学会報告

Archaeological Studies of Japan: Current Studies of the Jomon Archaeology

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I. Introduction palaeoenvironment

It is about 120 years ago that the scientific archaeology was introduced into Japan by E.S. Morse, an American zoologist who came to the country to conduct malacological research. Morse happened to see a shell heap from the window of a train during his first visit, which he thereafter soon excavated. It was the Omori shell-midden site of the Late Jomon Period located in the southern part of Tokyo. The techniques and ideas that Morse adopted in the excavation exerted substantial influence on the subsequent development of Japanese archaeology. Since Morse's ground breaking undertaking, a plethora of excavations have been conducted throughout the country and our knowledge on the Jomon Period has increased accordingly. The Jomon Period archaeology was initiated under the interest in the antiquity and the racial or ethnic affiliation of this unique archaeological culture. Today, the research interest has expanded to a variety of issues including the re-construction of palaeoenvironment, subsistence, social organization, religion, demography and so forth.

With such a historical backdrop, the current understanding of the Jomon Period is epitomized below. Along with the Japanese archaeology of other periods, the Jomon archaeology is also involved in an unprecedented information deluge that archaeologists in the world have never undergone. References cited in the text are merely a fraction of the thousands of excavation reports and journal articles incessantly published every year over the last couple of decades.

II. Environmental Background

1. Topography and climate

The Japanese archipelago stretches from the north to the south. It is about 3,000 km from the northern end of Hokkaido (45° N) to the southern end of Okinawa (25° N). The archipelago is traversed with a mountain ridge of 1,000 to 3,000 m high above sea level. For the presence of the mountains, the difference in the altitude is very large between the coastal area and the inland. Moreover, complex topography is produced in each area by a mosaic of mountains, hills, valleys, alluvial plains, rivers, coast lines, etc.

Climatically, the northern part of Hokkaido belongs to the Subarctic, the area from the southern part of Hokkaido to inland central Japan belongs to the cool temperate zone. The area from the Kyushu District to the coastal region of central Japan belongs to the warm temperate zone. The

Okinawan archipelago belongs to the subtropical. As a composite effect of monsoons and the mountain ridge, winter snowfall is remarkably heavy in the mountain areas on the Japan Sea side.

2 . Marine environment

During the maximum of the last glacial period (c. 20,000 years BP), the sea level lay c. −100 m. Since then, it began to rise rapidly. By about 10,000 years BP, it reached c. −40 m. In 6,500 to 5,500 years BP, it was stabilized at +2 to 3 m (Fig. 1). This drastic rise of sea level is called the "Jomon transgression", which is understood as a part of the eustatic changes caused by world wide climatic fluctuation (Umitsu 1991). As a result of the transgression, the Japanese archipelago was completely cut off from the mainland Asia. About 8,000 years ago, the Tsushima Current, a part of the Japan Current, began to flow into the Japan Sea (Oba 1991).

At the maximum of the Jomon transgression, deep inlets were created in many parts of the archipelago. However, due mainly to the deposition of alluvial soil the inlets became shallower and tidelands gradually expanded in the coastal areas. In this period, the Japan Current reached the Pacific coast of the middle part of the Tohoku District. The Tsushima Current, on the other hand, flowed out to the Northern Pacific through the Straits of Tsugaru and Soya; by then the entire coastal areas of the archipelago were influenced by these warm currents. The northward expansion of the habitat of warm water species of shellfish and coral reefs during this period indicates a rise of the water temperature of the sea (Matsushima 1984). Around 5,000 years ago, the sea level began to lower again. In the end of the Jomon Period (c. 2,000 years BP), it was about −2 m. The inlets created in the coastal areas rapidly disappeared for the transgression of river mouth deltas. Large tidelands appeared in front of the deltas and the alluvial plains expanded into the coastal areas (Endo and Kosugi 1989).

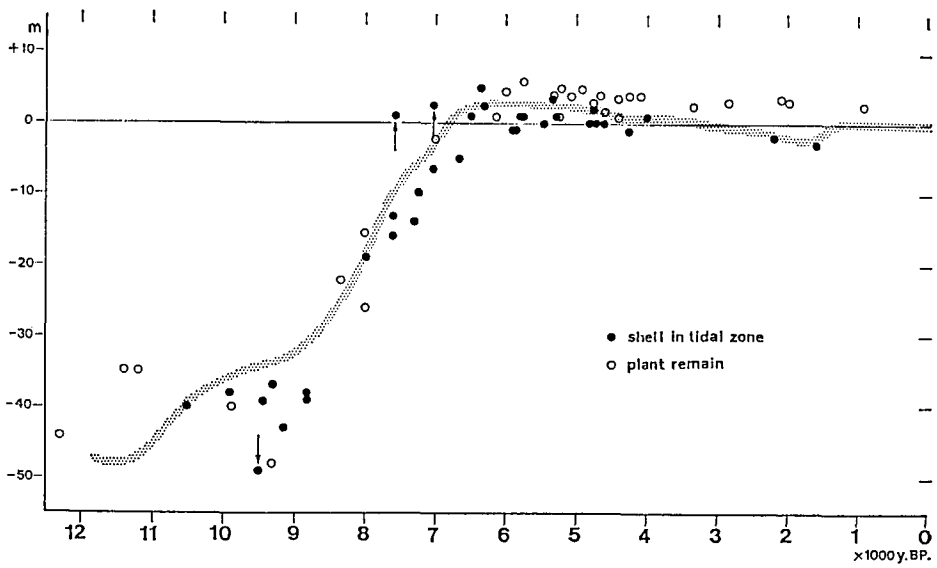


Fig. 1 Relative sea-level curve in Kanto, central Japan, during the last 12,000 years. (after Endo and Kosugi 1989: Figure 7)

3. Flora

20,000 years ago, conifer and deciduous broadleaf mixed forest predominated the south-western part of the archipelago, while conifer forest was prevalent in the north-eastern part of Japan. By 10,000 years ago, conifer forest retreated from the low-lands. Instead, cool temperate deciduous broadleaf forest consisted chiefly of deciduous oak and beech expanded to the areas.

From about 7,000 years BP, deciduous oak and beech further expanded to the north as conditions became warmer and more humid. By 4,000 years ago, these species became dominant from inland southwestern Japan to southern Hokkaido. On the other hand, by 6,000 years ago the deciduous broadleaf forest was replaced by the evergreen broadleaf forest consisted mainly of chinquapin and evergreen oak in the coastal areas of southwestern Japan to the central part of the archipelago.

From 4,000 years BP, mainly as a result of the increased precipitation, Japanese cedar began to rapidly expand, which had been thus far limited to the Pacific coast of southwestern Japan except for the Kyushu District, southern Japan and the Japan Sea coast of central Japan. At the end of the Jomon Period, it became slightly cooler again. In the inland mountain regions of central Japan, sub-alpine species, e.g., fir, hemlock and birch, expanded, while beech increased and expanded in inland south-western Japan (Tsukada 1988).

4. Mammalian fauna

Main species of the glacial period, Nauman elephants, Sinomegaceros, elk, bison, etc, became extinct in the latter half of the last glacial period. By 10,000 years BP, deer and wild boars were chief components of the large mammalian fauna all over the archipelago. Smaller mammals, racoon dogs, foxes and hares survived into the postglacial period (Kawamura 1994). Dogs were present by the beginning of the Earliest Jomon Period. They are likely to have been imported as a domestic animal from the mainland Asia during the end of the Pleistocene or the beginning of the Holocene.

III. Ceramic Chronology

In the 1930s, the Japanese archaeology underwent a major paradigmatic shift; the research focus of the Jomon archaeology shifted to the building of ceramic chronology. Before the 1930s, the majority of the archaeologists had treated the entire Jomon Period as a single historical entity. A polemic between pro-and anti-chronologists in the middle of the 1930s, which is known as "Minerva Controversy", played a decisive role in the shift in research paradigm. Yamanouchi Sugao, Kono Isamu and Yawata Ichiro were leading figures who played a vital role in the early attempts of ceramic chronology building. These scholars isolated time sensitive ceramic complexes (*keishiki*) based on stratigraphic information of pottery and meticulous analyses of pottery form and decoration. Currently, hundreds of chronologically significant ceramic complexes are isolated in each area throughout the archipelago from the beginning to the end of the Jomon Period. The ceramic sequences are divided into six periods; Incipient, Earliest, Early, Middle, Late and Final Jomon. Each period is subdivided into finer style phases. Because it is impossible to mention the current state of the ceramic chronology building in each period, only studies concerning the beginning and ending of the Jomon pottery tradition are outlined

below.

The ceramic chronology building of the Incipient Jomon Period witnessed a remarkable progress in the post-World War period. In the 1950s, the pottery having string-wrapped dowel impressions (*yoriitomon*) were regarded as the initial pottery of the Jomon tradition. However, from the end of the 1950s to the next decade, a series of chronologically earlier pottery styles was discovered, e.g., pottery having cord mark impressions (*ouatsujomon*), slender clay ridges (*ryukisenmon*) and fingernail-like impressions (*tsumegatamon*) in the Hinata cave (Yamagata prefecture, hereafter prefecture names in parenthesis), Kosegasawa and Muroya caves and Motonoki site (Niigata). A remarkable discovery with regard to the chronology building of the Incipient Jomon pottery took place in the Fukui cave (Nagasaki) in which the stratigraphic transition from the pottery having slender clay ridges to that having fingernail-like impressions was confirmed. In addition, microliths of the Final Paleolithic were associated with these potteries in this cave. Based on this observation, Serizawa (1961) postulated that the Jomon pottery is a product of an autochthonous cultural tradition generated from the Paleolithic tradition. The same stratigraphic observation was soon recognised in the nearby Senpukuji cave. In this cave, in addition to the above style pottery, the pottery having bean-like applique (*toryumon*) was detected stratigraphically below the pottery having slender clay ridges which had been thus far regarded as the earliest Jomon pottery (Fig. 2).

In contrast with the earliest Jomon pottery in southern to central Japan, the plain (*mumon*) pottery associated with the Chojakubo-Mikoshiba type stone tools of the Final Paleolithic was discerned in some sites located in northeastern Japan. Before this discovery, Yamanouchi and Sato (1962) had proposed a Siberian origin of the Incipient Jomon stone tools, i.e., edge polished stone axes, tranche, stone drills, crescent shaped tools and arrowshaft smoother. Thus, it became apparent that the genesis of the Jomon pottery needs to be investigated from wider perspectives, not only from the microlithic tradition in western Japan but also from the Paleolithic traditions of the northeast Asian mainland.

Also, the chronological order of the earliest pottery styles initially postulated, i.e., the slender clay ridges to the fingernail-like impressions, is currently being reconsidered. Recent discoveries in some sites, e.g., in the Miyabayashi site (Saitama) and the Hanamiyama site (Kanagawa), where the two styles of pottery are found together or pottery having two styles combined together are found suggests a significantly large temporal overlap in the manufacture of the successive pottery styles. However, based on the deep rooted assumption of no temporal overlap in the manufacture of successive styles, the view is still strong that each style belongs to independent time periods.

The chronological position of the plain pottery is also yet to be resolved. Pottery having latticework ornamentation (*koshimemon*) has been recently discovered in the Kamino site (Kanagawa) and the Torihama site (Fukui). Pottery having impressions of an unknown material was found associated with the Mikoshiba type stone tools in some sites, e.g., the Terao site (Kanagawa). Pottery having perforation (*enkoumon*) was also discovered in the Jin site (Niigata). Pottery having a prototypical decoration of the slender clay ridges was also found in the Mushagatani site (Kyoto) and the Sagamino No. 149 site (Kanagawa). It is pointed out in recent studies that there should have been a regional variation in the decorative technique within the pottery collectively designated the slendercalyridge style pottery (Ohtsuka 1982). Pottery having pitting decoration (*kamon*) and that having spatula

impressions (*heramon*) discovered in the lowest layer of the Kosegasawa cave have been compared with the pottery found in North Korea and the Maritime Province of the Siberia (Sato 1971). However, the pottery having similar decorations has not been thus far discovered and the genealogical argument of the pottery remains unresolved. To firmly determine the chronological and genealogical positions of the above pottery styles is an issue to be further investigated in the future.

In the Fukui and Senpukuji caves, the earliest Jomon pottery was dated by C-14 to be c. 12,000 years BP. It is curious to know how and why the earliest pottery in the world appeared at the continental

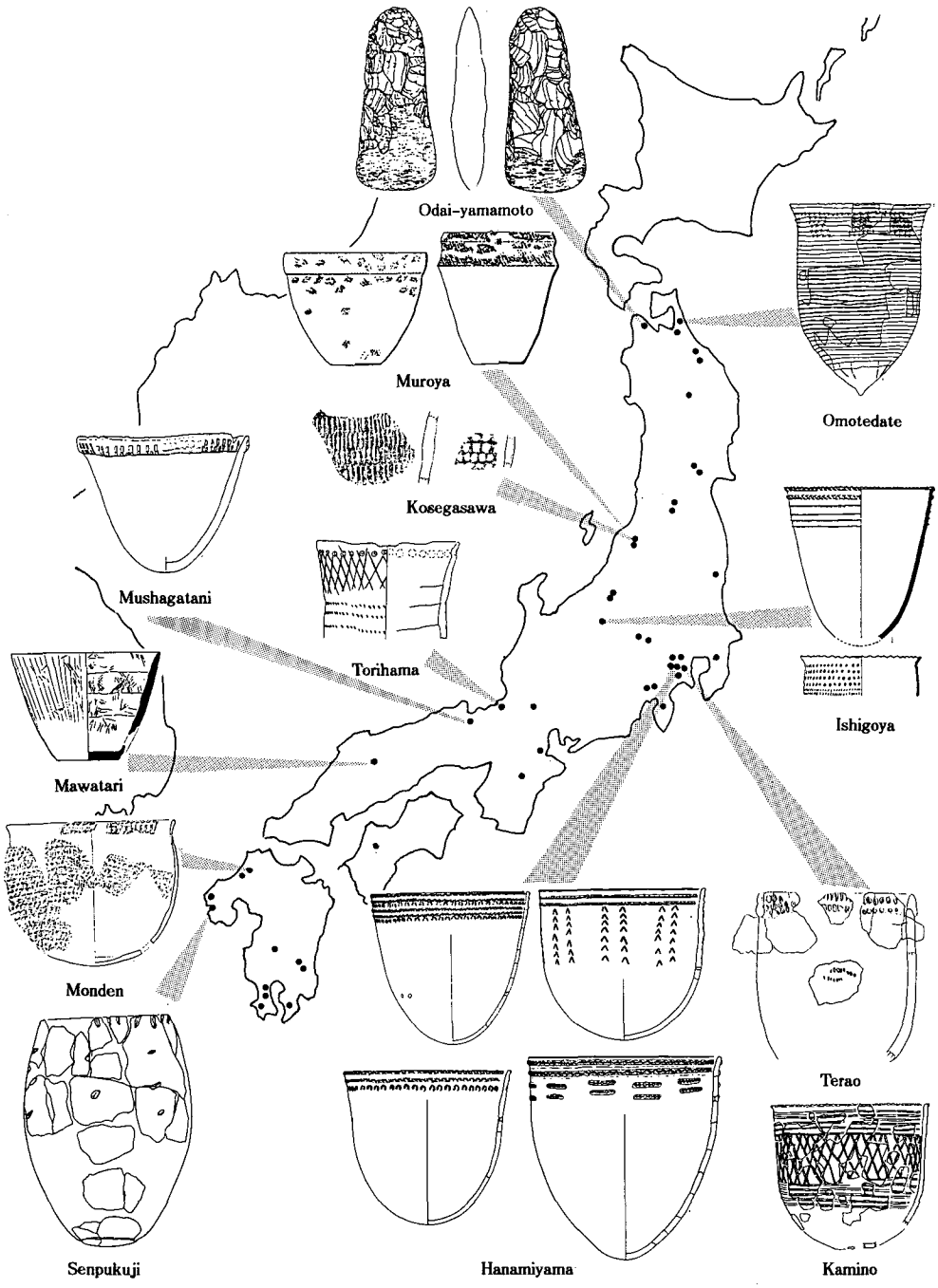


Fig. 2 Sites and pottery of the Incipient Jomon Period
(Pottery and an edge polishes Stone axe)

margin. It is assumed that the use of pottery contributed to the increase in potential food resources. It is discussed by many scholars that the emergence of the Jomon pottery took place as a result of the beginning of eating nuts in western Japan concomitant with the postglacial expansion of the deciduous broadleaf forest to the area; the pottery was used to get rid of harshness from nuts by boiling them (M. Watanabe 1987, Kato 1994). As a matter of fact, the nuts which are inedible unless harshness is removed are found in storage pits in the Higashi-kurotsuchida site (Incipient Jomon, Kagoshima). However, unless they were stored in a large quantity, nuts cannot be a food resource available throughout the year. Thus far, no such large storage facilities for nuts have been discovered in the Incipient Jomon context. Moreover, the Odai-yamamoto site (Incipient Jomon, Aomori) in northern Japan and the Ushirono site (Incipient Jomon, Ibaragi) in central Japan were apparently located out of the deciduous broadleaf forest range. It is likely that pottery was invented and widely spread not only for the processing of nuts but also for other unknown reasons.

With regard to the ceramic chronology in the Final Jomon Period (Fig. 3), the style sequence of the Obora ceramic complex in the Tohoku District has played a vital role; in other areas to the west (as far west as the Kinki District) ceramic chronology is established in accordance with the Obora pottery chronology. The Obora style pottery was initially divided into six successive style phases by Sugao Yamanouchi in the 1930s. Later, it was subdivided to nine phases. Further subdivisions are currently ongoing. It has been pointed out that the Obora style pottery was imported to the Kinki District, western Japan (Suenaga 1961). Lately, the pottery was discovered in some sites located further to the west in the Chugoku and Kyushu Districts, e.g., the Wasadaichi site (Oita) and the Sasai site (Fukuoka). Conversely, it was recently revealed that the Kashihara style pottery of the Kinki District was imported to the Tokai and Kanto Districts in central Japan and the southern part of the Tohoku District in northern Japan. Setting aside the reasons for the movements of the pottery, the long distance importation of the Final Jomon pottery throughout the archipelago is especially useful for correlating the ceramic sequences of distant localities.

In the areas to the west of the Kinki District, chronological changes of pottery having clay band decoration (*tottaimon*) are being established in each area (Izumi 1994). Specifically, in the northern part of the Kyushu District a smooth stylistic transition has been revealed from the Final Jomon to the earliest Yayoi pottery. However, it was also revealed that a unique technique for making vessel walls identical with that prevalent in the Korean peninsula is observable in the clay band decoration pottery in the northern part of the Kyushu District (Yane 1993). It seems that the migrants from the Korean peninsula, who apparently played an important role in the genesis of the subsequent Yayoi cultural tradition, were already present in the Final Jomon Period. Be that as it may, it is an intriguing fact that an external element was adopted in pottery making technique, while indigenous style traditions survived intact in the surface decoration and the shape of vessels.

IV. Subsistence

1. General characteristics

The Jomon population can be characterized as the temperate hunter-fisher-gatherers adapted to the

postglacial environmental fluctuation. The general characteristics of their subsistence system are as follows; (1) a broad spectrum exploitation of food resources (no reliance on a specific resource), (2) a large regional variation in food resources (no basic food resources common to all areas) and (3) adaptation to the seasonal variation of available food resources (the development of sedentary life under the seasonal variation in available food resources). These characteristics are elaborated below.

2. Dietary composition

The stable isotope analysis of bone collagen indicates a significant variation present in the dietary

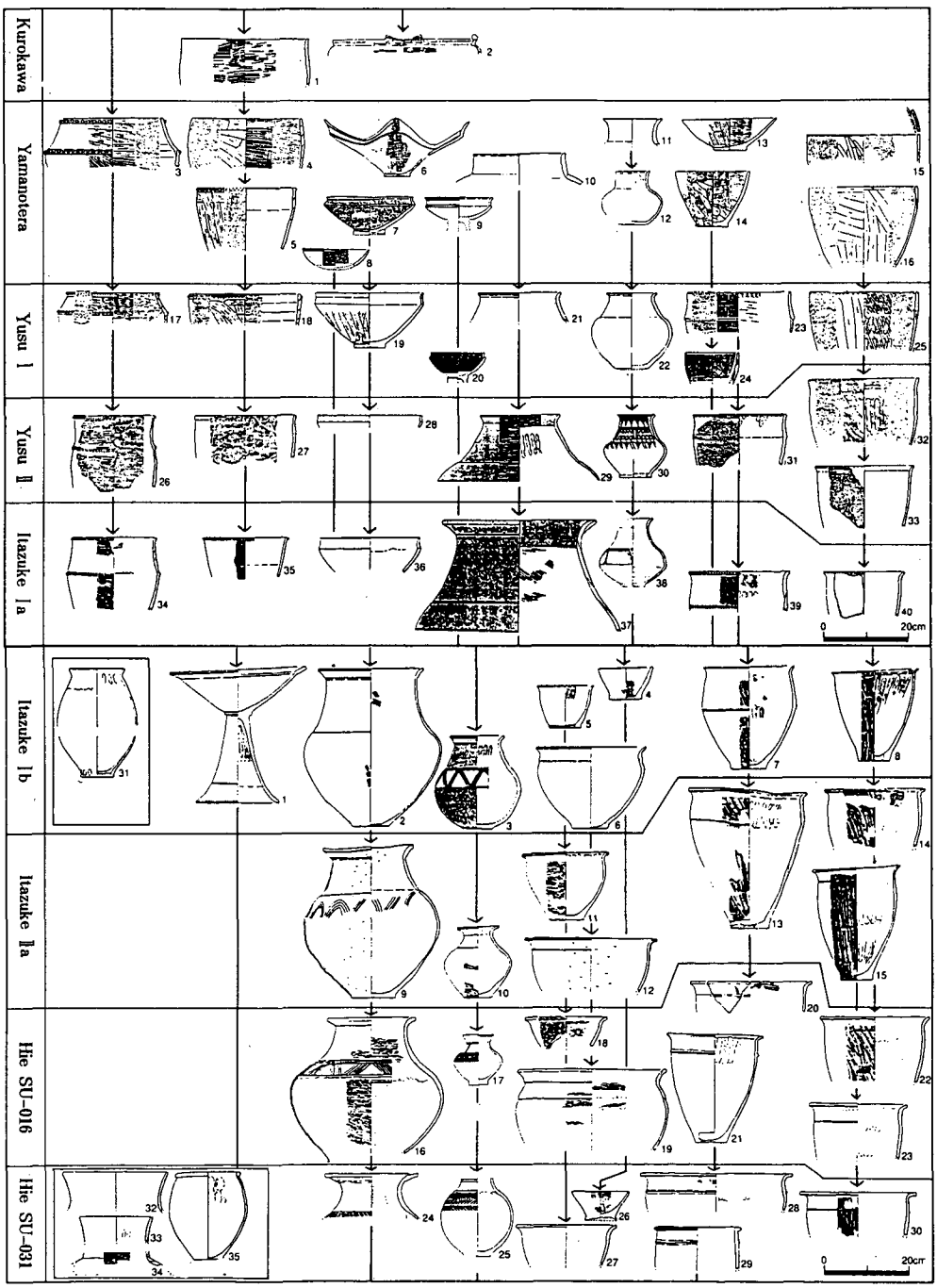


Fig. 3 Ceramic sequence from the Final Jomon to the Earliest Yayoi Period in Northern Kyushu (After Yane 1996)

composition between different areas and/or periods within the Jomon tradition; in Hokkaido (the northernmost part of Japan), the percentage of marine resources (fish and marine mammals) was high in the diet, while in the areas to the south that of terrestrial resources was high. In the latter areas, however, the inland population relied largely on the terrestrial resources, while the population inhabiting the coastal areas had a mixed diet consisted of both terrestial and marine resources. The proportions of each resource were variable between periods and areas (Minagawa 1990). The diet of the Jomon population varied possibly in accordance with the food resources available in the immediate environs of each settlement. This possibility is congruent with the dietary content reconstructed from faunal and floral remains.

3. Food resources and procurement techniques

The food resources exploited by the Jomon population are reconstructed from faunal and floral remains and tools for procuring or processing the resources.

(a) Shell collecting

The beginning of the intensive exploitation of marine resources, which is an important characteristic of the Jomon cultural tradition, was enabled by an increase in the biomass of coastal fauna concomitant with the expansion of shallow water zones and coast lines. The Jomon population was at home in the marine traffic by the use of dugout canoes which are recovered in a number of wet sites in the Early Jomon Period and thereafter throughout the archipelago. It is certain that the canoes were already in use from the earlier periods.

The clearest evidence for the intensive use of marine resources is shell-midden sites. The Natsushima shell-midden site is the earliest in the Jomon Period thus far known in the country (Eariest Jomon: 9,240 ± 500 years BP). The shell deposit in the site measures more than 1 m thick. Beautifully made fish hooks and bones of a variety of fish species are recovered in the site (Sugihara and Serizawa 1957).

Approximately 3,000 Jomon shell-midden sites are thus far known. They are endemic to shallow inlets located on the Pacific coast (especially in the seashores of the Kanto District, Hunka Bay, Ise Bay, Mikawa Bay, Seto Naikai Sea (Inland Sea of Japan), and Ariake Bay), while on the coast of the Japan Sea they are not numerous (Fig. 4). The reason for the scarcity of shell-midden sites on the Japan Sea coast is because of the lack of development of tidelands for the deep water and the small change in sea level by tidal movement in the area.

The density and size of shell-middens vary in accordance with the topography and the subsistence strategy adopted by the local population. In many areas, however, the number of shell-midden sites increases in the Late Jomon Period. Also, shell-middens were small in size until the Early Jomon Period ; they were usually created in a pit or an abandoned pit dwelling. In the Middle Jomon Period and thereafter, however, much larger shell-middens emerged. For instance, the Kasoriminami shell-midden (Late Jomon, Chiba) is estimated to be c. 9,500 m^2 in area and 5,500 m^3 in volume (K. Suzuki 1989). The substantial increase in the number and size of shell-middens in the period is an outcome of population growth and an increased reliance on marine resources made possible by the expansion of tidelands.

Shell species of the shell middens varies in accordance with temporal and spatial variation in coastal environment. The common species are tideland bivalve shellfish such as Oyster (*magaki*), Tegillarca (*haigai*), Meretrix (*hamaguri*), Tapes (*asari*), and brackish water species such as Corbicula (*yamato-shijimi*). Among these, Tegillarca and Meretrix (warm current species) are scarce in northern Japan. Oyster and Tegillarca (muddy bottom species) are popular in the Earliest and Early Jomon shell-middens, while Meretrix and Tapes (sandy bottom species) tend to become popular in the shell-middens in the Middle Jomon Period and thereafter. These differences are result of changes in coastal environment made in response to the sea transgression and retrogression. Corbicula is popular among inland shellmiddens located on the Japan Sea and the Pacific coasts. Because the above mentioned shellfish have a large biomass, large scale shell deposits consisted of these species were frequently created. Sea urchin is also popular in shell-middens located in the Tohoku District and Hokkaido,

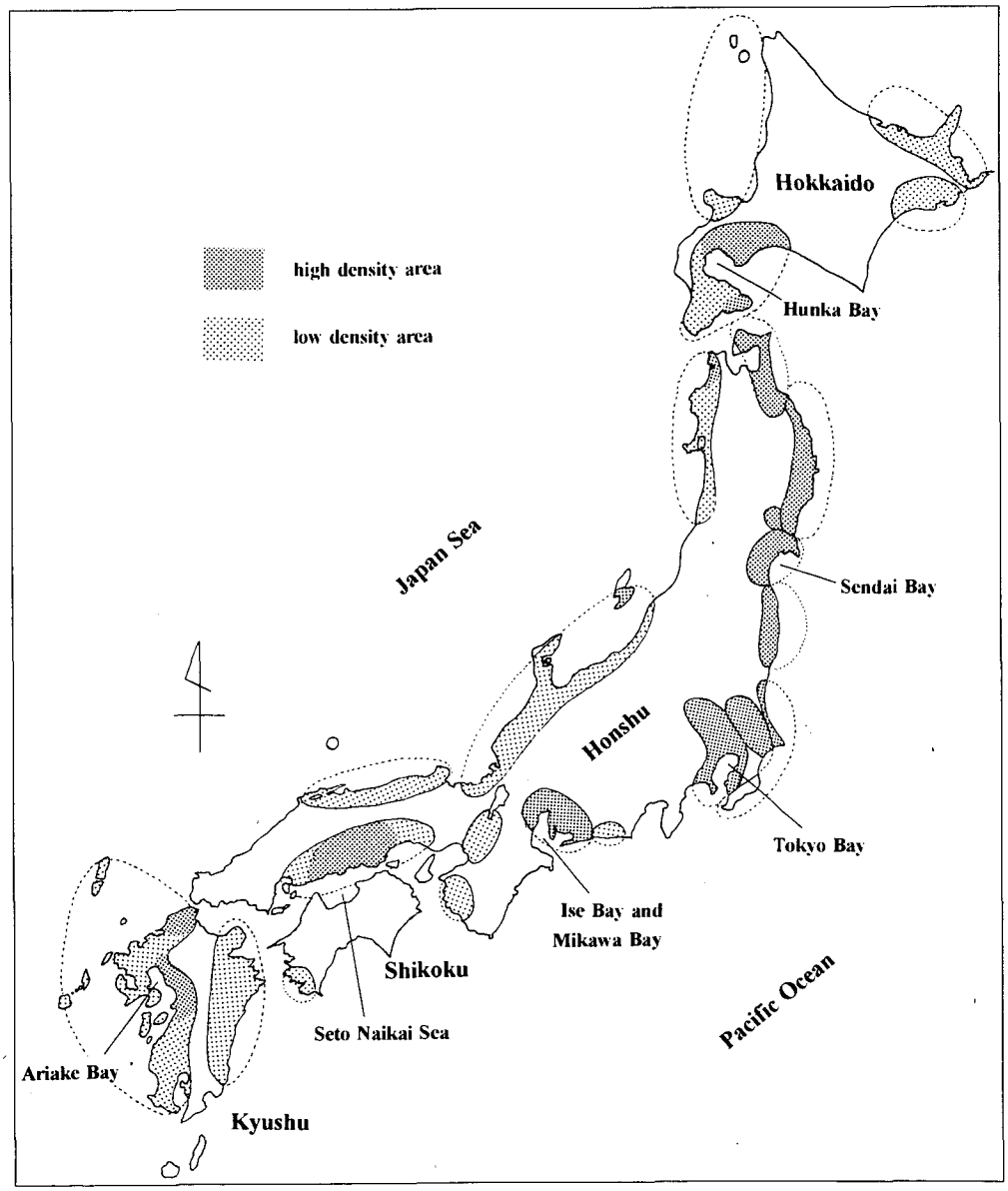


Fig. 4 Distribution of the Jomon shell-middens in Japan (Kaneko 1980: Figure 3 modified).

northern Japan.

The analyses of daily growth lines of Meretrix, Tapes, etc. indicate that the collecting seasons of these species were usually the spring to the summer. Shell collecting activities in the fall were not popular. The reason for this seasonality is explained as follows; (1) the shellfish become larger in size in preparation for spawning in the spring to the summer and they are easily collected from the flood tide in these seasons, (2) the spring is a lean season in which the availability of other food resources lowers, (3) the labor force available was spent largely to gather edible plants (nuts, etc.) in the fall. It should be noted, however, that despite the above generalization, a variation in shellfish collecting seasons is also large between sites in a region or between strata in a site. A large spatial and temporal variation in the seasonality may be an important characteristic of shell collecting activities in the Jomon Period.

Tidewater bivalve shellfish have a large biomass, whose fluctuation is minimal. Also, they are available throughout the year. In case that the availability of other resources lowered, they could be supplemented by shellfish. The large variation in shellfish collecting seasons suggests that the intensity of shellfish gathering activities varied in response to the availability of other food resources.

The shell-middens in the Jomon Period were, in many cases, formed in a settlement site having pit dwellings. Recently, however, it becomes apparent that there is also a unique type of shell-midden that does not entail pit dwellings and yields very few artefacts and fish and animal bones. For instance, in the Nakazato shell-midden site (Middle Jomon, Tokyo) and the Onishi shell-midden site (Final Jomon, Aichi) a large-scale shell deposit (a couple of hundreds meters in diameter and 3 to 4 m in thickness) was formed in a relatively short period. Because it is hard to conceive that the shellfish in the sites were consumed only by occupants of a single settlement, it is postulated that they used to be specialized processing sites for shellfish meat exchange.

(b) Fishing

Fish species yielded in the Jomon shell-middens vary in accordance with the period, area or site. The main species of the coastal sites are; in northern Japan herring (*nishin*), scorpion fishes (*kasago*, etc.), greenlings (*ainame*, etc.), flounders (*hirame*, *karei*, etc.), salmon (*sake*, etc.) and in southern Japan sea breams (*tai*, etc.), sea bass (*suzuki*), puffers (*fugu*, etc.), sardines (*iwashi*, etc.), mackerel (*saba*) and horse mackerel (*aji*). Roughly speaking, in the sites located in northern Japan, limited species are yielded in a large quantity. In southern Japan, the variety of species is large, but each species are yielded in small quantity. Such a tendency accords well with the north-south difference in fish species inhabiting the coastal areas of the country. In the shell-midden sites located in river mouths or inland estuaries, on the other hand, fresh water and brackish water species such as crucian (*huna*), carp (*koi*), minnow (*ugui*), catfish (*namazu*) and eel (*unagi*) predominate.

Fishing gears recovered in the Jomon sites include fish hooks, which appeared in the Earliest Jomon Period, fish spears and harpoons, which became prevalent at the end of the Earliest Jomon Period and thereafter. This gears were possibly utilized to catch large fish like sea breams, sea bass, flounders, etc. In the Pacific coast of the Tohoku District, a variety of fish spears, harpoons and fish hooks appeared in the Late Jomon Period, which suggests the development of offshore fishing of tuna (*maguro*), spearfish (*kajiki*), shark (*same*, etc.) and so forth. Similarly, large amounts of composite

fish hooks, inserted blade fish spears, whale and shark bones are recovered in the shell-middens in the coastal areas of the northern part of the Kyushu District, which was another center of the offshore fishing in the Jomon Period.

Since the Early Jomon period, stone or ceramic weights including those made by recycled potsherds become popular. These weights may have been used for fishnets. Basket traps are discovered in the Yamaga site (Final Jomon, Osaka) and a feature possibly of a weir has been detected in the Shidanai site (the end of the Late Jomon to the beginning of the Final Jomon Period, Iwate). It is conceivable that the traps had been widely used in inland fishing since earlier periods.

Bones of small fish species possibly captured with fishnets or traps are profusely recovered in some Early Jomon shell-middens. They become popular in the Late Jomon shell-middens regardless of located on a seashore, inlet or inland littoral. Thus, the fishing technology changed from mainly angling and spear fishing to fish netting and trapping. This technological change is likely to have been correlated with the change of fishing strategies from the individual centered to the collective fishing. Because fish netting and trapping are more stable in production than angling and spear fishing, it is likely that this technological change greatly contributed to enhance the residential stability of settlements. In the shell-midden sites located in the Pacific coast mentioned above, coastal fish bones are recovered much greater quantity than offshore ones, i.e., fish netting played an essential role in the procurement of sea food.

Because of the similarity in environmental settings to the areas from central California to the Northwest Coast, Sugao Yamanouchi once postulated that the subsistence of the Jomon population was similar to that of the native Americans inhabiting those areas; the Jomon population inhabiting northern Japan relied chiefly on salmon and other anadromous fish, while in southern Japan the population relied mainly on nuts (Yamanouchi 1969). The applicability of this hypothesis has been tested by discoveries of salmon bones in the Jomon sites.

The earliest site which yielded salmon bones is the Maedakochi site (Incipient Jomon, Tokyo) in which many salmon teeth were detected in the burnt soil deposited in a pit dwelling. In other periods, salmon bones are recovered in a number of sites mainly in the Tohoku District and Hokkaido, northern Japan. Owing to the recent increase in carrying out water sieveing techniques in excavations, the number of the sites which yield salmon bones is Increasing. In light of these discoveries, it is certain that salmon was widely captured among the Jomon populations inhabiting central and northern Japan.

Matsui (1996) pointed out that the processing method of salmon bones varied from site to site based on the observation that the preservation and composition of survived bones substantially differ from site to site. Nonetheless, it is clear that the mass of salmon bones recovered from the Jomon sites is too small to be a staple food resource. A polemic is ongoing between the scholars who understand that the scarcity of salmon bones in the Jomon sites reflects a past reality and those who consider that it is because of a specific method of bone processing or discarding adopted by the Jomon population. The settlements of the Ainu in Hokkaido, who relied heavily on salmon, clearly tend to be located in the vicinity of spawning beds of salmon (H. Watanabe 1972). The settlement sites of the Jomon Period were, however, not clearly located near the spawning beds. In terms of this observation, there is a skepticism that salmon fishing was the core of the Jomon subsistence in northern Japan.

(c) Hunting

The composition of game animals in the Jomon Period is relatively simple and homogeneous throughout the archipelago in response to the homogeneous distribution of mammalian fauna. In Honshu and the islands to the south, deer (*shika*) and wild boars (*inoshishi*) were main game animals. Especially in western Japan, wild boars predominated, while in eastern Japan deer were prevalent (Nishimoto 1991). Because wild boars did not inhabit, deer were the main animals hunted in Hokkaido. In the coastal area, however, fur seals (*ottosei*), sea lions (*todo*) and seals (*azarashi*) were also hunted. Among the middle sized animals, badgers (*tanuki* and *anaguma*) and hares (*nousagi*) were widely hunted throughout the archipelago. However, the small animals like mice (*nezumi*) are not abundantly recovered in the Jomon sites. Some of the coastal sites, e.g., the Shomyoji site (Late Jomon, Kanagawa), the Mawaki site (Final Jomon, Ishikawa), yield large amounts of dolphin (*iruka*) and small whale (*kujira*) bones, which suggests the emergence of fisher groups specialized in marine mammal hunting. In cave sites located in the inland mountain regions, bear (*kuma*), serow (*kamoshika*) and macaque (*nihonzaru*) bones are normally recovered, which indicates the presence of a different hunting tradition from that in the lowland.

Bones of avifauna are usually not found very much in the Jomon sites. In Honshu and the islands to the south, wild ducks (*kamo*, etc.) and pheasants (*kiji*) are widely found. Some inland estuary sites yield many wild duck bones. Albatross (*ahodori*) and cormorant (*u*) are normally found in Hokkaido. Amphibian and reptile bones are scarce in the Jomon sites.

The most important characteristic of the Jomon hunting tradition is the use of bows and arrows. Stone arrowheads emerged in the Incipient Jomon Period and rapidly disseminated over the archipelago. Spears appeared in the end of the Paleolithic Period and continued to be used into the Jomon Period. However, they were not so popular as bows and arrows. In eastern Japan, pitfalls of various shapes had been used since the Earliest Jomon Period. They are thought to have been used to capture deer and/or wild boars. It is conceivable that traps were also utilized in hunting animals, although they have not been archaeologically discovered. The earliest evidence of dogs appears in the Incipient Jomon Period. The discovery of dog bones increases in the Late Jomon Period and thereafter (Nishimoto 1984). Dogs are, in many cases, carefully buried; they are likely to have been used as hunting dogs.

(d) Plant gathering

The expansion of broadleaf forests concomitant with the postglacial climatic amelioration brought about an increase in the edible nuts and tubers. Along with the exploitation of marine resources, the increased reliance on plant food in comparison with the Paleolithic Period is one of the important characteristics of the Jomon subsistence economy. In the Higashi-kurotsuchida site (Kagoshima) located at the southern end of the Kyushu District where the expansion of deciduous oak and evergreen oak started, storage pits for nuts are discovered in the Incipient Jomon context.

Owing to the increase in excavations of wet sites, the recovery of macrobotanical remains is also increasing. A large part of the macrobotanical remains thus far recovered is nuts; in eastern Japan those of deciduous broadleaf forest, e.g., chestnuts (*kuri*), walnuts (*kurumi*), horse chestnuts

(*tochinoki*), acorn (*nara*, etc.) are prevalent. In western Japan, on the other hand, those of evergreen broadleaf forest, i.e., chinquapin (*shii*) and evergreen oak (*kashi*) are predominant. In the sites located on the inland estuaries, water chestnuts (*hishi*) are also normally found. In terms of the observation of folk traditions, it is probable that tubers like lily bulbs (*yurine*), arrow root (*kuzu*), and Japanese yam (*jinenjo*) were also exploited in the Jomon Period.

Procurement and processing tools of plant foods include the stones having surface pitting and the hammer stones which were possibly used for cracking nut shells and the stone mortars and the grinding slabs by which nuts were ground to a fine powder. These tools became popular at the end of the Earliest Jomon Period. Chipped stone axes are generally conceived as digging tools, because they are not suitable for cutting trees. The likelihood that they were used to dig tubers is high. Chipped stone axes were prevalent in eastern Japan in the Early Jomon Period. After the Middle Jomon Period, they disseminated to western Japan. Because chipped stone axes are so profusely found in the Middle Jomon sites in the Kanto District and the inland mountain area of central Japan, the cultivation of millet, etc. has been postulated by some scholars. As noted, storage pits appeared in the beginning of the Jomon Period and diffused over the archipelago thereafter. A well-preserved pit discovered in the Minami kata-maeike site (Final Jomon, Okayama) permits observation on the storage techniques for nuts.

In order to eat horse nuts and nuts of deciduous oak and evergreen oak, harshness needs to be removed. In the folk tradition, the oak nuts are soaked in water and boiled to get rid of harshness. In addition to these processes, horse nuts are soaked in ash mixed water (M. Watanabe 1984). These folk technologies can be traced back to the Jomon Period. As a matter of fact, piles of nutshells are discovered in some lowland wet sites of the Middle Jomon Period and thereafter, e.g., the Kuwagai-shimo site (Kyoto), the Akayama site (Saitama).

Based on the observation that many cultural traits are shared by ethnic groups inhabiting the broadleaf evergreen forest area stretching from the Japanese archipelago to southern China, Nakao Sasuke postulated the three stage evolutionary scheme of plant cultivation in the "Laurilignosa Forest Culture" : (1) incipient cultivation of yam, etc., (2) shiifting cultivation of millet and (3) paddy field cultivation (Ueyama 1969). M. Watanabe (1984) regarded the Jomon population who had the harshness removal technique of nuts as incipient cultivators by accepting the idea of Nakao that the technique is characteristic of this stage of the culture. Recent progress in paleobotanical research supports this understanding.

In the San'nai-maruyama site (Early to Middle Jomon, Aomori), substantial amounts of chestnut pollen are detected in the nearby river deposits (Yasuda 1995). It is interpreted that there was chestnut forest managed by the local population. Also, the DNA analysis of the chestnuts recovered from the site indicates that they are generically much more homogeneous than wild chestnuts (Sato 1997). Furthermore, Minaki (1994) points out that the size of chestnuts recovered from the Jomon sites generally become larger as they become chronologically younger. Thus, it is gradually revealed that the controled raising and selection of chestnut trees were prevalent in eastern Japan since the Early Jomon Period. The population growth took place in the Middle Jomon Period in central Japan is very likely to have been due to the elaboration of chestnut forestry.

The evidence for the incipient cultivation of other plants is also obtained. Macrobotanical remains

of Phaseolus radiatus (*ryokuto*), Perilla frutescens var. frutescens (*egoma*) and gourd (*hyotan*) are recovered from the Early Jomon context; the cultivation of these plants in the period and thereafter is certain. However, because they are not profusely found, they were obviously not staple foods. In the pollen analysis in the Ubuka bog site (Shimane), Tsukada (1988) interpreted the increase in charred substances and grass pollen in the soil stratum of 7,700 years BP to indicate intentional burning of the virgin forest. Also, he insists that slash-and-burn agriculture was already conducted in the Early Jomon Period based on the emergence of buckwheat (*soba*) pollen in the soil stratum dated to be 6,600 to 4,000 years BP.

Thus, by the Early Jomon Period the cultivation of some plant species had been the norm. Nonetheless, the reliance on natural resources was still large. The subsistence system of the Jomon population at large was not yet centered on cultivation.

(e) Adoption of rice cultivation

In the beginning of the Final Jomon Period, the rapid diffusion of rice cultivation was initiated and the diffusion front reached the Kinki District by the middle phase of the Final Jomon Period (alterna-tively called the Pre-Yayoi I Period). In western Japan, paddy fields became prevalent and stone tools of the continental origin had already emerged by this period (Kuraku 1991). The social system was rapidly transformed, oriented to rice cultivation thereafter.

In eastern Japan, however, rice remains and agricultural tools are seldom discovered in the sites of the end of the Final Jomon Period (i.e., the middle phase of the Early Yayoi Period in western Japan), although the rice fields are discovered in some sites, e.g., the Miyanomae site (Yamanashi) and the Sunazawa site (Aomori). It is probable that in eastern Japan rice cultivation was a minor component of the entire subsistence economy in this period. In western Japan, most of the cultural traits characteristic of the Yayoi tradition had emerged by the end of the Early Yayoi Period (Toyama and Nakayama 1992). In eastern Japan, they emerged after the middle phase of the Middle Yayoi Period; the transition to a fully agricultural society took place gradually in eastern Japan.

(f) Salt manufacture

In the Final Jomon Period, the sites at which salt making was carried out appeared in the lower reaches of the Tonegawa basin, the Kanto District, and in Sendai Bay, the Tohoku District. In these sites, an enormous amount of crudely-made plain pottery, thick ash deposits and strongly burnt hearths are present. These are very likely to have been remnants of making salt by boiling sea water. The reason why the salt making sites appeared in limited localities at this time period is unexplained.

4. Subsistence System

The subsistence system in the Jomon Period varied in accordance with local environmental settings and food procurement and processing technologies available. As a concrete example of the Jomon subsistence system, the seasonal and spatial structure of food procurement activities in the Ikawazu shell-midden site (Final Jomon, Aichi), central Japan is presented below.

The site is located at Mikawa Bay on the Pacific coast. Comprehensive studies of the shell deposit

of the early phase of the Final Jomon Period were conducted in this site. Species of the faunal and floral remains were identified. Daily growth lines of certain shellfish species were analysed. Ecological investigations of potential food resources available around the site today were also carried out.

In the faunal remains, tideland bivalve shellfish (e.g., *Tapes*), conchs inhabiting reefs (e.g. *Lunella*), bay fish (e.g., black sea breams, sea bass), eels, wild boars and deer predominate. While the composition of floral remains is not exactly known, nuts (chinquapin and evergreen oak) seem to have been a vital components.

Food resources available in each season of a year are recovered in this site (Fig. 5). No other sites possibly associated with this site to form a settlement system are known in the vicinity. It is, therefore, likely that the site was a permanent settlement inhabited throughout the year. Deer and wild boars were probably hunted in the fall to the winter. It is probable that nuts were intensively gathered in the fall and stored until winter or spring of the next year. Perhaps most of the marine resources were procured in the summer and the decreased food in this season was supplemented by the sea food. Tideland shellfish were collected throughout the year. However, the intensive collection season varied from year to year. This variation may have been correlated with the availability of other food resources. They are likely to have been buffers of unstable food supply.

The areas in which each food procurement activity was conducted are radially distributed around the site (Fig. 6). Among them, the intensively exploited areas are concentrated around the site. Owing to the location of the site at an ecotone of various environmental zones, a sedentary life was feasible.

Similar characteristics of the subsistence system are also recognized in other sites, e.g., the

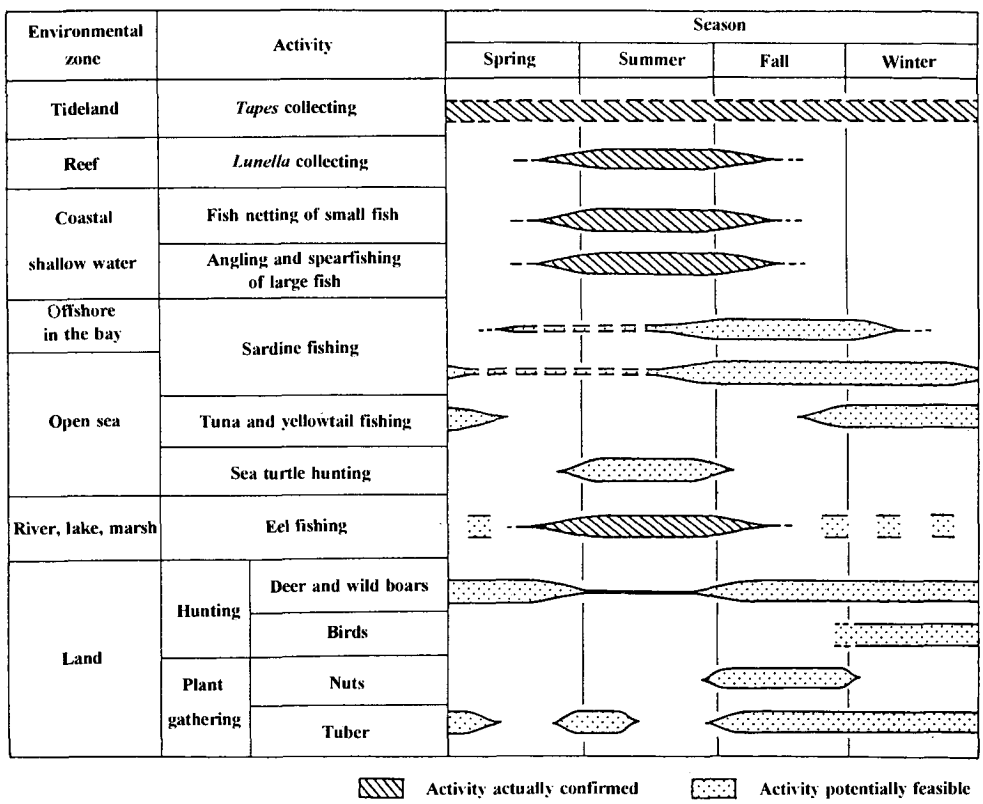


Fig. 5 Seasonality of food procurement activities at the Ikawazu shell-midden site.

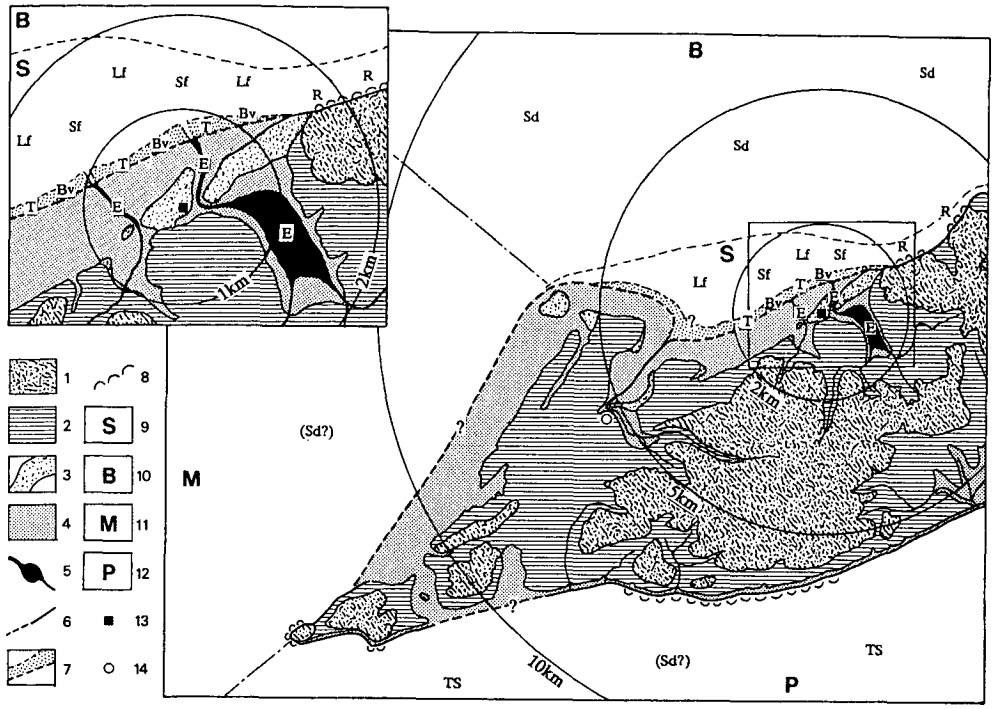


Fig. 6 Site catchment area of aquatic resources at the Ikawazu shell midden site (ca. 3000 years BP).

1, Hill; 2, Plateau; 3, Sand dune; 4, Alluvial lowland; 5, River, Lake and marsh; 6, coast line; 7, Tideland; 8, Reef; 9, Coastal shallow water; 10, Bay; 11, Bay mouth; 12, Open sea; 13, Ikawazu site; 14, Hobi site; T, *Tapes* collecting; Bv, Tideland bivalve shellfish collecting; R, *Lunella* collecting; E, Eel fishing; Sf, Fish netting of small fish; Lf, Angling and spearfishing of large fish; Sd, Sardine fishing; TS, Tuna and yellowtail fishing and Sea turtle hunting.

Torihama shell-midden site (Early Jomon, Fukui), the Satohama shell-midden site (Final Jomon, Miyagi). They are possibly general characteristics of the subsistence system of the populations inhabiting the coastal areas in Honshu and the islands to the south in the Early Jomon Period and thereafter. The transition from the nomadic life of the Paleolithic Period to a sedentary way of life during these periods is yet to be elucidated.

V. Settlement

Owing to the large scale salvage excavations rapidly increasing in the last couple of decades, the community patterns of the Jomon settlements are being gradually unveiled. In the Incipient Jomon Period, caves and rock shelters were frequently used as dwelling spaces. The Kosegasawa, Fukui and Senpukuji caves, etc. mentioned above are, among others, well-known examples of the Incipient Jomon cave sites. It should be stressed, however, that nearly 90% of the Incipient Jomon sites thus far discovered are open-air sites. Also, the fact that spearheads and arrow points are usually recovered in the cave sites suggests that these sites might have been temporary encampment for hunting activities.

Assuming that the presence of a pit dwelling is an indicator of the sedentary lifeway, sedentary settlements have been present since the earlier half of the Incipient Jomon Period. A pit dwelling associated with the slender clay ridge pottery was discovered in the Hinata-nishichiku site

(Yamagata) and the Maedakochi site (Tokyo). Also, pit dwellings associated with the plain pottery are found in the Sendaiuchimae and the Iwashita-mukai A sites (Fukushima). Probable pit dwellings associated with the various cord-mark impressed pottery are known from the Miyabayashi site (Saitama). Most of these pit dwellings are shallow and have no interior hearths and clear postholes. The number of pit dwellings discovered in a site is usually one or two. The sedentariness of these pit dwellers is a crucial issue. Many salmon teeth are recovered from the fill of a pit dwelling in the Maedakochi site. However, as a food salmon is not likely to have lasted longer than a couple of months or half a year.

In the Kanto District of central Japan, the settlement sites having more than a couple of pit dwellings increased from the Earliest Jomon Period (Harada 1988), e.g., the Tokyo tenmondai-konai site, the Oyamada site (Tokyo) and the Nishinojo site (Chiba) (Fig. 7). By the end of the Earliest Jomon Period, settlement sites having larger number of pit dwellings appeared. At the same time, pottery bases thus far pointed became flat. The inventory of stone tools also expanded. It seems that sedentary lifeways were being established as the norm in this period.

In the Early and Middle Jomon Periods, the number of pit dwellings in a site drastically increased. Approximately 600 pit dwellings are detected in the San'nai-maruyama site (Aomori), northern Japan. The site was occupied mainly in the Early and Middle Jomon Periods, i.e., possibly for about 1,500 years. Some scholars consider that the resident population of the site once became as large as 500, based mainly on an ethnographic analogy from the sedentary settlements of the Northwest Coast Indians (Koyama 1996, Okada 1997). In contrast to the Northwest Coast Indians, however, nuts were probably a main food source in the site.

It is suggested that at least 3,500 more pit dwellings are to be found in the unexcavated area (ca. 350,000 m^2) of the site (Okada 1997). Beyond doubt, the site is an extraordinarily large settlement in this period. However, the population size of the site needs to be carefully estimated by identifying the number of the absolutely contemporaneous pit dwellings based on the analysis of pottery styles associated with them. It seems that the site has most expanded not in the Early but in Middle Jomon Period.

In many Early and Middle Jomon settlement sites in the Kanto and Tohoku Districts, pit dwellings are circularly located around a central area in which traces of structures are usually not detected.

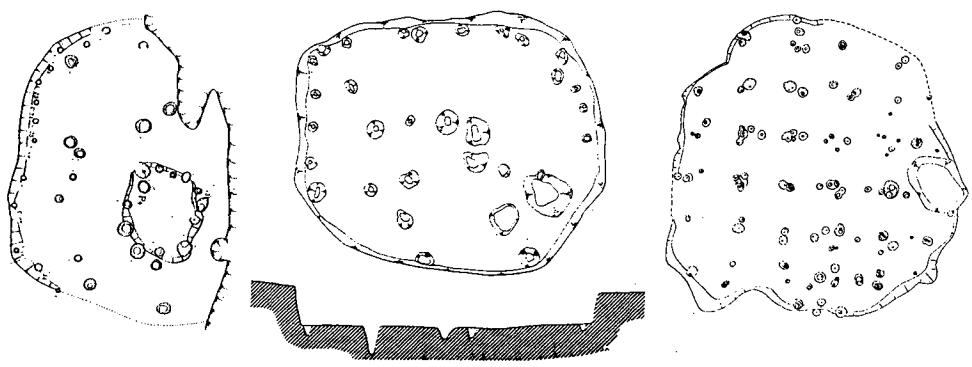


Fig. 7 Plan of the pit dwellings in the Earliest Jomon Period.

Burial grounds may be found at the perimeter of the central plaza (i.e., between the plaza and the pit dwellings). In some of these sites, an extraordinarily large pit dwelling (often larger than 30 × 10 m) coexists with the smaller (normal sized) ones. It is postulated that the large ones were communal houses (Kobayashi 1992). Some scholars regard the settlements having many pit dwellings, a central plaza and a burial ground as a regional center with which satellite settlements are associated (Y. Suzuki 1988).

It is not clearly elucidated how the circular settlements were formed. Nonetheless, it is certain that the circular plan of the settlement as observed today is a cumulative result of successively occupied pit dwellings. The general pattern of the movement of pit dwellings seems to be; (1) the initial dwellings located on the opposite sides of a central plaza at first made a lateral movement along an arc until becoming congested and (2) the dwellings then moved inward to the central plaza and repeated the same lateral movement.

Thus. in the Kusakari shell-midden site (Middle Jomon. Chiba) the earliest pit dwellings (Atamadai IV to Nakabyo Phase) are clustered and each cluster was located at the perimeter of the settlement (Fig. 8). Each cluster was also evenly spaced. Because some of the pit dwellings in a cluster stratigraphically overlap each other, they were not simultaneously occupied. The absolutely contemporaneous pit dwellings in each cluster numbered two or three.

Some pit dwellings accommodating multiple burials are also located at the perimeter of the site. They are also evenly spaced each other. It is plausible that the deceased members of a family or related families residing in a nearby pit dwelling cluster were buried at these pit dwellings. The number of burials detected in each special pit dwelling roughly corresponds to that of the pit dwellings in each cluster. It follows that if a resident of a pit dwelling died, he or she was buried in a "house of the deceased". Then, the pit dwelling that he or she resided was abandoned and the bereaved members moved to a new pit dwelling, which was built around the abandoned one. Thus, each cluster of pit dwellings is very likely to have been a product of a family or group of related families. In this site, eight clusters of pit dwellings are discerned (Takahashi 1991).

In the Uesato site (Iwate), a collective burial accommodating seven individuals is detected in a pit (not in a pit dwelling). The morphological analysis of the teeth of the deceased indicates that they were possibly members of a single family and a related individual (Yamauchi 1983). This instance suggests that the basic unit of burials in the Jomon Period was a family. In light of this possibility, the likelihood that the basic unit of residence was a family is also enhanced. It is, however, not known how the families residing in a settlement were integrated. In the case of the Kusakari shell-midden site, the entire settlement (i.e., all of the pit dwelling clusters) seems to have been simultaneously abandoned. It can be that the residents of the site were closely integrated in a labor organization for the collective exploitation of marine resources.

With regard to the size and sedentariness of the Jomon settlements, two opposite theories are proposed; (1) a number of pit dwellings in a settlement was simultaneously occupied and the settlement was continuously occupied for a long period (Y. Suzuki 1988, Nishida 1986) and (2) only a couple of pit dwellings were simultaneously occupied in a settlement and the occupation was episodic and short (Kuroo 1988). It is true that there are small sites consisted only of a pit dwelling or a couple of pit

dwellings. However, it is hard to regard all of the large sites as a consequence of episodic occupations of a small settlement in terms of the consistency observable in the spatial organization of the site throughout its occupation.

VI. Mortuary Practice

Because of the acidic soil prevalent in the country, human bones are seldom discovered in the Jomon sites except for shell-middens and limestone caves. Nevertheless, possible burial pits are frequently

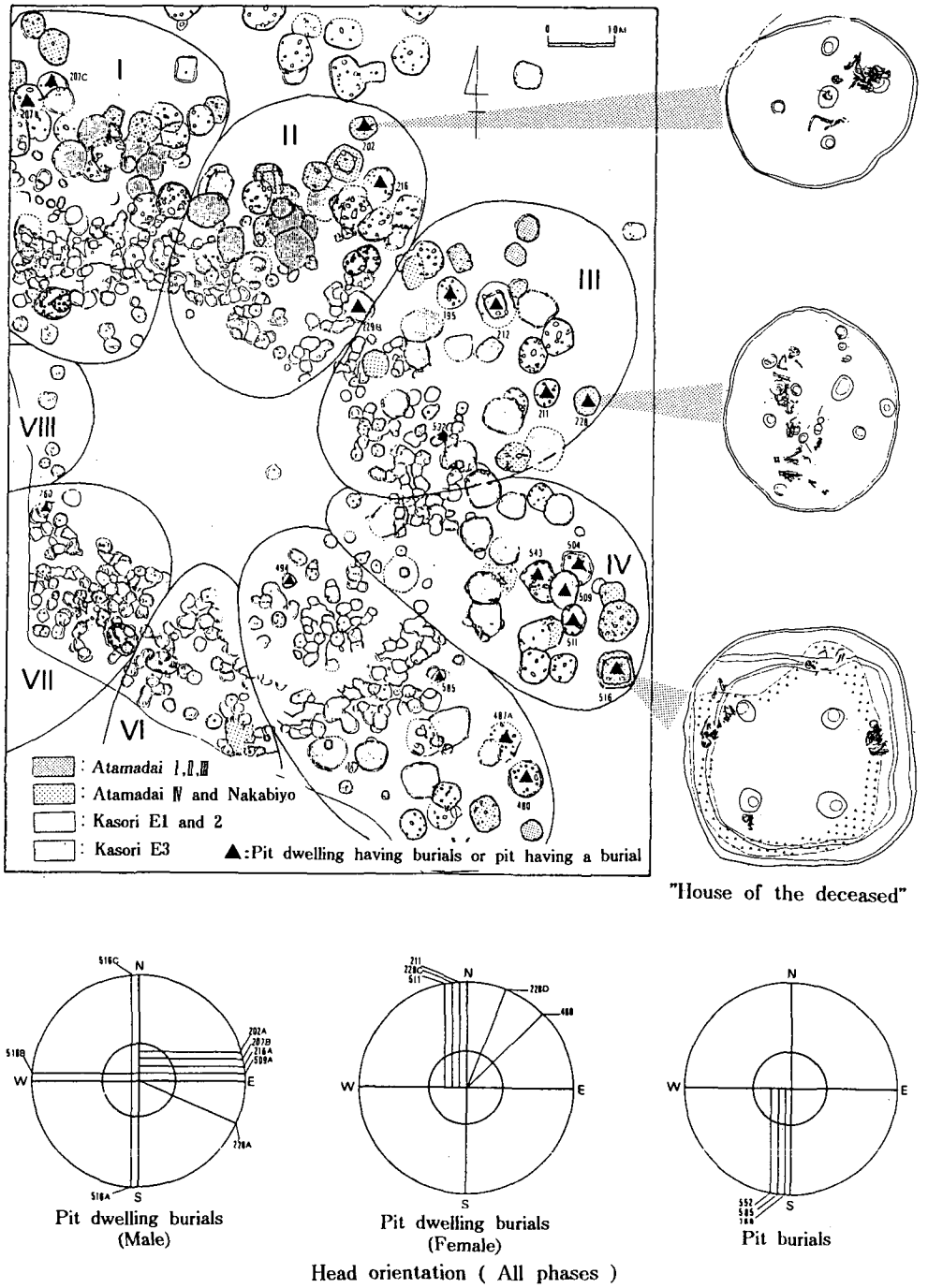


Fig. 8 Distribution and head orientation of the burials at the Kusakari shell-midden site.

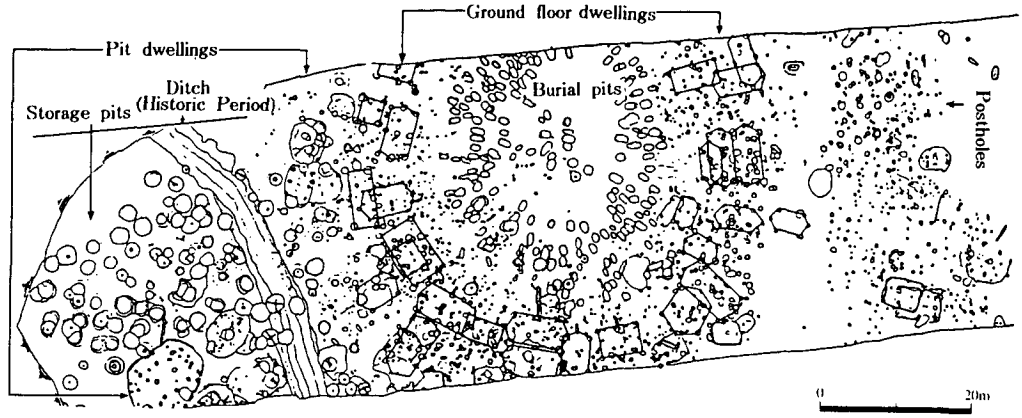


Fig. 9　Plan of the Nishida site.

detected in a number of open-air sites having no shell deposits. The earliest burial pit thus far known is the ones detected in the Nakamachi site (the early phase of the Incipient Jomon, Nagano). In this site, two pits having potsherds and arrowshaft smoothers are detected. Whereas bones were absent, the artefacts are interpreted to be grave goods offered to the deceased.

In the late phase of the Incipient Jomon to the beginning of the Earliest Jomon Period, definite evidence of burial having skeletal remains is known from the Hirasaka shell-midden site (Kanagawa). Unfortunately, the posture of the deceased is not clearly observable in this burial. In the later phases of the Earliest Jomon Period, burials are reported from several sites, e.g., the Jaodo cave (Iwate), the Oyaji rock shelter (Tochigi), the Tochihara rock shelter (Nagano), the Kamikuroiwa rock shelter (Ehime), the Ishiyama shell-midden site (Shiga).

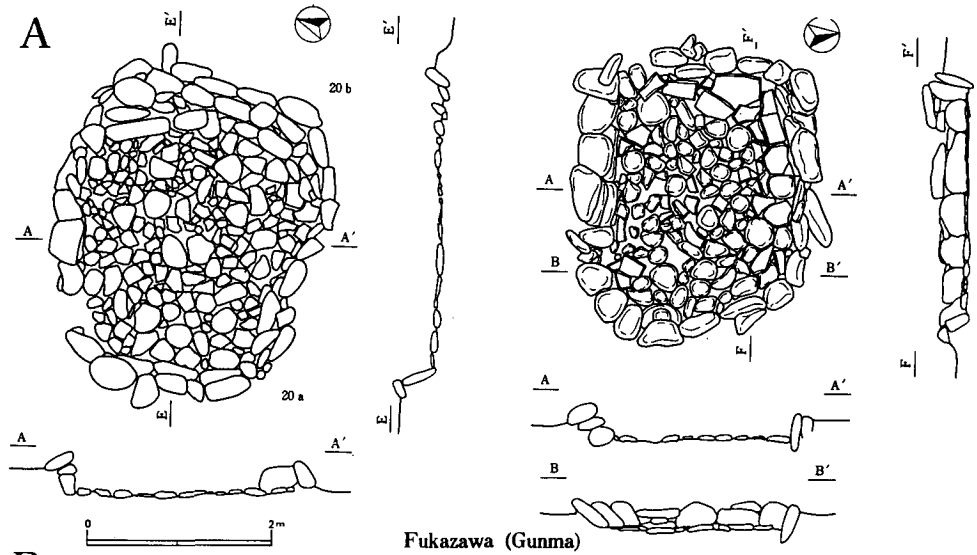
In the Earliest Jomon Period, most of the burials thus far known are those made in the interior of a cave, where the deceased was buried in a pit and a stone was placed over it. The flexed burial was the norm. In the Tochihara rock shelter, child burials were concentrated on a specific locality separated from the adult burials. In the Oyaji rock shelter, a flexed burial of an adult and three skulls were discovered. Because the skulls have no trace of being cut from a body, they are regarded as secondary burials. The observation that the number of burials detected in a site is small in the Earliest Jomon Period is congruent with the group size inferred from the number of pit dwellings present in a settlement.

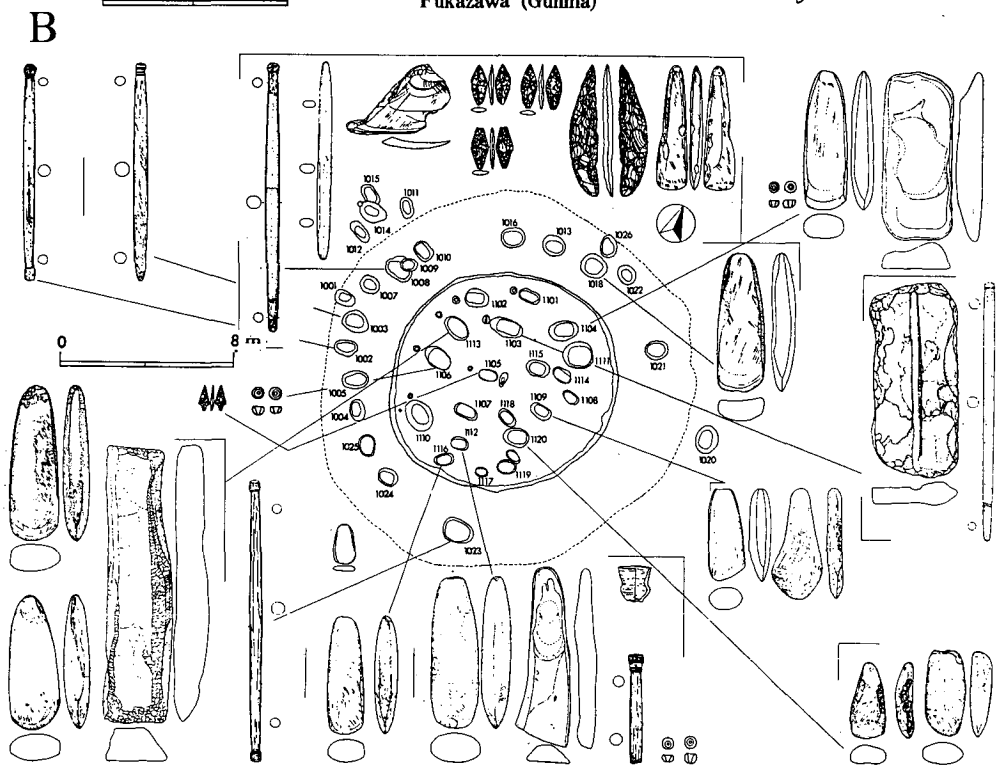
In the Early Jomon Period, a number of pit burials with or without skeletal remains is known. Among these, the most important discovery as to the mortuary practice in this period was made in the Nishida site (Iwate) (Fig. 9). At this site, a clearly bounded burial ground on which burial pits are concentrated is located between the central plaza and the circularly arranged pit or raised floor dwellings around it. Because the pits do not overlap each other, there should have been a marker on the ground in each pit. The burial pits seem to be clustered. Whether the clusters correspond to those of pit dwellings and, if they do, each pit cluster consisted of a single-family group as observed in the Kusakari shell-midden site should be examined in the future.

In the Middle Jomon Period, a unique burial that the deceased is buried in an abandoned pit dwelling becomes popular, while it possibly appeared earlier in the Early Jomon Period. A clear example of the abandoned house burial in the Kusakari shell-midden site is already mentioned above. In the Atamadai

IV and the Nakabyo phases, the deceased in a family group was disposed in a specific pit dwelling. However, in the subsequent phases this custom seems to have declined. In the Kasori E2 phase and thereafter, the deceased was buried in the pit dwelling where he or she possibly resided before death. Needless to say, the custom that the bereaved occupants of the pit dwelling moved to a new one continued (Takahashi 1991).

Throughout the occupation of the site, adult male (east or west) and female (north) were consistently distinguished by a different head orientation in this site. Also, in the Kasori E2 phase and thereafter some individuals were not buried in abandoned pit dwellings; three of the storage pits located between





Kashiwagi B (Burial pits associated grave goods are indicated)

Fig. 10 Stone coffin burial and earth circle.

the pit dwellings and the central plaza were reused as burial pits for adult males. The head of these individuals oriented to the south. It is curious to know the reason for these irregular burials.

A characteristic burial in the Late Jomon Period is the stone alignment tomb found in the Tohoku, Kanto and Chubu Districts. In the Tohoku district, it is often the case that a ceramic coffin (a pot) was placed within a stone coffin, which suggests secondary burials. However, in the Kanto and Chubu Districts, the deceased was directly buried in a stone alignment coffin (Fig. 10). The spatial relationship of the burial and the settlement is not clearly known. At several sites, the orientations of the longitudinal axis of the coffins are clearly divided into two groups; the north-south oriented and the east-west oriented ones. In the Tenjinbara site (Gunma), the east-west oriented coffins are slightly larger than the north-south oriented ones. It is likely that this difference is due to a male-female differentiation of the deceased. In the stone alignment tombs, the presence of grave goods mainly of pottery is the norm.

In the southern part of Hokkaido a collective burial ground called "earth circle" (*kanjodori*) appeared in the latter half of the Late Jomon Period (Ikawa-Smith 1992). The earth circle consists of a large circular embankment (50 m to more than 100 m in diameter). A number of burial pits are distributed within and on the embankment. In the Kashiwagi B site, 43 burial pits were detected (Fig. 10). In this site, stone pillars were erected near the pits as tomb stones. The grave goods include such prestigious artefacts as stone clubs, stone swords, etc. Also, red ocher (ferric oxide) was sprayed over the corpse. This custom diffused to the Tohoku District to the south in the Final Jomon Period.

In the Tohoku, Kanto and Chubu Districts, stone circles appeared in the end of the Middle Jomon Period and became prevalent in the Late Jomon Period. A notorious example of this feature is that in the Oyu site (Akita) which consists of the outer (45 to 50 m in diameter) and inner (10 to 15 m in diameter) concentric stone alignments. There are two stone circles located in the vicinity of this site. The basic unit of these features is, however, a small stone alignment (2 to 3 m in diameter). This small alignment was combined to form larger alignments.

The presence of burial pits is confirmed below the alignments; the alignments were the monuments above the burials. In some parts of the alignments, a feature called a sundial is present. It consists of an upright standing stone and lying stones placed radially from it. The significance of this feature in the burial ground is not clarified. In the Tateishino I site (Iwate), a meandered stone alignment was discovered. The basic unit of the alignment is two large stone boards erected on the ground and surrounded by pebbles. These units are evenly spaced and are connected by pebbles (Kikuchi et al. 1997 b).

In the Final Jomon Period, secondary burial became prevalent in the Tokai District. Bones of multiple individuals were often reburied collectively in a different locality. They were accommodated in a vessel or neatly arranged in a pit.

VII. Exchange

The items exchanged in the Jomon Period include jade, asphalt, amber, obsidian, pottery, salt, shellfish meat, etc. The source area of jade is limited to the Himegawa basin (Nagano and Toyama)

on the Japan Sea side of central Japan. A long distance exchange of jade was made in light of the discoveries of the stone in sites located in Aomori and Hokkaido, the northernmost part of Japan. Asphalt was used to glue harpoons and arrowheads on a shaft or to repair cracked pots or wooden artefacts. The source areas are located in central and northern Japan (Akita, Miyagi and Niigata). Also, a long distance exchange of the material was prevalent; it is found in sites located in Hokkaido, the Kanto District, etc. The sources of amber are also limited to some areas in the Kanto and Tohoku District. Amber is also recovered in distant localities from the sources, e.g., in Hokkaido.

A number of obsidian sources are known throughout the country. It was widely exchanged from each source. Lately, an obsidian mining site at the Wadatoge source (Nagano) was excavated: the Takayama site where mining pits were detected. Long distance exchange is observable also in some pottery. As noted, the Obora style pottery manufactured in the Tohoku District was imported to as far south as the Kyushu District. Also, as mentioned above in the Middle to the Final Jomon Period salt and shellfish meat were possibly exchanged in light of the presence of salt making sites and gigantic shell-middens which yield almost nothing other than shell valves in the Kanto District.

In spite of the cumulative evidence for the prevalence of exchange in the Jomon Period, the mode of the exchange systems is hardly elucidated; it is not known if the exchange of each item was reciprocal or redistributive, let alone more specific exchange mechanisms. It is urgently required to go beyond the simple identification and sourcing of exotic items.

VIII. External Relationships

Thus far, the Jomon population has been somewhat conceived as an autonomous entity insulated from the mainland Asia. Some of the recent discoveries, however, render this prevailing idea to be reconsidered. In the Kuwano site (Fukui) located on the Japan Sea coast of central Japan, 78 slit stone earrings were found in burial pits of the end of the Earliest Jomon to the Beginning of the Early Jomon context. Their style is very similar to the styles of slit earrings and perforated pendants found in the Xinglongwa site located in northern China. The date (c. 7,000 years BP) of the Kuwano site corresponds to that of the Chinese counterpart. Based on these observations, it is proposed that this site was occupied by the migrants from China.

The bronze knife found in the Misakiyama site (Yamagata), located also on the Japan Sea coast of northern Japan, is dated to the Late Jomon Period. The style of the knife is similar to that of the Anyang Period of the Shan Dynasty; it is generally accepted that the knife was imported from China.

The discovery of a *Li* like pottery having three legs in the Kurosuda site (Aomori) in northern Japan was discussed many years ago by Kita Sadakichi as possibly an imitation of a Chinese *Li* imported to Japan. After a long dormancy, the discussion was revived by a recent discovery of a similar pot in the nearby Imazu site (Okada 1980). Not all scholars agree with the Chinese influence on the pots, but many scholars conceive of the interaction with northeast China based on these and additional discoveries (Kikuchi *et al*. 1997a). Three leged pots are also discovered in the Late to Final Jomon sites located in the Kyushu District (Kagawa 1961).

With regard to the interaction with the Korean peninsula, combware pottery of southern Korea is

found in the Early and Middle Jomon contexts in the Myotoiwa site, the Tsushima Islands located to the south of the peninsula (Shimazu 1992). The similarity between this pottery and the Sobata Style pottery of the Early Jomon Period has long been discussed (Nin 1988).

As Jomon items imported to the Asian mainland, the obsidian of the Oki islands source in the Japan Sea, the Akaigawa and the Shirataki sources in Hokkaido is found in the Paleolithic to the Early Neolithic contexts in the Maritime Province of Siberia including the Amur River basin (Kato 1994).

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