



the  
**SAA** Archaeological record

NOVEMBER 2018 • VOLUME 18 • NUMBER 5

The 2018 SAA President's Forum:  
What We Have Learned

SOCIETY FOR AMERICAN ARCHAEOLOGY



# Jomon Food Diversity, Climate Change, and Long-Term Sustainability: What I Have Learned by Doing Archaeological and Ethnographic Studies in Japan

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International, interdisciplinary, and transdisciplinary research in the fields of anthropology, including archaeology and ethnography, and related disciplines can make important contributions to the debates on the resilience of food systems and long-term sustainability of human society. Japanese archaeology, in particular, with its rich excavation data and its long tradition of community engagement and public outreach, is in an excellent position to contribute to these important contemporary debates. Because Japanese archaeology emphasizes archaeology as history, it pays special attention to the local and historical contexts of archaeological data and their interpretation. In addition, ethnographic and ethnohistoric studies in Japan demonstrate the importance of local and traditional ecological knowledge in assessing the resilience of socioeconomic systems at multiple temporal scales. Combined with archaeological studies, these can enhance our understanding of continuity and change in landscape use from the prehistoric period to the present.

As an archaeologist working on the issues of sedentism, subsistence intensification, and the development of social complexity among prehistoric hunter-gatherers in Japan, I am interested in the causes, conditions, and consequences of long-term culture change. My earlier work on the subsistence-settlement systems and intersite variability among Early Jomon sites in central Japan focused on the relationships between subsistence strategies, residential mobility, and climate change. Results of this earlier work indicate that Early Jomon hunter-gatherers in this region changed their subsistence strategies and residential mobility in relation to changing climatic conditions and that these changes were not necessarily directional ones from simple to complex. Examining Early and Middle Jomon data at the Sannai Maruyama site and its vicinity in northern Japan, I began to explore the advantages and disadvantages of subsistence intensification among early sedentary populations (Habu 2004).

At different moments in its history, archaeology as a discipline has entertained competing theories about the causes and conditions of the development of complex societies. During the first half of the twentieth century, many scholars assumed that technological innovation, including the adoption of agriculture, was the key factor in societal development. The idea of the Neolithic Revolution proposed by V. Gordon Childe (1951) was particularly influential in understanding the shift from hunting-gathering to agriculture. Implicit in this perspective was an assumption that agriculturalists were more “advanced” than hunter-gatherers.

In the 1960s, scholars began to propose that the shift from hunting-gathering to food production was caused instead by population pressure. This new perspective was strongly influenced by economist Ester Boserup's (1965) work on agricultural development. As Bruce Trigger (2006: 411) stated, Boserup's thesis “was construed as evidence that developments which previous generations of archaeologists had interpreted as desirable results of humanity's ability to solve problems and make life easier and more fulfilling were in fact responses to forces beyond human control.” Comparative examination of contemporary subsistence systems demonstrated that hunting-gathering is generally more efficient than food production in terms of cost-benefit returns, even if food production can support a larger population. Both population- and efficiency-centered approaches were later severely criticized as functionalist, however, and many archaeologists began to focus more on the role of particular social phenomena, such as competition between aspiring elites, and social resistance, in relation to different paths of societal change. Even as different studies adopted quite distinct theoretical orientations, almost all accepted an implicit assumption that specialization and centralization are inevitable in the course of human history, and that further agricultural specialization and centralization would continue in the future.

Are specialization and centralization themselves so essential to societal development? More importantly, are specialized subsistence systems sustainable for the long-term, for periods of several hundreds to several thousands of years? Can they be assumed in contemporary discussions of agricultural sustainability? Large-scale, homogenized intensive production-consumption systems today allow production of a large amount of food and goods, but they also tend to inhibit diversity and damage the environment. Large-scale, homogenized economies are also quite vulnerable to changes such as global warming, natural disasters, and radical shifts in political and social structure. The Great East Japan Earthquake of March 11, 2011, for example, severely damaged food distribution networks and left many people in the Tokyo metropolitan area without access to food for several days, exposing the vulnerability of large-scale and long-distance food systems. Are such vulnerabilities of subsistence specialization and centralization only recent phenomena, or can we find analogues for them in the past? Might it even be possible to find evidence of the problem of overspecialization among prehistoric hunter-gatherers? Could case studies from the Jomon period, with its long time span and rich data, contribute towards these goals? If so, how could we pursue this question without dismissing the importance of historically unique local contexts and the roles of individuals (cf. Trigger 2006:407)?

### The Small-Scale Economies Project

With these questions in mind, from 2014 to 2017, I conducted a three-year transdisciplinary research project at the Research Institute for Humanity and Nature in Kyoto, Japan (<http://www.chikyu.ac.jp/fooddiversity/en/index.html>). This project examined the importance of place-based, small-scale, and diversified economies, particularly the importance of small-scale food production, for the long-term sustainability of human societies. For the purposes of this project, a “small-scale economy” was defined not solely on the basis of the absolute size of the economic unit, but rather in terms of the relative scale of food production within a given socioeconomic context. Our definition of small-scale economy addressed the range of local or regional networks that enable production, circulation, and consumption without precluding links to the outside economy. Long-term sustainability can be defined as “the capacity of humans to create, test out, and maintain abilities to adapt to environments” over a span of *several hundred to several thousand years*.

The theoretical genesis of this project was the approach of historical ecology (Balée 2006), which examines long- and short-term cultural change while emphasizing the impact of human activities on the environment. Our working hypothesis was as follows:

Highly specialized subsistence (i.e., food production) strategies can support a larger community for a short period,

but a decrease in subsistence and food diversity makes the production system and its associated community more vulnerable in the long-run.

Archaeological, historical, and paleoenvironmental studies were used to test this hypothesis or to examine the long-term impacts of the loss of subsistence and food diversity in relation to other environmental and cultural factors (Research Group I: *Longue Durée* Group). To link these studies with the current discussion of the scale and methods of alternative food systems, ethnographic and ecological studies of contemporary small-scale food systems and communities were conducted (Research Group II: Contemporary Society Group). In combination, studies of the past and present were used to point to the future, as the research process also involved collaborative design of ecologically sound and equitable food systems (Research Group III: Implementation, Outreach, and Policy Proposal Group).

By integrating past and present case studies on food diversity, the mobility of people, goods, and information, and the initiatives of local stakeholders in relation to the scale and resilience of societies and economies, this project aimed to advance theories on the interrelationship between culture and environment, including climate change. Other cultural factors, such as technological developments, sociopolitical structure, and rituals/religion, were also taken into consideration. Results of this three-year project generally indicate that high levels of diversity, networking, and local autonomy, all of which are strongly correlated with the scale of the system, are the keys to long-term sustainability of socioeconomic systems.

While the project consisted of more than 50 sub-projects on both sides of the North Pacific rim, northern Japan, with its solid archaeological record and continuing importance to contemporary food production in Japan, was a core area of field research. In the space that remains here, I will briefly discuss preliminary results of our archaeological and ethnographic case studies there.

### Lessons from the Jomon Period: Food Diversity and Climate Change

The Jomon period (ca. 16,000–2500 cal BP) of the Japanese archipelago offers a unique opportunity to examine both short- and long-term changes in complex hunter-gatherer societies. According to Koyama (1978) and others, in northeastern Japan, the human population increased from the Initial to the Middle Jomon period, reached its maximum during the latter half of the Middle Jomon, and then declined through the Late and Final Jomon.

Scholars have discussed the growth in the number and size of Jomon settlements from the Early Jomon to the Middle Jomon

periods. Central to this discussion is an abundance of plant food collecting and processing tools recovered from Middle Jomon sites. Many scholars agree that the Middle Jomon period was characterized by a heavy reliance on plant food, and some have suggested the possibilities of “Jomon agriculture” or tending of chestnut trees during the Middle Jomon period. As for the decrease in the number and size of settlements at the end of the Middle Jomon period, climate cooling approximately 4200 cal BP, the so-called “Bond 3 event” inferred from sedimentary deposits in the North Atlantic Ocean, has often been suggested as the major cause.

The Small-Scale Economies Project investigated the possibility that planetary cycles of climate change were not the only cause of Jomon population rise and decline. In particular, the project focused on the question of whether subsistence specialization, with an overdependence on a particular type or types of plant food, may have weakened the resilience of subsistence-settlement systems in the region, ultimately leading to a population decrease.

Building on my previous quantitative analyses of historical change in stone tool diversity, ritual objects, and site size at the Sannai Maruyama site (Habu 2008; Habu and Hall 2013), the project team conducted the following analyses (for details, see Habu 2016):

1. AMS (Accelerator Mass Spectrometry) <sup>14</sup>C dating of nut and plant seed remains retrieved from columnar soil samples
2. Summed probability distribution analysis of Jomon population dynamics in Eastern Japan using calibrated <sup>14</sup>C dates (Crema et al. 2016)
3. Pollen analysis and alkenone sea surface temperature analysis using samples from marine cores
4. Quantitative analyses of macro- and microfaunal/floral remains from Jomon sites
5. Molecular and isotopic analyses of pottery and charred food remains (Heron et al. 2016)
6. Carbon and nitrogen stable isotope analysis and physical anthropological analysis of human skeletal remains excavated from Initial to Final Jomon sites
7. GIS analysis of Jomon settlement data in northeastern Japan

Final reports of many of these analyses are yet to be published, but so far the results of our analyses are consistent with our initial hypothesis that a loss of food and subsistence diversity may have weakened system resilience. Newly obtained AMS <sup>14</sup>C dates confirmed that, at the Sannai Maruyama site, a decrease in food and subsistence diversity indicated in lithic assemblage characteristics began at around 5600 cal BP and culminated at 5200–5000

cal BP, followed by an abrupt decrease in the number of pit-dwellings at around 4900 cal BP. At the same time, the total number of pit-dwellings in the vicinity of this site also began to decrease. This was 700 years before major cooling occurred in the area (ca. 4200 cal BP), suggesting that Jomon population decline was not only caused by long-term climate change.

### Ethnographic Research in Rural Communities in Northern Japan

Members of the Small-Scale Economies Project also conducted ethnographic research in rural Japan to address questions regarding the positive role of small-scale and diversified production systems in relation to environment and environmental change through time, and whether social networks associated with small-scale and diversified production increase the resilience of local communities, especially in times of disaster. Three areas in northern Japan were chosen as main field sites: the Hei River Area (Miyako City), the Joboji Area (Ninohe City), and Fukushima City and its vicinity. Our interviews in the Hei River Area indicated that subsistence diversity supported by traditional ecological knowledge (TEK) has played a critical role in the resilience of food systems and communities. TEK and local networks have proven to be especially important in cases of floods, typhoons, and earthquakes. At Joboji, our interviews of lacquer sap collectors and co-owners of a small-scale farmers' market indicate that, historically, multiple backup plans supported by wide subsistence diversity and TEK are at the core of local strategies for survival. At Fukushima City and its vicinity, where environmental damage caused by the 2011 Fukushima Nuclear Plant Accident is serious, we found that TEK and local networks are critical for maintaining farmers' and residents' identity and pride (Habu et al. 2018).

### Concluding Remarks

The scientific literature of sustainability typically focuses on “greening” conventional agriculture. Our case studies in Japan suggest that archaeological and ethnographic studies can make substantive and much more nuanced contributions to contemporary discussions of sustainability, resilience, vulnerability, and the long-term significance of food and subsistence diversity. While the Small-Scale Economies Project began with an emphasis on food diversity, long-term system sustainability, and the scale of economy/community, the results of our archaeological and ethnographic studies also indicate the importance of social networks, local autonomy, and traditional ecological knowledge in local and regional food systems. Our ethnographic studies also demonstrated that these latter aspects are typically embedded in rituals and religions, local and individual identities, patterns of human action reflected in material culture, and human impacts on biodiversity. Understanding changes and continuity in landscape use from the prehistoric

period to the present may be a key to developing future proposals for place-based food production and consumption systems.

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# Election

January 2 - 31, 2019

The 2019 Election will be administered by a new GDPR compliant company, Intelliscan, Inc. Two weeks prior to the start of the election, SAA voting members will receive an e-mail from [election@intelliscaninc.net](mailto:election@intelliscaninc.net) announcing the upcoming election. When the election opens, a second e-mail will be sent from Intelliscan containing the link to the online ballot. Those without valid e-mail addresses will receive a postcard in the mail. As a reminder, only votes from eligible members who have renewed for 2019 will be counted.