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The background of transitions in microblade industries in Hokkaido, northern Japan

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ABSTRACT

The purpose of this paper is to discuss the archaeological transitions among microblade industries in Hokkaido and to propose some possible relations between human activities and natural environment. Hokkaido is situated in the north of the Japanese archipelago, and the microblade industries in this region lasted approximately from 24,000 to 13,000 cal BP, corresponding to the climatic changes of the MIS2 Last Glacial Maximum (LGM) Cold2 and MIS2 Late Glacial Warm (LG Warm). The primary purpose of this paper is to describe the whole picture of transitions observed in microblade industries through a series of examinations on the size of microblades, maintenance of burins, and the stone tool classes. Results suggest that the following changes in hunting-related stone tools were occurred during the LG Warm: 1) miniaturization in the part of spears (microblades), 2) high frequency in burin maintenance, and 3) appearance of the new hunting weapon (i.e., projectile points), and axes. Then, a preliminary discussion on the possible relations between human activities and the natural environment including some significant climate changes is made referring to the recent studies on the analyses of charred deposits on pottery from the Taisho 3 site which belongs to LG Warm. Given the fact that the alterations in the environment and human activities were coincident, I propose the hypothesis that the transitions in microblade industries in Hokkaido was an outcome of human adaptation to the fluctuation in accessible natural resources caused by the globally occurred warming trend.

1. Introduction

During the terminal Upper Paleolithic, microblade industries are common throughout the entire East Asia (Buvit and Terry, 2011; Kato, 2014). Likewise in the Japanese Archipelago, they seem to have been distributed to all regions except for the Ryukyu Islands (Sato and Tsutsumi, 2007).

In Hokkaido, located in the north end of the archipelago, microblade industries lasted approximately for 11,000 years from 24,000 cal BP to 13,000 cal BP (Izuho et al., 2012). Microblade industries in Hokkaido are divided into 3 temporal stages according to the characteristics of microblade cores (Sato and Yakushige, 2014). The Early stage (24,000–21,000 cal BP) includes Rankoshi Industry and Pirika-tougeshita Industry, the Middle stage (19,000–16,000 cal BP) includes Sakkotsu Industry (Kimura and Girya, 2016), the Late stage (16,000–13,000 cal BP) includes Oshorokko Industry and Small Boat-shaped Core Industry. This paper examines Sakkotsu, Oshorokko, and Small Boat-shaped Core Industries dating between 19,000–13,000 cal BP. Previously, Otsuka et al. (2013) conducted a series of preliminary analyses on the artifacts excavated from sites that existed in the same time period of the Sakkotsu to the Small Boat-shaped Core Industries. As a result, the following signatures were roughly suggested to have occurred simultaneously throughout the period: 1) miniaturization of microblades, 2) highly-frequent maintenance on the burin facets, and 3) changes in stone tool classes. Coincidentally, the global climate of the time experiences some major temperature variation from the MIS2 Last Glacial Maximum (LGM) Cold 2 to the MIS 2 Late Glacial (LG) Warm that sequentially existed (Kudo, 2012). This suggests that the microblade culture survived during the globally-recorded climate changes in the Pleistocene.

The present paper purposes to establish the precursory hypothesis (Otsuka et al., 2013) by increasing the number of observable artifacts and improving the accuracy of conducted analyses in the viewpoint of microblade miniaturization, burin maintenance, and the appearance of new tool classes. Then, a preliminary discussion on the possible relations between human activities and the natural environment including some significant climate changes is made referring to the recent studies on the analyses of charred deposits on pottery from the Taisho 3 site which belongs to LG Warm. Combining

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all the results, the paper aims to comprehensively describe the transitions observed in microblade industries in Hokkaido by integrating the environmental diversity into human activities.

2. Regional setting

2.1. Geographical setting

The Japanese archipelago situated at the eastern end of the Eurasian continent is consisting of four major islands: Hokkaido, Honshu, Shikoku, and Kyusyu. The Hokkaido Island lies in the northern end of the archipelago (about 41 °N–45 °N latitude, 140 °E–146 °E longitude), and its northern closest end is only 45 km southern away from the Sakhalin Island across the Soya Strait.

The Hokkaido and Sakhalin Islands are two independent islands, while they were connected to the Northeast Asian Continent by the Mamiya and the Soya Landbridges during the terminal Pleistocene from 70,000–10,000 years ago, due to the lowered sea level (Ono, 1990). Therefore, the connected islands were a part of the Asian continent, which formed a protruding peninsula (Fig. 1, Sato, 2005; Igarashi, 2008, 2011).

2.2. Paleoenvironmental setting

Kudo (2012) divided the environmental transitions on the Honshu island into 7 stages based on the examination for the climatic correlation between the entire planet and the island: MIS 3 Stable Warm (60,000–44,000 cal BP), MIS3 Transition (44,000–38,000 cal BP), MIS3 Early Cold (38,000–28,000 cal BP), MIS2 LGM Cold 1 (28,000–24,000 cal BP), MIS2 LGM Cold 2 (24,000–15,000 cal BP), MIS2 LG Warm (15,000–13,000 cal BP), and MIS2 LG Cold (13,000–11,500 cal BP). According to this classification, the period of microblade industries in Hokkaido corresponds to the global climate phases of the MIS2 LGM Cold 2 (about 24,000–15,000 cal BP) and the MIS2 LG Warm (approximately 15,000–13,000 cal BP). Evidently corresponding to the climate changes, the vegetation in the region shifted from dominant forest/open forest of *Larix gmelinii* and *Pinus pumila* in the LGM Cold 2 to the increase of *Picea* and *Betula* in the LG Warm. The increase of *Picea* and *Betula* is observed as the temperature goes up, yet the Younger Dryas phase begins with the increase of *Larix gmelinii* during the MIS2 LG Cold (approximately 13,000–11,500 cal BP), in between the warm climate (Igarashi, 2008, 2011; Igarashi et al., 2012).

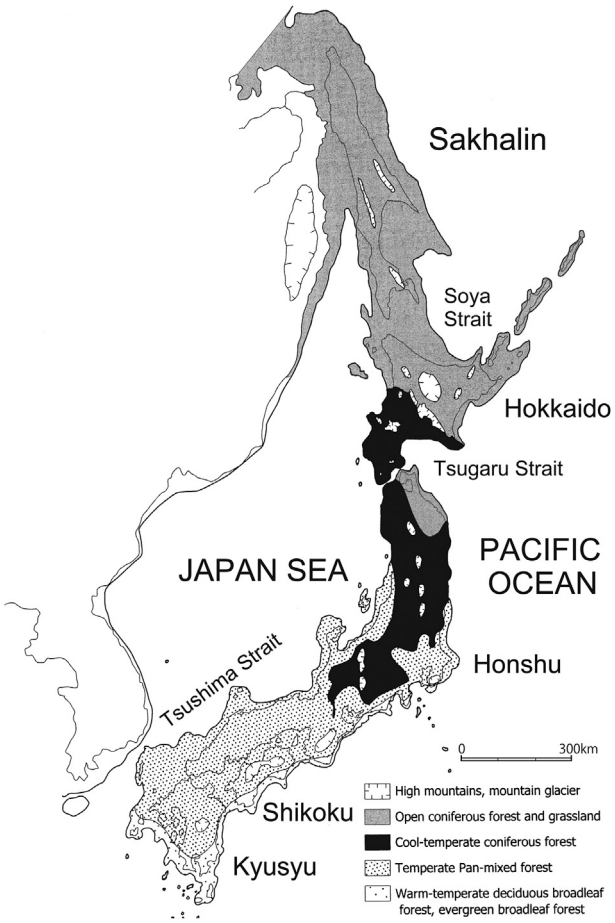

Fig. 1. The paleogeography of Japanese Archipelago during the Last Glacial Maximum (modified from Iwase et al., 2011).

On the other hand, faunal record shows that the Mammoth Fauna Group was the dominant fauna in this region during the MIS2 LGM Cold 2 (Iwase et al., 2011; Takahashi, 2015). The Mammoth Fauna Group consists of grazers such as wooly mammoth (*Mammuthus prigenius*), bison (*Bison priscus*), and moose (*Alces alces*) inhabited in the open forests. Wooly mammoth have only discovered in Hokkaido on the Japanese archipelago, which suggests that the LGM Hokkaido was covered by open forests. Cold-adapted wooly mammoth in Hokkaido lasted for 22,000 years from 45,000 to 23,000 cal BP. Due to the warming that follows the end of MIS2 LGM Cold 2, large animals including wooly mammoth became possibly extinct at the transitional period of MIS2 LGM Cold 2 and MIS2 LG Warm. Following the period of megafauna (around the end of LG Warm and afterward) comes the period of current fauna including brown bears (*Ursus arctos*) and Shika deer (*Cervus nippon*) (Kawamura, 1994; Sato and Izuho, 2011).

2.3. Chronology of the Paleolithic period in Hokkaido

The results of past excavations in Hokkaido have provided various insights into the chronologies of regional Paleolithic record. There is no consensus view among researchers on the topic, particularly on the earliest lithic industries before the appearance of microblade industries. For example, Izuho et al. (2012) proposed that the Small Flake Industry dates back to more than 30,000 cal BP, while Otsuka (2014) stated that it only dates to 28,000–25,000 cal BP. On the other hand, the understanding toward the chronology of microblade industries is largely shared among researchers due to the increasing data of ^{14}C analyses, technological analyses of stone tools, and site formation processes (e.g., Terasaki, 2006; Izuho et al., 2012; Naoe, 2014; Nakazawa and Yamada, 2015) (except for one or two controversial industries). Here, I define that the Paleolithic industries in Hokkaido are placed during 28,000–13,000 cal BP, and the microblade industries lasted for 11,000 years between 24,000 and 13,000 cal BP. Fig. 2 integrates the currently-proposed Paleolithic chronologies of Hokkaido (Yamada, 2006; Naoe, 2014; Otsuka, 2014; Suzuki, 2014; Nakazawa and Yamada, 2015) with the corresponding climatic conditions (Kudo, 2012).

As shown in Fig. 2, there are Small Flake Industry, Side-scraper Industry, End-scraper Industry, and Kawanishi Industry that existed for about 3000 years. From 28,000 to 25,000 cal BP, microblade technology is absent in all of these industries. However, instead, each industry is characterized by particular stone tool class or other specific features; retouched flakes from Small Flake Industry, side-scrapers and end-scrapers from each industry with its name, and consumption of blades seen in Kawanishi Industry. After 24,000 cal BP, all the industries share microblade technology and possess a set of tool classes that consists of burins, end-scrapers,

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