Journal of Archaeological Science 37 (2010) 1543–1556

Contents lists available at ScienceDirect

Journal of Archaeological Science

journal homepage: http://www.elsevier.com/locate/jas

Use-wear analysis of obsidian artifacts from Later Stone Age shell midden sites on the Red Sea Coast of Eritrea, with experimental results

Amanuel Beyin*

Turkana Basin Institute, Stony Brook University SBS bldg 5th FL, Stony Brook, NY 11794, USA

ARTICLE INFO

Article history:
Received 5 July 2009
Received in revised form
7 January 2010
Accepted 7 January 2010

Keywords:
Use-wear
Stone tools
Later Stone Age
Red Sea Coast
Eritrea

ABSTRACT

This paper presents results of use-wear study on lithic artifacts from two Later Stone Age sites (Gelalo and Misse) on the Red Sea Coast of Eritrea. The sites produced large quantities of lithic artifacts in association with mollusk shells and ostrich eggshell beads, but it is unclear if all the stone tools were required for bead and mollusk shell processing. The study involved recording of microfracture damage traces in order to infer the use-material and the manner in which the artifacts were used. A large percentage of the analyzed samples from Gelalo and Misse preserve wear patterns suggestive of human use. The diagnostic wear types include: (1) dense step, snap (crushing) and hinge fractures typically confined on the working edges, and (2) feather scars organized in a scalar manner visible on the ventral and dorsal surfaces of the active parts. The observed damage patterns suggest cutting and engraving medium to hard materials. The evidence is incomplete for more generalization about the specific activities carried out at the sites. A brief experimental study involving ostrich eggshell drilling, oak twig sawing and bark scraping, meat slicing, and mollusk shell sawing and drilling was carried out to aid interpretation of wear features observed on the archaeological specimens. Wear traces produced by sawing mollusk shell and oak wood showed close affinity to those observed on the archaeological specimens. The study contributes important information about early Holocene site use on the Red Sea Coast of Eritrea. The close association of used lithic artifacts, symbolic objects (beads) and broken shell remains indicates that the sites were habitation areas.

1. Introduction

By and large, stone tools represent some of the best remaining evidence of human culture and cognition, however, their functions are often not well understood (Hardy et al., 2001; Semaw et al., 1997; Stout, 2002). In the course of human evolution, lithic technology changed from general-purpose tools (chopper, handaxe) to more specialized forms, such as points and geometric microliths (Clark, 1977). The archaeological record suggests that stone tools showed greater regional and functional diversity toward the Later Stone Age (LSA), variably dated to between ~40 ka BP and early Holocene in Africa (Ambrose, 1998; McBrearty and Brooks, 2000). Due to low preservation of organic remains in many prehistoric sites of tropical Africa, inferences regarding tool function are usually linked to the observed damage pattern via experimental, actualistic, and/or ethnoarchaeological research (Clark and Kurashina, 1981; Keeley and Toth, 1981; Toth, 1991). Use-wear analysis is a technique used by archaeologists to infer tool function and behavior from damage patterns observed on the used parts of stone tools (Hayden, 1979b). As noted by Odell (1981, p.197), "stone tools that were utilized in prehistoric times often afford ample evidence of their use through the damage they sustained while being used." There are two main objectives of use-wear analysis in archaeological research: (1) to infer the manner in which the tools were used or "use action", and (2) to infer the contact surface or "use material" (Hurcombe 1992, p. 5). The underlying assumption is that different motions and contact surfaces produce specific damage traces (Keeley, 1980; Semenov, 1964). Patterning of edge damage can range between breakage, striations and polish (see definitions below). Because different researchers have different ways of measuring edge damage, no single use-wear approach may work consistently across different assemblages. Raw material type, edge angle, instrument type and analytic procedures are some of the common factors that affect use-wear interpretation (Grace, 1996; Hayden, 1979a; Lerner et al., 2007).

Applications of use-wear analyses to infer prehistoric behavior are broad and deemed useful as a line of evidence to assess a priori hypotheses about subsistence, artwork, hafting, etc. (Alvarez et al.,

* Fax: +1 631 632 5810.
E-mail address: abeyin@stonybrook.edu

0305-4403/$ – see front matter © 2010 Elsevier Ltd. All rights reserved.
doi:10.1016/j.jas.2010.01.015

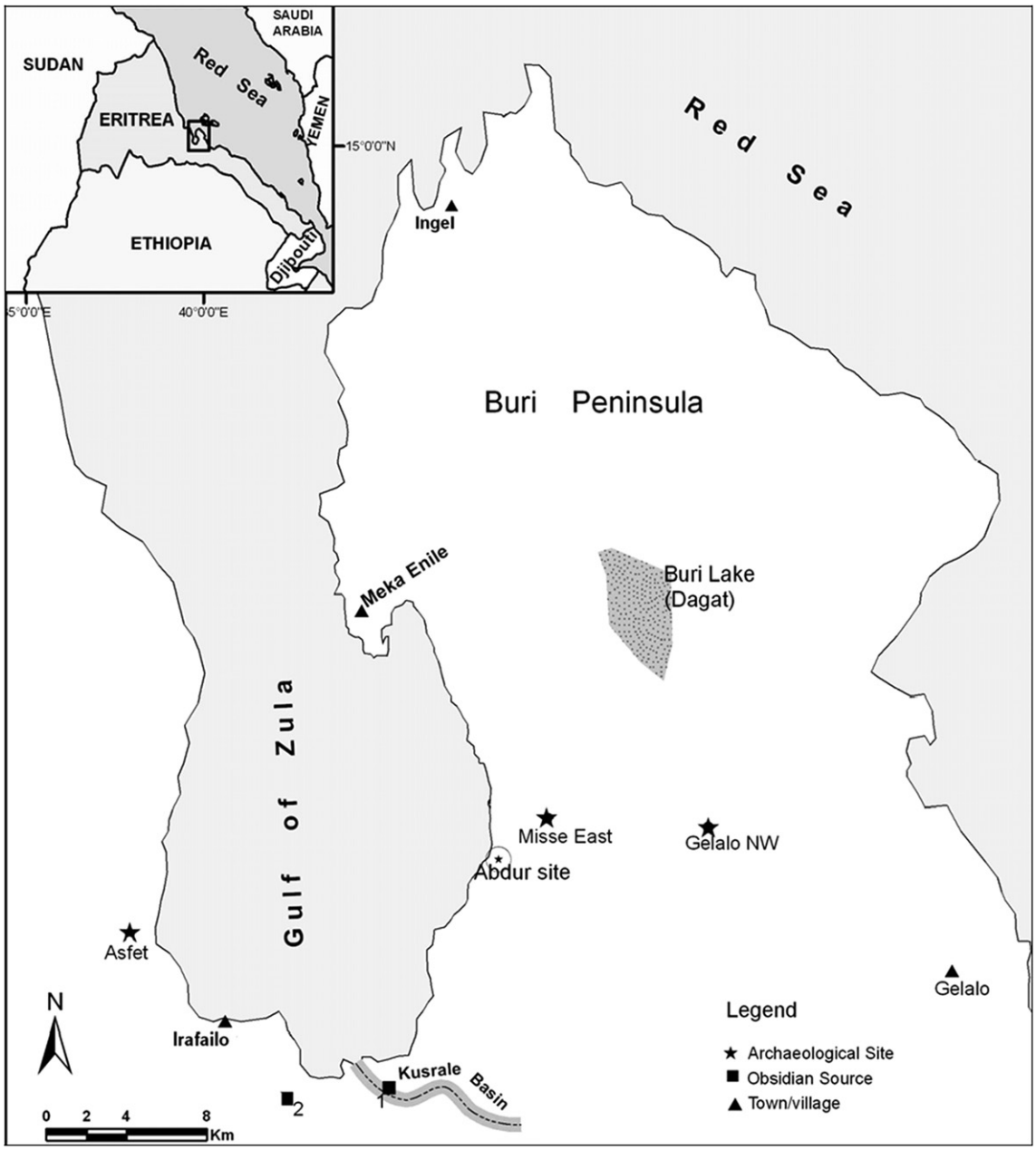

Fig. 1. Map of the study area and location of source sites for the analyzed samples.

2001; Evans and Donahue, 2008; Lombard and Wadley, 2007; Stemp et al., 2009; Stemp and Stemp, 2003). More often, analyses of stone tool use-wear are used to infer the subsistence behavior of prehistoric people when the actual dietary remains are not well preserved (e.g., Becker and Wendorf, 1993; Clark and Prince, 1978; Lombard, 2005a, 2008; Shea, 2007). In Africa, South African archaeologists are best known for utilizing use-wear and residue analysis more extensively in recent years (Lombard 2005a, b, 2008; Lombard and Wadley, 2007; Wadley and Lombard, 2007; Williamson, 2005). With the exception of a few case studies (Clemente et al., 2008; Moss, 1977; Stemp et al., 2009), functional studies of assemblages from shell middens are generally scarce. In a shell drilling experiment using flint tools, Moss (1983, p. 104) reported that, "shell boring produced a dull polish, like one of the varieties of stone polish, but the striations are parallel and extraordinarily regular possibly caused by the daily growth rings of the shell." Moss further noted that, "working shell is comparable to that of working stone,,, it is the striations alone which are the key to differentiating shell and stone working" (ibid.). A use-wear study of lithic assemblages from shell midden sites in the Caribbean Coast of Nicaragua found frequent use of lithic tools for woodworking and mineral processing (Clemente et al., 2008). In a chert dominated assemblage, only 15% of the tools were classified as drills for stone and shell bead making (ibid., p. 289). A more recent experimental study involving sawing a queen conch shell (*Strombus gigas*) showed a striated bright polish restricted to the areas of higher microtopography (Stemp et al., 2009, p. 370). The study employed a laser profilometer with a magnification ranging up to 200×. At present, observations on obsidian use-wear from shell middens and those associated with shell bead processing are rare, if not absent.

The aim of this paper is to present results of use-wear study on lithic artifacts from two recently excavated LSA sites on the Red Sea Coast of Eritrea, namely Gelalo Northwest and Misse East (Fig. 1). The sites produced large quantities of lithic artifacts in association