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Late Upper Paleolithic-Initial Jomon transitions, southern Kyushu, Japan: Regional scale to macro processes a close look

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ABSTRACT

Neolithization processes are among the most significant changes that have occurred in human history. The timing, order, and appearance of new behavioral elements and causes of behavioral change have been widely investigated. In the Japanese Archipelago, transitions from the Upper Paleolithic to Jomon show the first appearances of Neolithic behavioral elements. Research has commonly yielded inter-regional perspectives comparing technological changes with climate and landscape changes. This paper provides intra-regional comparisons of different environmental variables with technological changes focusing on southern Kyushu, Japan. This paper compares data on climate fluctuations, sea level changes, volcanic eruptions and impacts, and biomes with data on the appearance of and changes in pottery technology and variability, supplemented with studies of stone tools and archaeological features. Results suggest that climatic fluctuations, sea level changes, and biome variability may have had significant impacts on behavioral changes and that volcanic eruptions should be evaluated on an intra-regional and site-based scale.

1. Introduction

The evaluation of the causes and timing of the advent of Neolithic behaviors and the nature of artifacts, features, and behaviors associated with the Neolithic, or “Neolithization Processes” have undoubtedly been among the major topics in world archaeology. Extensive research into changes, such as hunting and gathering to farming, that occurred during the Upper Paleolithic to Neolithic transitions has been conducted. This research overlaps with studies of “sedentarization processes,” a concept that incorporates much of the same phenomena as Neolithization processes. Nevertheless, a consensus has not been reached on which behavioral and material elements constitute the Neolithic period or the changes that characterize Neolithization processes.

The earliest perspectives focused on the “Neolithic Revolution” in which extreme climate change occurred at the transition between the last Ice Age and the warm period (Childe, 1951(1936)). Childe argued that these changes triggered animal domestication in places such as West Asia and that agriculture with plant domesticates emerged nearly simultaneously with pottery, ground stone, and sedentary communities. The Neolithic Revolution was understood as a major shift from mobile, hunting and gathering lifeways to Neolithic lifeways (Iizuka, 2016: 1; Iizuka et al., 2016: 31).

After the 1960s, increasing number of researchers, following the lineages of processual archaeology, began to study change toward sedentism as comprised of processes. In their research regions, they investigated whether or not residentially mobile hunter-gatherers a) adopted agriculture and became sedentary, b) adopted logistical foraging, or c) continued mobile foraging lifeways, (e.g., Aldenderfer, 1989; Binford, 1968; Flannery, 1969, 1973; Habu, 2000; Keeley, 1988; Kelly, 1995; Piperno and Pearsall, 1998; Price and Brown, 1985; Iizuka et al., 2016: 31). Processualists examined artifacts, features, and behavioral and environmental changes and made inferences about mechanisms of occurrence of diverse trajectories toward sedentism. In recent years, our understanding of Neolithization processes and sedentarization processes have changed due to developments in scientific analytical techniques, including AMS dating and discoveries of sites in countries formerly without easy access. We now know, for example, that, in the Middle East, it took about/over 10,000 years with inter-regional variability for behavioral and material elements considered to be Neolithic to

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appear (Bar-Yosef, 1998; Zeder, 2009). Grinding stones were used by hunter-gatherers around 24,000 years ago, and it is likely that wild plants were tilled and tended for thousands of years before domestication. Animal domesticates appeared at the Pleistocene-Holocene boundary, about the same time as plant domesticates. Pottery making followed. There were varied tendencies toward increasing sedentism (Zeder, 2009). By contrast, cases from the Neotropics suggest a dramatic climatic change occurred at the Pleistocene-Holocene boundary that induced the adoption of cultivation. By 7000 to 8000 years ago, crops were produced from slash-and-burn farming (Piperno and Pearsall, 1998; Piperno, 2006, 2011). Grinding stones appeared with the use of cultivated plants (e.g., Piperno, 2011), but the timing of the adoption of pottery and inferred timing of sedentism varied (Oyuela-Caycedo and Bonzani, 2005; Iizuka, 2013). It is now clear that the evidence of Neolithic-like behaviors and materials emerged at different timings across space and there are variabilities within regions. Therefore, micro-regional scale case studies of the appearance of Neolithic behaviors need to be provided to better comprehend this phenomenon.

Materially, pottery has been considered among the major new technologies symbolizing the advent of Neolithic. New discoveries suggest that in the Russian Far East and Eastern Siberia, it was adopted by the Late Pleistocene mobile hunter-gatherers possibly to process nuts or fish for fat (Buvit and Terry, 2011); in Panama, it emerged much later than the advent of agriculture possibly for cooking (Iizuka, 2013); in the lowland Mexico, the first pottery was used mainly for display purposes and serving of special beverages or as a status symbol before it was used for cooking and storage (Clark and Gosser, 1995; Iizuka, 2016: 1). Varied pottery origins suggest that no single model can explain the behavioral context of the adoption of this technology.

This paper focuses on comparing paleoenvironmental changes with pottery and stone tool changes that occurred between the Upper Paleolithic and Initial Jomon of southern Kyushu, Japan. Micro-regional emphasis within the Japanese archipelago was conducted in order to contribute to the world-wide archaeological research theme of Neolithization processes. Our ultimate research goals are to investigate the causality of behavioral changes, providing thorough explanations. However, in the presented paper, we first assess the correlations between technological and environmental changes.

2. Timing of changes and intra-regional variability in southern Kyushu

In the Japanese Archipelago, the Incipient Jomon (ca. 15,000 to 13,000 ^{14}C B.P.) (Habu, 2004; Imamura, 1996; Kudo, 2011) has traditionally been considered the boundary between the Upper Paleolithic and Neolithic periods. From Hokkaido to Kyushu, many Incipient Jomon sites have been discovered and excavated. Extensive research has been done on pottery typology-based chronology (e.g., Amemiya, 1994; Otsuka, 1989; Murakami, 2008), changes in lithic production and technology (e.g., Inada, 1969; Sato, 1992), and the antiquity of the Incipient Jomon (Taniguchi, 2011; Kobayashi et al., 2006; Kudo, 2011; Iizuka et al., 2016: 31). The Neolithization processes, however, involve the appearance of new behavioral elements at different timings. Therefore, not only the Upper Paleolithic to Incipient Jomon transition but also the Incipient to Initial Jomon transition should provide a more complete picture.

Recently, research has compared behavioral changes inferred from stone tool technological changes and timings of paleoenvironmental changes during the Upper Paleolithic-Incipient Jomon transitions (e.g., Morisaki, 2015; Nakazawa et al., 2011; Ono and Izuho, 2012; Sato et al., 2011a,b). Results suggest that there are great degrees of correspondence between changes in variability in lithic technology, the timing of the advent of pottery and storage pits, and the timing of changes in climate and ecology, between ca. 18,000 and 10,000 ^{14}C BP (Iizuka et al., 2016: 32). New technological elements emerged in the Japanese archipelago roughly simultaneously. So far, these studies have been able to illuminate macro processes at the inter-regional scale; however, more research is needed at the micro-regional scale. The Japanese archipelago, stretching north to south, has diverse environmental conditions. Temperature ranges differ. Climatic conditions are distinct on the Sea of Japan and Pacific Ocean sides due to cordilleras running in the center of the archipelago. Therefore, comparisons of paleoclimatic and technological changes at an intra-regional scale should be conducted.

During the Last Glacial Maximum (LGM: ca. 26,000-19,000 Cal BP) (Clark et al., 2009, 2012), the Japanese archipelago consisted of two landmasses: the Paleo-Sakhalin-Hokkaido-Kuril peninsula, connected to Eurasia, and Paleo-Honshu Island, composed of the modern day Honshu, Shikoku, and Kyushu islands (Japan Association for Quaternary Research, 1987; Matsui et al., 1998; Morisaki et al., 2015: 555). By the Marine Isotope Stage 1, Honshu, Shikoku, and Kyushu were separated (Oba, 1993; Oba et al., 1995; Sato et al., 2011a). However, the timing of island separations has not been commonly presented at micro-chronological and regional levels. Therefore, more precise data on the timing of sea level changes at a regional level compared with behavioral changes should provide new archaeological insights.

Southern Kyushu (e.g., Kagoshima City: 31.5966° N, 130.5571° E) is an excellent place to conduct regional studies of the Neolithization processes (Fig. 1). There, Neolithic-like stone tool technology and variability emerged earlier than in Honshu and northern Kyushu (Sato et al., 2011a). Southern Kyushu has the first indicators of increased sedentism, with pottery, grinding stones, pit houses and hamlets, trap pits, and storage structures, dated to the Incipient Jomon, starting around 14,000/13,500 Cal BP (Morisaki and Sato, 2014; Pearson, 2006; Sato et al., 2011a). The subsequent Initial Jomon occupation began around 12,800 Cal BP. It is characterized by increases in site occupations—with settlements classified as villages—and variability of features and artifacts, including an abundance of highly decorated ceramics (Kurokawa, 2009; Pearson, 2006). The earliest timings of the Neolithization can be tested here.

Geologically, this region also has heterogeneous characteristics making it an appropriate place for provenancing artifacts. The Tanegashima Island and the exterior rim of the Aira Caldera are mainly composed of Oligocene sandstone/mudstone. The Yakushima Island and the southern Osumi Peninsula are composed of Miocene granite. The area surrounding the Aira Caldera is covered with Pleistocene pyroclastic flow. The northwestern Satsuma Peninsula consists of Oligocene dacite/rhyolite (Machida et al., 2001) (Fig. 2, GeomapNavi, 2016). Southern Kyushu, furthermore, has had volcanic eruptions throughout the Quaternary. Intra-regional variability in human behavioral responses to volcanic events can potentially be understood using the well-dated tephra (Machida and Arai, 2003; Okuno, 2002).

Additionally, it has been inferred that vegetation remained unchanged from Marine Isotope Stage 3 to 1 in the southern tips of Kyushu, Shikoku, and central Honshu (Miyake, 2013; Takahara and Hayashi, 2015), likely due to the warm, Black Current, running south to north. There are also archaeological sites with *in-situ* paleoenvironmental reconstructions in the region that can elucidate *in-situ* conditions associated with technology and change and inter-site relations.

This region, therefore, is not only appropriate for examining the earliest timings of the Neolithization processes in the archipelago,

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