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Beyond Foraging and Collecting

Evolutionary Change in Hunter-Gatherer Settlement Systems

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Chapter 3

Jomon Collectors and Foragers

Regional Interactions and Long-term Changes in Settlement Systems among Prehistoric Hunter-Gatherers in Japan

JUNKO HABU

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INTRODUCTION

The purpose of this chapter is to expand the utility of the forager/collector model (Binford 1980, 1982) by examining the dynamics of long-term system change on an interregional scale. Among numerous models of hunter-gatherer behavior, Binford's (1980, 1982) forager–collector continuum has been one of the most frequently cited models of subsistence and settlement organization during the past two decades. As with most formal models of subsistence and settlement (such as optimal foraging models), the forager/collector model assumes that economic rationality is the basic principle that determines hunter-gatherer subsistence strategies and residential mobility. However, unlike optimization models, which are deductive and formal in their structure, Binford's model was inspired by ethnographic examples. Because of its informal and inductive origins, the

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forager/collector model is flexible enough to account for various anomalies. The concept of serial foragers (Binford 1980: 16–17), which refers to cold-environment hunter-gatherers who adopt "mapping-on" strategies to position themselves so that they can exploit seasonally fluctuating resources, is a good example of this. Similarly, various nonenvironmental factors that can influence hunter-gatherer subsistence-settlement practice, such as population pressure, trade/exchange, and group alliance, are not necessarily ignored by the model. We may need to modify the model to incorporate these factors as part of the system, but the core of the model that outlines the basic principles of labor investment versus return with regard to resource distribution, subsistence strategies, and residential mobility can still be operational. Thus, despite some scholars' critical views (e.g., Wiessner 1982), the forager/collector model remains useful.

This does not imply, however, that the model does not need expansion or elaboration. Issues that have not been fully addressed since the original appearance of the model include the causes, mechanisms, and consequences of long-term system change in the context of regional interactions between groups. Though Binford (1983) was apparently interested in long-term hunter-gatherer behavior, what he was able to infer from Nunamiut ethnographic data and oral history was temporally and spatially limited. As a result, we have very little knowledge about the way changes in one system might affect neighboring systems, and what the long-term effects of these changes might be during the course of several hundred years.

In this regard, archaeological studies of prehistoric Jomon hunter-gatherers on the Japanese Archipelago provide us with an excellent opportunity to examine long-term settlement pattern change at the interregional level. In Japan, a large number of large-scale salvage excavations took place during and after the 1960s following the implementation of the national government's land development policy (Habu 1989). Tens of thousands of Jomon sites have been excavated with systematic financial support from national, prefectural, and municipal governments, as well as private developers. In many cases, the results of these excavations are available as published reports. As a result, we have hundreds, and sometimes even thousands, of excavated sites from each of the Jomon subperiods, which can be used to examine the course of long-term change in subsistence and settlement practice.

This chapter examines long-term change in regional settlement patterns from the Early to the Middle Jomon periods (ca. 6100–4000 uncalibrated b.p.; for the rest of this paper, lower-case b.p. will be used for uncalibrated ^{14}C dates) in the context of the forager/collector model (Binford 1980, 1982). Through this case study, possible factors that triggered changes between collecting and foraging systems are inferred, as are their mechanisms. The implications of these changes are discussed in relation to the development of hunter-gatherer cultural complexity.

BACKGROUND TO THE STUDY

Jomon is the name of a prehistoric culture in the Japanese Archipelago that followed the Palaeolithic period and preceded the agricultural Yayoi period. Unlike many other prehistoric hunter-gatherer cultures, the Jomon culture is characterized by the production and use of pottery. The Jomon period is conventionally divided into six subperiods: Incipient, Initial, Early, Middle, Late, and Final. The appearance of pottery (ca. 13,000 b.p.) marks the beginning of the Jomon period (Nakamura and Tsuji 1999; Taniguchi 1999), but not all of the characteristics that researchers commonly associate with the Jomon culture were present during the Incipient and Initial Jomon periods. By the Early Jomon, however, a distinctive set of cultural traits that characterize the rest of the Jomon period began to emerge. These include the presence of large settlements, various kinds of ceremonial features and artifacts, food storage, and long-distance trade. In this regard, the Early to Final Jomon cultures share a number of characteristics with so-called "complex" hunter-gatherers in various parts of the world (Price and Brown 1985). For this reason, researchers in the broader field of hunter-gatherer archaeology have been interested in the study of the Jomon culture (Aikens 1981; Aikens and Dumond 1986; Aiken et al. 1986; Cohen 1981; Hayden 1990; Pearson 1977; Price 1981; Price and Brown 1985; Soffer 1989).

Recent developments in Jomon studies have revealed that regional and temporal variability within the Jomon culture was far greater than scholars once assumed (Ikawa-Smith 1998). For example, at the Initial Jomon Uenohara site in Kagoshima Prefecture in southern Kyushu, sophisticated pottery, such as jars with long necks, and ornaments, such as clay earrings, were recovered (Okamura 1995). Neither of these two types of artifacts had been reported from Initial Jomon sites in other parts of Japan. Other lines of evidence, such as feature types and lithic assemblage characteristics, also indicate that the Incipient and Initial Jomon cultures in this region were quite different from those in the rest of the Japanese Archipelago (Amemiya 1999; Shinto 1995, 1999). At the Early and Middle Jomon Sannai Maruyama site in Aomori Prefecture, northern Japan, an extraordinarily large settlement associated with more than 700 pit-dwellings has been recorded (Habu et al. 2001; Kidder 1998; Okada 1995a,b; Okada and Habu 1995). Radiocarbon dates indicate that the site was occupied from approximately 5050 to 3900 b.p., or 5900 to 4300 calibrated B.P. (Tsuji 1999; see also M. Imamura 1999). Because the site was occupied for more than 1500 years,

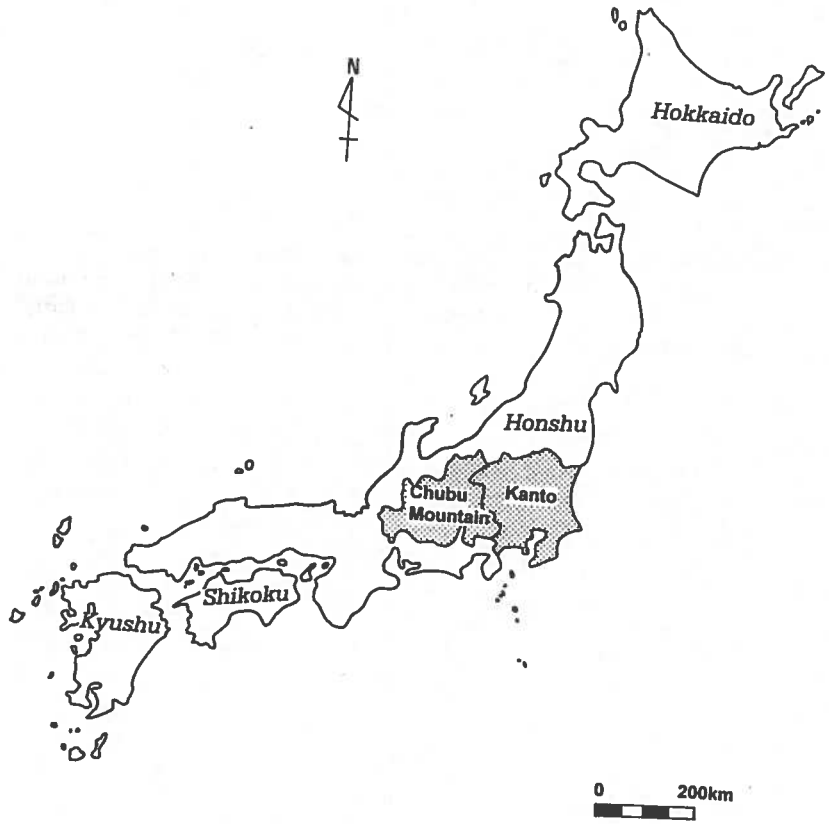

Figure 3.1. Map of Japan showing the location of the Kanto and Chubu Mountain regions.

it is unlikely that all of the 700 pit-dwellings were inhabited contemporaneously. Nevertheless, the number of pit-dwellings and other features from the site is unusually large compared to other Jomon sites.

Among these regional varieties, the Middle Jomon culture in the Kanto region (eastern side of central Honshu Island including Tokyo) and the adjacent Chubu Mountain region (inland part of central Honshu; Fig. 3.1) have attracted considerable attention because of the extremely high site density, large site size, and the complex pottery decoration in these sites. According to K. Imamura (1996: 93), 70% of all excavated Jomon pit-dwellings in the Kanto and Chubu Mountain regions belong to the Middle Jomon period, and 50% of all excavated pit-dwellings belong to the latter half of this period. Many researchers have also pointed out that the Middle

Jomon sites in these regions are characterized by an abundance of so-called "chipped stone axes." Although these stone tools are called "axes," most researchers believe that they were used as hoes for digging, either to collect wild plant roots (Watanabe 1976) or possibly for incipient plant cultivation (e.g., Fujimori 1950; Oyama 1927, 1934).

Archaeologists have long recognized the prosperity of the Middle Jomon culture in the Kanto and Chubu Mountain regions, but very few studies have systematically examined the processes of its development. Because of the presence of large settlements during and after the Middle Jomon period in these regions, scholars have assumed that the development of sedentary life in these regions began in the Early Jomon period and that the degree of Jomon cultural complexity increased gradually and smoothly from the Early to the Middle Jomon (e.g., Wajima 1948, 1958). However, detailed examination of changes in regional settlement patterns at the end of the Early Jomon period indicates that the long-term development from the Early to the Middle Jomon may have been more complex than previously assumed.

SETTLEMENT PATTERNS OF THE EARLY JOMON MOROISO PHASE

In a previous study, I examined regional settlement patterns of the Early Jomon Moroiso phase (ca. 5000 b.p.) of the Kanto and Chubu Mountain regions (Habu 1996, 2001) from the perspective of the forager/collector model (Binford 1980, 1982). The Moroiso phase is the second to the last phase of the Early Jomon period and is divided into three subphases: Moroiso-a, -b and -c from the earliest to the latest. The duration of the Moroiso phase is estimated to have been approximately 200–300 years (Habu 2001).

According to the forager/collector model, subsistence-settlement systems of hunter-gatherers can be classified into two basic systems: (1) forager systems that are characterized by high residential mobility and (2) collector systems that are characterized by low residential mobility. Foragers tend to acquire food on a day-to-day basis near their residential base, whereas collectors tend to organize their subsistence activities logistically (i.e., they send specialized task groups to acquire food resources located far away from their residential base, who then bring these resources back and store them). Forager systems are commonly found in environments in which the distribution of critical resources is seasonally and spatially homogeneous, whereas collector systems are adapted to environments in which the distribution of critical resources is seasonally or spatially uneven (for a description of the forager/collector model, see also Kelly 1995).

Table 3.1. Expected Patterns of Residentially Used Sites

Type	Intersite Variability in Lithic Assemblages	Intersite Variability in Site Size	Site Distribution Pattern
Fully sedentary collectors	Small	Small	Clustered
Collectors with seasonal moves	Large	Large	Clustered
Foragers	Small	Small	Dispersed

In my previous study (Habu 2001), I pointed out that collector systems would include fully sedentary hunter-gatherers who occupied a single residential base throughout the year, as well as relatively sedentary hunter-gatherers who moved their residential bases seasonally. Because the presence of large residential sites is characteristic of collector systems, the Jomon people in general were probably closer to the collector end of the forager–collector spectrum. However, the issue of whether they moved their residential bases seasonally has yet to be determined.

To address this issue, I suggested that examining intersite variability in lithic assemblages and site size could prove useful (Habu 1996, 2001; Table 3.1). Relatively sedentary collectors, who move their residential bases seasonally, would have used each of their residential bases for seasonally different subsistence activities. Accordingly, the lithic assemblages from each residential base should reflect these seasonal differences. Therefore, we can expect large variability in the lithic assemblages among residential bases. Furthermore, the seasonal movement of relatively sedentary collectors is often associated with the dispersion and amalgamation of residential groups. Therefore, we can also expect large variability in the size of residential bases. Accordingly, if the Jomon people were collectors who moved their residential bases seasonally, we can expect to find large intersite variability in both (1) lithic assemblages and (2) site size. In contrast, in the case of fully sedentary collectors, we can expect that lithic assemblage and site size variability among residential bases will be relatively small because residential bases of fully sedentary collectors were occupied year-round, thus reflecting generally similar activities. For both kinds of collectors, we would expect to find clusters of residential bases because collectors' residential bases are usually located near primary resource concentrations. Finally, in a forager system, lithic assemblage and site size variability among residential bases should be small because functions of residential bases are relatively similar to each other. This means that, in variability among residential bases, foragers and fully sedentary collectors may show similar characteristics. However, it is expected that foragers' residential bases would be much

Table 3.2. Summary of Subsistence-Settlement Systems in Each Region[a]

Region	Moroiso-a subphase (Oldest)	Moroiso-b subphase	Moroiso-c subphase (Youngest)
Northwestern Kanto region	Relatively sedentary collectors	Relatively sedentary collectors	Relatively sedentary collectors
Southwestern Kanto region	Relatively sedentary collectors	Relatively sedentary collectors	Foragers
Chubu Mountain region	Unknown (sample size was too small)	Relatively sedentary collectors	Relatively sedentary collectors

[a]From Habu 2001.

smaller than those of collectors, possibly with no permanent dwelling structures. Furthermore, foragers' residential bases would be dispersed throughout the research area, because the distribution of resources, which is closely related to the location of residential bases, is dispersed evenly.

In my previous work (Habu 2001), I applied this model to settlement pattern data from the Early Jomon Moroiso phase in the Kanto and Chubu Mountain regions of Japan. The results of this analysis (Table 3.2) suggested that the settlement patterns of the Moroiso Phase generally correspond well to the model of relatively sedentary collectors. The only apparent exception was that of the Moroiso-c subphase in the southwestern Kanto region (Fig. 3.2), which was characterized by a scarcity of dwelling sites (i.e., sites with pit-dwellings). Of the 278 sites identified from this subphase, only five sites (1.8%) are dwelling sites. However, the presence of a number of nondwelling sites (i.e., sites that have no pit-dwellings) indicates that the region was still actively used by Jomon hunter-gatherers. These nondwelling sites were interpreted as residential bases in a forager system. The fact that these nondwelling sites are dispersed throughout the southwestern Kanto region also supports the hypothesis that this was a forager system. None of the settlement patterns examined corresponded to the model of fully sedentary collectors. Based on these results, I suggested that the people of the Moroiso phase did not stay at the same site throughout the year and that the degree of sedentism in southwestern Kanto decreased through time as the subsistence-settlement systems in the region changed from relatively sedentary collector systems to forager systems (Habu 2001).

LONG-TERM CHANGES IN THE SOUTHWESTERN KANTO REGION

The primary purpose of the analysis described above was to examine the degree of sedentism of the Moroiso phase people, but the result of the analysis also provides insights in terms of long-term change in

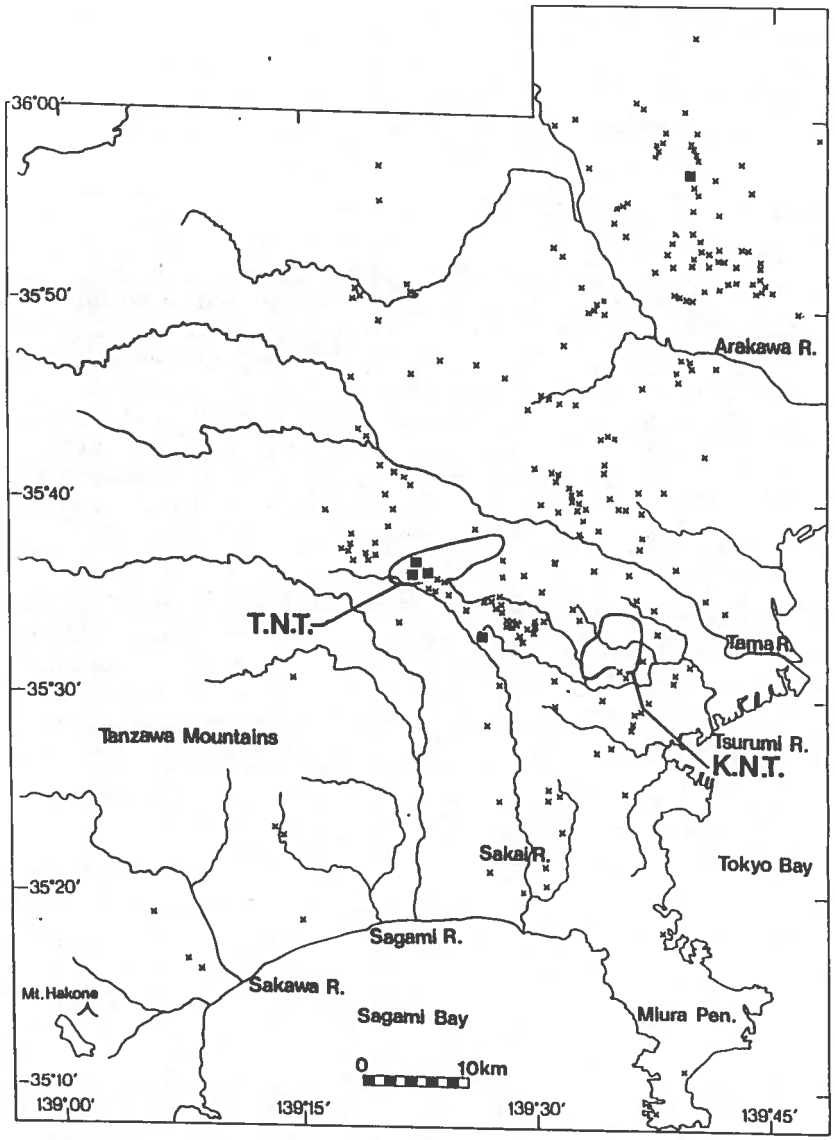

Figure 3.2. Distribution of Moroiso-c subphase sites in the southwestern Kanto region. ■: dwelling sites. x: nondwelling sites. In addition to the sites represented in the diagram, there are 37 nondwelling sites in the Tama New Town area (indicated as T.N.T.) and five nondwelling sites in the Kohoku New Town area (indicated as K.N.T.), respectively (modified from Habu 2001).

subsistence-settlement systems. First, the shift in southwestern Kanto from relatively sedentary collectors to foragers indicate that the degree of sedentism of hunter-gatherers in this region decreased through time. This shift contradicts the general expectation that increasing sedentism through time is an important indicator of cultural development.

One possible explanation for this shift is the change in the natural environment. The Moroiso phase roughly coincides with the "Climatic Optimum," the time of maximum sea level transgression (Matsushima 1979; Matsushima and Koike 1979). The sea level reached its maximum height during or just before the Moroiso-a subphase and then gradually retreated through the rest of the Moroiso phase (Fuji 1984; Sakamoto and Nakamura 1991; but see Horiguchi 1983). Some researchers suggest that the retreat of the sea level resulted in a significant decrease in the habitat of littoral shellfish species (e.g., Matsushima and Koike 1979). As shown in Table 3.3, the frequency of shell-midden sites in southwestern Kanto decreased dramatically from the Moroiso-b to the Moroiso-c subphases. Of all the Moroiso-a sites in southwestern Kanto, 8.4% have shell-middens, whereas only 2.2% of the Moroiso-b sites have shell-middens. No shell-middens have been reported from the Moroiso-c subphase (Habu 2001).

Note here that the difference in the total number of sites among subphases may reflect the difference in the duration of each subphase. In particular, the fact that the total number of sites in the Moroiso-b subphase is twice that for the other two subphases may indicate that the Moroiso-b subphase lasted longer than the other two subphases. Nonetheless, the decrease in the relative proportion of shell-midden sites through time is evident.

It seems that the decrease in the frequency of shell-middens is a direct response to a decline in shellfish resources. If so, the decline may have caused significant changes in the overall resource distribution patterns in southwestern Kanto. More specifically, the decline in the availability of shellfish would have resulted in less densely clumped distributions of available resources because the distribution of shellfish is spatially limited to the coastal area and they are available primarily during the spring to early summer.

Table 3.3. Frequencies of Shell-Midden Sites in Southwestern Kanto

	Moroiso-a	Moroiso-b	Moroiso-c
Number of all sites	273	631	278
Number of shell-midden sites	23	14	0
Percentage of shell-midden sites	8.4	2.2	0.0

By suggesting this, I do not necessarily imply that the people of the Moroiso-a subphase relied primarily on shellfish. As indicated by Suzuki (1979), the caloric value of shellfish is relatively low compared to other kinds of food available within the Japanese Archipelago. Furthermore, many Jomon researchers agree that plant food must have been the staple food source for most of the Jomon people (e.g., Watanabe 1976), with the exception of Hokkaido Jomon (e.g., Minagawa and Akazawa 1992). However, the primary importance of shellfish lies in its seasonality; it is one of the few food items in Japan that are available from the late winter to the spring, when other food resources are scarce (see Erlandson 1988). In this regard, it is possible that changes in the availability of shellfish may have had a significant effect on overall subsistence-settlement systems at that time. More specifically, lack of shellfish resources at the end of the winter may have prevented these people from forming large aggregation settlements for the winter. If this was the case, even though the caloric contribution of shellfish was small in the overall Jomon people's diet, the decrease in shellfish may have had a catastrophic effect on the overall subsistence-settlement systems in the region. Further analysis will be necessary to investigate the interrelationships among environmental change, the disappearance of shell-middens, and the collapse of logistically organized subsistence-settlement systems in this region.

DEVELOPMENT OF A NEW SYSTEM ASSOCIATED WITH AN ABUNDANCE OF CHIPPED STONE AXES

As discussed in the previous section, currently available data indicate that environmental adaptation may account for the shift from collecting strategies to foraging strategies in southwestern Kanto. However, it does not mean that the change had no evolutionary implications for long-term changes in the Jomon culture. On the contrary, several lines of evidence suggest that the change played a critical role in the development of the "Middle Jomon type" of subsistence-settlement systems that were characterized by an abundance of chipped stone axes.

First, the shift from collecting to foraging systems in southwestern Kanto seems to have been associated with a significant population decrease in this region. According to K. Imamura (1992) and others (e.g., Kobayashi 1973; Shibue and Kuro'o 1987), the scarcity of dwelling sites in southwestern Kanto is characteristic of the Moroiso-c subphase and also of the following Jusanbodai phase. In particular, Imamura (1992) points out that settlement patterns of the Moroiso-c subphase and the Jusanbodai phase in the southwestern Kanto region share a number of similarities, including

(1) scarcity of dwelling sites and (2) small site size in terms of both the number of associated dwellings and the amount of artifacts. Based on these observations, Imamura (1992) concludes that the decrease in the number of dwelling sites and site size during the Moroiso-c subphase and the Jusanbodai phase in this region represents a significant population decrease.

Assuming that this was the case, a question then arises whether this occurred through a gradual or catastrophic increase in the mortality rate or through emigration to other areas. Changes in the number of sites in each region seem to indicate the possibility of population migration from the Kanto to the Chubu Mountain regions. As shown in Table 3.4, the total numbers of sites from the Moroiso-b to Moroiso-c subphases in the northwestern and southwestern Kanto regions decreased, whereas the number in the Chubu Mountain region increased.

Detailed analysis of settlement pattern changes in the southwestern Kanto region also indicates that the shift from the collector system to the forager system occurred gradually throughout the Moroiso phase along with population movement from coastal to inland areas. As shown in Table 3.5, the settlement pattern of the Moroiso-a subphase in the southwestern Kanto region is characterized by a relative abundance of large and medium dwelling sites compared to the other two phases. The presence of large settlements is characteristic of relatively sedentary collectors who form large residential groups during a certain time of the year (often fall to early spring) and disperse in smaller settlements for the rest of the year. However, by the Moroiso-b subphase, the percentages of large and medium sites

Table 3.4. Changes in the Total Number of Sites in Each Region

Region	Moroiso-b	Moroiso-c
Northwestern Kanto region	128	69
Southwestern Kanto region	631	278
Chubu Mountain region	76	97

Table 3.5. Site Size Variability among Dwelling Sites in Southwestern Kanto

Site Size	Number of associated pit-dwellings	Moroiso-a	Moroiso-b	Moroiso-c
Small	1–4	41 (83.7%)	84 (92.3%)	5 (100.0%)
Medium	5–9	5 (10.2%)	6 (6.6%)	0
Large	10≦	3 (6.1%)	1 (1.1%)	0
Total		49 (100.0%)	91 (100.0%)	5 (100.0%)

decreased. This indicates that the settlement system of this subphase was less closely associated with the annual amalgamation of residential groups. Furthermore, many of the dwelling sites of the Moroiso-b subphase are located in the inland area of the southwestern Kanto region (i.e., closer to the Chubu Mountain region). This is in sharp contrast to the settlement pattern of the Moroiso-a subphase, in which dwelling sites are primarily concentrated in the coastal area of southwestern Kanto. Thus, by the time of the Moroiso-b subphase, there was a major population shift from the coastal to the inland areas within southwestern Kanto. Because the inland area is the gateway from the coastal area to the Chubu Mountain region, such a population shift is consistent with the assumption of emigration from southwestern Kanto to the Chubu Mountain region.

Second, examination of lithic assemblage changes through time in the Chubu Mountain region indicates that, in this region, the shift to the "Middle Jomon type" of subsistence-settlement systems (i.e., those characterized by an abundance of chipped stone axes) occurred as early as the Moroiso-c subphase (the second to the last phase of the Early Jomon period). None of the dwelling sites from the Moroiso-a and Moroiso-b phases is characterized by an abundance of chipped stone axes, but they are the most abundant type of stone tools in four out of the thirteen dwelling sites from the Moroiso-c subphase (Fig. 3.3). This is the first phase in which the dominance of chipped stone axes in site assemblages can be observed in this region. As noted above, an abundance of chipped stone axes is often considered a characteristic of Middle Jomon settlements in this region (e.g., Fujimori 1950). Many archaeologists suggest that this reflects the importance of either plant food collecting or possibly plant cultivation in the subsistence systems of the Middle Jomon people in this region (Fujimori 1950, 1970; Oyama 1927, 1934; Tsuboi 1962).

Unlike the southwestern Kanto region, where environmental deterioration in the coastal area may explain the change from collecting to foraging systems, no clear evidence of environmental change in the Chubu Mountain region has been found. Instead, the previously described lines of evidence indicate the possibility of population migration from the southwestern Kanto to the Chubu Mountain region. If this were the case, the migration would have resulted in a significant increase in population pressure within the Chubu Mountain region. It is quite possible that the increased population pressure caused a major system change, which resulted in the beginning of the "Middle Jomon type" of subsistence-settlement systems characterized by an abundance of chipped stone axes. Because both the previous and the new systems were collector systems, the shift may have initially seemed insignificant. Nevertheless, from the perspective of long-term development within the Jomon culture, the shift was critical. Though this shift first

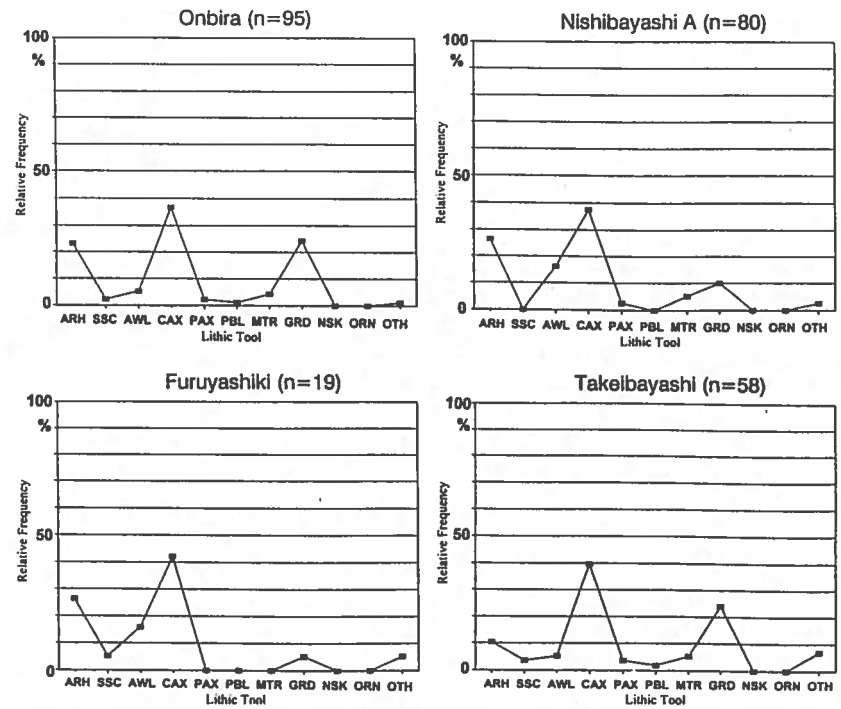

Figure 3.3. Relative frequencies of lithic tools per category in assemblages from four sites (Onbira, Nishibayashi, Furuyashiki, and Takeibayashi) in the Chubu Mountain region. ARH: arrowheads; SSC: stemmed scrapers; AWL: awls; CAX: chipped stone axes; PAX: polished stone axes; PBL: pebble tools; MTR: stone mortars; GRD: grinding stones; NSK: net sinkers; ORN: ornaments; OTH: others.

occurred in the Chubu Mountain region at the end of the Early Jomon period, by the Middle Jomon period, a similar system was adopted by the people of the southwestern Kanto region. As a result, the subsistence-settlement systems in southwestern Kanto shifted back from foraging to collecting systems.

K. Imamura's (1992) analysis is quite suggestive of the nature of the subsistence-settlement systems characterized by an abundance of chipped stone axes. According to his analysis, Middle Jomon sites associated with a large number of chipped stone axes are distributed only in the southwestern Kanto and Chubu Mountain regions. In contrast, Middle Jomon sites in the northeastern Kanto region are characterized by an abundance of large storage pits. Imamura points out that the distribution of these two types of sites is mutually exclusive and suggests that the chipped stone axes were used to

collect wild root crops such as yam (*Discorea japonica*), whereas storage pits were more closely related to the heavy reliance on nuts such as acorns and chestnuts. Further study is necessary to identify the type(s) of staple food associated with these two types of subsistence-settlement systems.

DISCUSSION

The analysis presented above has several implications for studying long-term changes in hunter-gatherer settlement patterns. First, the results indicate that the shift between collecting strategies and foraging strategies may have occurred fairly frequently. In particular, the archaeological data from southwestern Kanto indicates that the shift from collecting strategies to foraging strategies through the Moroiso phase was gradual and continuous. This corresponds well with Binford's (1980) suggestion that forager and collector systems are not polar opposites of settlement systems but rather are a graded series from simple (forager) to complex (collector). Also, if the shift from collecting strategies to foraging strategies was triggered by a decrease in the availability of shellfish, which probably was not the staple food of the Moroiso phase people, it implies that the shift between collectors and foragers can be caused by only a minor change in available resources, not necessarily by major environmental changes. In other words, hunter-gatherers' decision-making processes for their subsistence strategies may be extremely intricate; a minor change in the quality and/or quantity of available resources may result in fundamental system changes.

Previous studies have emphasized such Jomon cultural characteristics as the presence of large settlements and food storage, both of which are typical of collecting systems. However, given the evidence of system fluidity discussed above, it is probable that the Jomon subsistence-settlement systems were quite flexible and included varying combinations of collecting and foraging strategies. Similar variability in subsistence-settlement systems may also have been present among many other prehistoric hunter-gatherers, who had to cope with constantly changing environments.

Second, the case study presented here suggests that regional interactions may have played a critical role in long-term system changes and that archaeological analyses of settlement patterns at the interregional level can reveal the mechanisms of these changes within the context of a dynamic cultural landscape. Because the core of the Binford's model is ecological, one tends to think that the model assumes a direct relationship between resource distribution and hunter-gatherer subsistence and settlement organization. However, through the case study presented here, it is clear that hunter-gatherer systems do not exist in a cultural vacuum and that

interactions between regional systems can be an important factor in determining the course of long-term system changes. This implies that we may need to reevaluate the scale of regional settlement pattern analysis in archaeological studies. Since Willey's (1953) pioneering Viru Valley project, numerous studies of regional settlement patterns have been published. In many cases, however, regional settlement pattern analyses are based on the results of surveys conducted at the "local" level, for example, within a single valley or river drainage basin (e.g., Adams 1965; Sanders et al. 1979; Willey et al. 1965). The case study presented here clearly demonstrates the research potential of settlement pattern analysis at the interregional level.

Finally, the previous explanation for the development of the "Middle Jomon type" systems provides insights in the light of previous discussions on the evolution of hunter-gatherer sedentism and cultural complexity. For example, several researchers have suggested population pressure (i.e., necessity) as a major condition for, or cause of, the development of hunter-gatherer sedentism and cultural complexity (e.g., Cohen 1981), whereas others have suggested that resource abundance (i.e., opportunity) was a more critical factor (e.g., Hayden 1995) (for discussions on opportunity vs. necessity, see also Cannon 1998; Yesner 1987). Assuming that the "Middle Jomon type" systems, which are characterized by an abundance of chipped stone axes and large settlements, are highly logistically organized systems, the present study can be used as an example to support the population pressure theory. However, supporters of this theory typically assume that the population pressure increases naturally (i.e., with no specific causes or conditions), and they tend to interpret the process of the development in terms of a general model. The analysis presented here, on the other hand, describes a case in which population increase and resulting system changes in one region was a consequence of population migration caused by system changes in an adjacent region. In this regard, the present study suggests that the development of the "Middle Jomon type" systems was a historically unique event.

CONCLUDING REMARKS

This chapter presented a case study of long-term settlement pattern changes in which a shift from collectors to foragers in one region (southwestern Kanto) triggered a system change in another region (Chubu Mountain). As a result of this system change, the "Middle Jomon type" of subsistence-settlement systems developed first in the Chubu Mountain region and were then adopted in the southwestern Kanto region. These new systems were characterized by an abundance of chipped stone axes,

which suggests some kind of subsistence intensification, possibly intensive collecting of wild root crops, and also by the presence of extremely large settlements and high site density. These characteristics indicate that the systems were highly logistically organized collector systems, even though detailed settlement pattern analyses from this period have yet to be conducted. The combination of environmental factors and population pressure was suggested as the cause for the development of this new system.

It should be noted that, unlike prehistoric hunter-gatherer cultures in California (e.g., Arnold 1992, 1995) and the Northwest Coast of North America (e.g., Ames 1995; Ames and Maschner 1999; Matson and Coupland 1995), currently available data from the Middle Jomon period in the Kanto and Chubu regions lack clear evidence of social stratification. Accordingly, even though the Middle Jomon culture shares a number of characteristics with so-called "complex" hunter-gatherers, it may not be "complex" in a strict sense if we take the position that hunter-gatherer cultural complexity should be defined on the basis of the presence of hereditary social inequality (e.g., Arnold 1996; see also Hayden 1995). Nevertheless, the Middle Jomon culture is characterized by logistically organized collector systems, and also by sophisticated material culture, large ceremonial features, and long-distance trade. In this regard, systematic examination of the causes and consequences of the development of this unique culture will help answer a number of general questions regarding the long-term development of hunter-gatherer cultural complexity in a dynamic landscape.

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REFERENCES

Adams, R. M., 1965, *Land behind Baghdad: A History of Settlement on the Diyala Plains.* University of Chicago Press, Chicago.

Aikens, C. M., 1981, The Last 10,000 Years in Japan and Eastern North America: Parallels in Environment, Economic Adaptation, Growth of Social Complexity, and the Adoption of Agriculture. In *Affluent Foragers: Pacific Coasts East and West*, edited by S. Koyama and D. H. Thomas, pp. 261–273. Senri Ethnological Studies, No. 9, National Museum of Ethnology, Osaka.

Aikens, C. M., Ames, K. M., and Sanger, D., 1986, Affluent Collectors at the Edges of Eurasia and North America: Some Comparisons and Observations on the Evolution of Society among North-Temperate Coastal Hunter-Gatherers. In *Prehistoric Hunter-Gatherers in Japan*, edited by T. Akazawa and C. M. Aikens, pp. 261–273. University of Tokyo Press, Tokyo.

Aikens, C. M., and Dumond, D. E., 1986, Convergence and Heritage: Some Parallels in the Archaeology of Japan and Western North America. In *Windows on the Japanese Past: Studies in Archaeology and Prehistory*, edited by R. J. Pearson, G. L. Barnes, and K. L. Hutterer, pp. 261–273. Center for Japanese Studies, University of Michigan, Ann Arbor.

Amemiya, M., 1999, Minami Kyushu ni Miru Jomon Teiju Shuryo-Saishu-min Sekai [Jomon Sedentary Hunter-Gatherers in Southern Kyushu]. *Kikan Kokogaku* [Archaeology Quarterly] 64:19–24 (in Japanese).

Ames, K. M., 1995, Chiefly Power and Household Production on the Northwest Coast. In *Foundations of Social Inequality*, edited by T. D. Price and G. M. Feinman, pp. 155–188. Plenum, New York.

Ames, K. M., and Maschner, H., 1999, *Peoples of the Northwest Coast: Their Archaeology and Prehistory.* Thames and Hudson, London.

Arnold, J. E., 1992, Complex Hunter-Gatherer-Fishers of Prehistoric California: Chiefs, Specialists, and Maritime Adaptations of the Channel Islands. *American Antiquity* 57(1):60–84.

Arnold, J. E., 1995, Social Inequality, Marginalization, and Economic Process. In *Foundations of Social Inequality*, edited by T. D. Price and G. M. Feinman, pp. 155–188. Plenum, New York.

Arnold, J. E., 1996, The Archaeology of Complex Hunter-Gatherers. *Journal of Archaeological Method and Theory* 3(2):77–126.

Binford, L. R., 1980, Willow Smoke and Dogs' Tails: Hunter-Gatherer Settlement Systems and Archaeological Site Formation. *American Antiquity* 45(1):4–20.

Binford, L. R., 1982, The Archaeology of Place. *Journal of Anthropological Archaeology* 1(1):5–31.

Binford, L. R., 1983, Long-Term Land-Use Patterning: Some Implications for Archaeology. In *Working at Archaeology*, edited by L. R. Binford, pp. 155–188. Academic Press, New York.

Cannon, A., 1998, Contingency and Agency in the Growth of Northwest Coast Maritime Economies. *Arctic Anthropology* 35(1):57–67.

Cohen, M. N., 1981, Pacific Coast Forager: Affluent or Overcrowded? In *Affluent Foragers: Pacific Coasts East and West*, edited by S. Koyama and D. H. Thomas, pp. 155–188. Senri Ethnological Studies No. 9. National Museum of Ethnology, Osaka.

Erlandson, J. M., 1988, The Role of Shellfish in Prehistoric Economies: A Protein Perspective. *American Antiquity* 53(1):102–109.

Fuji, N., 1984, *Koko Kafungaku* [Archaeo-Palynology]. Yuzankaku, Tokyo (in Japanese).

Fujimori, E., 1950, Nihon Genshi Rikuko no Sho-mondai [On Primitive Dry Field Cultivation in Japan]. *Rekishi Hyoron* [Critiques in History] 4(4):41–46 (in Japanese).

Fujimori, E., 1970, *Jomon Noko* [Jomon Plant Cultivation]. Gakusei-sha, Tokyo (in Japanese).

Habu, J., 1989, Contemporary Japanese Archaeology and Society. *Archaeological Review from Cambridge* 8(1):36–45.

Habu, J., 1996, Jomon Sedentism and Intersite Variability: Collectors of the Early Jomon Moroiso Phase in Japan. *Arctic Anthropology* 33(2):38–49.

Habu, J., 2001, *Subsistence-Settlement Systems and Intersite Variability in the Moroiso Phase of the Early Jomon Period of Japan*. International Monographs in Prehistory, Archaeological Series 14, Ann Arbor, MI.

Habu, J., Kim, M., Katayama, M., and Komiya, H., 2001, Jomon Subsistence-Settlement Systems at the Sannai Maruyama Site. *Bulletin of the Indo-Pacific Prehistory Association* 21:9–21.

Hayden, B., 1990, Nimrods, Piscators, Pluckers, and Planters: The Emergence of Food Production. *Journal of Anthropological Archaeology* 9(1):31–69.

Hayden, B., 1995, Pathways to Power. In *Foundations of Social Inequality*, edited by T. D. Price and G. M. Feinman, pp. 15–86. Plenum, New York.

Horiguchi, M., 1983, Saitama-ken Juno Deitanso Iseki no Gaikyo to Shizen Kankyo ni Kansuru 2, 3 no Mondai [Summary of Juno Peaty Site and Some Problems of Its Natural Environment]. *Daiyonki Kenkyu* [Quaternary Research] 22(3):231–244 (in Japanese with English title and summary).

Ikawa-Smith, F., 1998, Gender in Japanese Prehistory. Paper Presented at the Worldwide Perspective on Women and Gender Conference, Bellagio, Italy.

Imamura, K., 1992, Jomon Zenki Matsu no Kanto ni okeru Jinko Gensho to Sore ni Kanren-suru Sho-gensho [Population Decrease and Associated Phenomena at the End of the Early Jomon Period in the Kanto Region]. In *Musashino no Kokogaku: Yoshida Itaru Sensei Koki Kinen Ronbunshu* [Essays in Honour of Dr. I. Yoshida's 70th Birthday], edited and published by Yoshida Itaru Sensei Koki Kinen Ronbunshu Kanko kai [Editorial Committee of Essays in Honour of Dr. I. Yoshida's 70th Birthday], pp. 85–115. Tokyo (in Japanese).

Imamura, K., 1996, *Prehistoric Japan*. University of Hawaii Press, Honolulu.

Imamura, M., 1999, Koseido ^{14}C nendai Sokutei to Kokogaku [High Precision ^{14}C Dating and Archaeology]. *Chikyu* [The Earth], Special Issue No.26:23–31 (in Japanese).

Kelly, R. L., 1995, Foraging and Mobility. In *The Foraging Spectrum*, by R. L. Kelly, pp. 111–160. Smithsonian Institution Press, Washington DC.

Kidder, J. E., 1998, The Sannai Maruyama Site: New Views on the Jomon Period. *Southeast Review of Asian Studies* 20:29–52.

Kobayashi, T., 1973, Tama New Town no Senjusha: Shu to shite Jomon Jidai no Settlement System ni tsuite [Previous Inhabitants of the Tama New Town Area: Settlement Systems during the Jomon Period]. *Gekkan Bunkazai* [Monthly Journal of Cultural Property] 112:20–26 (in Japanese).

Matson, R. G., and Coupland, G., 1995, *The Prehistory of the Northwest Coast*. Academic Press, San Diego.

Matsushima, Y., 1979, Minami Kanto ni okeru Jomon Kaishin ni Tomonau Kairui Gunshu no Hensen [Littoral Molluscan Assemblages during the Post-Glacial Jomon Transgression in the Southern Kanto, Japan]. *Daiyonki Kenkyu* [Quaternary Research] 17(4):243–265 (in Japanese with English title and summary).

Matsushima, Y., and Koike, H., 1979, Shizen Kaiso ni yoru Naiwan no Kankyo Fukugen to Jomon Jidai no Iseki [Reconstruction of the Littoral Environment Using the Result of Natural Shell Deposit Analysis, with Special Reference to the Distribution of Jomon Sites]. *Kaizuka* [Shell-Midden] 22:1–9 (in Japanese).

Minagawa, M., and Akazawa, T., 1992, Dietary Patterns of Japanese Jomon Hunter-Gatherers: Stable Nitrogen and Carbon Isotope Analyses of Human Bones. In *Pacific Northeast Asia in Prehistory*, edited by C. M. Aikens and S. N. Rhee, pp. 53–57. Washington State University Press, Washington.

Nakamura, T., and Tsuji, S., 1999, Aomori-ken Higashi-Tsugaru-run Kanita-machi Odai Yamamoto I Iseki shutsudo no Doki Hahen Hyomen ni Fuchaku shita Biryo Tanka-butsu

no Kasokuki ^{14}C Nendai [AMS ^{14}C Dates of Carbon Samples Collected from the Surface of Potsherds Recovered at the Odai Yamamoto I Site at Kanita Town, Higashi-Tsugaru County, Aomori Prefecture]. In *Odai Yamamoto Iseki no Kokogaku Chosa: Kyusekki Bunka no Shumatsu to Jomon Bunka no Kigen ni kansuru Mondai no Tankyu* [Archaeological Research at the Odai Yamamoto I Site: Inquiry into the Question of the End of the Palaeolithic Culture and the Beginning of the Jomon Culture], edited by Odai Yamamoto I Iseki Hakkutsu Chosa-dan [The Odai Yamamoto I Site Excavation Team], pp. 107–111. Odai Yamamoto I Iseki Hakkutsu Chosa-dan, Tokyo. (in Japanese).

Okada, Y., 1995a, Ento Doki Bunka no Kyodai Shuraku [A Large Settlement from the Ento Pottery Culture: The Sannai Maruyama Site in Aomori Prefecture]. *Kikan Kokogaku* [Archaeology Quarterly] 50:25–30 (in Japanese).

Okada, Y., 1995b, Nihon Saidai no Jomon Shuraku "Sannai Maruyama Iseki" [The Largest Jomon Site in Japan, The "Sannai Maruyama Site"]. In *Jomon Bunka no Hakken: Kyoi no Sannai Maruyama Iseki* [Discovery of the Jomon Civilization: Amazing Discoveries at the Sannai Maruyama Site], edited by T. Umehara and Y. Yasuda, pp. 107–111. PHP Kenkyujo, Tokyo (in Japanese).

Okada, Y., and Habu, J., 1995, Public Presentation and Archaeological Research: A Case Study from the Jomon Period Sannai Maruyama Site. Paper Presented at the 1995 Chacmool Conference, Calgary.

Okamura, M., 1995, Uenohara Iseki [The Uenohara Site]. In *Hakkutsu Sareta Nihon Retto: >'95 Shin-hakken Koko Sokuho* [Excavations in the Japanese Archipelago: New Archaeological Discoveries in the 1995 Fiscal Year], edited by Bunka-cho [Agency of Cultural Affairs], pp. 14–15. Asahi Shinbun-sha, Tokyo (in Japanese).

Oyama, K., 1927, *Shizen Kenkyukai Shubo 1: Kanagawa-kenka Araiso-mura Aza Katsusaka Ibutsu Hoganchi Chosa Hokoku* [Report of the Association of Prehistory, No. 1: Excavation Report of the Open Site at Katsusaka, Araiso Village in Kanagawa Prefecture]. Shizen Kenkyukai [Association of Prehistory], Tokyo (in Japanese).

Oyama, K., 1934, Nihon Sekki Jidai no Seigyo Seikatsu [Subsistence Activities during the Japanese Stone Age]. *Kaizo* 16(1): 69–83 (in Japanese).

Pearson, R. J., 1977, Paleoenvironment and Human Settlement in Japan and Korea. *Science* 197 (No. 4310):1239–1246.

Price, T. D., 1981, Complexity in 'Non-Complex' Societies. In *Archaeological Approaches to the Study of Complexity*, edited by S. E. van der Leeuw, pp. 14–15. Albert Egges van Giffen Instituut voor Prae-en Protohistorie, Universiteit van Amsterdam, Amsterdam.

Price, T. D., and Brown, J. A., 1985, Aspects of Hunter-Gatherer Complexity. In *Prehistoric Hunter-Gatherers*, edited by T. D. Price and J. A. Brown, pp. 3–20. Academic Press, Orlando.

Sanders, W. T., Parsons, J. R., and Santley, R. S., 1979, *The Basin of Mexico: Ecological Processes in the Evolution of a Civilization*. Academic Press, New York.

Sakamoto, A., and Nakamura, W., 1991, Jomon Kaishin-ki no Jukyoshi Fukudo-nai Kaiso: Yokohama-shi Nishinoyato Kaizuka J30-go Jukyoshi to Sono Kaiso ni tsuite [A Shell-Midden Associated with a Pit-Dwelling from the Jomon Marine Transgression Period: Dwelling J30 of the Nishinoyato Site, Yokohama City and Its Associated Shell-Midden], *Chosa Kenkyu Shuroku* [Excavation and Research Results], Vol. 8, pp. 61–130. Yokohama-shi Maizo Bunkazai Center [Buried Cultural Property Center of Yokohama City], Yokohama (in Japanese).

Shibue, Y., and Kuro'o, K., 1987, Jomon Jidai Zenki Matsuyo no Kyoju Keitai: Yosatsu [Settlement Patterns at the End of the Early Jomon Period: A Preliminary Analysis]. *Kaizuka* [Shell-Midden] 39:1–9 (in Japanese).

Shinto, K., 1995, Minami Kyushu no Shoki Jomon Bunka [Incipient and Initial Jomon Cultures in Southern Kyushu]. *Kikan Kokogaku* [Archaeology Quarterly] 50:56–61 (in Japanese).

Shinto, K., 1999, Minami Kyushu no Tokushu-sei: Sosoki o Chushin ni [The Uniqueness of the Jomon Culture in Southern Kyushu, with Special Reference to the Incipient Jomon]. *Kikan Kokogaku* [Archaeology Quarterly] 69:18–22 (in Japanese).

Soffer, O., 1989, Storage, Sedentism and the Eurasian Palaeolithic Record. *Antiquity* 63:719–732.

Suzuki, K., 1979, Jomon jidai ron [The Jomon Period]. In *Nihon Kokogaku o Manabu* 3: *Genshi Kodai no Shakai* [Studying Japanese Archaeology Vol. 3: Ancient, Prehistoric Societies], edited by H. Otsuka, M. Tozawa, and M. Sahara, pp. 178–202. Yuhikaku, Tokyo (in Japanese).

Taniguchi, Y., 1999, Chojakubo Bunka-ki no Sho-mondai [Problems of the Chojakubo Culture Period]. In *Odai Yamamoto Iseki no Kokogaku Chosa: Kyusekki Bunka no Shumatsu to Jomon Bunka no Kigen ni kansuru Mondai no Tankyu* [Archaeological Research at the Odai Yamamoto I Site: Inquiry into the Question of the End of the Palaeolithic Culture and the Beginning of the Jomon Culture], edited by Odai Yamamoto I Iseki Hakkutsu Chosa-dan [The Odai Yamamoto I Site Excavation Team], pp. 178–202. Odai Yamamoto I Iseki Hakkutsu Chosa-dan, Tokyo (in Japanese).

Tsuboi, K., 1962, Jomon Bunka-ron [Controversy over the Jomon Culture]. In *Iwanami Koza Nihon no Rekishi* 1: *Genshi oyobi Kodai* [Iwanami Lectures in Japanese History, Vol.1, pp. 109–138. Prehistoric and Protohistoric Periods]. Iwanami Shoten, Tokyo (in Japanese).

Tsuji, S., 1999, Koseido ^{14}C Nendai Sokutei ni Yoru Sannai Maruyama Iseki no Hennen [Chronology at the Sannai Maruyama Site Using a High Precision ^{14}C Dating Method]. *Chikyu* [The Earth], Special Issue No.26:32–38 (in Japanese).

Wajima, S., 1948, Genshi shuraku no kosei [The Organization and Composition of Prehistoric Settlements]. In *Nihon Rekishigaku Koza* [Lectures in Japanese History], edited by Tokyo Daigaku Rekishigaku Kenkyukai [Historical Association of the University of Tokyo], pp. 1–32. Tokyo Daigaku Rekishigaku Kenkyukai, Tokyo (in Japanese).

Wajima, S., 1958, Nanbori Kaizuka to Genshi Shuraku [The Nanbori Shell-Midden and Settlements of the Prehistoric Period]. In *Yokohama Shi-shi* [The History of Yokohama City], Vol. 1, pp. 29–46. Yokohama City, Yokohama (in Japanese).

Watanabe, M., 1976, *Jomon Jidai no Shokubutsu-shoku* [Plant Food during the Jomon Period]. Yuzankaku, Tokyo (in Japanese).

Wiessner, P., 1982, Beyond Willow Smoke and Dogs' Tails: A Comment on Binford's Analysis of Hunter-Gatherer Settlement Systems. *American Antiquity* 47(1):171–178.

Willey, G. R., 1953, *Prehistoric Settlement Patterns in the Viru Valley, Peru*. Bureau of American Ethnology, Bulletin 155, Smithsonian Institution, Washington DC.

Willey, G. R., Bullard, W. R., Glass, J. B., and Gifford, J. C., 1965, Prehistoric *Maya Settlements in the Belize Valley*. Papers of the Peabody Museum of Archaeology and Ethnology, Harvard University, 54, Cambridge, MA.

Yesner, D. R., 1987, Life in the "Garden of Eden." In *Food and Evolution*, edited by M. Harris and E. B. Ross, pp. 285–310. Temple University Press, Philadelphia.