



Contents lists available at ScienceDirect

Quaternary International

journal homepage: www.elsevier.com/locate/quaint

A newly discovered antler flint-knapping hammer and the question of their rarity in the Palaeolithic archaeological record: Reality or bias?



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ARTICLE INFO

Article history:

Available online 19 January 2016

Keywords:

Laugerie-Haute West (France)
CT-scanning
Focus variation microscope
Scanning electron microscope
Energy dispersive X-ray spectroscopy
Magdalenian

ABSTRACT

The use of soft (bone, antler, tooth and wood) hammers and retouchers is a key innovation in early stone tool technology, first appearing in the archaeological record with Lower Palaeolithic handaxe industries (e.g. Boxgrove, UK ~500 ka). Although organic knapping tools were undoubtedly a component of early human toolkits and are essential, for example, for the manufacture of finely-flaked handaxes, Mousterian scrapers and Upper Palaeolithic blades tools, such archaeological finds are exceptionally rare. In this study, we present qualitative and quantitative analyses (focus variation optical microscope, scanning electron microscope, micro-CT scanning and energy dispersive X-ray spectroscopy), of a newly discovered antler flint knapping from Laugerie-Haute West (France). This specimen was originally identified as a waste-product from splinter manufacture, and the use-damage appears to have been overlooked by earlier workers. The new analysis shows that prior to being used as a flint-knapping percussor, the red deer antler had been modified to reduce the length of its beam and to remove the tines. Although minimally used, characteristic use-damage includes attrition (pits and scores), compression of the antler matrix and flint chips embedded within some of the percussion features on the base of the burr. An AMS radiocarbon date of $12,385 \pm 55$ BP ($12,647 \pm 335$ BC calibrated) confirms a Magdalenian context for the hammer. The fact that the Laugerie-Haute knapping hammer went unrecognized in a well-studied and accessible collection where it was stored for almost 200 years, suggests that antler hammers may be more common than generally assumed. Only further re-examination of prehistoric antlers in museum collections will confirm whether the apparent rarity of antler hammers during the Lower and Middle Palaeolithic is real phenomenon or the result of analytical biases.

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1. Introduction

The experimental reproduction of archaeological flint tools is an important source of information for understanding how pre-historic stone tools were manufactured and for investigating associated aspects of past human activities (e.g. Vincent, 1993; Armand and Delagnes, 1998; Bourguignon, 2001; Mallye et al., 2012; Bello et al., 2013c). Several popular books are now available that describe how to knap stone tools (e.g. Whittaker, 1994; Butler, 2005; Turner, 2013). Modern flint knapping kits generally include a range of hard hammers (hammer stones – often stream-

rounded pebbles and cobbles) to prepare the piece, or to remove larger flakes, as well as softer stone and organic hammers for more carefully controlled removals (Wenban-Smith, 1989). Soft hammers are used, for example, to thin and shape bifacial tools (e.g. handaxes) by percussion, and antler tines can be used as pressure-flakers in the final stages of bifacial tool working. Modern knappers favour soft hammers made from the beam or basal part of deer antlers, usually from red deer (*Cervus elaphus*), fallow deer (*Dama dama*) or white-tailed deer (*Odocoileus virginianus*), or even elk (*Alces alces*). The natural shape and physical and mechanical properties that combine strength with resilience, make antlers particularly suited for use as soft hammers. Despite the preference of modern knappers for antler hammers, evidence for the use of antler percussors in the Lower and Middle Palaeolithic is generally rare and restricted to very few sites. This paucity of data contrasts

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with evidence for the significant role of bone ‘retouchers’ in this period, a type of organic material rarely used or considered by modern knappers as suitable for knapping hammers or pressure-flakers (Wenban-Smith, 1989). In Europe and Asia, bones used as retouchers have been recovered from numerous Neanderthal sites (e.g. Henri-Martin, 1906; Chase, 1990; Auguste, 2002; Griggo, 2002; Veselsky, 2008; Conard et al., 2012; Jéquier et al., 2012; Mallye et al., 2012; Abrams et al., 2014; Daujeard et al., 2014; Romandini et al., 2014) and, increasingly, from Lower Palaeolithic sites (Rosell et al., 2011; Blasco et al., 2013; Rosell et al., 2015; van Kolfschoten et al., 2015). The limits of modern knapping experiments are highlighted by the much wider range of knapping tools found with Upper Palaeolithic and later lithic industries in Eurasia and North America; these include various types of hammers, retouchers and punches made from a range of raw materials including bone, teeth (including ivory) and antler (Bourlon, 1907; Bordes, 1974; Saunders et al., 1991; Averbouh and Bodu, 2002; Haynes, 2002; Leroy-Prost, 2002; Castel et al., 2003; Steguweit and Trnka, 2008; Tartar, 2012; Évora, 2013; Goutas, 2015). More recent (Neolithic) examples may include modified antlers from the ceremonial site of Durrington Walls (Wiltshire, UK) and flint mines at Grimes Graves (Norfolk, UK), some of which appear to have served a dual use as picks and hammers (Clutton-Brock, 1984, plate 12); whether any of these antlers were used for knapping is currently unclear.

Antler hammers are known only from a very few Palaeolithic sites in Europe (Girod and Massenat, 1906 pl. XCVI; Breuil and Barral, 1955; Bordes, 1974, Fig. 4; Stodiek, 1990; Averbouh, 1999; Averbouh and Bodu, 2002; Bolus, 2003; Goutas, 2004), occurring as single examples in often rich archaeological horizons that also include bone retouchers (Patou-Mathis and Schwab, 2002; Teyssandier and Liolios, 2003). Currently, the oldest well-documented antler knapping hammers are from Boxgrove (UK) and date to about 500,000 years ago (Pitts and Roberts, 1997; Roberts and Parfitt, 1999; Pettit and White, 2012; Smith, 2013; Stout et al., 2014). It isn’t until the end of the Middle Palaeolithic that innovations in the use of organic raw materials incorporated antler working to an important degree (Vialou, 2004; Vitezović, 2014). Prior to this, there is little evidence for the use of antler as a raw material. This may be due to various factors, such as choice of raw material (Jaubert, 1999), techniques of debitage (Inizan et al., 1992), preservation and survival in the archaeological record, or Middle Palaeolithic site occupation and activity (Costamagno et al., 2006; Maureille, 2010; Niven et al., 2012).

The rarity of archaeological evidence for antler hammers remains to be adequately explained. A possibility is that antler percussors may not have been systematically recognised in archaeological collections or that they have been misidentified, either as naturally modified pieces or as waste products from antler working (Olsen, 1989; Averbouh and Bodu, 2002; Jin and Shipman, 2010; Pétilion and Ducasse, 2012; Goutas, 2015). Support for the latter suggestion comes from a previously unrecognised Palaeolithic knapping antler hammer from Laugerie-Haute West (France). This example was found during a survey of Pleistocene archaeological bone collections in the Natural History Museum (NHM), London, and identified as a possible flint-knapping hammer by one of us (S.A.P.) in April 2011. This knapping hammer had been overlooked because it was curated with other antlers that had been modified to make blanks using the ‘groove and splinter’ technique (Clark and Thompson, 1954; Goutas, 2009).

In this paper, we present a detailed description and analysis of the Laugerie-Haute antler and evaluate the implications of this find for wider debates concerning the rarity of antler hammers in the archaeological record, particularly for the Lower and Middle Palaeolithic.

2. Material and methods

2.1. Laugerie-Haute West antler knapping hammer

In 2011 a survey of Upper Palaeolithic faunal remains and artefacts stored at the NHM was carried out in order to identify humanly modified specimens. Important specimens found during this survey included an engraved reindeer antler from the Magdalenian site of Neschers, France, (Bello et al., 2013a and 2013b) and the previously unrecognized antler hammer from Laugerie-Haute, described in this paper (Fig. 1). The context and curatorial history of the Laugerie-Haute antler hammer (NHMUK PA E 7605) is poorly documented. The antler is marked in black ink “*Laugerie Ht ou*”, “*Ht*” and “*ou*” being the abbreviation of the French words “Haute” and “*ou(est)*” respectively, the antler was most certainly found during excavations at Laugerie-Haute West (Fig. 1B).

The site of Laugerie-Haute (Dordogne, France) is located about 2 km northwest of the village of Les Eyzies-de-Tayac on the west bank of the river Vézère. It is a large rock shelter, about 180 m long and 35 m wide, with approximately 6 m of archaeological layers (Bordes, 1958). Separated in its centre by a large talus cone, the site is divided into Laugerie-Haute East and Laugerie-Haute West, each coinciding with one of the two extremities of the rock-shelter (Demars, 1995; Delluc et al., 2001; Texier et al., 2004; Vialou, 2004). Levels of human occupation at Laugerie-Haute span the late Gravettian to the Magdalenian (see e.g. Peyrony and Peyrony, 1938; Bordes, 1958, 1978; Demars, 1995; Smith, 1966; Bosselin and Djindjian, 1997). Acquired by the French state in 1921 (Cleyet-Merle, 1990), Laugerie-Haute was first excavated, and possibly discovered, in 1863 by archaeologist E. Lartet and collector H. Christy (Lartet and Christy, 1875; Cleyet-Merle and Marino-Thiault, 1990). The site was subsequently visited and excavated by collectors (e.g. Hauser between c. 1898 and 1914 (Cleyet-Merle, 1990), Rivièrè from 1887 to c. 1907 (Roussot, 1990)) and by archaeologists (see e.g. Capitan and Breuil, 1902; Girod and Massenat, 1906; Maury et al., 1936; Peyrony and Peyrony, 1938; Bordes, 1958, 1978; Smith, 1966). Among the numerous finds, antler ‘*percuteurs*’ were mentioned since 1900 (Girod and Massenat, 1906; Bourlon, 1907). These possibly represent the first prehistoric organic knapping hammers to have been recognised as such, although it took over seventy years to see them fully described and published (Bordes, 1974). Capitan and Breuil (1902), Peyrony and Peyrony (1938) and Bordes (1958, 1974, 1978, 1992) report an important bone and antler industry as raw material and various stages of manufacture in Upper Palaeolithic levels at Laugerie-Haute East and Laugerie-Haute West, as do Girod and Massenat (1900) and Maury (1925) at nearby Laugerie-Basse.

An Upper Palaeolithic (Upper Magdalenian) age for the Laugerie-Haute West antler is confirmed by radio-carbon dating undertaken at the Research Laboratory for Archaeology and the History of Art (RLAH), University of Oxford (UK). The radiocarbon determination of $12,385 \pm 55$ corresponds to a calibrated date of about $12,647 \pm 335$ BC (OxA-29438).

2.2. Analytical methods

The antler was examined following the protocol proposed by Bello et al. (2013c). Initial observations were conducted with a variable magnification binocular microscope to identify and record the distribution and extent of use-damage and to locate lithic chips embedded in the base of the coronet of the antler. Observations were aided by a fibre-optic light source. Under low-incidence illumination it was possible to observe embedded lithic chips, which were visible as translucent inclusions against the opaque and darker antler matrix.

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