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Differentiating bamboo from stone tool cut marks in the zooarchaeological record, with a discussion on the use of bamboo knives

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Abstract

The archaeological record of Southeast Asia is marked by a relative lack of Acheulian assemblages compared with the rest of the Old World. Suggestions that prehistoric human populations in this area relied instead on a non-lithic technology based on bamboo have not been supported by archaeological evidence. To provide a diagnostic means of assessing prehistoric use of bamboo, cut marks were experimentally produced on bone using chert tools and bamboo knives. A scanning electron microscope (SEM) examination revealed morphological differences in cut marks produced by the two materials that allow identification of bamboo knife cut marks on faunal materials. Such evidence, if found in Pleistocene through early Holocene archaeological sites in Southeast Asia, would indicate early human reliance on bamboo technology.

Keywords: Cut marks; Bamboo; Zooarchaeology; Southeast Asia; Stone tools

1. Introduction

The paucity of Acheulian assemblages in the prehistoric record of East and Southeast Asia led Movius [22: 539] to describe the region as a ‘‘marginal area of cultural retardation.’’ This proposition has been challenged by the idea, first suggested by Boriskovskii [3–9], that early populations in the area may have relied heavily on a non-lithic technology which included bamboo and wood, and that the East Asian Pebble Tool tradition and the Hoabinhian tradition of Southeast Asia may have been used in the manufacture of wood tools [1,2,13]. According to this view, long-edged cutting tools, represented in the Acheulian by handaxes and cleavers, may have been made from bamboo rather than stone [14,18,23,24].

Bamboo represents an integral part of Asian culture and is used for many different purposes including building, storage, tools, and as a food source [12,15–17,20,34,36,37]. The large scale utilization of this resource can be explained by the ease with which it lends itself for use, as well as its natural abundance.

Bamboo does not preserve archaeologically and therefore the importance of this resource to past populations in Southeast Asia must be assessed through indirect means. Evidence for the prehistoric use of bamboo consists chiefly of ethnographic examples of bamboo technology utilized by modern people in Southeast Asia, Polynesia, and New Guinea [12,15–17,19,20,30,36] and also from use-wear and residue experiments that indicate the steep-edged Hoabinhian tools may have been used in the preparation of wood or bamboo artefacts [2,19]. Archaeological remains from a Holocene site in Papua New Guinea suggests the use of bamboo on human and pig remains [31,32], albeit not definitively interpreted. Ethnographic data show that today bamboo knives are

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used in rituals, in food preparation, and when butchering expediency is desired ([12,16,20,30] and references therein). These knives can be produced by splitting a fresh bamboo halm (outer stem) into thinner slips [36]. The outer halm of bamboo contains large amounts of silica and offers a thin, sharp edge. Slips ideal for knife use have a bevelled edge, which places the silica-rich halm out beyond the inner pulp (Fig. 1). Experimental work [28–30] shows that bamboo knives produce discernable cut marks on bone as do stone tools, although they are considerably smaller, shallower and less easily seen macroscopically.

SEM examination of experimentally produced stone tool cut marks has identified a number of morphological features attributable to the edge morphology of stone tools [10,25,27]. By demonstrating the relationship between the edge morphology of the cutting tool and the morphology of the cut mark, such analyses offer empirically based criteria for the interpretation of surficial damage on bones from archaeological sites. The following study attempted to produce bamboo knife cut marks on bones from two different species of large mammal in order to detail what characterises the use of bamboo, as opposed to stone tools, as preserved in the zooarchaeological record. Observations related to the use of bamboo knives are noted. In order to replicate the lowest level of technological expertise, simple stone tools (unretouched flakes) were also manufactured and utilised.

2. Methods and materials

Two experiments were conducted: (1) a defleshing experiment, from which marks were examined both macro- and microscopically, and (2) a cut mark experiment in which marks were subjected to SEM analysis. The cut marks examined in the defleshing experiment were made by bamboo knives manufactured from *Phyllostachys*, a common genus in southern China. These knives were made by splitting small diameter shoots, either by pounding them with a cobble, or by hitting them against a rock or tree, and from these tearing strips bearing the outer halm. Both recently cut (<1 week) and dry shoots were tested for their efficiency. The stone knives were made as crudely as possible in order to best mimic the least sophisticated lithic technology. These were made by striking flakes of chert from a larger core using a geological hammer. Two sheep (*Ovis aries*) humeri were defleshed, one by bamboo (Fig. 2) and the other by stone tools. Around ten bamboo blades and three stone flakes were used during the defleshing process. This experiment was conducted by novice butchers, and the marks examined both macroscopically and under a Leica MZ6 binocular microscope.

In the second experiment cut marks were experimentally produced on four *Bos* tibia using bamboo knives (manufactured as above) made of *Phyllostachys aureosulcata* (“Yellow-groove” bamboo), native to central and eastern China, and using bifacially flaked, retouched chert tools. Twelve individual cut marks were produced on each bone, with one bamboo knife utilised per bone. Negative casts of the cut marks were made from Express® (3M Corporation), a polysilioxene dental impression material. Positive casts were then produced with Spurr’s epoxy resin, coated with gold-palladium, and examined with SEM.

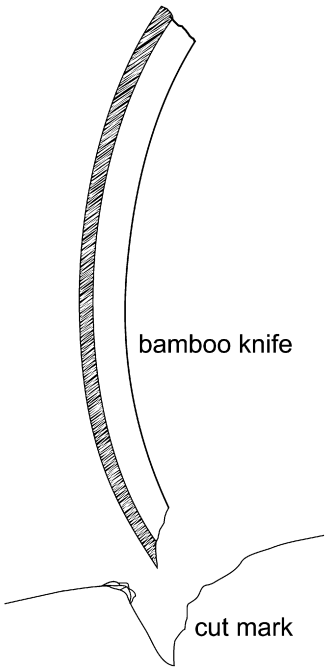

Fig. 1. Schematic cross-section through bamboo knife and cut mark showing correlations between knife edge and cut mark morphology. Greatly enlarged, not to scale.

3. Results

3.1. Observations on the mechanical qualities of bamboo and stone tools in defleshing

The following observations are those of a novice in the use of both stone and bamboo tools. Bamboo is surprisingly sharp—considerably more so than was anticipated. Relatively small halms are the easiest size to form into knives. The

Fig. 2. Cutting flesh from the sheep using a bamboo knife.