Experimental use-wear analysis on the Early Upper Paleolithic edge-ground stone axes in the Japanese Archipelago

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Abstract

In the Japanese islands, the earliest edge-ground stone axes and/or adzes appeared at the beginning of the Early Upper Paleolithic (EUP: ca. 38,000-30,000 calyrBP) in the late Marine Isotope Stage 3 (MIS3), probably corresponding with the arrival of *Homo sapiens*. This tiny archipelago has yielded about 400 edge-ground axes (Hashimoto 2005), implying that axes played a pivotal role in adapting to the temperate island environments of late MIS3 (Izuho and Kaifu 2015). Thus, functional studies for the earliest stone axes will contribute to illuminating the adaptive technologies of first modern human immigrants to the Japanese Archipelago. In this study, we replicated edge-ground axes and used for wood-chopping experiments and the use-wears were observed.

Seven axes were manufactured in hornfels, slate, and nephrite and replicated with the edge-ground axes from the EUP sites in the central Honshu, Japan. The replicas were mounted on wooden juxtaposed hafts, fixed with plant bindings, and used for felling coniferous trees. The use-wear analysis is undertaken by the high-power and low-power approaches.

As a result, the grinding trace, micro-flaking, striation, abrasion, and use-wear polish are observed on the ground edges of replicas. Traces are mainly distributed on the dorsal faces of axes, which intensively contacted with worked materials. The use-wear polish, representing very bright and smooth appearance, can be distinguished from the polishes formed from grinding which were dull and rough in texture. Furthermore, the microtopography of use-wear polishes shows a flat appearance in intensive contact areas and undulates in lesser contact areas.

Previous studies on ground stone axes and adzes used for woodworking experimentations also suggest that the use-wear polish has a very bright and smooth appearance, but its microtopograhy is usually flat (e.g. Gaetner 1994; Saino 1998; Ishikawa and Saino 2000; Takase 2005, 2007; Masclans Latorre et al. 2017). These features are slightly different from the typical "wood polish" (Keeley 1980) on handheld tools. The heavy activities including wood chopping seem to produce use-wear polishes that are similar to the "wood polish" but lack the roundness on its topography. These results can make great contributions to the use-wear analysis on the archaeological edge-ground stone axes.

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