



Woodworking sites from the Late Paleolithic of South Arabia: Functional and technological analysis of burins from Dhofar, Oman



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ARTICLE INFO

Keywords:

South Arabia

Burins

Functional analysis

Woodworking

Late Paleolithic

ABSTRACT

Burins are a geographic and time-transgressive tool type, found in lithic industries throughout the world. The defining feature of a burin is the administration of a precisely placed blow (i.e., burin blow) on a natural or prepared striking platform at the edge of a blank. Burins were used for various activities, such as fashioning hunting equipment, figurines, musical instruments, or other decorative objects manufactured from wood, antler, or bone. In other settings, researchers have observed burins that were also used as cores, demonstrating the flexibility and utility of this tool type. Here we present the results of technological, typological and functional analyses of three burin assemblages from the Late Paleolithic of Dhofar, southern Arabia. Technological analysis indicates a significant degree of standardized production. Functional analysis suggests that these tools have been used in woodworking activities. Traceological studies suggest that the function of the burin blow was not the creation of an active working face, as often seen in the Southwest Asian and European Upper Paleolithic; rather, the burin blow functioned to stabilize the truncation and working edge of the tool. Traces of use have been identified mainly on the wide truncations, indicating that the artifacts were likely used to plane broad wooden surfaces. From these observations, we infer that woodworking was a significant component of Late Paleolithic human activity in Dhofar.

1. Introduction

In this paper, we examine three Late Paleolithic assemblages (TH.87b, TH.267 and TH.413) collected in southern Oman. The lithics from these sites stood out in comparison to other surface occurrences identified during the survey activities conducted by the authors between 2010 and 2013 given their unusually high numbers of burins. The aim of this paper is to explore the function(s) of these tools as well as to better understand these sites in a wider geographical context and to trace some of the behavioral adaptations of local hunter-gatherers to the Early Holocene climatic optimum in South Arabia.

1.1. Early Holocene burin sites across the Arabian Peninsula

Researchers working throughout Southwest Asia have documented a specific type of lithic scatter that consists of dense concentrations of

burins on truncations made on elongated blanks. Some of these sites, found in Jordan and Syria are attributed to the “desert burin” facies of the terminal Pre-Pottery Neolithic B (PPNB) (e.g., Baird et al., 1992; Betts et al., 2013; Garrard et al., 1985; Rollefson and Fröhlich, 1982). Broadly speaking, the PPNB is characterized by complex behaviors including public architecture, plant cultivation, animal husbandry, food storage, and elaborate mortuary practices. PPNB tool makers employ a variety of lithic reduction strategies to produce morphologically pre-determined blanks, from which tools were manufactured (Abbès, 2003; Barzilai and Goring-Morrise, 2010; Borrell, 2011; Pelegrin and Inizan, 2013). Dated PPNB sites fall within an age range between ~10,700 and 8000 years BP. The southernmost known distribution of artifacts with PPNB affinities is JQ-101, a stratified open-air site in the southern Nefud desert of Saudi Arabia (Crassard et al., 2013). A functional study conducted on burins from the PPNB-related site of Gabal Na'ja, eastern Jordan, concludes that these specimens were primarily used as cores to

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produce narrow and sturdy bladelets. In some cases, the spalls were further modified into stone tipped borers for bead manufacture (Betts and Finlayson, 1990). Of the seventeen burins analyzed, two showed defined traces of use along the edge on the opposite side of the burin scar and one on a small notch at the end of the burin scar.

1.2. The Late Paleolithic of South Arabia

Archaeologists working in the south of the Arabian Peninsula have discovered seemingly similar sites that are composed almost exclusively of burins made on blades. These assemblages are a facies of the Late Paleolithic, a regionally distinct technocomplex in southern Arabia bracketed within the Early Holocene (11,700–8200 BP). Various manifestations of Late Paleolithic settlement, technology, and subsistence strategies have been documented across the diverse landscapes of South Arabia. At Natif 2 Cave on the coast of Dhofar, material culture and faunal remains from the site includes tanged points manufactured with a simple blade technology, pelagic fish bones, and worked bone fishing equipment (Charpentier et al., 2016). Inland sites with Late Paleolithic technological and typological features have been mapped along water courses in central and eastern Yemen (Amirkhanov, 1994; Crassard, 2008a, 2008b; Rose, 2002), central Oman (Bonilauri et al., 2015; Charpentier, 2008; Jagher and Pümpin, 2010; Rose, 2006) and Sharjah Emirate (Uerpmann et al., 2013).

Cremaschi and Negrino (2002) note the occurrence of burins at two sites in the Dhofar Mountains of southern Oman (KR143 and KR252). The presence of 38 large burins, mostly on truncation, and the absence of burin spalls lead the authors to posit that the spalls were used as cores for the production of bladelets with sturdy triangular cross sections, as was found to be the case at Gabal Na'ja in Jordan. A series of radiocarbon ages from nearby rockshelters KR213, KR108 and GQ-12/23, bearing assemblages with the same simple blade technology, fall between 10,500 and 9500 cal BP (Cremaschi et al., 2015). Survey conducted between 2009 and 2013 by our team mapped 302 Late Paleolithic archaeological sites across the Dhofar region of southern Oman (Fig. 1), of which 74 findspots include different percentages of burins made on blades.

One such burin assemblage was excavated from al-Hatab, a partially collapsed rockshelter at the southern edge of the Dhofar Nejd scablands (Rose and Usik, 2009). The deposition of the Late Paleolithic layers at al-Hatab were dated by Optically Stimulated Luminescence (OSL) to $12,500 \pm 1000$ and $12,700 \pm 1500$ years ago (Hilbert et al., 2015b). Additional OSL ages of 9700 ± 700 BP come from the Late Paleolithic horizon at Khamseen Rockshelter, and as late as 8600 ± 600 and 7300 ± 500 BP at Ghazal Rockshelter (Hilbert et al., 2015a).

These Late Paleolithic assemblages are characterized by simple hard hammer blade and flake production. Refitting from multiple Late Paleolithic assemblages consistently show a homogenous laminar reduction strategy that typically reduces a unipolar core in a recurrent, semi-tournant fashion. The absence of core tablets and crested blades underscores the simplicity of this technology, which lacks any discernible method of core maintenance (Hilbert, 2014). Late Paleolithic tool assemblages typically include tanged points, also known as Fasad points (Charpentier and Crassard, 2013), Wa'shah points (Crassard, 2008a, 2008b), endscrapers, sidescrapers, diverse bifacial implements, piercers, partially retouched points, and burins.

At first glance, the Early Holocene lithic industries of southern and northern Arabia exhibit typologically similar burins made on blades, which does not mean that a migration from an immediate source in northern Arabia is inferred. Technologically the burins from the desert-burin facies and those found in southern Oman were made using distinct core reduction strategies. Industries from the former group, found in Jordan and Syria, show specific blank production strategies of which bidirectional naviform cores are the most distinguishable (additional technological components include unipolar blade reduction and to a lesser extend bifacial production). In the Late Paleolithic of South

Arabia, on the other hand, core reduction is characterized exclusively by a simple unidirectional technique with minimal preparation (of either the working surface, striking platform, or platform edge) and no maintenance or rejuvenation throughout the life cycle of the core. This technological difference makes it germane to infer separate technological trajectories for these two cultures. This study seeks to expand our limited knowledge of Late Paleolithic human activities in South Arabia by combining technological and traceological analysis of burin assemblages.

2. Materials and methods

2.1. Site location, assemblage composition and artifact properties

Dhofar is part of a massive incised tableland - the South Arabian Highlands - stretching from the Jol plateau in central Yemen to the Nejd plateau in southern Oman. Dhofar's steep mountain scarp traps moisture from the Indian Ocean monsoon, forming a seasonally lush cloud forest on the seaward slopes and mountain highlands. Dhofar comprises a mosaic of diverse ecosystems, generally partitioned into five ecological zones encompassing the coastal plain, the southern facing slopes of the Dhofar mountains, the grassy highlands, the interior plateau (also known as the Dhofar Nejd) and the Rub 'al-Khali desert. Endemic species in Dhofar indicate that this region, which even today experiences heightened precipitation from the annual monsoon, served as a natural habitat for plants and animals, including humans, throughout prehistory (Aronson et al., 2017; Bayoumi et al., 2016; Gandini et al., 2016; Hilbert et al., 2015b; Parker and Rose, 2008; Rose et al., 2011).

The artifacts sampled in this study were collected from surface sites; therefore, they have no directly associated numeric ages. Based on the overwhelming technological and typological similarities to dated Late Paleolithic assemblages, in particular the burins from al-Hatab, it is warranted to posit at least an Early Holocene age for these specimens. Burins are a common element within Late Paleolithic assemblages, often constituting a high percentage of the overall toolkit. Among the three assemblages selected for this study, TH.84b, TH.267, and TH.413, burins were, by far, the predominant typological element comprising over 95% of the tool assemblage. These surface scatters were recognized in the field to represent some form of specialized activity site and collected for subsequent functional analyses. A brief description of each site and assemblage in respect to its location, sampling methodology, and general artifact composition is presented below.

The TH.84b assemblage in particular represents an interesting surface scatters containing only tools and therefore consisting almost exclusively of burins. TH.84b is located atop a small inselberg rising some 20 m over a gravel-covered plain, three kilometers west of al-Hatab at the southern edge of the Dhofar Nejd in southern Oman. The site is a moderate-high density lithic scatter (6–20 artifacts per sq m) found in a small area of about four square meters. No raw material source was present at the site and all collected artifacts were manufactured from the same chert type.

The burin scatter found at TH.413 was located at the edge of a low inselberg near Wadi Ribkhut, which had chert raw material eroding from its base. This high density (20+ artifacts per sq m) scatter of burins and burin related production waste, such as burin spalls and truncation sharpening elements, was also found within a small concentrated scatter. All artifacts were systematically collected in a two by one meter sampling area, totaling 159 pieces of which 114 are classified as burins.

The TH.267 assemblage was found in the western portion of the surveyed territories on the dry plateau, at the foot of a low inselberg between Wadis Amawt and Banawt. The concentration of burins found at this site was located amidst a high-density lithic workshop scatter containing a large number of blade cores, primary blades, and other laminar elements. The scatter is situated on a lag surface, from which

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