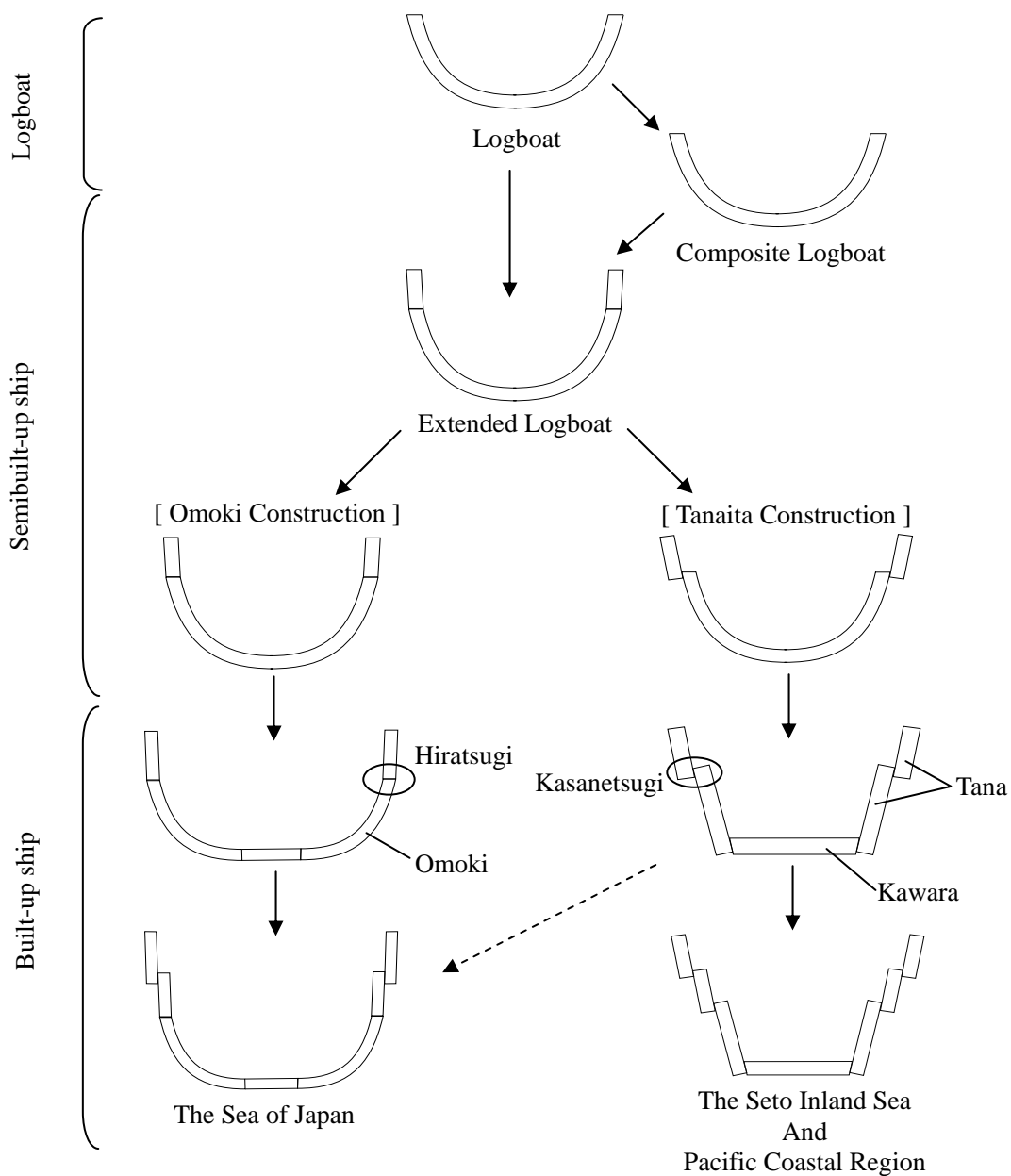


Fig. 2. Development process of Japanese ships.

extended logboat or semibuilt-up ship, and built-up ship (fig. 2). Logboats were the foundation of ship culture in Japan. Although logboats are often considered a primitive watercraft, they are sturdy and have been used for thousands of years. Logboats were the main watercraft during the entire Jomon period (11000 – 300 B.C.E.), and after that, with slightly changing forms, logboats have continued to be used as small ships until surprisingly recently.

In the Yayoi period (300 B.C.E. – 300 C.E.), wet-rice cultivation and metal-working technology were brought to Japan from the continent and rapidly spread throughout the country. With this technological revolution, especially the improvement of wooden technology by iron tools, logboats also greatly evolved. Composite logboats began being built as a solution to the necessity to expand in size, and extended logboats, or semibuilt-up ships, which had washstrakes on their sides, appeared as well, allowing an increase in capacity and seaworthiness. There is almost no doubt that these ships were used both along coastal routes and to cross over to the continent via the Iki and Tsushima islands (fig. 1). These composite and extended logboats represent the next stage of development and seem to have been the mainstream of shipbuilding technology until the thirteenth or fourteenth century C.E.

It seems that the transition from composite and extended logboats to built-up ships came about sometime in the medieval period. Built-up ships did not use a logboat as a bottom plank, but were composed solely of planks. These ships were built following the *tanaita* construction method, which used a bottom central plank, *kawara*, which overlapped the adjacent planks as in lapstrake construction, and formed two or

three overlapping sections of planking, *tana*. A number of beams were added in order to reinforce the hull structure. Ships based on building methods continued in use until the nineteenth century, even after the adoption of western type ships. Although there are many documents and illustrations of ships from the early modern period (1568 – 1867 C.E.), which has led to the study and clarification of some hull structure, the details of medieval Japanese ship representations are ambiguous and little archaeological evidence has been found so far.³ Although some achievements in scholarship were certainly made by using illustrations of ships in scrolls, they are still largely a matter of speculation.

The development process from semibuilt-up ships to built-up ships was different in the Seto Inland Sea and the Pacific coastal region than along the Sea of Japan (fig. 1). The former is based on *tanaita* construction, whereas the latter is based on *omoki* construction, which used L-shaped timbers hollowed out of logs as curved transitional pieces between the bottom and the sides of the hull. Although this difference seems to be related to the fastening techniques and materials, there is little direct evidence, even from documents and illustrations, to reconstruct the development process in the Sea of Japan.

Definitions

A logboat is a hollowed out log and has no adjunctive structure. Following

³ The scarcity of archaeological evidence is the same for both the medieval and early modern periods.

McGrail's preference, the term logboat is used here rather than dugout canoe.⁴ In order to distinguish logboats from composite or extended logboats, the term logboat alone shall designate single logboats which have no additional structures. A composite logboat consists of two or more hollowed logs and has no washstrake. Multiple logs are connected fore and aft, not transversely. It may also be called a multiple logboat. A semibuilt-up ship uses a single logboat or composite logboat as a bottom board and extends it upwards by adding washstrakes on the sides. Therefore, it is also called an extended logboat. A built-up ship does not use a logboat as a bottom board but is composed only of planking.

Sources

Many areas can be considered when researching ancient ships: archaeological remains, iconography, documentary and ethnographic evidence. Documentary evidence in terms of ships is available after the seventh century C.E. In the ancient texts, there are a number of descriptions about ships and maritime wars. Although they provide significant information with respect to the ancient maritime states, their descriptions do not mention ship building techniques in detail. The ethnographic evidence of traditional boats and ships still in use can also provide useful information for the interpretation of excavated remains; both their structure and their use. However, there is a large amount of information and it seems to be out for alignment of the

⁴ McGrail 1978, 2. The author pointed out that the term "canoe" has connotations of birch bark canoes and the "dugout" cannot stand alone. Therefore, "logboat" most aptly describes a vessel made from a single tree or log.

purpose of this study.

Most utilized in this study are archaeological remains and iconographic evidence. Representations of boats and ships provide information for the times that is absent from the archaeological record. However, they cannot be accepted without rigorous analysis and interpretation.

Archaeological and iconographic evidence for boats and ships in Japan is broadly divided into three types: ship remains, models, and illustrations.⁵ Ship remains include the vessel itself and propulsion tools such as paddles and oars. Models are wooden and clay representations or ship-shaped objects of soil and stone. Illustrations include wall paintings and engravings in burial mounds and caves, and surface paintings on earthenware, clay figures, bronze bell-shaped vessels, and bone tools.

⁵ Yasui 1968a; see also Kubo 1987b. Yasui was the first to classify the archaeological sources, and his typology was subsequently advanced by Kubo.

RESEARCH HISTORY

Studies of ancient ships have been undertaken within several fields – archaeology, history, and folklore – since prewar periods. A considerable amount of research has been conducted on this subject, and has brought about substantial results.

Although the study of ancient ships of Japan earnestly started in the twentieth century, an important work on ships was published in the eighteenth century. This first treatise on the history and technology of ships in Japan, *Wakan Senyo Shu*, was written in 1761 and published five years later by Kanemitsu Kanazawa, who came from a family in Osaka with a long shipwrighting tradition.⁶ In the introduction of this treatise, the author explains that he used the documents which his ancestors had collected for two hundred years.

The treatise consists of 12 volumes and about 560 pages. Approximately 150 references to ships from ancient sources are cited. This work comprehensively treats all watercraft from logboats to contemporary ships, with a section about carpentry and shipwright tools. *Wakan Senyo Shu* is indispensable for the study of Japanese ships and technologies of its time.

Modern researchers have long used this work as a virtual encyclopedia of Japanese ships, but while it stands as a valuable resource for the study of ships in the early modern period, it has been shown that it is not always credible where ships before the early modern period are concerned. It seems that the author may have

⁶ Kanazawa 1766. *Wakan Senyo Shu* was reprinted in 1827, but neither issue is obtainable today.

introduced some inaccuracies into his interpretations of hull structures and illustrations of older ships.⁷ Illustrations of old ships are mostly drawn in the style of the Edo period (1603 – 1867 C.E.), since Kanazawa thought the technology of his contemporary ships came directly from the ancient traditions. The illustrations of ancient and medieval ships are basically unreliable and therefore require a healthy skepticism when studying these old ships. Furthermore even Kanazawa's understanding of the various local ships from the Edo period may be inaccurate due to his dependence on oral information from sailors.

In 1838, a logboat of camphor laurel (*Cinnamomum camphora* Sieb.) was found in Morokuwa village, Aichi.⁸ This was the first logboat found in Japan. It seemed fairly rare at that time and was recorded with illustrations in *Owari Meisho Zukai*, which consists of 13 volumes dealing with notable spots, historic scenes, temples, folkways, and commodities.⁹ The news of its discovery was also reported by the broadsheets, *kawaraban*, the newspapers of that time. Sometime thereafter, the logboat was misplaced and believed lost, until it was rediscovered recently in several pieces.¹⁰ It was recorded as approximately 18 – 24 m in length and 1.5 – 2.1 m in width. This logboat seems to have originally consisted of four parts which were joined together fore and aft with a complex fastening system, which will be explained in

⁷ Ishii 1957, 5.

⁸ Ishida 1994; see also Matsumoto 1978, 26; Shimizu 1975, 17.

⁹ Ishida 1994, 99.

¹⁰ Ishida 1994, 112-3. The remains were found at the boundary between the estates of a temple and a private citizen. It was too large to move, and therefore, was cut in to several pieces. After being put on display for the public, they were returned to the possession of estates owners.

detail in the section on *composite and extended logboats*.¹¹ According to the results of radiocarbon testing done in the early 1990s, the boat was most likely constructed between the seventh and ninth centuries C.E. using both old and new timber. Although it is difficult to reconstruct the boat's original shape from its remaining timbers, the information they provide is still relevant to the study of the techniques of composite logboat construction.

After the Meiji period (1868 – 1912 C.E.), discoveries of logboat remains began to appear over all the country and triggered the study of ancient ships in Japan. The first pioneer to study ancient ships in a worldwide context was Nishimura.¹² He proposed six stages in the development of watercraft: float, raft, logboat, skin boat, sewn boat, and built-up ship. Although floats, rafts, and skin boats commonly are conjectured as the initial means of water transportation, archaeological remains of these types of watercraft have not been found so far. As a result, research has been focused on logboats.

Using categories created by J. Déchelette for logboats from Europe, Nishimura established three types of Japanese logboats (fig. 3):¹³

- A. Möringen or German type (*waritake-gata*)
- B. Robenhausen or Sussex type (*katsuobushi-gata*)

¹¹ Ishii 1983, 10-1.

¹² Nishimura 1938.

¹³ Déchelette 1908, 540-3.

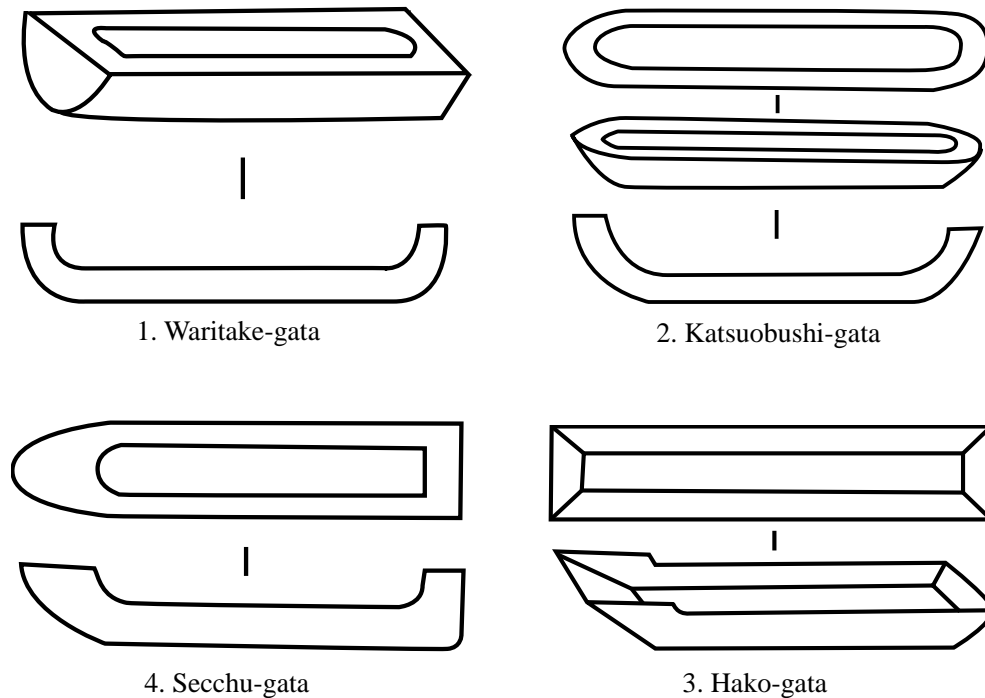


Fig. 3. Logboat types by the plan view.

C. St. Albans en Charollais type (*hako-gata*).¹⁴

Waritake-gata logboat is a simple hollowed out log, with the edges left as cut. The bottom of the boat is left unshaped as a raw log. *Katsuobushi-gata* has a rounded bow and stern, and a pronounced sheer with a long, elliptical shape in the plan view. *Hako-gata* has an elongated box shape in the plan view with square ends and non-acicular edges. Nishimura attempted to associate differences in the logboats to regions in Japan, analyzing the remains of logboats based on this classification.

¹⁴ Möringen and Robenhausen are in Switzerland, Sussex in Britain, and St. Albans en Charollais in France.

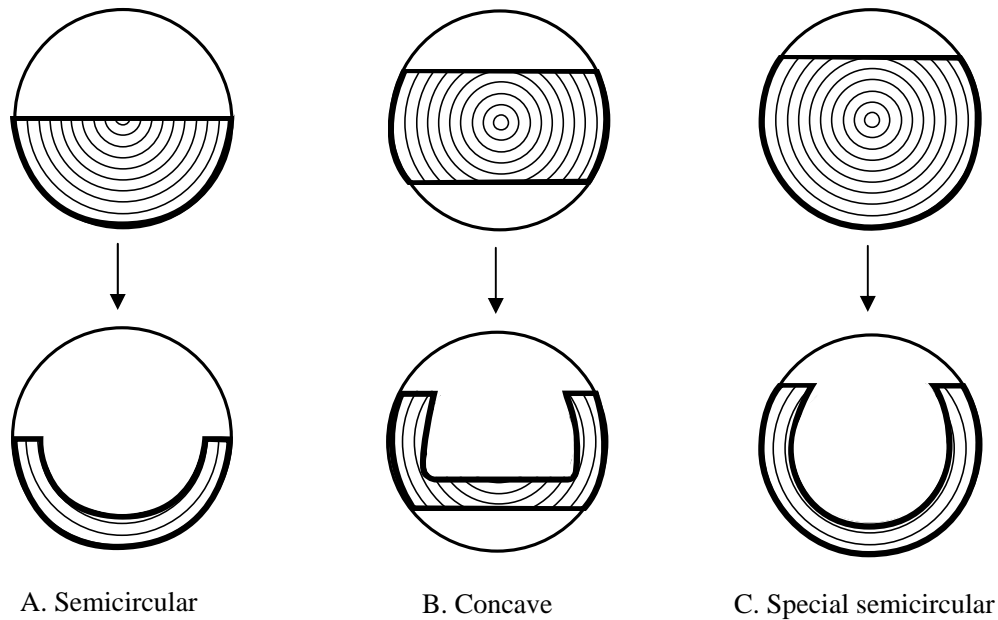


Fig. 4. Logboat types by cross section.

Matsumoto and Shimizu took over Nishimura's research, dedicating themselves to cataloguing the remains of logboats and studying the archaeological remains of ancient ships from the Early Jomon period (4000 – 3000 B.C.E.) to the Kofun period (300 – 700 C.E.).¹⁵ Shimizu, in particular, clarified four types of logboats, adding one type to Nishimura's classification of logboats; this hybrid type, *secchu-gata*, has a rounded bow and square stern.¹⁶ Furthermore, he classified logboats by cross section and pointed out three types: semicircular, concave, and special semicircular (fig. 4). The difference between them is how a log is cut vertically. The semicircular type is one in which a log is cut down the center and hollowed out from the cut surface. In the

¹⁵ Matsumoto 1952, 1958, 1978; see also Shimizu 1968, 1971, 1975, 1977, 1982.

¹⁶ Shimizu 1975, 53-62.

concave type, the top and bottom of a log are cut. One edge is hollowed out and the other is used as the flat bottom of the boat. The special semicircular type looks similar to the semicircular type, but it is either cut only shallowly before hollowing, or it is hollowed directly from a full log. Shimizu explained the relationship between the boats' plan views and cross sections, and sorted logboats based on actual examples:

1. *Waritake-gata*¹⁷
- 2.A. *Katsuobushi-gata* semicircular type
- 2.C. *Katsuobushi-gata* special semicircular type
- 3.A. *Hako-gata* semicircular type
- 3.B. *Hako-gata* concave type
- 3.C. *Hako-gata* special semicircular type
- 4.B. *Secchu-gata* concave type.

Shimizu went on to suggest that timber selection, logboat types, date, and provenience all are inter-related. In particular, he emphasized the correlation between timber selection and woodworking technology.

Ishii pursued the study of ancient ships from a perspective of shipbuilding history.¹⁸ He outlined a framework of ancient and medieval shipbuilding techniques based on the remains of logboats, clay ship figures, and illustrations. He pointed out the existence of semibuilt-up ship which bridged the period between logboats and built-up ships.¹⁹ His research on the development process from logboats to built-up

¹⁷ In the logboats found so far, no clear example of *waritake-gata* has been confirmed.

¹⁸ Ishii 1957, 1976, 1983, 1987, 1995, 2002.

¹⁹ The existence of built-up ships, which were called *wasen* in the Edo period, were commonly known.

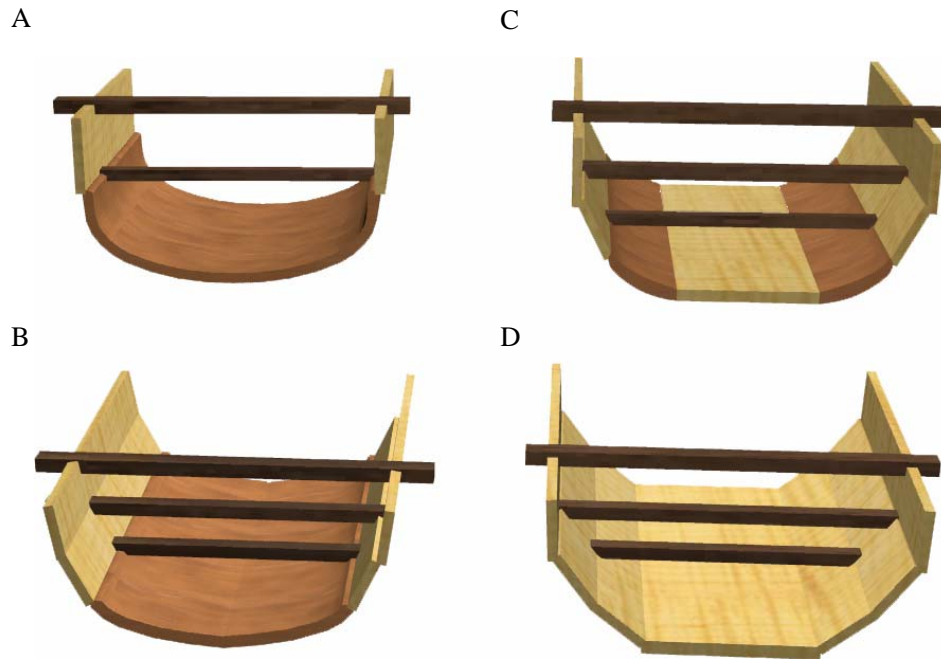


Fig. 5. Ishii's development process of ships in the Seto Inland Sea.

ships was groundbreaking and influenced later research significantly. Furthermore Ishii first noted that ships developed differently in the Seto Inland Sea and the Sea of Japan during the period of transition. He divided ship development in the Seto Inland Sea into four stages (fig. 5):

- A. ships added washstrakes on a bottom board hollowed out like a logboat;
- B. ships added diagonal washstrakes on a hollowed out bottom board to increase capacity;
- C. ships added washstrakes and put a bottom plank between split bottom boards;
- D. ships wholly made of straight planks.

Although he pointed out differences between ship development in the Seto Inland Sea

and that along the Sea of Japan, he did not clearly define the process of the latter.

Meanwhile, Sakurada approached this subject from the point of view of folklore.²⁰ He studied the development process of ships based on painstaking investigations of the technology of existing fishing boats. There were two reasons for his choice of fishing boats as the key element of his study. For one thing, it was difficult to pursue the development of shipbuilding technology as material culture based solely on documentary resources.²¹ For another, he recognized several types of fishing boats representing various technological stages. He estimated that it was possible to reconstruct the ship development process based on a classification of fishing boats and to extract from this the original features of early Japanese ships. He showed the differences in the structures of Japanese and European ships and underlined the importance therein of using L-shaped timbers called *omoki*. Whereas in European types the keel and frames formed the essential support structure of ships, *omoki* were used predominantly in Japanese types. Based on this, Sakurada classified the developmental process of ships by the cross section. He outlined six stages (fig. 6):

- A. a simple logboat hollowed out from a log;
- B. a ship transversely joined by two *omoki*;
- C. a ship with a bottom plank between two *omoki*;
- D. a ship of the previous type extended with washstrakes;
- E. a ship composed of only bottom and side planks with no *omoki*;

²⁰ Sakurada 1955, 1958.

²¹ Sakurada 1958, 252-7.

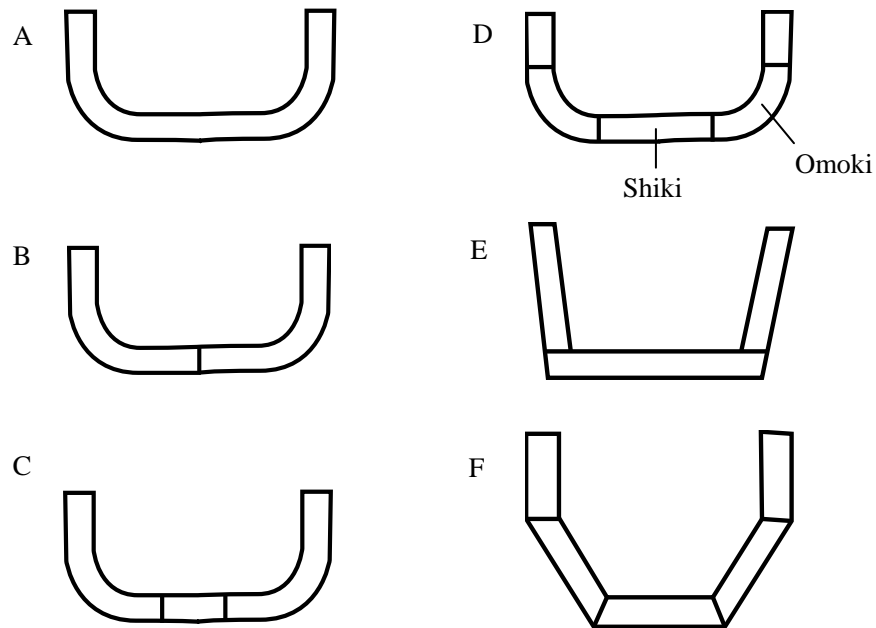


Fig. 6. Sakurada's development process of ships.

F. a ship with diagonal planks added between bottom and side planks.

Deguchi advanced Sakurada's work.²² She provided a scheme for ships classified by their cross section and based on schemes proposed by Sakurada and by Hasslöf.²³ A single logboat was set as the starting point, with three stages of bottom board development arranged on the horizontal axis and three stages of washstrake development on the vertical axis (fig. 7). Using this matrix based on two attributes, washstrakes (*tana*) and bottom board (*shiki*), Deguchi was able to categorize most known ship examples. Although the purpose of this scheme is to classify ship types, it does not show directly the actual development process of logboats to built-up ships.

²² Deguchi 1986, 1987, 1995, 2000, 2001.

²³ Hasslöf 1972.

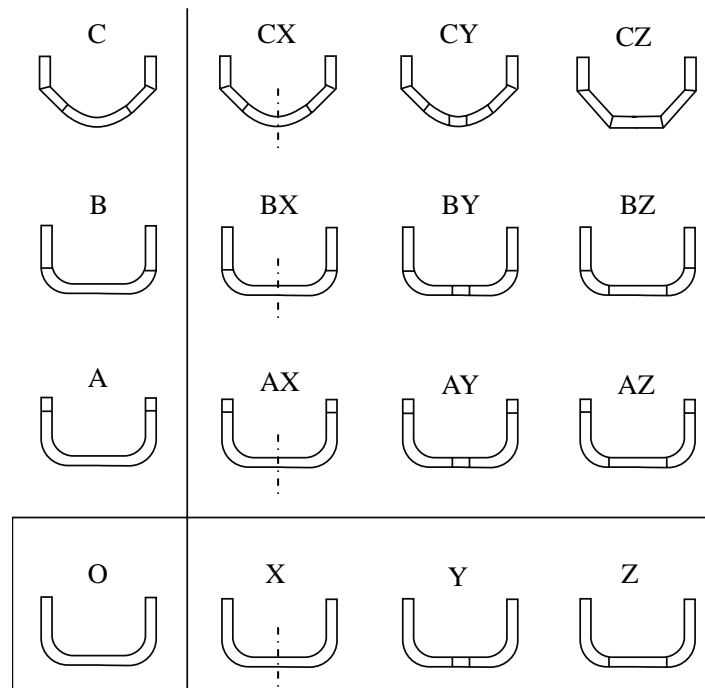


Fig. 7. Deguchi's scheme of ships classified by cross section.

However, it was a very important step in the understanding of the structural development of ships. Comparing existing ship examples with the historical remains of ships, she suggested that the technology of *tana* was more common than that of *shiki*. Furthermore, she recognized the existence of ship types which were not easily classifiable by the cross section method. These were composite logboats, which were constructed with more than two logs connected longitudinally. She suggested the technologies of *tana* and *shiki*, in addition to composite logboats, were important in discussing the development process from logboats to built-up ships.

Finally, Adachi analyzed Ishii's and Sakurada's ideas of the development

process in great detail and considered Ishii's work more reasonable than Sakurada's.²⁴ He agreed with Ishii's suggestion that ships developed differently in the Seto Inland Sea and the Sea of Japan during the transition from semibuilt-up ships to built-up ships. However, he was not convinced by Ishii's proposed *omoki* stage. He emphasized the importance of edge joining techniques in considering the developmental process of Japanese ships and described two construction methods – *hiratsugi*, in which planks are joined edge to edge in carvel style, and *kasaneetsugi*, in which planks overlap as in clinker-built or lapstrake style (fig. 2).

It is said that Japanese ships evolved along two axes, that is to say, *tanaita* construction and *omoki* construction. Adachi clarified that *tanaita* construction was based on the *kasaneetsugi* method and *omoki* construction on the *hiratsugi* method. He doubted the abrupt appearance of *omoki* construction in the developmental process, because *tanaita* construction and *omoki* construction are based on different tying techniques. Up to this point the ships of the Kofun period and the medieval period had generally been classed together as semibuilt-up ships. Adachi suggested the joining techniques changed from *hiratsugi* to *kasaneetsugi* sometime between these periods and that ships from these periods represent different stages of development.²⁵

Furthermore, in terms of the differences in development between the Seto Inland Sea and the Sea of Japan, Adachi paid special attention to the differences in timber types. The timbers of the camphor laurel were used mainly in the Seto Inland Sea, while cedar was used in the Sea of Japan region. Composite logboats found in the

²⁴ Adachi 1997, 1998.

²⁵ Adachi 1997, 6-9.

Kinki region were made of camphor laurel. Camphor laurel has a wide trunk but does not provide long runs of straight timber. Therefore, multiple logs were required in order to make a ship long. Along the Sea of Japan, tall-growing and straight cedar was abundant and hence could be used in shipbuilding without requiring composite construction. Adachi pointed out the relation between the fastening technique of composite logboats and *kasanetsugi* and therefore concluded that *tanaita* construction was used in the Seto Inland Sea and *omoki* construction, in order to make ships large in the Sea of Japan.

The devoted studies of these past researchers have elucidated significantly the developmental processes of Japanese ships. However, archaeological ship remains from after the medieval period are still quite rare. Furthermore, there are very few drawings and models of ships from until the end of sixteenth century C.E., and those few that do exist are limited to the region of the Seto Inland Sea. Therefore, it is difficult to trace back in detail the development process from semibuilt-up ships to built-up ship, though the transition is believed to have taken place during in the Muromachi period (1336 – 1573 C.E.).²⁶ Around the Sea of Japan, the development process is a matter for speculation. Hence, based on what has been proposed so far, the periods between Early Jomon and Kofun, for which ships are best represented in the record, will be discussed primarily.

²⁶ Adachi 1997, 6.

LOGBOATS



Fig. 8. Map of logboats.

Although the oldest examples date to the Early Jomon period, about 5,500 years old, it seems that logboats were in use even before then. Remains of approximately 240 logboats, including composite logboats and semibuilt-up ships,

have been catalogued based on the antecedent research.²⁷ The locations of these logboats finds have been plotted on the map (fig. 8). New discoveries are continuing to be made and the actual number of logboats which have been found has increased even in the time since this research was conducted.

As previously mentioned, there are four ways to distinguish logboats by their plan view: *waritake-gata*, *katsuobushi-gata*, *secchu-gata*, and *hako-gata*. As Shimizu pointed out, the cross section must also be taken into consideration. *Waritake-gata* is a simple logboat that is hollowed out of a log, the edges of which are left as cut. It has a semicircular cross section. This seems to have been the primitive stage. One of the oldest examples found was from the Kamo site and dated to the Early Jomon period. It seems to be *waritake-gata*, but its poor state of preservation makes definite identification difficult. Therefore, although *waritake-gata* is assumed to be the early stage, a clear example has not been found yet. *Katsuobushi-gata*, which has a rounded bow and stern, a pronounced sheer, and a long elliptical shape in the plan view, was used beginning in the Early Jomon period. Because *katsuobushi-gata* is considered to be the second stage of logboats, it is assumed that more primitive logboats were in used before the Early Jomon period. *Katsuobushi-gata* seems to have been the most dominant type during the Jomon period. Most of *katsuobushi-gata* have semicircular cross sections. In the Kofun period, *hako-gata*, which has an elongated box shape in the plan view, and *secchu-gata*, which has rounded bow and square stern, appeared mainly in the Kanto region. *Secchu-gata*'s most distinctive feature is its concave cross

²⁷ See APPENDIX C: LOGBOAT LIST. Recent data were added to the list based on the following references: Board of Education in Fukuoka City 1988, 73-6; Senda 2002, 16-21.

section. Following are specific examples of single logboats presented in chronological order.

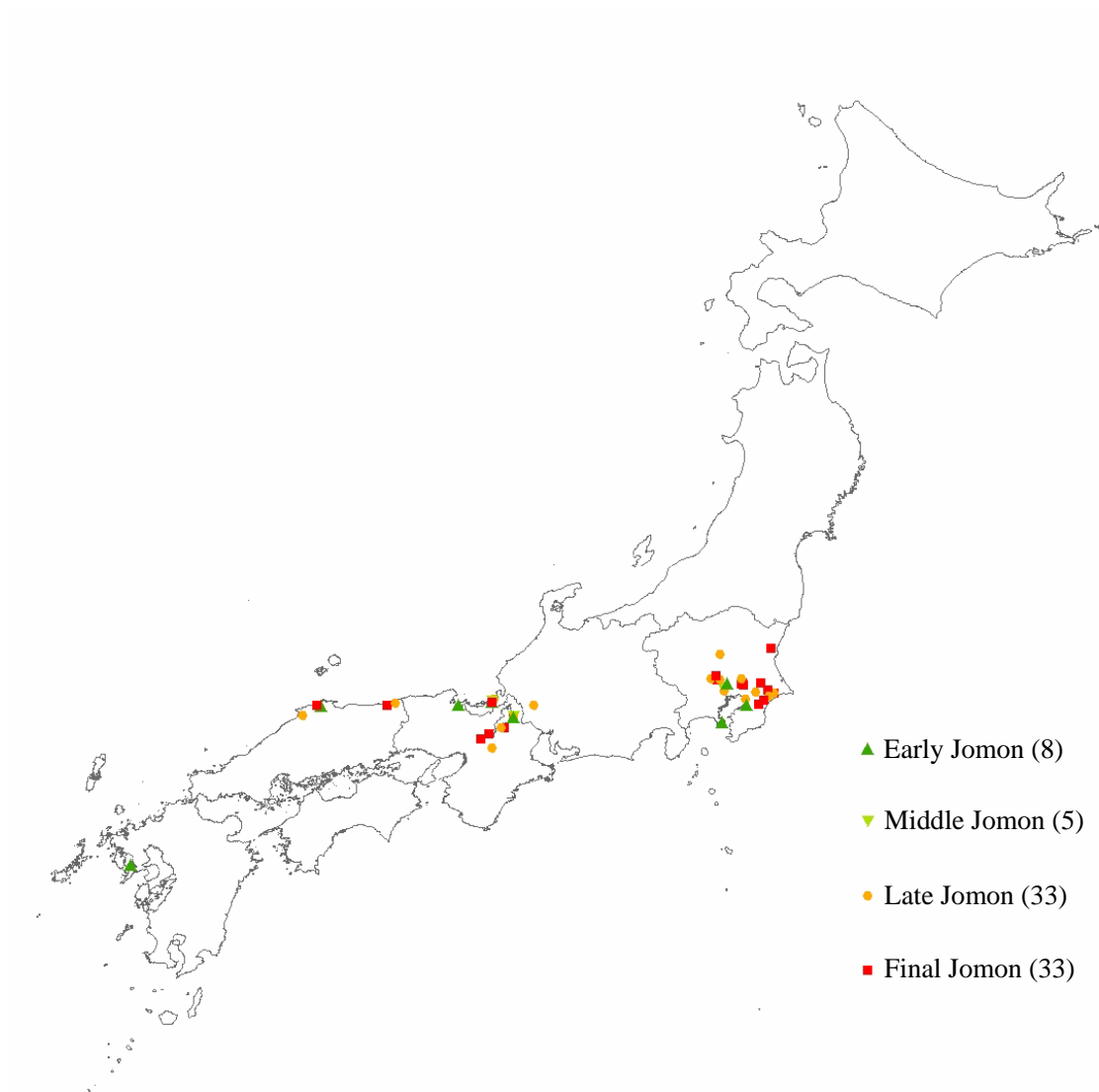


Fig. 9. Map of logboats from the Jomon period.

The Early Jomon Period (4000 – 3000 B.C.E.)

Eight logboats from the Early Jomon period have been confirmed so far (fig. 9). *Katsuobushi-gata* had already appeared by this period. The materials for logboats were diverse and the areas in which logboats have been found are scattered. Paddles also have been found with some hull remains from this period.²⁸ The examples will be briefly described.

1. Irienaiko

One of the oldest logboats was found in the Irienaiko site in Shiga in 2004. It is 5.47 m in length, 0.5 m in width, and 0.3 m in height. It has an arc-shaped cross section and both the bow and stern are V-shaped. It is made of a kind of conifer and is in a good state of preservation. It is dated from 3,700 – 3,500 B.C.E. Four more contemporary logboats were also found in this site.

2. Torihama

This logboat was found in a nearly complete state in the Torihama site in Fukui in 1982.²⁹ It is 6.08 m long, 0.63 m wide and 0.26 m tall. The boat is broadest at its stern end and tapers toward the bow. It is made of *Cryptomeria japonica* D. Don. and is an example of *katsuobushi-gata*. It has two transverse ridges and bears four burn marks. It was radiocarbon dated to 3,500 B.C.E.

²⁸ See *Propulsion tools*, below.

²⁹ Fukui Prefectural Wakasa History and Folklore Museum 1985, 36; see also Kawasaki 1991, 376.

3. Uranyu

It was found with its bow facing toward Maiduru Bay in the sand spit of the Uranyu site in Maiduru, Kyoto in 1998. It measures 4.6 m long, 0.89 m wide, and 0.31 m high, but only the bow end was preserved. Its overall length is estimated to have been approximately 8 m. It is made of *Cryptomeria japonica* D. Don and has a U-shaped cross section. There are burn marks on the surface, that were made with fired stones, apparently to make the hollowing easier. The earthenware found at the site dated to the Early Jomon period and thus the boat has been dated to 3,300 B.C.E.

4. Ayasegawa

It was found in the bottom of Ayase River in Osaka in 1929 while dredging.³⁰ It was 6.06 m in length, 0.66 m in width, 0.45 m in height at the bow and 0.65 m at the stern. It was *katsuobushi-gata*. The date and material were unknown until 2001, when a reinvestigation determined that the boat was made of *Torreya nucifera* Sieb. et Zucc. Radiocarbon analysis dated the log's cutting to 3,300 B.C.E. The study also confirmed the presence of three transverse ridges.

5. Kamo

This logboat was found upside down in a peat deposit in the Kamo site in Chiba in 1948.³¹ It was in a poor state of preservation and while excavating it was broken into approximately 250 pieces during its excavation. It was reconstructed later

³⁰ Matsumoto 1978, 46-7.

³¹ Shimizu 1975, 26-8; see also Matsumoto 1978, 50-1; Kawasaki 1991, 375; Kosada 1981, 158-9.

by Shimizu, to a length of 4.8 m and a width of 0.7 m. One end and most of the sides were lost, but it appears to be *waritake-gata*. It is made of *Aphananthe aspera* Planch., which was cut around 3,100 B.C.E. based on radiocarbon analysis.

6. Ikiriki

The only example from the Kyushu region dated to the Jomon period was found in the Ikiriki site in Nishisonogi, Nagasaki in 1985.³² It is 6.5 m long, 0.76 m wide, and 2.5 – 5 cm thick. It is made from some type of hardwood.

The Middle Jomon Period (3000 – 2000 B.C.E.)

Only five logboats dating to the Middle Jomon Period have been confirmed, and these come from only three sites in three separate regions (fig. 9).

1. Nakazato

This example was found in a good state of preservation in Nakazato, Tokyo, during the construction of a bullet trainrail to the Tohoku region in 1984.³³ It measures 5.79 m in length, 0.72 m in width, and 0.42 m in height, is 2 – 5 cm thick and is made of *Aphananthe aspera* Planch, the same material as the logboat of the Kamo site. It is dated to the beginning of the Middle Jomon period.

³² Fukui Prefectural Wakasa History and Folklore Museum 1985, 37; see also Kawasaki 1991, 375.

³³ Fukui Prefectural Wakasa History and Folklore Museum 1985, 37; see also Kawasaki 1991, 376.

2. Yuri

Four logboats were found at Yuri, near the Torihama site in Fukui in 1990. Two logboats are dated to the Middle Jomon period, one to the Late Jomon period, and one to the Final Jomon period. The two Middle Jomon period examples are made of *Cryptomeria japonica* D. Don.

3. Irienaiko

Two logboats were found at the Irienaiko site in Shiga. Made from a softwood, they most likely were used in Lake Biwa for fishing and communication. They are dated to the end of the Middle Jomon period.

The Late Jomon Period and Final Jomon Period (2000 – 300 B.C.E.)

The remains of logboats from the Late Jomon period greatly increase in number (fig. 9). Most of them were *katsuobushi-gata*.

1. Hatamachi

In 1948, three logboats were found in Hatamachi, Chiba.³⁴ The first logboat is 6.2 m long and 0.43 m wide. The second has a good state preservation and is almost complete, measuring 5.8 m in length, 0.48 m in width, and 0.44 m in height (fig. 10). Third was missing both the ends and is 3.48 m in length and 0.52 m in width. They are *katsuobushi-gata* with rounded cross sections, and are made of *Torreya nucifera* Sieb.

³⁴ Shimizu 1975, 24-6; see also Fukui Prefectural Wakasa History and Folklore Museum 1985, 38; Kawasaki 1991, 377.

et Zucc.

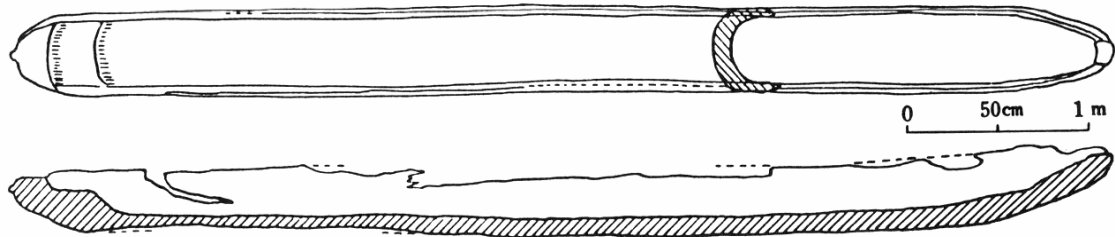


Fig. 10. Hatamachi. (From Shimizu 1975, 74)

2. Moto Suikei

Seven logboats were excavated in Moto Suikei, Shiga, around Lake Biwa in 1964 and 1965.³⁵ They are dated to the early Late Jomon period. The first logboat is in a good state preservation and is 7.9 m long, 0.75 m wide, and 5 cm thick, with two transverse ridges. The second is 8.25 m long, 0.5 m wide, and 4 cm thick, while the third measures 5.6 m long, 0.45 m wide, and 2 – 5 cm thick. There are two additional logboats which have transverse ridges.

3. Hizako

This logboat was found in the Hizako site of Saitama in 1959.³⁶ It is approximately 7 m long, 0.5 m wide and is made of *Castanea crenata* Sieb. et Zucc. It

³⁵ Shimizu 1975, 43-4; see also Fukui Prefectural Wakasa History and Folklore Museum 1985, 37; Kawasaki 1991, 378; Yokota 1992.

³⁶ Shimizu 1975, 59; see also Fukui Prefectural Wakasa History and Folklore Museum 1985, 38; Kawasaki 1991, 377.

was found in association with some earthenwares. A few dozens logboats were also confirmed around the Hizako site.

The Yayoi Period (300 B.C.E. – 300 C.E.)

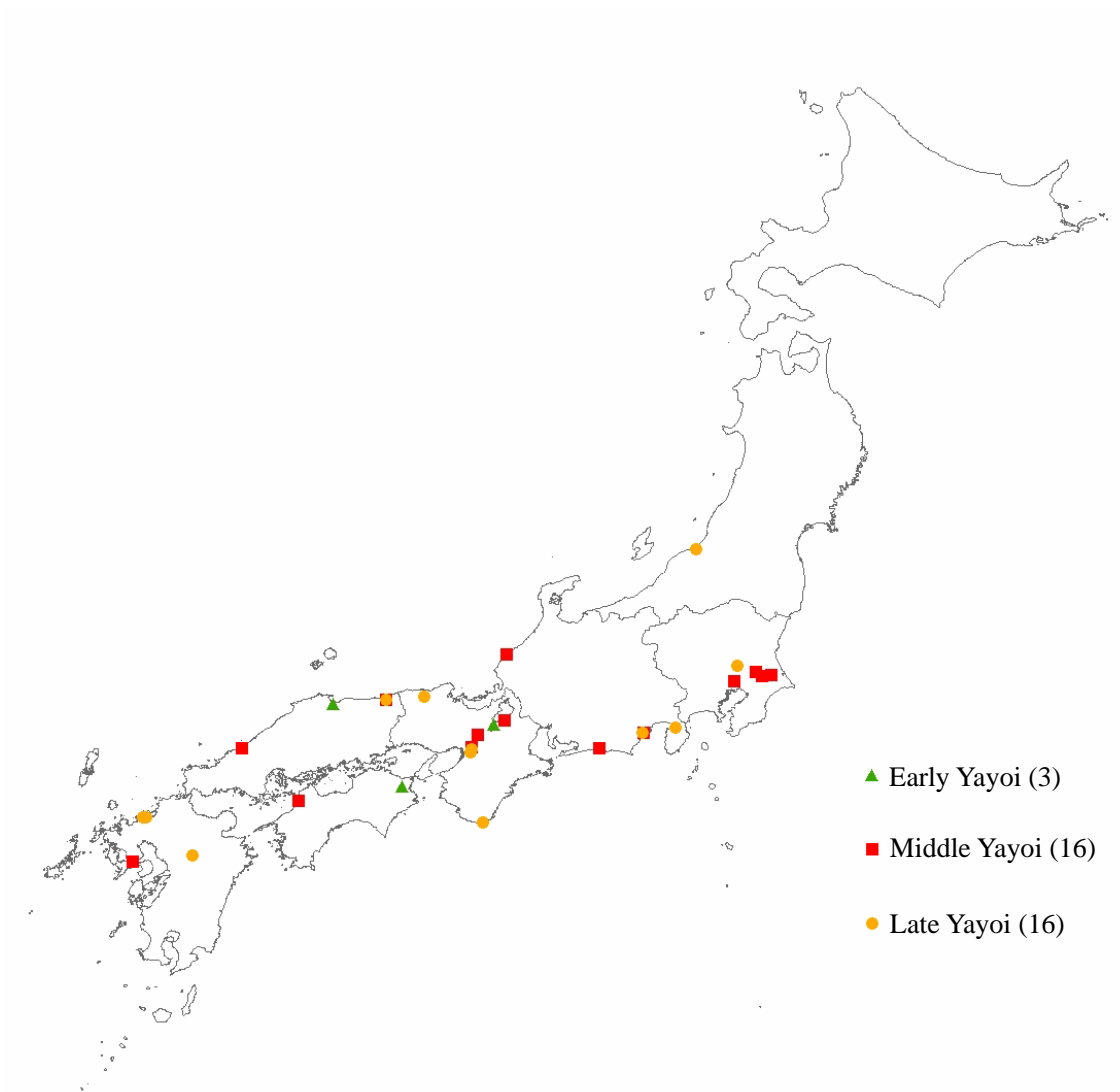


Fig. 11. Distribution of logboats from the Yayoi period.

The number of excavated logboats in the Yayoi period has increased recently,

but few are well preserved (fig. 11). While logboats similar to or slightly more advanced than those of the Jomon period were still used, more sophisticated, extended logboats or semibuilt-up ships first appeared in the Yayoi period.

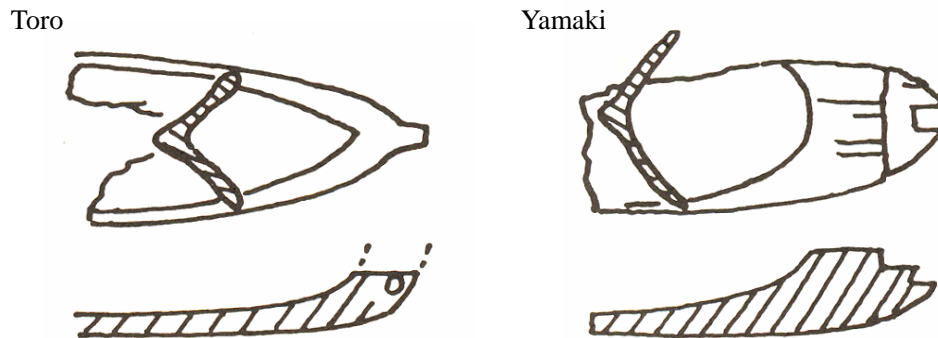


Fig. 12. Toro and Yamaki. (Shimizu 1975, 82)

1. Toro

The bow fragment of logboat was found at the Toro site in Shizuoka in 1943 (fig. 12).³⁷ It was preserved for 0.98 m in length, 0.5 m in width, and 0.18 m in height, and had a V-shaped bottom and pointed end. There was a transverse hole piercing the end of the bow that was possibly used for towing.³⁸ It is dated to the Late Yayoi period.

³⁷ Nakanishi 1986, 78-9.

³⁸ Kakinuma 1999, 8.

2. Yamaki

Another part of a bow, similar to that found at Toro, was found in the Yamaki site in Shizuoka (fig. 12).³⁹ It is 0.56 m wide and has a preserved length of 1.1 m. It has a V-shaped bottom and pointed end. The end of the bow is notched at two levels,



Fig. 13. Map of logboats in the Kofun period.

³⁹ Nakanishi 1986, 79-80.

presumably to attach some type of superstructure.

The Kofun Period (300 – 700 C.E.)

In the Kanto region, logboats of *hako-gata* or *secchu-gata* appeared in the Kofun period (fig. 13). Not many examples have been discovered, but it appears that these two types were distinctive to this region and period. *Pinus densiflora* Sieb. et Zucc. or *Pinus Thunbergii* Parl. were used commonly in the Kanto region. Meanwhile, during this period in the Kinki region, composite logboats and extended logboats or semibuilt-up ships were used. *Cinnamomum camphora* Sieb. seems to have been the wood of choice. *Hako-gata* or *secchu-gata* logboat remains will be discussed briefly here, while composite and extended logboats will be treated in the following section.

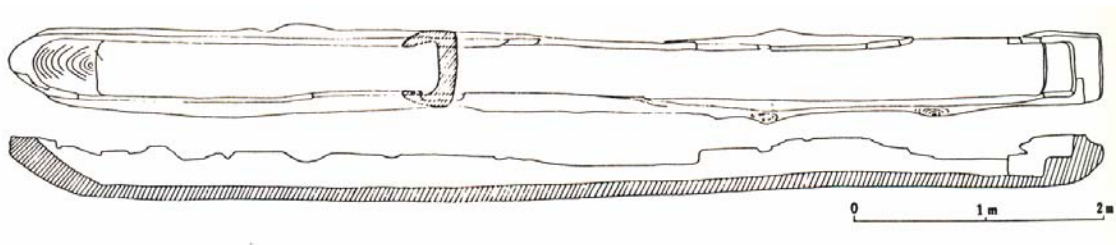


Fig. 14. Murakuni. (From Shimizu 1975, 75)

1. Murakuni

A logboat from the Kofun period, measuring 8.43 m long, 0.67 m wide, and 0.24 m high, was found in Murakuni, Saitama in 1951 (fig. 14).⁴⁰ From its

⁴⁰ Kawasaki 1991, 381-2; see also Matsumoto 1978, 59-60; Shimizu 1975, 28-9.

square-shaped stern and concave cross section, it is considered to be representative of *secchu-gata*.⁴¹ It is made of *Pinus densiflora* Sieb. et Zucc.

2. Kokaigawa

Three logboats were found in the Kokai River in Ibaraki during the repair work of 1951 and 1952.⁴² They seem to have had square sterns and concave cross sections, and are therefore *secchu-gata*. They are made of *Pinus densiflora* Sieb. et Zucc. or *Pinus Thunbergii* Parl. and were found with some associated earthenwares which are distinctive to the Kofun period.

3. Oki

A logboat was found at the left side of the Kuriyama River in Oki, Chiba.⁴³ It probably dates to after the Kofun period. The rake of both the bow and stern is 45 degrees and it seems to be *hako-gata*.

Evidence of Burning

Traces of burning were found on several of the excavated logboats. Ishii mentioned that fire was applied to the interior of the log to make it easier to hollow out using stone tools.⁴⁴ Meanwhile Kawasaki used ethnographic examples of burning logboats to suggest that fire was not used for hollowing out logs, but for expanding

⁴¹ Shimizu, 1975. Shimizu admitted this logboat to call as Murakuni type.

⁴² Shimizu, 1975, 29-31; see also Kawasaki 1991, 384.

⁴³ Shimizu, 1975, 59.

⁴⁴ Ishii 1957, 45-6; see also Kosada 1981, 160. Kosada also suggested the same rationale for fire use.

logboats by burning and warming them.⁴⁵ He explained that logboats were hollowed out and filled about 70 – 80 percent with water. The bottom and sides were then heated by burning dead leaves and trees. The pressure of the water on the pliable wood caused the boat to widen outward. Sometimes, instead of water, sand was used. In order to aid expansion of the sides, struts were put into the opened place between the sides during heating. These struts were taken away after the hull had cooled and stabilized. Similarly, McGrail noted the use of fire in logboats in Europe as a way to expand logboats.⁴⁶

Transverse Ridges

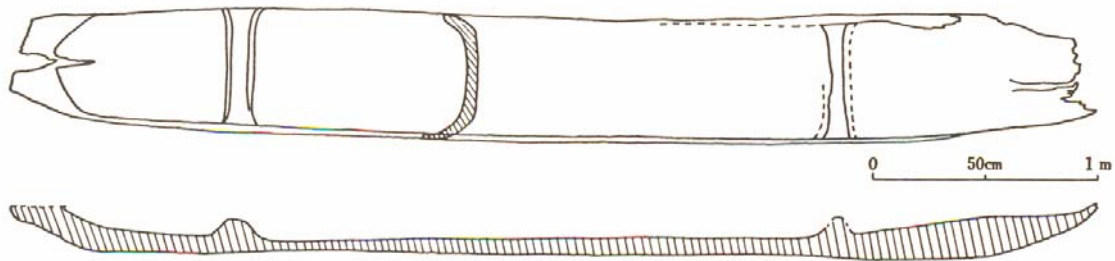


Fig. 15. Logboat with transverse ridges. (From Shimizu 1975, 78)

Interior transverse ridges are a feature of many excavated logboats (fig. 15). Approximately 10 examples are reported each with from two to four ridges.⁴⁷ They have been found in remains starting from the Early Jomon period. Although several

⁴⁵ Kawasaki 1991, 408-10.

⁴⁶ McGrail 1978, 38-41.

⁴⁷ Kawasaki 1991, 411-2.

possible functions for these ridges have been postulated, their function remains uncertain. Ishii considered that they might have been used to increase the transverse strength of the boats. However, they were not likely to have been effective in this regard since they are positioned at the bow and stern, rather than towards the middle of the boat.⁴⁸ He suggests that a more likely purpose might have been to prevent water from coming into the boat and to facilitate bailing any that did. Kawasaki suggested that their purpose was to prevent cracking as well as reinforcing the hull. The bottom board was the most perishable part of logboats and the bow and stern needed to be sturdy enough for frequent beaching. Furthermore, wood shrinks and cracks when it dries, and its thickness had to be optimized between the needs of strength and weight. Therefore, transverse ridges may have been carved into the bottom of logboats to bolster their strength and to prevent the hull from cracking, while at the same time not making it overly heavy. Finally, Shimizu suggested that the ridges provided foot-holds for paddlers in order to enhance their power.⁴⁹ Ultimately, the position and spacing of these transverse ridges seem somewhat random and their true purpose remains difficult to ascertain.

Transverse ridges also are known in logboats found in Europe, for which McGrail pointed out several possible functions: to divide the interior of the boat into functional spaces for propulsion, cargo, and passengers; to keep cargo clear of bilge water; as thwarts for paddlers; and as foot-timbers for standing or sitting paddlers.⁵⁰

⁴⁸ Ishii 1957, 41-2; 1983, 2-4.

⁴⁹ Shimizu 1975, 36-44.

⁵⁰ McGrail 1978, 55-7.

Regions

Logboats have been found all over the country, but most examples come from the Kanto region, Kinki region, around Lake Biwa, and along the Sea of Japan. Most of the logboats from the Jomon period have been found in the Kanto region, Kinki

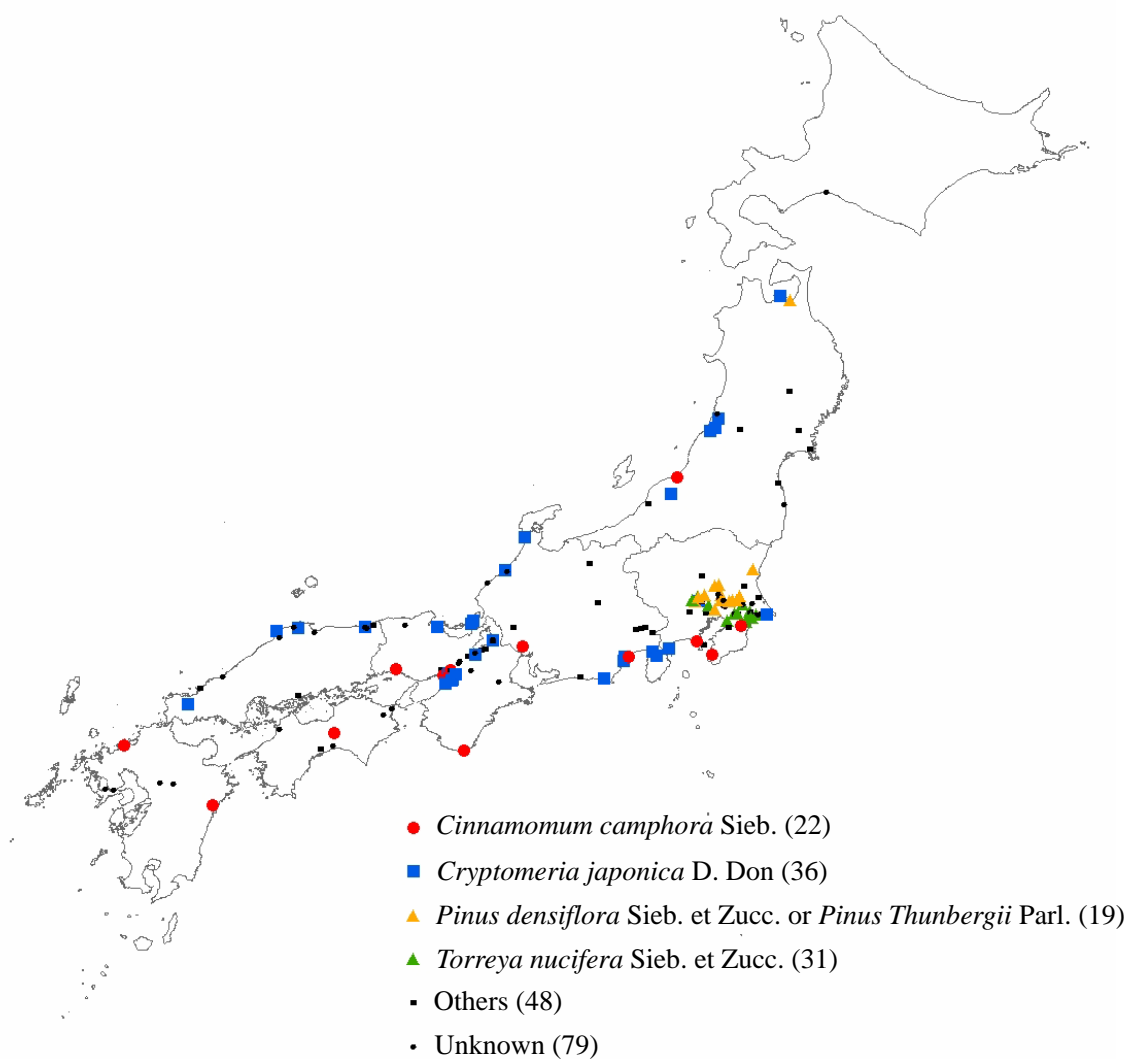


Fig. 16. Map of logboats sorted by materials.

region, and along the Sea of Japan, except one example from the Kyushu region. Examples from the Yayoi period have been found more widely. In addition to Jomon-period areas, they have been found in the Kyushu, Shikoku and Tokai regions. Some of these same regions have produced logboats from the of the Kofun period. If examples post-dating the Kofun period are included, logboats have been found in virtually all over the country, including the interior regions. Not surprisingly, logboats are found near the sea, lakes, and along rivers. The Tone River, the largest waterway in Japan, runs through the Kanto region. In the Kinki area there is the Yodo River, which flows from Lake Biwa. These rivers have a large number of tributaries and it is safe to assume that logboats were used extensively along these as well.

Material

Over 20 types of wood have been recorded as having been used for logboats (fig. 16).⁵¹ Among them, *Torreya nucifera* Sieb. et Zucc., *Cinnamomum camphora* Sieb., *Cryptomeria japonica* D. Don, *Pinus densiflora* Sieb. et Zucc. and *Pinus Thunbergii* Parl. are dominant. The choice of woods seems to relate to specific areas and historical periods. Most logboats found in the Kanto region from the Jomon period are made of *Torreya nucifera* Sieb. et Zucc. Logboats of *Cinnamomum camphora* Sieb. have been found mainly in the Kinki region and post-date the Kofun period. Examples of *Cryptomeria japonica* D. Don have been found on both the coast of the Sea of Japan and the Pacific Ocean. *Pinus densiflora* Sieb. et Zucc. and *Pinus Thunbergii* Parl. were

⁵¹ Yamauchi 1950, 1954, 1981.

used predominantly in the Kanto region after the Kofun period. Timbers use to make logboats diversified over time. The usage correlates with ancient vegetation patterns and the development of woodworking tools and technology. For instance, *Cinnamomum camphora* Sieb. did not grow widely in the Kanto region, and when it did, the trees tended to be small. In the Kinki region, however, such trees were abundant and large. Furthermore, *Pinus densiflora* Sieb. et Zucc. or *Pinus Thunbergii* Parl. were not easy to work and it is likely that the appearance of iron tools was necessary before such trees were used for logboats.

Discussion

Four stages of logboats construction have been established: *waritake-gata*, *katsuobushi-gata*, *hako-gata*, and *secchu-gata*. Although a clear example of *waritake-gata* has not been found to date, it is likely to have been the most primitive stage. *Katsuobushi-gata* appeared early in the Jomon period and was the dominant type throughout. In the Kofun period, *hako-gata* or *secchu-gata* appeared mainly in the Kanto region. Areas, materials, and periods correlate closely with each other. In the Jomon period, *Torreya nucifera* Sieb. et Zucc. was used in the Kanto region. *Cryptomeria japonica* D. Don was widely used over time. After the Kofun period, *Pinus densiflora* Sieb. et Zucc. or *Pinus Thunbergii* Parl. were used, but mainly in the Kanto region. Meanwhile in the Kinki region, *Cinnamomum camphora* Sieb. was the wood of choice of the same time as composite logboats and semibuilt-up ships began being built. These types of boats will be discussed in detail in the following section.

As Shimizu pointed out⁵², logboats diversified over time and most likely were not limited to just one type in each period. People would have used different types addapted to their specific needs and environment, such as for river, lake, and sea transport. Furthermore, types seem to have varied in relation to region, available material, and the time period.

⁵² Shimizu 1975, 71.

COMPOSITE AND EXTENDED LOGBOATS

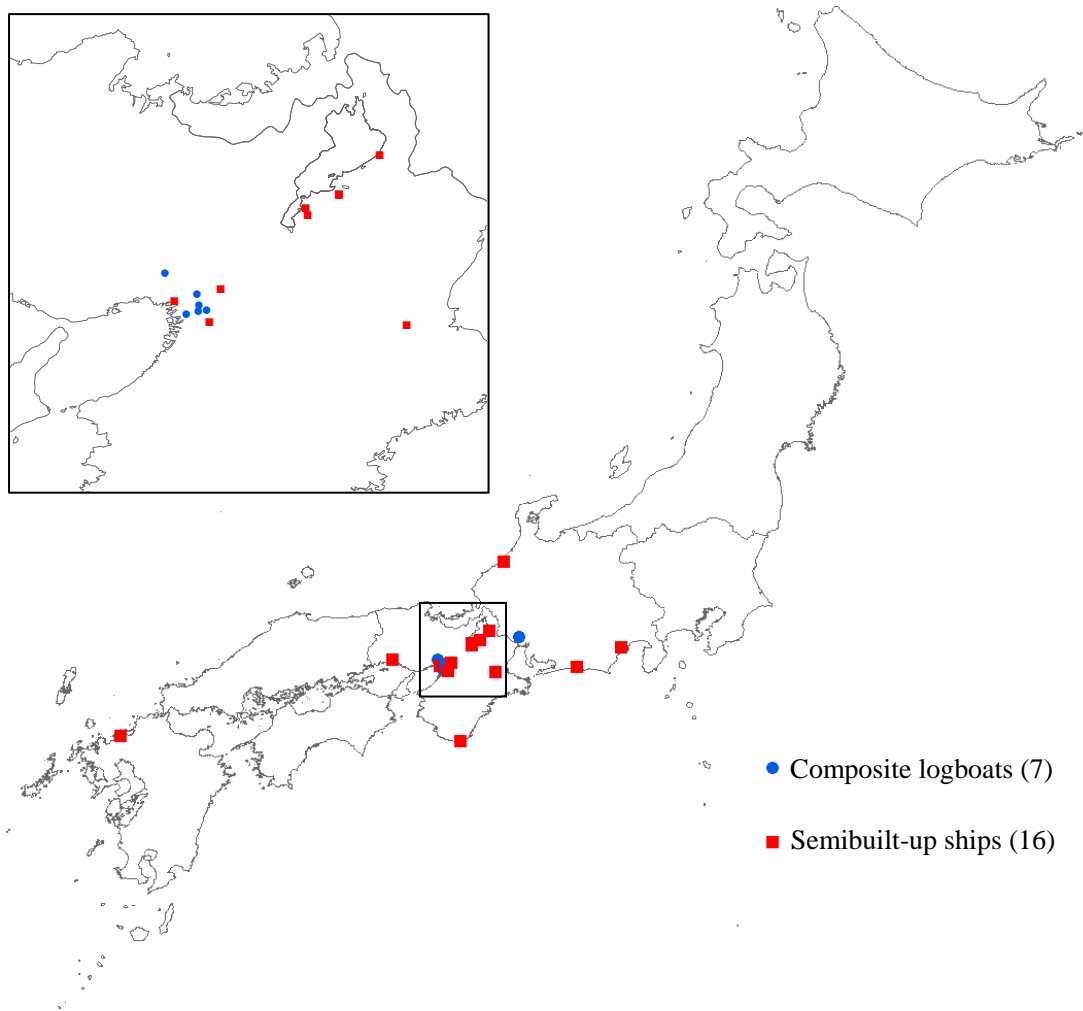


Fig. 17. Map of composite logboats and semibuilt-up ships.

In the Yayoi period, wet-rice cultivation and metal-working technology were brought to Japan from the continent and spread rapidly throughout Japan. As a result of this technological revolution, especially the improvement brought about by the

introduction of iron tools, logboats greatly evolved as well. Composite logboats were built in response to the need for greater size, and extended logboats or semibuilt-up ships with washstrakes added to their sides more developed as a means of increasing tonnage capacity and seaworthiness (fig. 17). There is almost no doubt that these ships were used along coastal routes and to cross over to the continent by way of Iki and Tsushima islands. These composite and extended logboats represent the next stage of development, and appear to have remained the mainstream of shipbuilding technology in Japan until the thirteenth or fourteenth century C.E.

Composite Logboats

Sometime during the Yayoi period, composite logboats composed of two or more logs joined end to end appeared. The joining method used is known as *inrotsugi*, in which two parts overlap like a scarf (fig. 19).⁵³ The outside of one part and the inside of the other part were pruned and fitted together smoothly, without any ridge on either side. The concept of *inrotsugi* is similar to that of the scarf of a keel, but the overlapping area was larger than that of a normal scarf; the joining pieces of Itachigawa overlapped up to 1.8 m, compared to several dozen centimeters for a normal scarf. There were two different methods used to fix the joining parts in *inrotsugi*: the *kannuki*⁵⁴ technique and nail joints. *Kannuki* used two through-beams that spanned the hull above the joint and held down a square timber that ran

⁵³ *Inro* was a case for holding small objects, especially medicines. The word *inrotsugi* was derived from the way the caps were fitted onto inro.

⁵⁴ *Kannuki* means a barred lock in Japanese.

longitudinally over the length of the joint (fig. 19). The square timber was notched to receive the through-beams in order to fix them further.

Iron nails were sometimes used instead of *kannuki*. These were driven from the inside along the entire length of the *inrotsugi* joint. Nail joints helped reduce the size of *inrotsugi* joint and were more economic. They also allowed for more interior space than the *kannuki* technique. On the other hand the *kannuki* join was stronger and more durable than nailed assemblies. It is not known which method appeared first.

Examples of composite logboats are few. Furthermore, the remains from Morokuwa village were already fragmented and most others except that from Oimazato were lost in air raids during World War II.⁵⁵ Although recently found extended logboats might be also composite logboats, clear examples of simple composite logboats have yet to be confirmed and, therefore, one must rely on historical records. Recently, remnants which appear to be composite logboats have been found, but detailed information on them could not be obtained. Five known examples can be securely identified as composite logboats:

1. Morokuwa

This logboat, which has already been discussed, was found at Morokuwa village, Aichi, in 1838 (fig. 18).⁵⁶ It was recorded as approximately 18 – 24 m. in length and 1.5 – 2.1 m in width. This logboat, made of *Cinnamomum camphora* Sieb., apparently consisted of four parts joined with *inrotsugi* and *kannuki* joinery. It has been

⁵⁵ They were displayed in Osaka castle.

⁵⁶ Ishida 1994; see also Ishii 1957, 61-2; 1983, 10-1; Matsumoto 1978, 26; Shimizu 1975, 17.

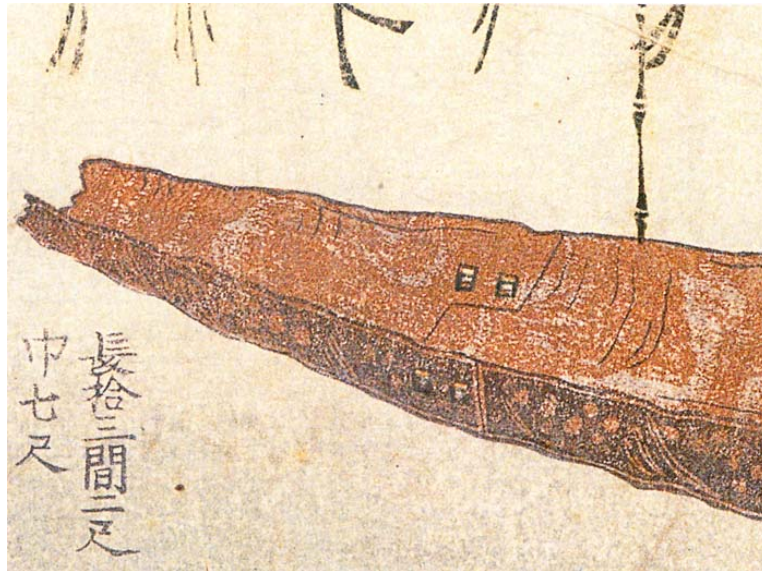


Fig. 18. Morokuwa. (From Adachi 1998, fig. I-10)

radiocarbon dated from the seventh to ninth century C.E. and consisted of both old and new timbers. Whether there were washstrakes on this composite logboat is not known. If there were, the boat probably would have been for marine use, and if not, then more likely for river or coastal use.

2. Itachigawa

A composite logboat was found in the Itachi River, Osaka, during the river's dredging in 1878 (fig. 19).⁵⁷ It was 11.6 m in length, 1.2 m in width and 0.55 m in height. It was made of *Cinnamomum camphora* Sieb. As only one extremity was

⁵⁷ Ishii 1957, 61; see also Deguchi 1995, 261-70; Ishii 1983, 9-11; Kawasaki 1991, 387; Matsumoto 1978, 26; Morse 1917, 197-9; Shimizu 1975, 45-6; Tsujio 1981, 60-1. When Morse, who effected modernization in Japanese archaeology, was traveling in Japan in 1879, he observed and illustrated this composite logboat at its exhibit in Osaka.

preserved when it was found, the maximum length is estimated to have been approximately 15 m. Ishii suggested that it was made either from two parts of different lengths, or from three parts – the bow, body, and stern. Deguchi agreed with Ishii's hypothesis. The sections were joined by the *inrotsugi* method fastened by the *kannuki* technique. The scarf section was approximately 1.8 m long, or one eighth of boat's entire length. The joint was caulked with tree bark to prevent leaking. Along with the hull remains, a fragment of a *sueki* vessel was found, and dated to the Kofun period or later.

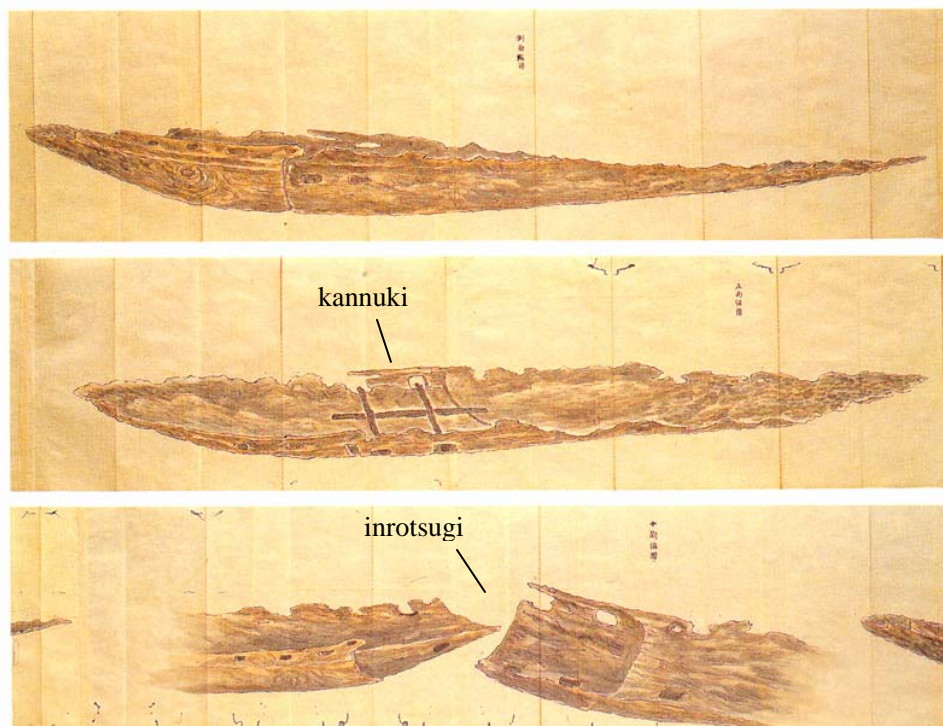


Fig. 19. Itachigawa. (From Adachi 1998, fig. I-7)

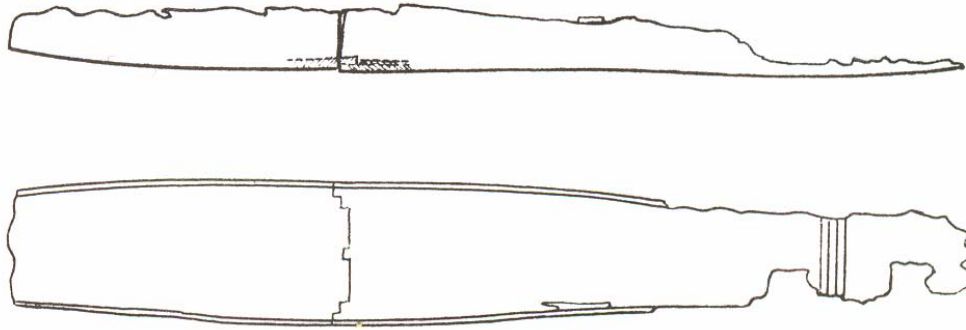


Fig. 20. Namazuegawa. (From Ishii 1983, 10)

3. Namazuegawa

In 1917, during repair work on the Namazue River, Osaka, a composite logboat was discovered (fig. 20).⁵⁸ It measured 13.4 m long, 1.89 m wide and 0.82 m high, was made of *Cinnamomum camphora* Sieb., and most likely consisted of four parts. The body was made from two parts and the bow and stern, neither of which survived, made up the other two parts. The joining method was *inrotsugi* fastened with nails. The joints were caulked and alternating iron and wooden nails were used in the overlapped section. The nails were driven from inside of the hull and clenched back onto the outside surface of hull. Furthermore there were two closely spaced, shallow grooves near the narrower surviving end. Nishimura pointed out that some sort of timbers, such as bulkheads, may have been seated in these grooves in order to prevent leakage.⁵⁹ Traces of nails in the stern end and evidence of washstrakes were found. Therefore, this vessel is considered to be both a composite logboat and also an extended logboat.

⁵⁸ Ishii 1957, 62; see also Ishii 1983, 9-11; Kawasaki 1991, 387; Matsumoto 1978, 26-7; Shimizu 1975, 46-7; Tsujio 1981, 61-2;

⁵⁹ Nishimura 1938, 27.

The boat was dated to the Kofun period, or later, based on a *sueki* pottery fragment found with it that is similar to the example from Itachigawa.

4. Toyosato Sugawara

In 1937 a composite logboat was excavated in Toyosato Sugawara, Osaka.⁶⁰ The hull remains were 4.5 m in length and 0.99 m in width. It was made of *Cryptomeria japonica* D. Don. Although only half of the entire length survived, it was clearly a composite logboat because the scarf was preserved. The joint area was fastened with iron nails arranged in two lines. Umehara, who excavated the boat, dated it to the end of the Nara period based on the type of iron nails used. Furthermore, fragments of washstrakes were attached along both sides of the hull. Thus, this also was a composite and extended logboat.

5. Oimazato

A composite logboat was excavated in Oimazato, Osaka, during sewage work in 1955 (fig. 21).⁶¹ It was displayed in the Osaka Municipal Museum.⁶² Two thirds of the remaining hull was preserved and measured 10.2 m in length, 1.14 m in width and 0.79 m in height. It was made of *Cinnamomum camphora* Sieb. and had a crescent-shaped cross section. The scarf was located near the center of the hull and was fastened by the *inrotsugi* method with iron nails. A board was nailed over part of the

⁶⁰ Shimizu 1975, 48; see also Kawasaki 1991, 386; Matsumoto 1978, 29; Tsujio 1981, 64-5.

⁶¹ Ishii 1957, 62-3; see also Kawasaki 1991, 387-8; Shimizu 1975, 49-51; Tujio 1981, 66.

⁶² The Osaka Municipal Museum was closed in 2001 and then reopened as the Osaka Museum of History later that same year. It is unclear whether or not the boat was still displayed.

joint section on the inside of the hull. The joint overlap was 0.4 m. Traces of nails were found along the sides of the hull as well as timbers which seem to have been washstrakes. Additionally, a bulkhead that was fitted into one of three grooves was also found. This piece was 0.15 m thick, matching the width of the three grooves, which were grouped together at one end of the hull. It is unclear why three grooves were carved so close together on the same place. It is likely they served the same function as the two grooves of the Namazuegawa logboats. However, Shimizu pointed out the intangibility of these grooves and was doubtful that the remains were even from a ship, due to the weakness of the joint area.⁶³ He suggested the possibility that the remains were part of a sluiceway. If so, the three grooves were used with the device that adjusted the flow of water. Shimizu did not come to a final conclusion as to what these remains were, since both ends were lost. If indeed the remains are from a boat, then it was both a composite and extended logboat. It has been dated by associated *sueki* and *hajiki* pottery to the Kofun period or later.

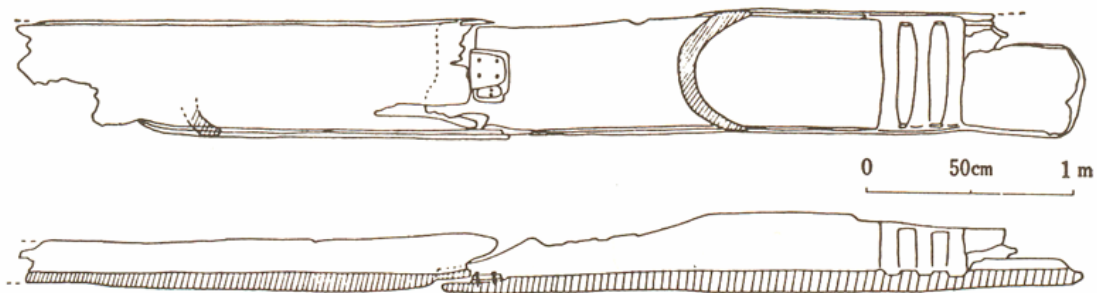


Fig. 21. Oimazato. (From Kawasaki 1991, 405)

⁶³ Shimizu 1975, 50.

Discussion

It was commonly thought that composite logboats appeared sometime in the Yayoi period, but archaeological remains have been found from as early as the Kofun period. The boats were made of two and often three or four parts. Most of them were fashioned from logs of *Cinnamomum camphora* Sieb., which grows abundantly along the Seto Inland Sea and in the Kyushu area. *Cinnamomum camphora* Sieb. is a wide tree, sometimes reaching up to 2 m in diameter.⁶⁴ However, it does not grow particularly straight, like *Cryptomeria japonica* D. Don and *Chamaecyparis obtusa* Sieb. et Zucc. It typically branches out at about 10 m in height. Therefore, in order to obtain greater lengths, composite logboats had to be produced.

Inrotsugi construction was used to join the sections, and the overlapping parts were fastened either by the *kannuki* technique and nails. While it is unknown which method appeared first, the two were apparently used simultaneously.

Extended Logboats

Extended logboats, or semibuilt-up ships, which had washstrakes added onto their sides, appeared sometime during the Yayoi period. More than a dozen remains have been found thus far, the oldest of which dates to the early part of the period. Although the number of archaeological remains has increased recently, well-preserved examples are rare. As the result, the exact shape of these hulls is still not clear, nor is it understood how the washstrakes were added. However, some of the remains are

⁶⁴ Ishii 1983, 11; see also Kosada 1981, 164.

diagnostic and certain details of the shipbuilding technology of semibuilt-up ships can be deduced.

1. Akanoihama

A semibuilt-up ship was found at the Akanoihama site in Moriyama, Shiga in 2004.⁶⁵ A bow and a washstrake were excavated. The surviving portion of the bow measured 0.37 m in length, 0.16 m in width, and 7.5 cm in height. The washstrake was 1.07 m long and 0.2 m wide. Although the washstrake was not dated, the bow was dated to the Early to Middle Yayoi period. Traces of a plug for fixing a forward plank was found in the bow. The ship was estimated to have been approximately 6 m in length.

2. Kakue

A Y-shaped piece of a semibuilt-up ship was found in the Kakue site, Shizuoka, in 1996.⁶⁶ The piece, the remains of the bow, measures 0.9 m in length, 0.63 m in width, and 0.17 m in height, and was made of chestnut (*Castanea crenata* Sieb. et Zucc.). There are eight holes in the left side and three in the right side, each about 2.5 – 3.0 cm square. There is a single, larger square hole at the end of the bow: about 3.0 – 3.5 cm square, with fragments of lashing found inside it. The top and bottom of the piece are worked and the sheer curves up at the bow. It seems that this piece may have been lashed to the bottom board in order to deflect waves. This is the only hull of this

⁶⁵ Board of Education in Shiga 2004.

⁶⁶ Hashiguchi, 1997.

shape yet found. It is dated to the Middle Yayoi period.

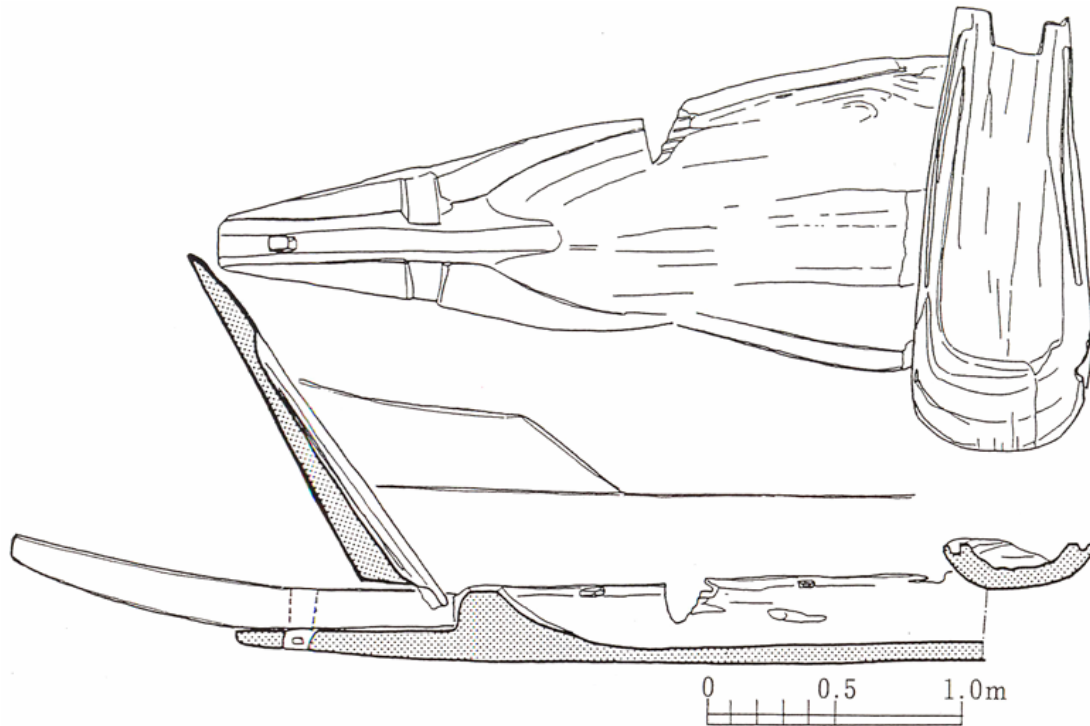


Fig. 22. Kyuhoji. (From Okita 1995, 284)

3. Kyuhoji

Three pieces of a semibuilt-up ship were found in the Kyuhoji site in Yao, Osaka in 1983 (fig.22).⁶⁷ Kyuhoji is a large site encompassing a million square meters, and containing levels from the Late Jomon period to the early modern period. It was in the southern part of the site that the ship remains were found. A bottom board, bow end plank, and washstrake were discovered and dated to the Late Yayoi period. They are all

⁶⁷ Nakanishi 1986, 80-1; see also Akagi 1988; Fukui Prefectural Wakasa History and Folklore Museum 1985, 39; Ichinose 1987; Okita 1995, 285-6; 2005, 15.

made of *Cryptomeria japonica* D. Don. The bottom board is 3.0 m long, 1.24 m wide, and 0.42 m high and is estimated to represent one fourth of the entire hull. The upper surface of this piece has a groove extending along the main axis from the tip to the point where the hollowing begins. There is an 11 × 8 cm rectangular, vertical hole near the forward end. There is also a 5 × 2 cm hole that cuts laterally across the larger hole. These holes seem to be used for fixing a bow timber to the bottom board. A groove across the interior of the bottom board about 80 cm from the end most likely held the bow end plank. There are mortises along the edges of the bottom board spaced about 40 – 50 cm apart for affixing the washstrakes. Cherry tree bark and U-shaped thin, wooden chips remained in some of the mortises. The bottom board was cut at the end, but most likely connected to another bottom board. It seems to be a composite logboat, but the joining method is unknown. The bow end plank is 1.73 m long, 0.7 m wide and the bottom end is carved to fit into two mortises. There are grooves in these protruding pieces used to lock them in place and to prevent them from tipping forward. There are grooves on the sides of the bow end plank for inserting washstrakes. The washstrake is 1.21 m long, 0.22 m wide, and 2 cm thick, and has two mortises for attaching it to the bottom board or the bow end plank.

4. Kasajima

A piece of a semibuilt-up ship dated to the Late Yayoi period was found at the Kasajima site in Sairo, Wakayama, in 1960.⁶⁸ It is a bottom board of 4.1 m length, 0.5

⁶⁸ Yasui 1968b; see also Nakanishi 1986, 80.

m width, and 3 cm thickness. There is a V-shaped groove at the bow, most likely for the insertion of a washstrake. Another timber that appears to be a washstrake was also found. The bottom board was flat and made of *Cinnamomum camphora* Sieb.

5. Uruu Jidokyu

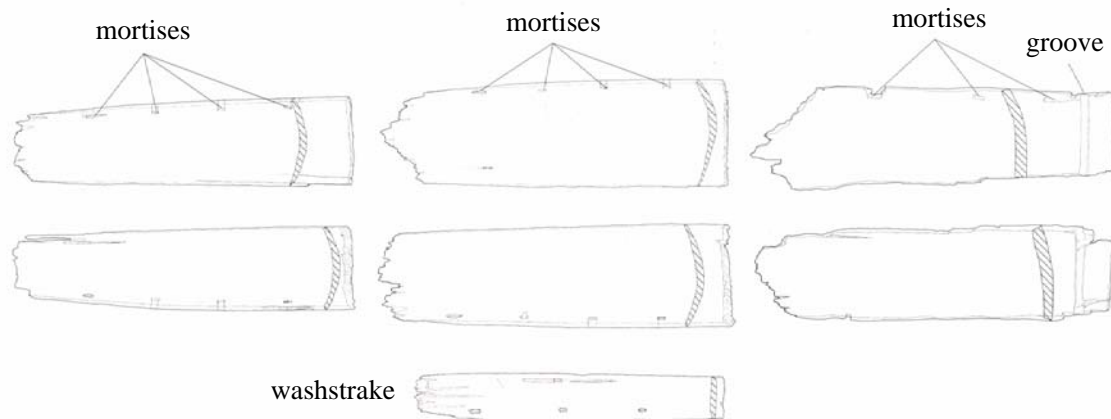


Fig. 23. Uruu Jidokyu. (From Board of Education in Maebaru City 2004)

An extended logboat was found in a well at the Uruu Jidokyu site in Maebaru, Fukuoka, in 2004 (fig. 23).⁶⁹ It is the only archaeological example of a semibuilt-up ship from the Kyushu region. The hull remains were used to shore up as the shaft wall of the well. Two bottom boards, the stern and a washstrake were discovered. The bottom board is 3.1 m long, 0.82 m wide, and 3.5 cm thick and was horseshoe shape. Both sides of the bottom board have mortises set 25 cm apart. In the mortises, bits of cherry bark remained which were probably used as caulking. The stern is 1.2 m long,

⁶⁹ Board of Education in Maebaru City 2004.

0.65 m wide, and 4.5 cm thick. It has a groove, most likely for stepping an end plank. The washstrake is 1.5 m in length, 0.23 m in width, and 2.5 cm thick. The stern has mortises on both sides and the washstrake has three mortises on a single side and one mortise on the other side. The bottom board and washstrake are made of *Cinnamomum camphora* Sieb. and the stern is of *Cryptomeria japonica* D. Don. It is proposed that the remains come from more than one ship – dismantled and diverted to the well structure – because the mortises of the bottom board and washstrake did not align. This ship was dated to the end of the Yayoi period and reconstructed to an original size of 7 m length and 0.43 m height (fig. 24). It is considered to be an inland sea vessel because its draft seems too shallow for an ocean-going ship.

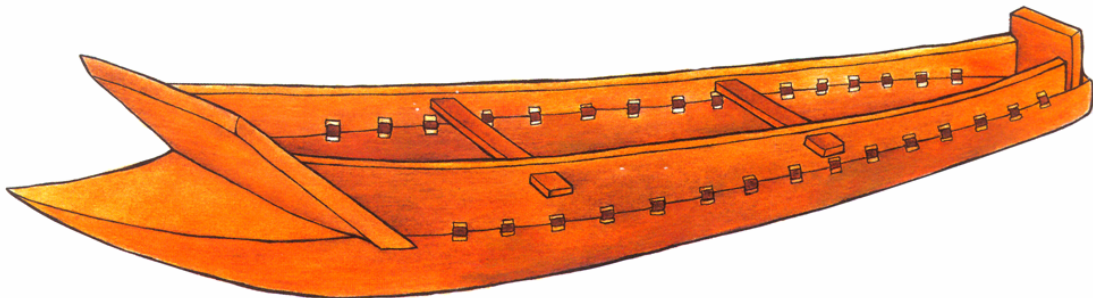


Fig. 24. Uruu Jidokyu. (From Board of Education in Maebaru City 2004)

6. Sena

Two pieces of a semibuilt-up ship were found at the Sena site, Shizuoka, in 1992.⁷⁰ A crescent shaped piece was 6.36 m in length and 0.32 m in width. A knife

⁷⁰ Hashiguchi, 1997.

shaped piece was 4.12 m in length and 0.37 m in width. Both pieces have elliptical and rectangular holes spaced uniformly along one edge. The larger piece seems to be from a washstrake, while the smaller one is probably from the side part of a bottom board. They are dated from the end of the Yayoi period to the Early Kofun period.

7. Sendai Nomi

A bow end plank and three washstrakes of a semibuilt-up ship were found in a dry river bed in the Sendai Nomi site in Komatsu, Ishikawa in 2000. The end plank is 1.04 m long, 0.26 m wide, and 6.4 cm thick. One of the washstrakes is 0.71 m long, 0.22 m wide, and 2.5 cm thick. The end plank is horseshoe-shaped and has grooves and holes for inserting the washstrakes. In these holes, cherry bark caulking remained. A paddle 1.09 m long, 0.12 m wide, and 2.1 cm thick was also discovered. The remnants are dated to the Early Kofun period.

8. Chomeiji Kotei

Five ships were recently found at the Chomeiji Kotei site in Shiga.⁷¹ Within one of them, there was part of the bow of a semibuilt-up ship. It is dated to the Early Kofun period, but detailed information on it is not yet available.

9. Nagakoshi

A bottom board of a semibuilt-up ship was found in the Nagakoshi site in

⁷¹ Imanishi and Ogasawara 2000, 16.

Moriyama, Shiga.⁷² It has a mortise that seems to be for connecting a washstrake. Within it are the remains of a tenon and cherry bark wraps. It is dated to the Early Kofun period.

10. Shimonaga

Part of a semibuilt-up ship was found on the Shimonaga site in Moriyama, Shiga.⁷³ It was dated to the Middle Kofun period and estimated to be approximately 6 m in length. Part of the bow and a bottom board with washstrake were discovered. The bow piece is 0.64 m long and made of *Cryptomeria japonica* D. Don. The bottom board with washstrake is 0.94 m long and 0.79 m wide. The bottom board has a groove for stepping a bow end plank. Pieces of cherry bark approximately 2.4 cm wide were lashed twice through the holes of the bottom board and washstrake to connect them. Tenons were inserted into the holes in order to keep the ties from loosening. The washstrake was made of *Cryptomeria japonica* D. Don.

11. Nishihiru

Part of a semibuilt-up ship dating from the Late Kofun period was found in the Nishihiru site in Ichishi, Mie, as part of a well.⁷⁴ It was cut to a suitable length for the well and was 0.7 m wide. It seems to have been a bottom board. The sides were thinner than the bottom and are mortised. Some tenons reported remained in their mortises.

⁷² Imanishi and Ogasawara 2000, 16.

⁷³ Imanishi and Ogasawara 2000, 16; see also Okita 2005, 15.

⁷⁴ Mie Archaeological Research Center 2004.

The inside of the hull was better preserved than than the outside.

12. Sagisu

This example was excavated from the schoolyard of an elementary school in Sagisu, Osaka.⁷⁵ It seems to have been a semibuilt-up ship made of *Cinnamomum camphora* Sieb. It is 11.7 m in length and 1.77 m in width. The right side was damaged during its use and was repaired by adding a strake. Furthermore, a washstrake was added on the side that overlapped it in lapstrake fashion. Both strakes had matching mortises with tenons fitted in them. It was caulked to prevent leakage. It is dated by associated *hajiki* pottery to the Kofun period.

Discussion

Beginning in the Yayoi period, logboats became more diverse and sophisticated, with the addition of such pieces as end planks, washstrakes, and the pointed bow found in the Kakue site. Archaeological remains of semibuilt-up ships have been found primarily in the Kinki region, with rare examples from the Kyushu and Tokai regions. They are made mainly of *Cinnamomum camphora* Sieb. or *Cryptomeria japonica* D. Don. The bottom boards are typically *Cinnamomum camphora* Sieb. and the washstrakes *Cryptomeria japonica* D. Don. However, it is not clear whether this is a regular pattern due to the paucity of remains.

According to the known examples, semibuilt-up ships tended to have end

⁷⁵ Shimizu 1975, 47.

planks. The planks themselves were found at the Kyuhoji and Sendai Nomi sites and remains of bottom boards which had grooves for stepping end planks were also found at Akanoihama, Uruu Jidokyu, and Shimonaga. End planks seem to have been the distinctive feature of semibuilt-up ships at that time and iconographic evidence, especially clay ship figures, confirms their existence. Clay ship figures will be discussed in the next section.

In order to add washstrakes to the sides of bottom boards, lashings, typically made from cherry bark, seem to have been the fasteners of choice. Mortises were carved into the sides of the bottom board and washstrakes once they were aligned. Strips of cherry bark were wrapped through both mortises and then locked in place with tenon inserts. It is not clear whether or not the bottom board and washstrakes were overlapped. In the example found at Sagisu, the tenons were inserted into both the bottom board and washstrakes and they seem to have overlapped. There are insufficient examples to determine if these differences are related to different locations or periods.

ICONOGRAPHIC EVIDENCE

Yasui was the first to classify the archaeological evidence for ancient ships.⁷⁶ Kubo added new examples to Yasui's classifications.⁷⁷ They divided the evidence into three categories: ship remains, ship models, and ship depictions. Two or three dimensional representations of ships – images and models – will be considered together as iconographic evidence. Ship images come from a variety of sources including wall paintings and engraving from burial tumuli and caves, and surface paintings on earthenware, clay figures, bronze bell-shaped vessels, and bone tools.

Models often reflect the attitudes of ancient Japanese people toward ships. They may have been used to pacify evil spirits in marine rituals and funerals.⁷⁸ Wood, soil, stone, and clay materials were all used to make ship models, but the clay figures are especially important in reconstructing ancient ships because they carry more details than the other model types. Thus, primary focus is given to clay examples, with only a brief look at figures made of other materials.

Wooden Ship Models

Wooden ship models were widely produced in ancient times up to the early modern period. Over 300 wooden ship models have been found from all parts of the country.⁷⁹ They range in length from 0.1 – 1 m in length. Generally, large models were

⁷⁶ Yasui 1968a.

⁷⁷ Kubo 1987b, 1988.

⁷⁸ Kubo 1988, 48.

⁷⁹ Kubo 1988, 47.

constructed in the Yayoi and Early Kofun periods and thereafter they began to diminish in size. Models over 0.4 m long are usually restricted to before the Early Kofun period; those between 0.1 – 0.3 m in length date typically from the seventh to twelfth centuries, and examples 0.2 m and smaller tend to come from the medieval and early modern periods. Their forms can be divided into two basic types: stereoscopic and flat. There are wooden ship models that bear traces of ink and vermilion, and some are decorated with carved lines representing waves and possibly paddles. There are a number of wooden ship models which have small holes, both through-holes and closed holes. They are found in the bow, washstrakes, and bottom board. The purpose of these holes is unknown, although it is possible that of these represent holes for masts.

Soil Ship Figures

Approximately 40 ship figures made from soil have been found.⁸⁰ Their provenience and date are limited mainly to the Chugoku region from the Yayoi and Kofun periods, and to Hokkaido from the fifth to ninth centuries C.E. Most of these soil models are small, poorly preserved, and lacking in detail. They are all under 10 cm in length, except for one 20 cm example found in the Tsukinowa tumulus in Okayama. There are a number of examples whose extremities are rised up and others wherein one end is more exaggerated than the other. There are also soil figures which have a horizontal piercing in one end. The examples found in Hokkaido, however, appear to

⁸⁰ Kubo 1988, 47.

have a vertical through-hole in one end.⁸¹ The function of these holes is unknown.

Stone Ship Figures

Stone ship figures have been found predominantly in Okinoshima⁸², Fukuoka. From outside of this area, there are only a few examples. So far, more than 130 stone ship figures have been found in ritual sites scattered throughout Okinoshima. They are found in context with stone animal and fish figures and probably had ceremonial significance. Most of them are less than 20 cm in length. Like wooden ship models, stone ship figures can be grouped into stereoscopic and flat types. Most are very simple and do not provide many details about ship construction. Some have holes inside the hull in the center, possibly for a mast. They are dated from the Late Kofun period to the Heian period.

Clay Ship Figures



Fig. 25. Split-hulled and single-hulled figures. (From Adachi 1998, 16)

⁸¹ Kubo 1987a, 284-6.

⁸² Kagamiyama 1958.

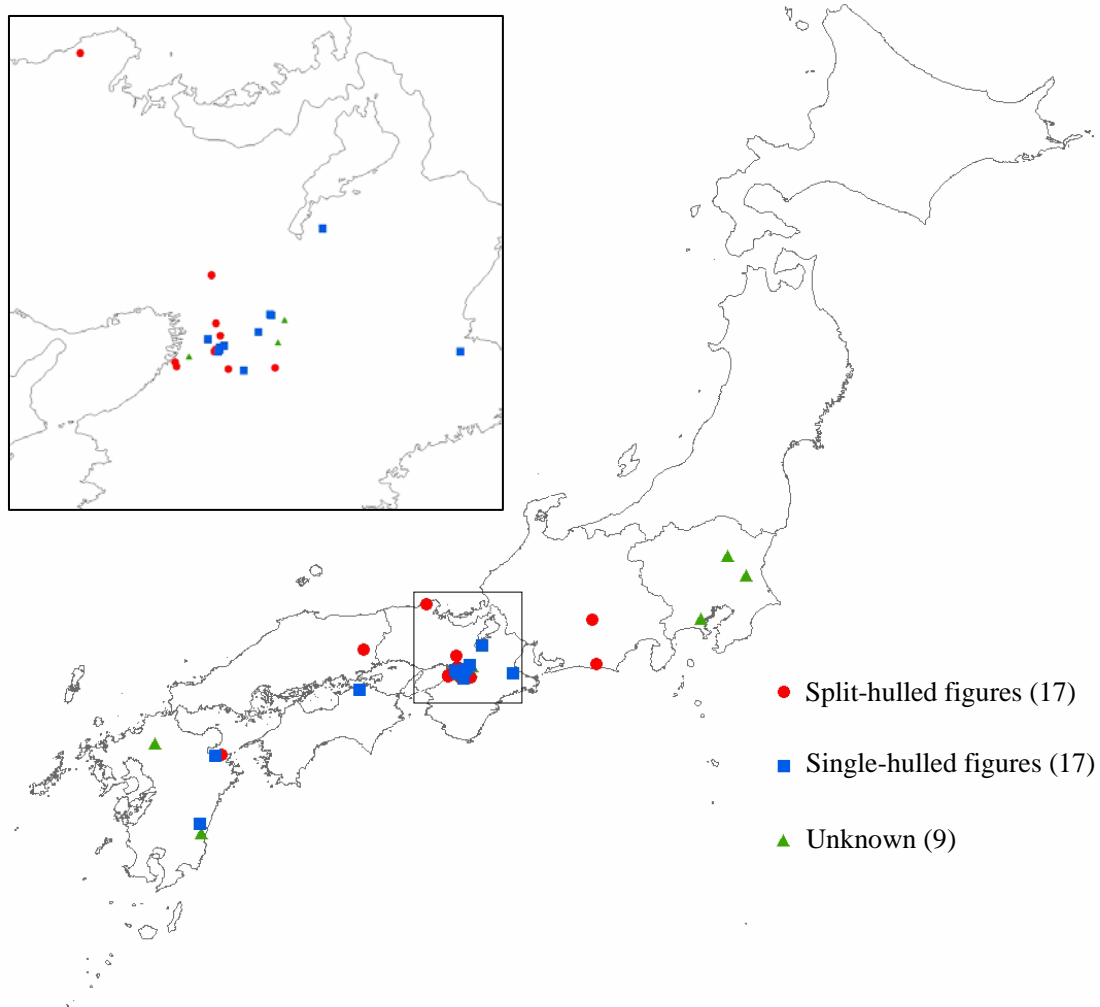


Fig. 26. Map of clay ship figures.

To date, over 40 clay ship figures, called *haniwa*, have been found from throughout the country, though the majority come from the Kinki region (fig. 26).⁸³ They are rare compared to other types of figures. A number of these models are in good condition, while others are fragmentary and with missing pieces. The largest

⁸³ *Haniwa* are distinctive funerary figures found in thousands of Kofun-period tumuli. See APPENDIX C: CLAY SHIP FIGURE LIST.

example is 1.5 m long. Clay ship figures are modeled after semibuilt-up ships and can be divided into two types: split-hulled and single-hulled (fig. 25). The former is a type in which washstrakes are added onto the bottom board and the hull rises away from the bottom board at the bow and stern. A bow and stern end plank are inserted at the branching point to close up the hull to prevent waves from washing in. In the second type, washstrakes are added to the bottom board and both the two remain together all the way to upcurving bow and stern. There is no end plank in single-hulled figures. Split-hulled figures will be referred to as type A and single-hulled figures as type B.

Type A: split-hulled figures

Seventeen of the confirmed clay ship figures are split-hull designed. Representative examples (fig. 27) in good conditions include:

1. Nagahara Takamawari 2

This figure has a rounded bottom board and no pedestal.⁸⁴ The joint between the bottom board and washstrakes is expressed by banded wales. It has two levels of washstrakes, and the upper strakes each have four raised sections that may have functioned as oarlocks. There are two bulkheads at both the bow and stern, with decks between each set of bulkheads. There are two end planks which widen slightly at their upper end, and the deck and bottom board have two small holes. The figure is dated to the late fourth century C.E.

⁸⁴ Board of Education in Matsuzaka City 2003, 11; see also Board of Education in Osaka City 1989, 27; Imanishi and Ogasawara 2000, 10; Okita 1995, 283.

2. Oka

This example has a flat bottom and no pedestal.⁸⁵ The joint between the bottom board and washstrakes is expressed by banded wales. There are two levels of washstrakes, with five oarlock sections on each side of the upper strake. There is one step towards each extremity, as well as two bulkheads at the bow and stern. End planks cap off the washstrakes, and a small hole pierces the center of the bottom board. It is dated to the early fifth century C.E.

3. Bodaiike Nishi 3

This figure has a rounded bottom board and cylindrical pedestals with transverse piercings.⁸⁶ The joint between the bottom board and washstrakes is expressed by banded wales. There are two levels of washstrakes, but no indication of earlocks. A single bulkhead stands at the bow and stern, and rectangular end planks close the washstrakes. The figure is dated to the early fifth century C.E.

4. Nigore

This figure sits on a flat bottom and, again, the joint between bottom board and washstrakes is expressed by banded wales.⁸⁷ It has a single level of washstrake, with seven oarlocks on one side and six oarlocks on the other. One oarlock may be missing.

⁸⁵ Board of Education in Fujiidera City 1989; see also Board of Education in Matsuzaka City 2003, 6; Imanishi and Ogasawara 2000, 10.

⁸⁶ Imanishi and Ogasawara 2000, 12; see also Board of Education in Matsuzaka City 2003, 14; Board of Education in Osaka City 1989, 28; Nogami 1982, 32.

⁸⁷ Imanishi and Ogasawara 2000, 10; see also Board of Education in Matsuzaka City 2003, 7; Okita 2000, 22-3.

There is a large rectangular end plank at one end, while the other end has a smaller plank and a shallower rake. A single bulkhead stands at the bow and stern. The figure is dated to the middle fifth century C.E.

5. Saraike

The figure sits on a flat bottom with no pedestal.⁸⁸ The bottom board and washstrake joints are expressed by banded wales. The washstrake has one level, and there is a pair of bulkheads at both bow and stern. The tops of the outside bulkheads dip slightly before angling down, and the tops of the inner bulkheads are carved out in the center. There are three thwarts for seating inside the ship, and is a small, rounded

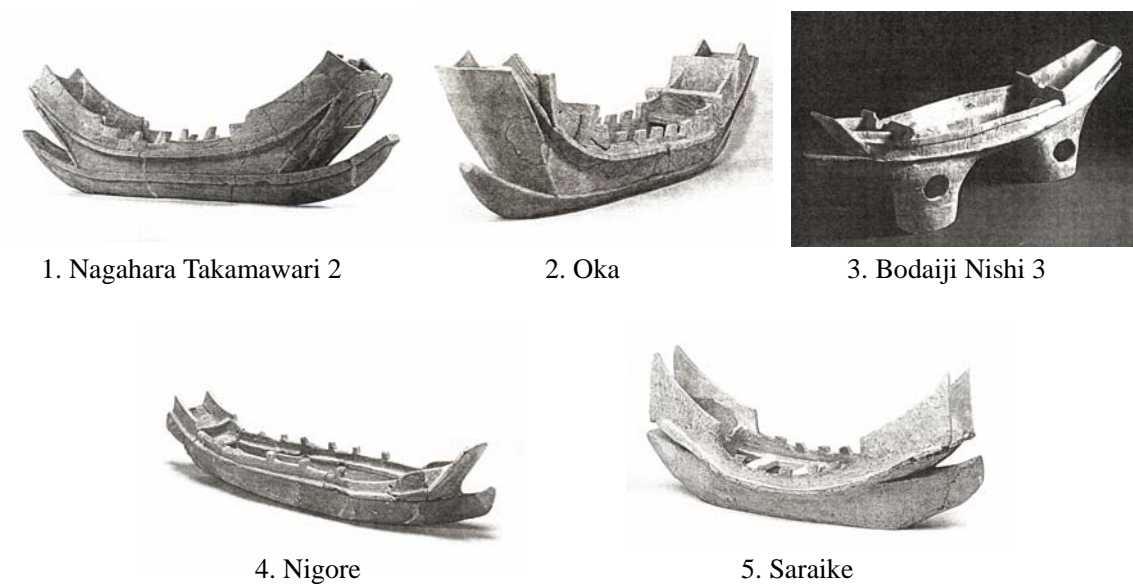


Fig. 27. Split-hulled figures. (From Board of Education in Matsuzaka City 2003)

⁸⁸ Ueno 1997; see also Board of Education in Matsuzaka City 2003, 4.

hole in the center of the bottom board. It is dated to the late fifth century C.E.

Type B: single-hulled figures

Seventeen of the confirmed clay ship figures are single-hulled figures. Representative examples in good condition include (fig. 28):

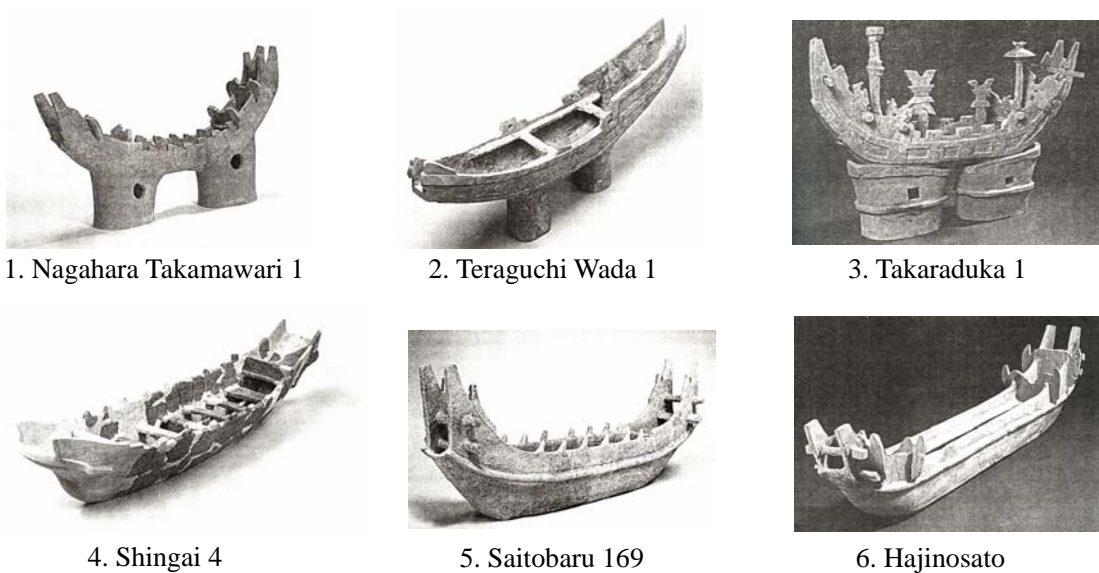


Fig. 28. Single-hulled figures. (From Board of Education in Matsuzaka City 2003)

1. Nagahara Takamawari 1

This ship figure has a rounded bottom board, a washstrake with five oarlocks each side, and cylindrical pedestals.⁸⁹ The joint between the bottom board and washstrakes is depicted as two lines. Both bow and stern rise up at their ends. Pairs of

⁸⁹ Takahashi and Kamo 1988; see also Board of Education in Matsuzaka City 2003, 10; Board of Education in Osaka City 1989, 28; Imanishi and Ogasawara 2000, 12.

heart-shaped bulkheads are present at the bow and stern. To the center of the bottom board is a small, round hole. The figure is dated to the early fifth century C.E.

2. Teraguchi Wada 1

This example has a rounded bottom board and cylindrical pedestals.⁹⁰ The joint between the bottom board and washstrakes is expressed by banded wales. It has two raised L-shaped oarlock sections on each side, which are penetrated by a single hole. There is a thwart at each oarlock position. The hull's profile at the bow and stern is complex. There is an upper washstrake at the stern starting just aft of the last oarlock. The figure is dated to the early fifth century C.E.

3. Takaraduka 1

This is the largest clay ship figure found to date.⁹¹ It has cylindrical pedestals which can be detached from the ship. It has also other removable objects such as a large sword, two scepters, and an umbrella-shaped object used as a symbol of authenticity. It has three wide oarlock sections on each side each of which is pierced with a single hole in its center. The joint between the bottom board and washstrakes is expressed by banded wales. There is a pair of heart-shaped bulkheads at the bow and the stern; the outer bulkheads being larger than the inner ones. There are panels with X-shaped reliefs between the wales, but their purpose is unknown. It may be that they

⁹⁰ Imanishi and Ogasawara 2000, 12; see also Board of Education in Matsuzaka City 2003, 8; Board of Education in Osaka City 1989, 30.

⁹¹ Fukuda and Matsuba 2004; see also Board of Education in Matsuzaka City 2003, 16; Imanishi and Ogasawara 2000, 13.

provided additional strength. There is a long through-beam at the bow and stern and above the outer bulkheads. The figure is dated to the early part of the fifth century C.E.

4. Shingai 4

This figure has no pedestal.⁹² The joint between the bottom board and washstrakes is depicted as double levels of two lines. There are seven oarlocks on each side, with matching number of thwarts on the inside of the hull. There is a bulkhead at each end, but it does not touch the bottom board. There are two holes through the center of the bottom board. This example is dated to the middle of the fifth century C.E.

5. Saitobaru 169

This model has a flat bottom board and no pedestal.⁹³ The joint between the bottom board and washstrakes is expressed by banded wales. The single-level washstrakes have six oarlocks on either side, rise sharply at the extremities, and are bifurcate throughout the length of the boat. There is a deck which has four large open areas providing access to the interior of the hull. There are two through-beams at each end, as well as a bulkhead at the stern, and the bottom board is pierced with a single round hole at its center. The figure is dated to the late fifth century C.E.

⁹² Imanishi and Ogasawara 2000, 10; see also Board of Education in Matsuzaka City 2003, 13.

⁹³ Shimizu 1980; see also Board of Education in Matsuzaka City 2003, 9; Goto 1935a, 1935b; Imanishi and Ogasawara 2000, 13; Kitano 1972, 6-10.

6. Hajinosato

This model has no pedestal.⁹⁴ The joints between the bottom board and washstrakes are expressed by banded wales. There are two heart-shaped bulkheads and two square through-beams at either end. There is a small hole in the center of the bottom board.

Discussion

Clay ship figures are divided into two types: split-hulled figures and single-hulled figures. The number of known examples of each type is almost identical.

Two shapes of bottom boards – rounded and flat – are exhibited, and examples of both shapes are found in each type of hull. Washstrakes can be made up of one or two levels. Dual-level washstrakes are slightly more common in type A, but both types have examples of both single and double level washstrakes. End planks are only found in type A. There are shield-shaped and rectangular end plank, wherein the latter seem to be simplified versions of the shield-shaped planks. Type A figures sport bulkheads, whereas type B figures may have bulkheads or through-beams or a combination of the two.

Considering the structure of the clay ship figures and their chronological order, type B figure appear to be more technologically complex than type A. However, both types seem to have developed concurrently and, therefore, must demonstrate different genealogies.

⁹⁴ Board of Education in Matsuzaka City 2003, 12.

According to the remains of semibuilt-up ships which were discussed in the previous section, only split-hulled types have been found so far. However, because the ship remains are analogous to the clay figures, it is possible that single-hulled ships may one day be discovered.

Pictures

The number of illustrations depicting Japanese ships is too numerous to be treated properly here (figs. 29, 30). Several of the most diagnostic examples have been selected for discussion.

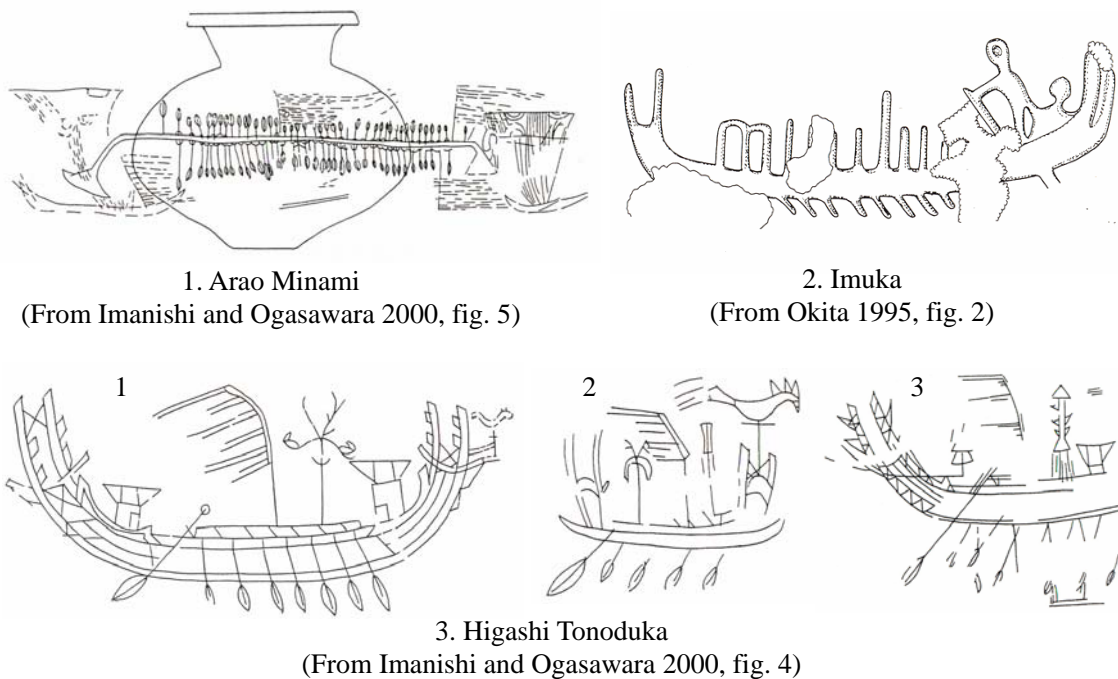


Fig. 29. Pictures of ships (1).

1. Arao Minami

An earthen pot decorated with three ship depictions and dated to the Late Yayoi period was found in the Arao Minami site at Gifu.⁹⁵ It is one of the oldest ship illustrations in Japan. There is a large ship with 82 paddles in the center, flanked on either side by a smaller ship with a square sail. The center and left ships are decorated with square flags.

2. Imuka

Three ships are depicted in relief on a decorative bronze, bell-shaped vessel from the Yayoi period.⁹⁶ At the stern of the best preserved ship is a person handling a steering oar. On the port side, there are more than eight paddles or oars. Both ends curve up sharply.

3. Higashi Tonoduka

Three ships are painted on a cylindrical clay figure from the Higashi Tonoduka site in Nara and dated to the fourth century C.E.⁹⁷ The first and third ships have sharply rising ends similar to the type B ship models, but the second one seems to have end planks in the style of type A ships. The first and second ships have a bird perched on the bow. Paddles or oars are depicted on all three ships, and each has some sort of

⁹⁵ Imanishi and Ogasawara 2000, 30; see also Fukazawa 2005, 12; Okita 1998, 288-9; Owa 1997, 134-5; Sawara 1997, 5.

⁹⁶ Okita 1995, 280-1; 1998, 287-9; 2000, 22; see also Fukui Prefectural Wakasa History and Folklore Museum 1985, 39; Namba 1955, 4; Tanaka 1983, 3.

⁹⁷ Imanishi and Ogasawara 2000, 30; see also Fukazawa 2005, 12; Okita 1998, 289-90; 2000, 23-4; Owa 1997, 130-1; Sawara 1997, 3-4.

rod or pole in the center bearing what appear to be flags. A superstructure with a trapezoidal roof is seen on ships 1 and 3, and umbrellas are seen on ships 1 and 2. All three ships sport a steering oar at the stern.

4. Hakaza

Fifteen ships are incised on a board found in a trench at the Hakaze site in Hyogo.⁹⁸ The board is 1.97 m long, 0.16 m wide, and 2 cm thick and is made of *Cryptomeria japonica* D. Don. It is dated from the Late Yayoi period to the Early Kofun period. All ships face to the left and no means of propulsion are depicted. Both ship types A and B ships are confirmed. One ship, likely a scout, is depicted to the left of the scene, away from the other vessels.

5. Karako

A single ship is painted on a Kofun-period cylindrical clay figure from the Karako site in Nara.⁹⁹ Its ends curve up and have two umbrella-like structures and a superstructure with trapezoidal roof. Lines which seem to be through-beams are depicted at both the bow and stern. Two lines crossed on top of the through-beams.

6. Mezurashiduka

A wall painting in the Kofun-period Mezurashiduka tumulus in Fukuoka

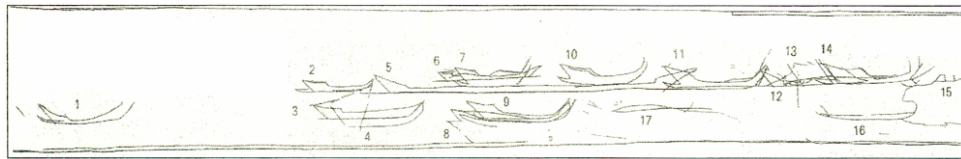
⁹⁸ Fukazawa 2005, 14; see also Okita 2005, 16-7.

⁹⁹ Kitano 1972, 10-1; see also Imanishi and Ogasawara 2000, 30; Kobayashi 1941; Namba 1955, 3; Nishitani 1960.

depicts a single ship.¹⁰⁰ It has up-curving, a bird on its bow, and a person holding a steering oar at the stern. Two poles with a line between them stand forward on the ship, possibly depicting a sail.

7. Torifunetsuka

A ship which resembles that from Mezurashiduka is painted on the wall of the Torifunetsuka tumulus in Fukuoka, also from the Kofun period.¹⁰¹ Its ends rise up sharply and both have a bird on them. A person mans the steering oar at the stern. Two poles connected with a line near the top are also depicted towards each end.



4. Hakaze
(From Okita 2005, fig. 1)



5. Karako
(From Kitano 1972, fig. 3)



6. Mezurashiduka
(From Imanishi and Ogasawara 2000, fig. 6)



7. Torifunetsuka

Fig. 30. Pictures of ships (2).

¹⁰⁰ Imanishi and Ogasawara 2003, 32.

¹⁰¹ Takahashi 1992, 14. see also Imanishi and Ogasawara 2003, 32.

Discussion

Most of the ships depicted on walls, earthenwares, clay figures, and bronze vessels rise up their ends. They are similar to the single-hulled clay ship figures. There are depictions of ships which seem to have split-hulls, but these are rare. Propulsion tools such as paddles or oars, steering oars, and sails are sometimes depicted. These will be discussed further in the following section. Furthermore, some superstructures and items such as flags and umbrellas are also depicted. It has been pointed out that birds, which are sometimes depicted on the end of ships in the West may be related to navigation.¹⁰²

¹⁰² Wachsmann 1998, 300.

PROPULSION TOOLS

Rowing

A number of paddles have been found along with logboat remains from the Jomon period.¹⁰³ Paddles have been found at Kamo, Hatamchi, Torihama, and Yokaichiba.¹⁰⁴ They include paddles decorated with sophisticated carvings and some with pierced handles. Furthermore, the shaft was extended into the blade of the paddle, making it appear like a ridge running down the center of the blade. After the Yayoi period, as already seen, many depictions include paddles or oars. Paddlers are positioned facing the bow, but rowers face the stern. It is difficult to distinguish paddles from oars in the pictures because people are seldom depicted and when they are, it is indiscernible which direction they are facing. Most of the clay ship figures have oarlocks along their sides, indicating that oars were used from at least the Kofun period. It is assumed that paddles were used on the small ships and oars were used on the large vessels.

Sail

Specific archaeological evidence for sails in the ancient period has yet to be found. However, there are a number of pictures from the Yayoi and Kofun period which seem to depict sails (figs. 31, 32). Uemura catalogued likely sailing ships, found

¹⁰³ Kosada 1978, 131; see also Ishii 1983, 13.

¹⁰⁴ Matsumoto 1978, 52-7.

predominantly in tumuli wall paintings and discussed them.¹⁰⁵

1. Harada

A line drawing of sailing ship is incised on the bottom of an earthenware vase found in Harada, Kagoshima. It looks to have a square sail. It is dated from the end of fourth to the initial fifth century C.E.

2. Yanboshiduka

Two ships which have a mast are incised on the wall of a chamber tomb dug into a side of a tumulus in Yanboshiduka, Kumamoto. Both of them are ships with sharply rising ends. The form of sail is unknown. It is dated to the late fifth century C.E.

3. Hyakutagashira

Two sailing ships are incised on the walls of the chamber tomb dug into a side of the rounded tumulus in Hyakutagashira, Nagasaki.¹⁰⁶ One has a square sail and the other appears to have triangular sails. These sails are tied with lines from the ends of both the bow and stern. On the square sailing ship, two lines on the center of the ship depict the mast. Lines which seem to be stern rudder or steering oar are also depicted. They are dated to the end of sixth century C.E.

¹⁰⁵ Uemura 1991.

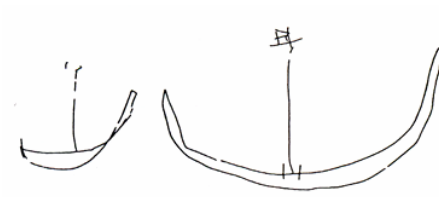
¹⁰⁶ Takahashi 1992, 14.

4. Karanegadake

One ship is incised on a cylindrical clay figure found in Karanegadake, Kyoto.¹⁰⁷ Two poles which have two lines between them on one end seem to be a sail. Lines on the opposite end are difficult to interpret, but might represent an end.



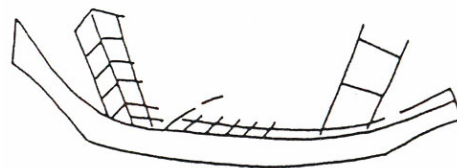
1. Harada
(From Uemura 1991, fig. 2)



2. Yanboshiduka
(From Uemura 1991, fig. 2)



3. Hyakutagawa
(From Uemura 1991, fig. 4)



4. Karanega
(From Okita 1995, fig. 3)

Fig. 31. Pictures of sailing ships (1).

5. Karimata

A number of sailing ships are incised on the walls of a chamber tomb dug into a side of the tumulus in Karimata, Kumamoto. On the east side, a group of approximately ten ships overlap along with designs of leaves. The area of the grouping

¹⁰⁷ Okita 1995, 282.

extends 1.62 m in width and 0.76 m in height. The ships have steeply curving ends and appear to have square sails though they are difficult to distinguish. On the west side there is a single more distinguishable sailing ship, which extends to 0.75 m in width and 0.55 m in height. It seems to have a triangular sail. It is dated to the early seventh century C.E.

6. Sorayama

Several sailing ships along with fishes, birds, and leaves are incised on the walls of a chamber tomb dug into a side of the tumulus in Sorayama, Tottori. Both square and triangular sails are shown. It is dated from the end of sixth to the early seventh century C.E.

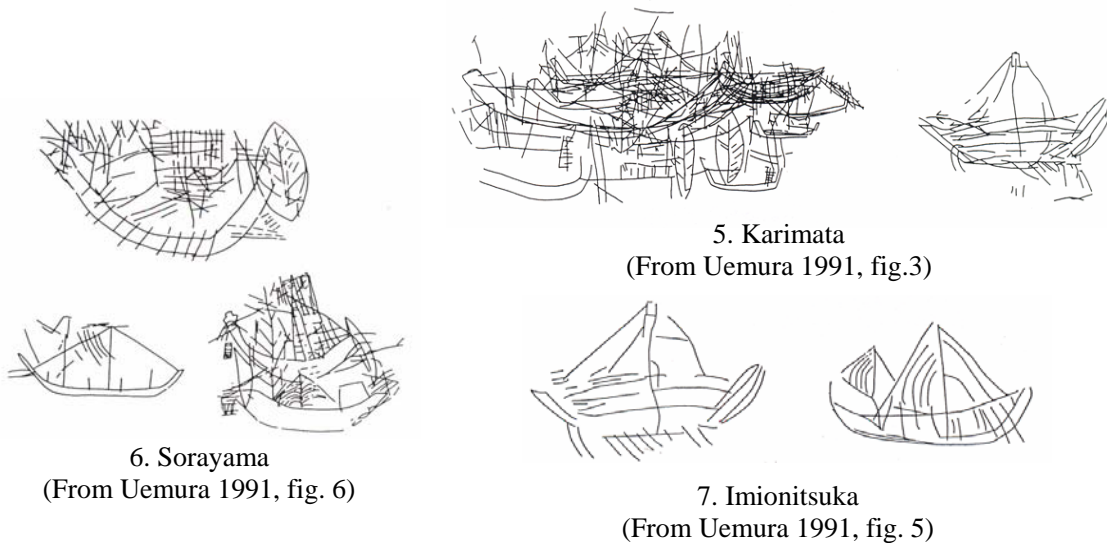


Fig. 32. Pictures of sailing ships (2).

7. Imioniduka

A number of sailing ships are incised on the walls of a chamber tomb dug into a side of the small rounded tumulus in Imioniduka, Oita. Several overlapping ships along with two men are depicted. There is also a two-masted sailing ship, which seems to be carrying triangular sails. It is dated to the end of seventh century C.E.

Discussion

After the sixth century, the examples of sailing ships increase in number. It seems that line drawings from the late sixth century to the early seventh century are dominant. It seems that the sources for sailing ships are abundant in the western side of the Kyushu region and the Sanin region facing the Sea of Japan. The ships depicted on the earthen pot which was found in the Arao Minami site were discussed in the previous section, dated to the Late Yayoi period. This picture seems to be the oldest example of a ship with a sail. If they truly are sails, sails must have existed at least by the Late Yayoi period.

It seems that there were several types of sails at the ancient period. There were illustrations which had two masts which were in parallel. Ishii suggested a rush mat was set between these parallel masts and were a primitive sail.¹⁰⁸ It is known that such sails were also used in the ships of Ainu in the early modern period. They were only used in a fair wind and cannot be large in size. Therefore, they were secondary propulsion tools. If the sails in the ancient illustrations were like of those of Ainu, their

¹⁰⁸ Ishii 1983, 14.

capability might have been the same. Meanwhile, illustrations of triangular or square sails on a centrally-placed mast were also found. It seems that these sails were the next stage. Ishii assumed these sails on one mast developed in the initial Heian period, but from these illustrations, they seem to have appeared before that.

In addition to the wall paintings, Uemura reported stone ship models appeared to have sails. Although stone ship figures are briefly discussed in the previous section, he pointed out that the holes which stone ship figures have in the center of the models were for stepping a mast. As already seen, clay ship figures, wooden ship models as well as stone ship figures have similar holes. While it is possible that these holes are for stepping masts, Ishii suggested that the holes in the clay ship figures are actually for drainage.¹⁰⁹ As the clay ship figure found in Takaraduka has some kind of removable decorative objects and there are a number of pictures which have ornamentation such as flags and umbrellas, these holes might be for inserting these decorative pieces. Although there are many possibilities, it is still uncertain what these holes are for.

¹⁰⁹ Ishii 1983, 14.

COMPARISON WITH WATERCRAFT FROM OTHER COUNTRIES

Only ancient ships of Japan have been discussed so far. However, as Japan is an island country, it is taken for granted that interaction with the continent must have been conducted by ship since ancient times. Especially after the Yayoi period, Japan was greatly influenced by the continent in several ways. Wet-rice cultivation and metal-working technology were brought to Japan at that time and it is possible that shipbuilding technology was also carried with it which affected the development of ships in Japan. Therefore it is necessary to look at ships from neighboring countries across the sea.

Logboat Remains

Compared to the examples of ship remains of Japan, those of both China and Korea are limited. Logboat remains, especially from ancient times, which have been confirmed, are the following:

1. China

According to Wang, about 20 logboats from 2000 B.C.E. to the Tang Dynasty (618 – 907 C.E.) have been found.¹¹⁰ Composite logboats and semibuilt-up ships have been also found.

A composite logboat, which is also semibuilt-up ship, was found in Wujin,

¹¹⁰ Wang 2000, 19-20.

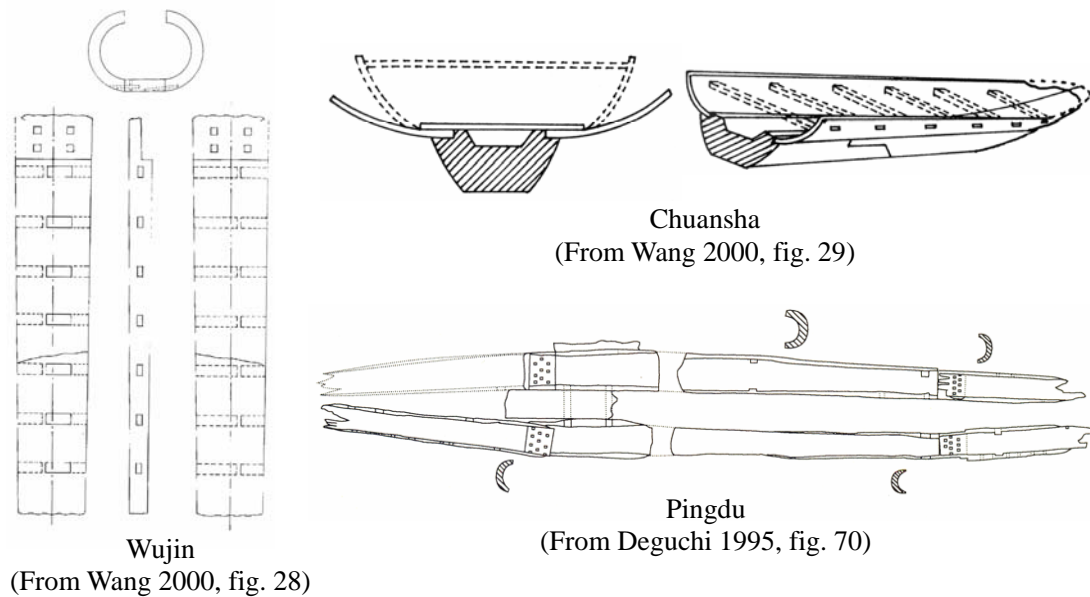


Fig. 33. Logboat remains in China.

Jiangsu in 1975 during the work on a water facility for a paddy (fig. 33).¹¹¹ It was fully investigated in 1982 and was dated to the Han Dynasty (206 B.C.E. – 220 C.E.). It was approximately 20 m in length and 1 m in width. The remains were bottom board, washstrakes, and tenons. The bottom board was consisted of three parts: bow, body, and stern. They were connected by use of scarfs overlapping. The joint area was 0.34 m in length and 0.64 m in width. Four holes were bored through the joined scarf. 5 cm by 5 cm square treenails were inserted into each hole and fixed.

A twin-hulled composite logboat dated to the Sui Dynasty (581 – 618 C.E.) was found in Pingdu, Shandongsheng.¹¹² The hull remains are 20.24 m in length and the original length is estimated to be 23 m. The right and left hulls each consisted of three

¹¹¹ Kitano 1982; see also Wang 2000, 28-9.

¹¹² Deguchi 1995, 258; see also Wang 2000, 93-4.

sections joined together. They were made of *Cinnamomum camphora* Sieb. and *Liquidambar* which did not grow in Shandongsheng. This suggests that there was contact with the southern part of China for wood sources and ship construction.

A riverine composite logboat dated to the Sui Dynasty or the Tang Dynasty was found in Chuansha, Shanghai.¹¹³ It was made of *Cinnamomum camphora* Sieb. It was also consisted of three parts. Washstrakes were added on the sides of the hull.

2. Korea

A logboat dated to 6,000 B.C.E was found at Changnyeong County in South Gyeongsang Province in 2005. It is 3.1 m in length, 0.6 m in width, and 0.2 m in height. It is made of pine and the original length seems to have been at least 4 m.

A composite logboat was found in Chindo (fig. 34).¹¹⁴ It is made of

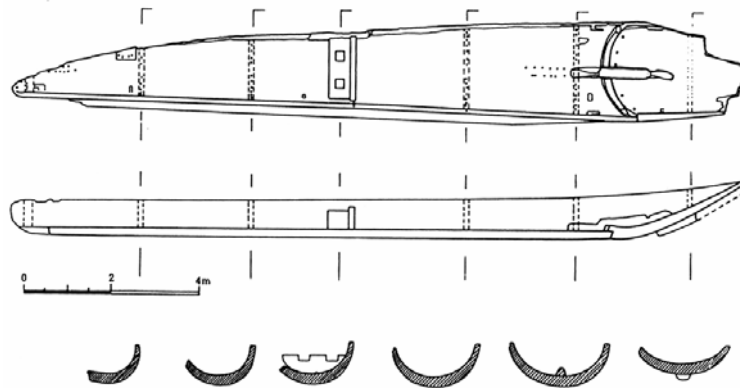


Fig. 34. Chindo. (From Deguchi 1995, fig. 72)

¹¹³ Deguchi 1995, 258-9; see also Wang 2000, 28-9.

¹¹⁴ Deguchi 1995, 259-61.

Cinnamomum camphora Sieb. and is 16.85 m in length, 2.34 m in width and 0.75 m in height. It was estimated to be 20 m in original length. It was 10 cm to 23 cm thick and had a mast. It consisted of three parts. The fastening method of the hull pieces was *inrotsugi*. The joint section was 0.5 m long. The outside of the joint was smooth, but the inside was uneven. Therefore, frames were put over the joint section. The joint was fixed by both the *kannuki* technique and iron nails. Putty made of wood oil and lime was used for caulking the joint. It was radiocarbon dated to 1260 to 1380 C.E. This vessel is believed to have been as a cargo ship that ran between Korea and China.

Iconographic Evidence

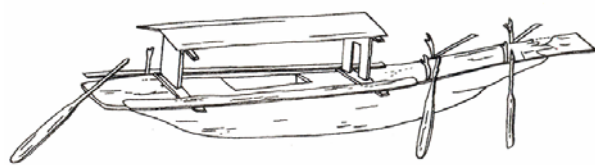
1. China

A wooden model of a ship was found as part of a collection of burial goods in Jiangling Xian, Hubei (fig. 35).¹¹⁵ It is dated to the Western Han Dynasty (208 B.C.E. – 8 C.E.). It was found in pieces, but was well enough preserved to reconstruct. It is 0.71 m in length and 0.1 m in width. It has a square shape on plan view and a broad deck. Both ends of the ship rise up. It has a superstructure which has a roof. Five paddles were also found and it is believed that two are used on each side and one is a steering oar. On the bow, there are four poles. If they are oarlocks, this ship would have been oared.

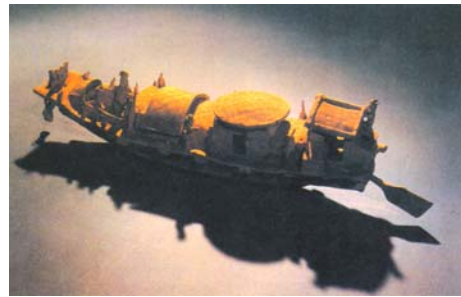
A ceramic ship figure dated to the Eastern Han Dynasty (25 – 220 C.E.) was

¹¹⁵ Kitano 1975, 1-3; see also Wang 2000, 63.

found in a tomb in Guangzhou (fig. 35).¹¹⁶ It is a semibuilt-up ship and has a different profile at the bow and stern. It is 0.54 m in length, 0.155 m in width, and 0.16 m in height. It has a superstructure and a stern rudder. In addition to this model at least a dozen of other wooden and clay models were reported from a nearby tomb of the same period.¹¹⁷ They represented a wide range of sizes indicating the early diversity of ship types in this region.



Jiangling Xian
(From Wang 2000, fig. 61)



Guangzhou
(From Wang 2000, fig. 4)

Fig. 35. Iconographic evidence in China.

2. Korea

It is not rich as Japan, but a dozen iconographic examples such as wall paintings and clay ship figures have been found.¹¹⁸

Four ships capturing a whale are depicted in a petroglyph in Bangudae. It seems to be dated to the Bronze Age (1000 – 300 B.C.E.). All of them have rising ends

¹¹⁶ Kitano 1983; see also Ishii 1983, 7.

¹¹⁷ Kitano 1983, 25.

¹¹⁸ Kaku 1988.

and a horizontal protrusion at one end (fig. 36).

Clay ship figures which seem to be semibuilt-up ships have been found mainly from the fifth and sixth century C.E. There are two types of clay ship figures, just as in Japan: split-hulled figures and single-hulled figures. Split-hulled figures have end planks at the bow and stern of the bottom board of logboats. Single-hulled figures rise up at the ends. Washstrakes and bulkheads are attested on both types. Oarlocks and thwarts are also seen. These features of clay ship figures are similar to those of Japan.

Two ships are incised on a petroglyph in Cheonjeon-Ri, Ulju. They are dated to the Unified Silla (668 – 918 C.E.). They seem to have sails and person who has a steering oar or paddle.

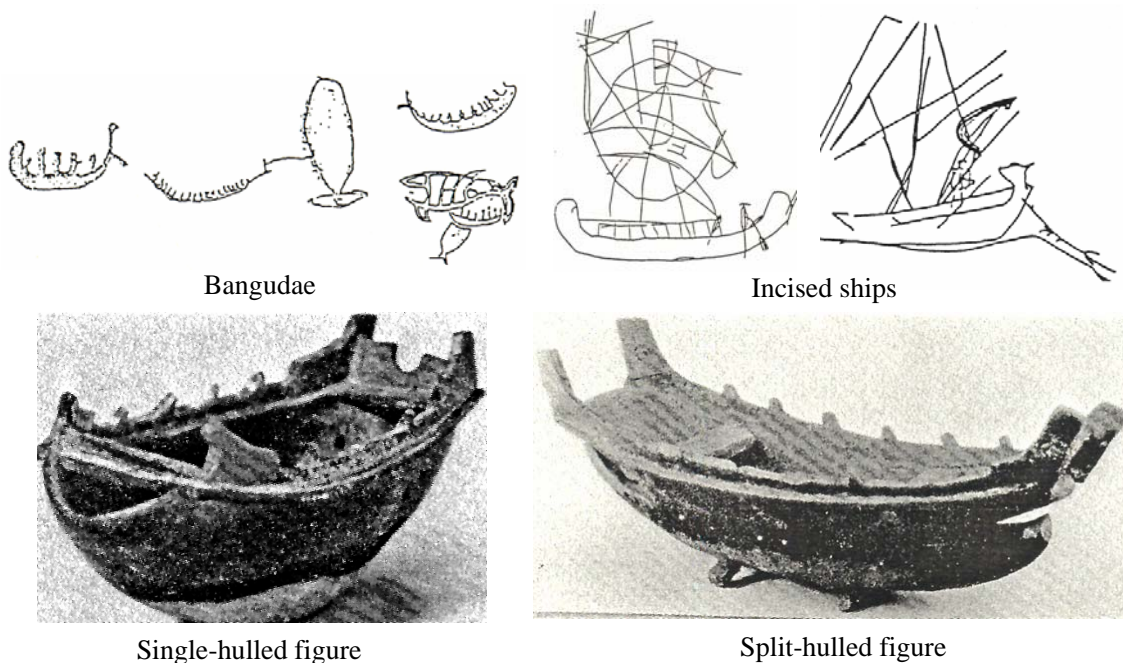


Fig. 36. Iconographic evidence in Korea. (From Kaku 1988, 68-9)

Discussion

Although there are fewer archaeological examples of logboats in China than in Japan, the ships of China seem to have developed earlier than Japan. From the archaeological remains of ships, semibuilt-up ships have been confirmed in the Han Dynasty. Furthermore, based on the iconographic evidence, it is most likely that the appearance of stern rudders and superstructures in China goes back to at least the Han Dynasty. While clear examples of sails have not been found so far, significantly advanced ships must have appeared in ancient times.

It is pointed out ships in the Korean Peninsula also developed from logboats to semibuilt-up ships like the development process of ships in Japan, although the archaeological remains are few and iconographic evidence is mainly restricted to the fifth and sixth centuries C.E. and to the southern part of the Peninsula.¹¹⁹ Points of similarity between Korea and Japan have been confirmed in iconographic evidence, showing that there is a strong cultural linkage.

It should be noted that composite logboats were also found in China and Korea. The structure of ships in China seems to be a little different from that in Japan. However, the concept of connecting logs fore and aft seems to be the same. It is interesting that the example found in Korea had an *inrotsugi* and *kannuki* technique and iron nails for the fastening which were the same as examples from Japan, although its date is in more recent years. It is feasible that these techniques of composite logboats derived from the continent and were brought to Japan along with wet-rice

¹¹⁹ Kaku 1988, 67.

cultivation and metal-working technology.

Due to the lack of the remains, it is difficult to know detailed information about ship construction in the continent. It is expected that more remains will be found in the near future.

CONCLUDING REMARKS

Based on the studies of ancient ships of Japan made since the World War II, the actual process of ship development has gradually become clearer. Most of the research has focused on the transition from logboats to the semibuilt-up ships. The number of logboat remains which have been found from all over the country has increased over time. In particular, a large number of logboats dated to the Jomon period have been found, and therefore it is likely that logboats were commonly used at that time.

Ship remains from after the Yayoi period are still a few, although they have increased in number recently. Several end planks which resemble those seen in the split-hulled type A clay ship figures have been found, but clear evidence for single-hulled type B ships has not been found yet. Clay ship figures show detailed information, so type B and other features such as bulkheads, through-beams, and oarlocks can be expected to be found in the future.

As mentioned above, Adachi suggested the joining techniques changed from *hiratsugi* to *kasanetsugi*. Most of the semibuilt-up ships found so far were made using *hiratsugi* and seem to have been fastened by lashing and tenons. One example found in Sagisu was probably made by *kasanetsugi* using tenons, but its date is not clear. Although Adachi's comprehensive analysis seems to be reasonable, discoveries of more recent ships are necessary in order to have a decisive proof.

It is documented that in the seventh century C.E., the Japanese government started sending official diplomatic delegations to China, during the Sui and Tang

dynasties. Embassies to Tang China continued over two centuries. Ships used in these delegations are assumed to have been the Chinese junk type which had a keel and a V-shaped cross section based on documents and illustrations.¹²⁰ However, these ships were specially built and these techniques seem not to have been adopted into the traditional shipbuildings of Japan. Basically, most Japanese ships are based on the *tanaita* construction and the features of Chinese ships are not seen in the development process.

After the Yayoi period, Japanese ships diversified according to the purpose of their use. As mentioned above, logboats had been used as small boats and composite logboats appeared in order to expand in size, then extended logboats or semibuilt-up ships were produced so as to increase tonnage capacity and seaworthiness. Like ships used in the delegations, the Chinese junk type probably existed in Japan but probably only in limited regions.

Watercrafts have been irreplaceable tools for people's lives since the ancient times. People have used different ships in different areas.¹²¹ Ships reflect the technologies of the times and they can provide insights into cultural contacts and the transmission of ideas. Future discoveries may shed more light on the process of ship development in Japan which in turn may give us a better understanding of ancient Japanese people and culture.

¹²⁰ Ishii 1983, 25-9.

¹²¹ Hornell 1970; see also Greenhill 1995; McGrail 2003.

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APPENDIX A
CHRONOLOGY OF JAPANESE PERIODS

Jomon	11,000 – 300 B.C.E.
Incipient Jomon	11,000 – 8,000 B.C.E.
Initial Jomon	8,000 – 4,000 B.C.E.
Early Jomon	4,000 – 3,000 B.C.E.
Middle Jomon	3,000 – 2,000 B.C.E.
Late Jomon	2,000 – 1,000 B.C.E.
Final Jomon	1,000 – 300 B.C.E.
Yayoi	300 B.C.E. – 300 C.E.
Early Yayoi	300 – 100 B.C.E.
Middle Yayoi	100 B.C.E. – 100 C.E.
Late Yayoi	100 – 300 C.E.
Kofun	300 – 700 C.E.
Early Kofun	300 – 400 C.E.
Middle Kofun	400 – 500 C.E.
Late Kofun	500 – 700 C.E.
Aska	538 – 710 C.E.
Nara	710 – 794 C.E.
Heian	794 – 1192 C.E.
Kamakura	1192 – 1336 C.E.

Muromachi	1336 – 1573 C.E.
Aduchi Momoyama	1573 – 1603 C.E.
Edo	1603 – 1867 C.E.
Meiji	1868 – 1912 C.E.
Taisho	1912 – 1926 C.E.
Showa	1926 – 1988 C.E.

PERIODIZATION

The ancient period	– 1167 C.E.
The medieval period	1167 – 1568 C.E.
The early modern period	1568 – 1867 C.E.

APPENDIX B
GLOSSARY OF TERMS

- bottom board (船底材) A section of a hull up to the turn of bilge.
- bow (舳・船首) The forward part of a vessel.
- built-up (plank-built) ship (構造船) A ship which does not use a logboat as a bottom board but only composed of planks.
- bulkhead (隔壁) Transverse and longitudinal partitions of a vessel.
- composite (multiple) logboat (複材刳船) A logboat which consists of two or more hollowed logs and has no washstrake.
- concave type(凹形) A cross section type of logboats, in which the top and bottom of a log are cut and one edge is hollowed out and the other is used as the bottom of the boat.
- end plank (豎板) A plank inserted into either bow or stern to close up the hull.
- hako-gata* (箱型) A plan view type of logboats, which has an elongated box shape with square ends.
- hiratsugi* (平継ぎ) A construction technique which planks are joined edge to edge in carvel style.
- inrotsugi* (印籠継ぎ) A joining method which two parts overlap like a scarf.
- kannuki* technique (門技法) A method to fix the joint parts by *inrotsugi*.
- kasansugi* (重ね継ぎ) A construction technique which planks overlap as in clinker-built or lapstrake style.

katsuobushi-gata (鯉節型) A plan view type of logboats, which has a rounded bow and stern, and a pronounced sheer with a long elliptical shape.

kawara (カワラ) A bottom central plank.

logboat (単材刳船・丸木舟) A watercraft which is a hollowed out log and has no adjunctive structure.

mortise (ほぞ穴) A cavity cut into a timber to receive a tenon.

omoki (オモキ) A L-shaped timber hollowed out of a log, a chine.

omoki construction (面木造り) A construction, which used *omoki* as curved sections to transition from the bottom to sides of a ship.

secchu-gata (折衷型) A plan view type of logboats, which has rounded bow and square shaped stern.

semibuilt-up ship (extended logboat) (準構造船) A ship, which uses a single logboat or composite logboat as a bottom board and extends it by adding washstrakes on the sides.

semicircular type (半円形) A cross section type of logboats, in which a log is cut at the center and is hollowed out from the inner cutting section.

shiki (シキ) A bottom central plank.

special semicircular type (半円特殊形) A cross section type of logboats, which looks similar to the semicircular type, but it is either cut only shallowly before hollowing or hollowed directly from a full log.

stern (艫・船尾) After end of a vessel.

tana (タナ) A strake, which sometimes formed two or three overlapping sections of

planking.

tanaita construction (棚板造り) A construction, which used *kawara* overlapped the adjacent planks, like lapstrake construction, and added *tana*.

tenon (ほぞ) A wooden projection cut from the end of a timber or a separate wooden piece that was shaped to fit into a corresponding mortise.

waritake-gata (割竹型) A simple logboat type that is hollowed out of a log.

washstrake (舷側板・タナ) A plank that forms the lower part of a bulwark.

APPENDIX C
LOGBOAT LIST

no	prefecture	city	site	period	size	material	status	type
1	Fukuoka	Fukuoka	Imajuku Goroe	Late Yayoi	L=1.48		body	
2	Fukuoka	Maebaru	Uruu Jidokyu	Late Yayoi	L=3.10 W=0.82 T=0.035 (body) L=1.20 W=0.65 T=0.045 (stern) L=1.50 W=0.23 T=0.025 (washstrake)	<i>Cinnamomum camphora</i> Sieb. <i>Cryptomeria japonica</i> D. Don	bottom board, stern, washstrake, barks of cherry tree	semibuilt-up ship
3	Nagasaki	Isahaya		Yayoi	L=1.90			
4	Nagasaki	Isahaya		Yayoi	L=1.10			
5	Nagasaki	Nishisonogi	Ikiriki	Early Jomon	L=6.50 W=0.76 T=0.025-0.05			
6	Kumamoto	Aso	Myojinyama	Late Yayoi	L=3.00 W=0.70 T=0.05-0.08			
7	Kumamoto	Kikuchi						
8	Miyazaki	Nobeoka		Kofun	L=1.43 W=0.37 H=0.10	<i>Cinnamomum camphora</i> Sieb.		
9	Yamaguchi	Abu				<i>Abies firma</i> Sieb. et Zucc.		
10	Hiroshima	Mihara				<i>Aphananthe aspera</i> Planch.		
11	Shimane	Matsue	Nishikawatsu	Early Kofun	L=0.70	<i>Cryptomeria japonica</i> D. Don	bow	
12	Shimane	Hikawa	Inome Dokutsu		L=2.20 W=0.5	<i>Cryptomeria japonica</i> D. Don		
13	Shimane	Masuda	Okite	Middle Yayoi	L=5.30 W=0.55 H=0.12		almost complete	
14	Shimane	Masuda	Okite	Middle Yayoi	L=3.13 W=0.36		half	
15	Shimane	Matsue	Shimadai Konai	Early Jomon	L=6.04 W=0.57	<i>Cryptomeria japonica</i> D. Don	almost complete	
16	Shimane	Matsue	Satakobu	Final Jomon	L=0.93 W=0.26		fragments	
17	Shimane	Matsue	Satakobu	Final Jomon	L=1.16 W=0.24		fragments	
18	Shimane	Izumo	Santadani I	Late Jomon	L=5.54 W=0.60 H=0.15		almost complete	
19	Tottori	Tottori	Katsurami	Late Jomon	L=7.24 W=0.74 H=0.35	<i>Cryptomeria japonica</i> D. Don	almost complete	
0	Tottori	Tottori	Katsurami	Late Jomon	L=6.41 W=0.70 H=0.10		almost complete	
21	Tottori	Tottori	Higashi Katsurami	Late Jomon	L=1.05 W=0.50		fragments	
22	Tottori	Tottori	Shima	Final Jomon	L=0.66 W=0.55 H=0.15		fragments	
23	Tottori	Tottori	Sainotani	Kofun				paddy field boat?
24	Tottori	Tottori	Aoya Kamijichi	Late Yayoi	L=4.70		almost complete	
25	Tottori	Tottori	Aoya Kamijichi	Late Yayoi	L=3.50 W=0.40		almost complete	
26	Tottori	Tottori	Aoya Kamijichi	Late Yayoi	L=0.42 W0.39		fragments	
27	Tottori	Tottori	Aoya Kamijichi	Middle Yayoi	L=0.35 W0.2		fragments	
28	Tottori	Tottori	Aoya Kamijichi	Late Yayoi	L=1.31 W=0.2		fragments	
29	Tottori	Tottori	Aoya Kamijichi	Late Yayoi	L=1.2 W0.25		fragments	

no	prefecture	city	site	period	size	material	status	type
30	Tottori	Yonago	Megumi	Early Yayoi	L=0.76 W=0.29 H=0.10		fragments	
31	Tottori	Iwami	Kuriya	Late Jomon	L=7.00 W=0.60	<i>Zelkova serrata</i> Makino.		
32	Ehime	Matsuyama	Kodera	Yayoi				
33	Tokushima	Tokushima	Minami Sako Josuijo	Early Yayoi				
34	Tokushima	Naruto	Renkon Batake		L=2.4 (bow) L=1.1 (body) W=0.4 H=0.26			
35	Kochi	Nagaoka	Akibashi	Middle Kofun		<i>Cinnamomum camphora</i> Sieb.		
36	Kochi	Nankoku						
37	Kochi	Agawa	Hatta	Late Kofun	L=2.70 W=0.75	<i>Chamaecyparis obtusa</i> Sieb. et Zucc.		
38	Hyogo	Himeji	Nagakoshi	Middle Kofun	L=1.38	<i>Cinnamomum camphora</i> Sieb.	bottom board, barks of cherry tree	semibuilt-up ship
39	Hyogo	Kawanishi	Sakane	Late Kofun	L=4.30 W=0.50 T=0.04-0.05	<i>Chamaecyparis obtusa</i> Sieb. et Zucc.		composite logboat
40	Hyogo	Kinosaki		Late Yayoi	L=3.40 W=0.38 H=0.15			
41	Osaka	Osaka	Tenjinbashi	Kofun	L=7.77 W=0.38 H=0.67	<i>Cinnamomum camphora</i> Sieb.		hako-gata
42	Osaka	Osaka	Funade (Itachigawa)	Kofun	L=11.6 W=1.20 H=0.55	<i>Cinnamomum camphora</i> Sieb.		composite logboat
43	Osaka	Osaka	Sagisu	Kofun	L=11.7 W=1.77	<i>Cinnamomum camphora</i> Sieb.	bottom board	semibuilt-up ship
44	Osaka	Osaka	Saishoyama	Nara	L=4.06 W=0.70	<i>Cinnamomum camphora</i> Sieb.		
45	Osaka	Osaka	Oimazato	Late Kofun	L=10.21 W=1.14 H=0.79	<i>Cinnamomum camphora</i> Sieb.		composite logboat
46	Osaka	Osaka	Imafuku Namazuegawa	Kofun	L=13.46 W=1.89 H=0.82	<i>Cinnamomum camphora</i> Sieb.		composite logboat
47	Osaka	Osaka	Toyosato Sugawara	Nara	L=4.45 W=0.91	<i>Cryptomeria japonica</i> D. Don		composite logboat
48	Osaka	Osaka	Chuoichiba	Kofun	L=6.32 W=1.15 H=0.25	<i>Shorea</i> sp. ?		katsuobushi-gata
49	Osaka	Osaka	Adigawa Funadubashi	Kofun	L=6.42 W=1.27	<i>Cinnamomum camphora</i> Sieb.		
50	Osaka	Ibaraki	Higashi Nara	Kofun		<i>Cinnamomum camphora</i> Sieb.		
51	Osaka	Ibaraki	Higashi Nara	Kofun		<i>Abies firma</i> Sieb. et Zucc.		
52	Osaka	Ibaraki	Higashi Nara	Kofun		<i>Chamaecyparis obtusa</i> Sieb. et Zucc.		
53	Osaka	Kadoma	Mitsushima	Yayoi	L=17.0 W=1.0 H=0.8	<i>Zelkova serrata</i> Makino.		
54	Osaka	Sakai		Kofun		<i>Cryptomeria japonica</i> D. Don		
55	Osaka	Daito				<i>Paulownia tomentosa</i>		
56	Osaka	Higashiosaka	Araya	Late Yayoi	L=0.54		bow	
57	Osaka	Higashiosaka	Nishitsutsumi	Nara	L=6.50	<i>Cinnamomum camphora</i> Sieb.		composite logboat
58	Osaka	Yao	Kyuhoji Minami	Late Yayoi	L=2.94	<i>Cryptomeria japonica</i> D. Don	bottom board, end plank, washstrake, barks of cherry tree	semibuilt-up ship
59	Osaka	Yao	Nishiguchi Kuribayashi	Kofun	L=1.16			
60	Osaka	Yao	Kayafuri	Kofun	L=10.00 W=1.40	<i>Cryptomeria japonica</i> D. Don	well cast	
61	Osaka	Neyagawa	Jori	Late Kofun	L=1.30 H=0.50		estimated L=10	semibuilt-up ship
62	Osaka	Shijo Nawate	Shitomiya Kita	Middle Kofun	L=2.65 W=0.97 T=0.065	<i>Cryptomeria japonica</i> D. Don	well cast	
63	Kyoto	Nagaokakyo	Kumonomiya	Middle Yayoi				
64	Kyoto	Muko	Higashi Tsuchikawa	Final Jomon	L=3.70 W=0.5			
65	Kyoto	Sagara	Waduka	Late Jomon				

no	prefecture	city	site	period	size	material	status	type
66	Kyoto	Maiduru	Uranyu	Early Jomon	L=4.60 W=1.0 T=0.05	<i>Cryptomeria japonica</i> D. Don		
67	Wakayama	Sairo	Kasajima	Late Yayoi	L=4.13 W=0.50 T=0.03	<i>Cinnamomun camphora</i> Sieb.	bottom board	semibuilt-up ship
68	Mie	ichishi	Nishihiru	Late Kofun	W=0.70		bottom board	semibuilt-up ship
69	Shiga	Otsu	<i>Nishikiori</i>	Final Jomon		<i>Cyclobalanopsis</i> sp.		
70	Shiga	Omi Hachiman	Chomeiji Kotei	Final Jomon	L=6.20 W=0.60 T=0.02			
71	Shiga	Omi Hachiman	Chomeiji Kotei	Early Kofun			bow	semibuilt-up ship
72	Shiga	Omi Hachiman	Moto Suikei	Late Jomon	L=7.90 W=0.75 T=0.05		transverse ridge	
73	Shiga	Omi Hachiman	Moto Suikei	Late Jomon	L=8.25 W=0.50 T=0.04		transverse ridge	
74	Shiga	Omi Hachiman	Moto Suikei	Late Jomon	L=5.60 W=0.50 T=0.02-0.05		transverse ridge	
75	Shiga	Omi Hachiman	Moto Suikei	Late Jomon	L=1.75			
76	Shiga	Omi Hachiman	Demachi	Early Kofun	L=0.57 W=0.175 H=0.19		bow	semibuilt-up ship
77	Shiga	Hikone	Matsubara Naiko	Late Jomon	L=5.50 W=0.45 H=0.10	<i>Cryptomeria japonica</i> D. Don		
78	Shiga	Hikone	Matsubara Naiko	Late Jomon	L=4.90 W=0.70 H=0.35	Cherry?	unfinished	
79	Shiga	Hikone	Matsubara Naiko	Final Jomon				
80	Shiga	Hikone	Matsubara Naiko	Early Kofun			bow, end plank, washstrake	semibuilt-up ship?
81	Shiga	Gamo	Dainakanokonan	Middle Yayoi		<i>Abies firma</i> Sieb. et Zucc.	fragments	
82	Shiga	Sakata	Irienaiko	Late Jomon	L=4.00 W=0.50 H=0.20		partly lost	
83	Shiga	Sakata	Irienaiko	Middle Jomon	L=5.27 W=0.51 H=0.21		almost complete	
84	Shiga	Sakata	Irienaiko	Middle Jomon	L=3.59 W=0.48 H=0.10			
85	Shiga	Sakata	Irienaiko	Late Jomon	L=5.70 W=0.50 H=0.20		almost complete	
86	Shiga	Sakata	Irienaiko	Early Jomon	L=5.47 W=0.50 H=0.30		almost complete, two transverse ridges	
87	Shiga	Moriyama	Shimonaga	Early Kofun		<i>Cryptomeria japonica</i> D. Don	bow, bottom board, barks of cherry tree	semibuilt-up ship
88	Shiga	Moriyama	Akanoihama	Early Yayoi	L=0.37 W=0.16 H=0.075 (bow) L=1.07 W=0.20 (washstrake)		bow, washstrake	semibuilt-up ship
89	Fukui	Sakai	Kado Shimoyashiki	Middle Yayoi	L=3.50			
90	Fukui	Mikata Kaminaka	Torihama	Early Jomon	L=6.80 W=0.63 H=0.26	<i>Cryptomeria japonica</i> D. Don	almost complete	katsuobushi-gata
91	Fukui	Mikata Kaminaka	Torihama	Late Jomon	L=3.47 W=0.48 T=0.034-0.04	<i>Cryptomeria japonica</i> D. Don		
92	Fukui	Mikata Kaminaka	Yuri	Late Jomon	L=5.20		flat bottom	
93	Fukui	Mikata Kaminaka	Yuri	Middle Jomon	L=4.90 W=0.48 H=0.075	<i>Cryptomeria japonica</i> D. Don		katsuobushi-gata
94	Fukui	Mikata Kaminaka	Yuri	Middle Jomon	L=5.80 W=0.30	<i>Cryptomeria japonica</i> D. Don		katsuobushi-gata
95	Fukui	Mikata Kaminaka	Yuri	Final Jomon	L=5.90 W=0.57	<i>Cryptomeria japonica</i> D. Don	estimated L=6.5	katsuobushi-gata
96	Ishikawa	Hakui	Amada		L=4.09	<i>Cryptomeria japonica</i> D. Don		
97	Ishikawa	Komatsu	Matsunashi	Late Kofun	L=0.95 W=0.60 (bow) L=0.97 W=0.55 (stern)	<i>Cryptomeria japonica</i> D. Don	well cast	
98	Ishikawa	Komatsu	Sendai Nomi	Early Kofun	L=1.04 W=0.26 H=0.064 (bow end)		end plank, washstrakes, barks of	semibuilt-up ship

no	prefecture	city	site	period	size	material	status	type
					plank) L=0.71 W=0.22 H=0.025 (washstrake)		cherry tree	
99	Niigata	Kitakanbara	Kameshiro Shidai	Late Yayoi	L=5.36 W=1.25 H=0.35	<i>Cinnamomum camphora</i> Sieb.		
100	Niigata	Mishima	Okawatsu Hasamada			<i>Aesculus turbinata</i> Bl.		
101	Niigata	Mishima	Okawatsu Gobiuchi			<i>Aesculus turbinata</i> Bl.		
102	Niigata	Nakakanbara	Koai		L=8.07 W=0.95 H=0.43	<i>Cryptomeria japonica</i> D. Don		
103	Niigata	Nakakanbara	Kameda		L=2.46	<i>Cryptomeria japonica</i> D. Don		
104	Gifu	Ibi	Suefuku	Late Jomon	L=2.59 W=0.45 H=0.18	<i>Thujaopsis dolabrata</i> Sied. et Zucc.		
105	Gifu	Ibi	Suefuku	Late Jomon	L=3.50 W=0.43 H=0.23	<i>Thujaopsis dolabrata</i> Sied. et Zucc.		
106	Nagano	Kami Ina	Minowa			Cherry ?		paddy field boat?
107	Nagano	Kita Adumi	Kizakiko		L=2.45	<i>Castanea crenata</i> Sieb. et Zucc.		
108	Nagano	Kita Adumi	Kizakiko		L=2.63	<i>Castanea crenata</i> Sieb. et Zucc.		
109	Yamanashi	Nishiyatsushiro	Kamikuishiki Suko		L=9.62 W=1.21 H=0.76	<i>Quercus serrata</i> Murray		
110	Yamanashi	Minami Tsuru	Ashiwada Nishiko		L=6.15 W=0.79 H=0.52	<i>Tsuga Sieboldii</i> Carr?		
111	Yamanashi	Minami Tsuru	Ashiwada Nishiko		L=6.00 W=0.8 H=0.3			
112	Yamanashi	Minami Tsuru	Ashiwada Nishiko		L=7.28 W=0.78			
113	Yamanashi	Minami Tsuru	Kawaguchi Kawaguchiko		L=5.50 W=0.30 T=0.058	<i>Picea polita</i> Carr.		
114	Yamanashi	Minami Tsuru	Kawaguchi Kawaguchiko		L=5.55 W=0.55 T=0.077	<i>Picea polita</i> Carr.		
115	Yamanashi	Minami Tsuru	Nakano Yamanakako		L=6.24 W=0.55 H=0.42	<i>Ulmus propinqua</i> Koidz.		
116	Aichi	Ama	Saori (Morokuwa)	Nara	L=21.0	<i>Cinnamomum camphora</i> Sieb.		composite logboat
117	Shizuoka	Shizuoka	Shinmeihara Motomiyagawa	Middle Yayoi	L=6.7 W=0.65 T=0.02-0.10		14 traits of burning	katsuobushi-gata
118	Shizuoka	Shizuoka	Toro	Late Yayoi	L=0.98 W=0.50 H=0.18	<i>Cryptomeria japonica</i> D. Don		katsuobushi-gata
119	Shizuoka	Shizuoka	Sena	Early Kofun	L=6.36 W=0.32	<i>Cryptomeria japonica</i> D. Don	washstrake	semibuilt-up ship
120	Shizuoka	Shizuoka	Sena	Early Kofun	L=4.12 W=0.37	<i>Cryptomeria japonica</i> D. Don	bottom board	semibuilt-up ship
121	Shizuoka	Numadu	Sawada	Early Kofun		<i>Cryptomeria japonica</i> D. Don		
122	Shizuoka	Hamamatsu	Kakue	Middle Yayoi	L=0.90 W=0.63 H=0.17	<i>Castanea crenata</i> Sieb. et Zucc.	bow	semibuilt-up ship
123	Shizuoka	Shimizu	Tomoe-gawa Gogan	Late Kamakura	L=5.10 W=1.30 H=0.60 (box)	<i>Cinnamomum camphora</i> Sieb.		hako-gata
124	Shizuoka	Ogasa	Chihama		L=1.93 W=0.57 H=0.15	<i>Cryptomeria japonica</i> D. Don		
125	Shizuoka	Tagata	Yamaki	Late Yayoi	L=1.06 W=0.56 H=0.27	<i>Cryptomeria japonica</i> D. Don		katsuobushi-gata
126	Kanagawa	Yokosuka	Denpukuji Ura	Early Jomon	L=3.04 W=0.37 T=0.04	<i>Aphananthe aspera</i> Planch.	traits of burning	
127	Kanagawa	Ashigara Shimo	Fuchu		L=1.55	<i>Cryptomeria japonica</i> D. Don		
128	Kanagawa	Ashigara Shimo	Shimo Nakamura			<i>Cryptomeria japonica</i> D. Don		
129	Kanagawa	Miura	Hayama Kaigan			<i>Cinnamomum camphora</i> Sieb.		
130	Tokyo	Kitaku	Nakasato	Middle Jomon	L=5.79 W=0.72 H=0.42 T=0.02-0.05	<i>Aphananthe aspera</i> Planch.		

no	prefecture	city	site	period	size	material	status	type
131	Tokyo	Kitaku	Nakasato	Late Jomon	L=7.79 W=0.55 H=0.42	<i>Aphananthe aspera</i> Planch.		
132	Tokyo	Higashi Murayama	Ishikawa			<i>Aphananthe aspera</i> Planch.		
133	Saitama	Omiya	Juno Deitan	Final Jomon	L=0.62	<i>Cryptomeria japonica</i> D. Don	bow	
134	Saitama	Omiya	Toda			<i>Pinus densiflora</i> Sieb. et Zucc. or <i>Pinus Thunbergii</i> Parl.		
135	Saitama	Omiya	Hizako	Late Jomon	L=7.00 W=0.50	<i>Castanea crenata</i> Sieb. et Zucc.		katsuobushi-gata
136	Saitama	Ageo				<i>Castanea crenata</i> Sieb. et Zucc.		
137	Saitama	Irima	Nakaoibukuro	Late Jomon	L=5.49 W=0.60 H=0.35	<i>Torreya nucifera</i> Sieb. et Zucc.		katsuobushi-gata
138	Saitama	Kita Adachi	Inashi Yakataato	Final Jomon	L=3.70 W=0.60 H=0.08 T=0.05	<i>Zelkova serrata</i> Makino.		
139	Saitama	Kita Adachi	Inashi Yakataato	Final Jomon	L=4.85 W=0.55 H=0.20 T=0.05	<i>Torreya nucifera</i> Sieb. et Zucc.		
140	Saitama	Kita Adachi	Ina					
141	Saitama	Soka	Ayasegawasoko	Early Jomon	L=6.06 W=0.60 H=0.65	<i>Torreya nucifera</i> Sieb. et Zucc.	three transverse ridges, traits of burning	katsuobushi-gata
142	Saitama	Kita Adachi	Toda		L=3.00 W=0.3			
143	Saitama	Kita Adachi	Misono					
144	Saitama	Minami Saitama	Ayasegawasoko			<i>Pinus densiflora</i> Sieb. et Zucc.		
145	Saitama	Minami Saitama	Komuro		L=5.40 W=0.40 H=0.21	<i>Pinus densiflora</i> Sieb. et Zucc. or <i>Pinus Thunbergii</i> Parl.		katsuobushi-gata
146	Saitama	Minami Saitama	Wado Murakuni	Kofun	L=8.48 W=0.67 H=0.24	<i>Pinus densiflora</i> Sieb. et Zucc.	flat bottom	secchu-gata
147	Chiba	Chiba	Hatamachi	Late Jomon	L=6.20 W=0.43 H=0.28	<i>Torreya nucifera</i> Sieb. et Zucc.		katsuobushi-gata
148	Chiba	Chiba	Hatamachi	Late Jomon	L=5.80 W=0.48 H=0.44	<i>Torreya nucifera</i> Sieb. et Zucc.		katsuobushi-gata
149	Chiba	Chiba	Hatamachi	Late Jomon	L=3.48 W=0.52	<i>Torreya nucifera</i> Sieb. et Zucc.	body	katsuobushi-gata
150	Chiba	Sakura	Kaminojiri			<i>Torreya nucifera</i> Sieb. et Zucc.		
151	Chiba	Sakura	Kashimagawa	Kofun	L=6.94 W=0.55	<i>Abies firma</i> Sieb. et Zucc.	two transverse ridges	
152	Chiba	Sawara	Onogawa	Middle Yayoi	L=5.83 W=0.80 H=0.45			
153	Chiba	Matsudo	Yagiriwatashi	Yayoi	L=1.26	<i>Pinus densiflora</i> Sieb. et Zucc.		
154	Chiba	Yokaichiba	Minaminaka Kariategawa	Late Jomon	L=5.13 W=0.50 H=0.21			
155	Chiba	Yokaichiba	Minaminaka Kariategawa		L=2.50			
156	Chiba	Yokaichiba	Nagawaribori	Final Jomon	L=4.20 W=0.45			
157	Chiba	Yokaichiba	Nokoshinuma	Late Jomon	L=5.85 W=0.58 H=0.24	<i>Torreya nucifera</i> Sieb. et Zucc.		katsuobushi-gata
158	Chiba	Yokaichiba	Shichikenbori	Final Jomon	L=3.45 W=0.58	<i>Torreya nucifera</i> Sieb. et Zucc.		
159	Chiba	Yokaichiba	Shimonuma	Final Jomon	L=4.16 W=0.40			
160	Chiba	Yokaichiba	Yonekura Ozakai	Final Jomon	L=3.47 W=0.42 H=0.21	<i>Torreya nucifera</i> Sieb. et Zucc.	almost complete, two transverse ridges	
161	Chiba	Yokaichiba	Yonekura Ozakai	Final Jomon	L=4.21 W=0.40 H=0.16	<i>Torreya nucifera</i> Sieb. et Zucc.	four transverse ridges	katsuobushi-gata
162	Chiba	Yokaichiba	Yonekura Ozakai	Final Jomon	L=4.84 W=0.55	<i>Torreya nucifera</i> Sieb. et Zucc.	two transverse ridges	
163	Chiba	Yokaichiba	Yonekura Ozakai	Final Jomon	L=5.55 W=0.45 H=0.10	<i>Torreya nucifera</i> Sieb. et Zucc.		katsuobushi-gata
164	Chiba	Yokaichiba	Yonekura Nagawaribori		L=4.20 W=0.45	<i>Torreya nucifera</i> Sieb. et Zucc.	almost complete, three transverse ridges	

no	prefecture	city	site	period	size	material	status	type
165	Chiba	Yokaichiba	Kasho Sone no Ne mae			<i>Torreya nucifera</i> Sieb. et Zucc.		
166	Chiba	Yokaichiba	Yoshida Miyata			<i>Torreya nucifera</i> Sieb. et Zucc.		
167	Chiba	Yokaichiba	Yoshida Kariategawa			<i>Torreya nucifera</i> Sieb. et Zucc.		
168	Chiba	Yokaichiba	A go			<i>Torreya nucifera</i> Sieb. et Zucc.		
169	Chiba	Yokaichiba	Yateki Deitan	Late Jomon	L=3.19 W=0.45 H=0.18 T=0.08	<i>Castanea crenata</i> Sieb. et Zucc.		katsuobushi-gata
170	Chiba	Yokaichiba	Yoshida Miyata	Late Jomon	L=3.80			
171	Chiba	Yasufusa	Nishimisaki Hamada		L=2.77 W=0.68	<i>Cinnamomum camphora</i> Sieb.		katsuobushi-gata
172	Chiba	Yasufusa	Kamo	Early Jomon	L=4.80 W=0.70 H=0.15	<i>Aphananthe aspera</i> Planch.		waritake-gata?
173	Chiba	Inba	Inbanuma	Late Jomon	L=6.55 W=0.50	<i>Torreya nucifera</i> Sieb. et Zucc.		
174	Chiba	Inba	Aso	Kofun	L=6.70 W=0.30	<i>Abies firma</i> Sieb. et Zucc.	four transverse ridges	
175	Chiba	Inba	Aso		L=3.53	<i>Abies firma</i> Sieb. et Zucc.		
176	Chiba	Inba	Aso		L=1.30	<i>Torreya nucifera</i> Sieb. et Zucc.		
177	Chiba	Kaijo	Takisato		L=8.79 W=0.94			
178	Chiba	Katori	Kojo	Final Jomon	L=4.85 W=0.76 T=0.06	<i>Torreya nucifera</i> Sieb. et Zucc.		katsuobushi-gata
179	Chiba	Katori	Hikari Kuriyamagawa			<i>Torreya nucifera</i> Sieb. et Zucc.		hako-gata
180	Chiba	Katori	Tako Minamikarigamigawa	Final Jomon		<i>Torreya nucifera</i> Sieb. et Zucc.		
181	Chiba	Katori	Tako Funakoshi			<i>Torreya nucifera</i> Sieb. et Zucc.		
182	Chiba	Katori	Tako			<i>Aphananthe aspera</i> Planch.		
183	Chiba	Katori	Kojo Kaburaki Okita	Final Jomon	L=6.06 W=0.61 H=0.45	<i>Torreya nucifera</i> Sieb. et Zucc.		katsuobushi-gata
184	Chiba	Katori	Kojo Ichibanwari	Final Jomon	L=6.84 W=0.52 H=0.35	<i>Torreya nucifera</i> Sieb. et Zucc.		katsuobushi-gata
185	Chiba	Katori	Nakamura Kariategawa		L=1.68	<i>Torreya nucifera</i> Sieb. et Zucc.		
186	Chiba	Katori	Chuka	Final Jomon	L=4.85	<i>Torreya nucifera</i> Sieb. et Zucc.		
187	Chiba	Katori	Sawara	Middle Yayoi	L=5.83 W=0.80 H=0.35			
188	Chiba	Kimitsu	Osawa	Final Jomon		<i>Pinus densiflora</i> Sieb. et Zucc. or <i>Pinus Thunbergii</i> Parl.		
189	Chiba	Sanmu	Yokoshiba			<i>Pinus densiflora</i> Sieb. et Zucc. or <i>Pinus Thunbergii</i> Parl.		
190	Chiba	Sanmu	Yokoshiba Kuriyama		L=5.76 W=0.70	<i>Juglans mandshurica</i> Maxim. subsp. <i>sieboldiana</i> Kitam.		hako-gata
191	Chiba	Sanmu	Yokoshiba Takaya	Late Jomon	L=5.85 W=0.70	<i>Torreya nucifera</i> Sieb. et Zucc.		
192	Chiba	Sanmu	Yokoshiba Takaya	Late Jomon	L=2.50 W=0.43	<i>Torreya nucifera</i> Sieb. et Zucc.		
193	Chiba	Sanmu	Futagawa	Final Jomon	L=4.64	<i>Torreya nucifera</i> Sieb. et Zucc.		katsuobushi-gata
194	Chiba	Sanmu	Masaki Magamegawa	Final Jomon	L=6.20 W=0.60 H=0.15	<i>Cinnamomum camphora</i> Sieb.		katsuobushi-gata
195	Chiba	Sanmu	Masaki Magamegawa	Final Jomon	L=5.80	<i>Cinnamomum camphora</i> Sieb.		
196	Chiba	Sanmu	Masaki Magamegawa	Final Jomon	L=3.48	<i>Cinnamomum camphora</i> Sieb.		
197	Chiba	Higashi Katsushika	Abiko	Final Jomon	L=5.50 W=0.61 H=0.48			katsuobushi-gata
198	Chiba	Higashi Katsushika	Abiko	Final Jomon	L=4.38 W=0.75 H=0.40			
199	Chiba	Higashi Katsushika	Abiko	Kofun	L=7.70 W=0.57 H=0.19	<i>Pinus Thunbergii</i> Parl.		secchu-gata

no	prefecture	city	site	period	size	material	status	type
200	Chiba	Higashi Katsushika	Kounoyama	Final Jomon	L=4.48 W=0.68 H=0.10			katsuobushi-gata
201	Chiba	Higashi Katsushika	Tega Iwai	Final Jomon	L=3.07 W=0.68 H=0.10			
202	Chiba	Higashi Katsushika	Tega Washinotani	Final Jomon	L=6.91 W=0.66 H=0.30			katsuobushi-gata
203	Chiba	Higashi Katsushika	Tega Yashimo	Kofun	L=7.77 W=0.57 H=0.19			
204	Chiba	Higashi Katsushika	Yagi			<i>Cryptomeria japonica</i> D. Don		
205	Ibaraki	Mitsukaido	Toyooka			<i>Pinus densiflora</i> Sieb. et Zucc. or <i>Pinus Thunbergii</i> Parl.		
206	Ibaraki	Ryugasaki	Kawaradai Hakkengawa	Kofun	L=6.26 W=0.65 H=0.35	<i>Pinus densiflora</i> Sieb. et Zucc.		secchu-gata
207	Ibaraki	Inashiki	Edosaki			<i>Pinus densiflora</i> Sieb. et Zucc. or <i>Pinus Thunbergii</i> Parl.		
208	Ibaraki	Kitasoma	Uchimoriya Furuyanuma		L=1.26	<i>Castanea crenata</i> Sieb. et Zucc.		paddy field boat?
209	Ibaraki	Kitasoma	Fujishiro Oka		L=10.97 W=0.80 H=0.25			
210	Ibaraki	Kitasoma	Fujishiro Omagari		L=8.50 W=0.63 H=0.24	<i>Kalopanax pictus</i> Nakai	flat bottom	
211	Ibaraki	Niihari	Sekigawa Ishikawa	Kofun	L=5.45 W=0.35 H=0.13 T=0.025	<i>Castanea crenata</i> Sieb. et Zucc.	flat bottom	
212	Ibaraki	Makabe	Daiho	Kofun	L=6.05 W=0.58 H=0.43	<i>Pinus densiflora</i> Sieb. et Zucc.	flat bottom	hako-gata
213	Ibaraki	Joso	Ishige Kokai	Kofun	L=2.16	<i>Pinus densiflora</i> Sieb. et Zucc. or <i>Pinus Thunbergii</i> Parl.		secchu-gata
214	Ibaraki	Joso	Ishige Kokai	Kofun	L=6.24	<i>Pinus densiflora</i> Sieb. et Zucc. or <i>Pinus Thunbergii</i> Parl.		secchu-gata
215	Ibaraki	Joso	Ishige Kokai	Kofun	L=6.47	<i>Pinus densiflora</i> Sieb. et Zucc. or <i>Pinus Thunbergii</i> Parl.		secchu-gata
216	Ibaraki	Moriya	Moriya	Kofun	L=7.27			
217	Ibaraki	Moriya	Moriya	Kofun	L=6.36 W=1.00 T=0.06	<i>Pinus densiflora</i> Sieb. et Zucc. or <i>Pinus Thunbergii</i> Parl.		katsuobushi-gata
218	Ibaraki	Yuki	Yuki Shimoyamagawa	Kofun	L=8.46 W=0.71H=0.45	<i>Pinus Thunbergii</i> Parl.		katsuobushi-gata
219	Ibaraki	Kashima	Shichitanda	Nara	L=1.80 W=1.00	<i>Zelkova serrata</i> Makino.		
220	Ibaraki	Iwai	Oguchi Funawatari	Late Yayoi				
221	Ibaraki	Ushikushi	Kotoori Koya	Kofun	L=6.00 W=0.65 H=0.25	<i>Pinus densiflora</i> Sieb. et Zucc. or <i>Pinus Thunbergii</i> Parl.		
222	Ibaraki	Ushikushi	Okuhara Tenno	Yayoi	L=6.00 W=0.50	<i>Pinus densiflora</i> Sieb. et Zucc. or <i>Pinus Thunbergii</i> Parl.		
223	Ibaraki	Tsukuba	Inamachi Mujinabuchi	Late Jomon	L=5.00 W=0.56 H=0.20			katsuobushi-gata
224	Tochigi	Shimotsuga	Nishiyamada	Late Jomon	L=6.69	<i>Ulmus propinqua</i> Koidz.		
225	Gunma	Takasaka	Hidaka			<i>Gleditsia japonica</i> Miq.		
226	Fukushima	Soma	Idagawaura					Donbo-bune
227	Fukushima	Soma	Inawashiroko			<i>Quercus serrata</i> Murray		
228	Miyagi	Ojika	Inainuma		L=5.23 W=0.53 H=0.18	<i>Quercus serrata</i> Murray		
229	Miyagi	Tome	Kaminuma		L=3.48 W=0.48	<i>Quercus serrata</i> Murray	holes for beams	hako-gata

no	prefecture	city	site	period	size	material	status	type
230	Miyagi	Tome	Kaminuma		L=4.42 W=0.45	<i>Quercus mongolica</i> var. <i>grosseserrata</i> Rehd. et Wils.		hako-gata
231	Yamagata	Sakata	Oishi	Heian	L=5.80 W=1.00 H=0.50	<i>Cryptomeria japonica</i> D. Don		
232	Yamagata	Shinjo	Torigoe			<i>Zelkova serrata</i> Makino.		
233	Yamagata	Higashitagawa	Fujishima		L=11.45 W=1.24 T=5-9	<i>Cryptomeria japonica</i> D. Don		
234	Yamagata	Yusa	Ukibashi	Heian			well cast	
235	Yamagata	Fujishima	Fujishima Shiroato	Late Heian	L=14.2	<i>Cryptomeria japonica</i> D. Don		
236	Iwate	Waga	Kamieduri		L=1.22	<i>Castanea crenata</i> Sieb. et Zucc.		
237	Aomori	Kamikita	Kochi Funagasawa		L=7.30 W=0.54 H=0.38	<i>Pinus densiflora</i> Sieb. et Zucc.		
238	Aomori	Shimokita	Higashidori		L=5.00 W=0.48	<i>Kalopanax pictus</i> Nakai		
239	Aomori	Higashisugaru	Arakawa	Kofun	L=7.36 W=1.09 H=0.49	<i>Cryptomeria japonica</i> D. Don		
240	Hokkaido	Abashiri				<i>Cercidiphyllum japonicum</i> Sieb. et Zucc.		
241	Hokkaido	Kushiro	Akanko			<i>Tilia japonica</i> Simonkai		
242	Hokkaido	Tomakomai				<i>Cercidiphyllum japonicum</i> Sieb. et Zucc.		
243	Hokkaido	Tomakomai				<i>Fraxinus mandshurica</i> Rupr. var. <i>japonica</i> Maxim.		

CLAY SHIP FIGURE LIST

no	prefecture	city	site	period	length	width	height	type	washstrake	Oarlock (each)	status	pedestal	hole
1	Miyazaki	Saito	Saitobaru 169	Late 5 c.	101.0	19.0	39.0	B	1	6	Almost Complete	0	1
2	Miyazaki	Miyazaki	Shimokitakata	Early 6 c.	20	-	-	-	-	-	Fragments	-	-
3	Oita	Oita	Kametsuka	Early 5 c.	10	-	-	A	1	-	Fragments	1	-
4	Oita	Oita	Ozai	Late 5 c.	-	-	-	B	1	-	Fragments	1	-
5	Fukuoka	Amagi	Tsutsumi Toshoji	Middle 5 c.	-	-	-	-	-	-	Fragments	1	-
6	Okayama	Kume	Tsukinowa	Middle 5 c.	23.2	8	7	A	1	0	Almost Complete	0	0
7	Kagawa	Takamatsu	Nakama Nishiitsubo	-	29	11	8.4	B	-	-	Fragments	0	0
8	Osaka	Osaka	Nagahara	Middle 5 c.	40.0	-	-	B	1	-	Broken	1	-
9	Osaka	Osaka	Nagahara Takamawari 1	Early 5 c.	99.5	12.0	46.6	B	1	5	Almost Complete	1	-
10	Osaka	Osaka	Nagahara Takamawari 2	End of 4 c.	128.7	26.1	37.2	A	2	4	Almost Complete	0	2
11	Osaka	Sakai	Suemura/Fuseo A	-	12	-	-	-	-	-	Fragments	-	-
12	Osaka	Izumi	Bodaidi Nishi 3	Early 5 c.	110	22.08	37	A	2	0	Almost Complete	1	-
13	Osaka	Kashiwabara	Tamateyama 10	Middle 5 c.	95.0	20.0	15.0	B	1	—	-	-	-

no	prefecture	city	site	period	length	width	height	type	washstrake	Oarlock (each)	status	pedestal	hole
14	Osaka	Habikino	Goteji	Late 4 c.	-	-	-	A	-	-	Fragments	-	-
15	Osaka	Habikino	Nonogami	End of 4 c.	12.4	9	7	A	-	-	Fragments	-	-
16	Osaka	Fujiidera	Kuratsuka	Middle 5 c.	-	18	15	B	1	-	-	-	-
17	Osaka	Fujiidera	Oka	Early 5 c.	150.0	30.0	45.0	A	2	5	Almost Complete	0	1
18	Osaka	Fujiidera	Oka Minanzai	Early 5 c.	33	-	-	B	-	-	Fragments	1	-
19	Osaka	Fujiidera	Hayashi	5 c.	(70.0)	(10.0)	(30.0)	B	1	-	Fragments	1	-
20	Osaka	Fujiidera	Hajinosato	-	104.8	18	26.4	B	1	0	Almost Complete	0	1
21	Osaka	Takaishi	Osono	Late 5 c.	-	-	-	A	-	-	Fragments	1	-
22	Osaka	Higashi Osaka	Saraike	Late 5 c.	67.1	17.4	28	A	1	5	Almost Complete	0	1
23	Osaka	Takatsuki	Tsukamawari	-	20	-	-	A	-	-	Fragments	0	-
24	Osaka	Takatsuki	Tsukamawari	-	20	-	-	A	-	-	Fragments	0	-
25	Osaka	Minamikawachi	Kankoji 5	Early 5 c.	100.0	-	30.0	A	2	-	Broken	1	-
26	Osaka	Yao	Nakata	Late 4 c.	35	7.8	8	A	1	0	Almost Complete	0	1
27	Kyoto	Kyotango	Nigore	Middle 5 c.	82.5	17.5	8.8	A	1	7(6)	Almost Complete	0	-
28	Nara	Nara	Uguisuduka	5 c.	-	-	-	-	-	-	-	-	-
29	Nara	Nara	Heijogu	-	-	-	-	-	-	-	Fragments	1	-
30	Nara	Nara	Heijogu	Early 5 c.	32	21	24	B	1	-	Broken	-	-
31	Nara	Nara	Hokkeji	End of 4 c.	35	19.5	25.5	B	1	-	Broken	-	-
32	Nara	Kashihara	Minami Uradeyashiki	-	33.2	13	10.7	A	1	-	Broken	-	-
33	Nara	Yamato	Jikoin Urayama	Late 5 c.	48	15	15	B	1	0	Broken edge	0	1
34	Nara	Katsuragi	Teraguchi Wada	Early 5 c.	113.0	22.5	53	B	1	2	Almost Complete	1	1
35	Nara	Tenri	Minami Rokujo Kita Mino	-	-	-	-	-	-	-	-	-	-
36	Mie	Matsusaka	Takaraduka 1	Early 5 c.	140.0	35	94.0	B	2	3	Almost Complete	1	-
37	Mie	Matsusaka	Takaraduka 2	Early 5 c.	33	28	21	B	-	-	Fragments	-	-
38	Shiga	Ritto	Shingai 4	Middle 5 c.	115.0	27.0	23.0	B	2	7	Fragments	0	-
39	Kanagawa	Yokohama	Setogaya	-	-	-	-	-	-	-	-	-	-
40	Tochigi	Mooka	Niwatoriduka	Late 6 c.	25.6	-	-	-	1	-	Broken	-	1
41	Nagano	Iida	Tonomura	End of 5 c.	77.3	24.8	13.5	A	1	4	Fragments	1	-
42	Ibaraki	Niihari	Funatsuka	Early 6 c.	-	-	-	-	-	-	-	-	-
43	Shizuoka	Iwata	Doyama 2	Middle 5 c.	20	-	-	A	-	-	Fragments	-	-

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