Quaternary International 406 (2016) 166–173

Contents lists available at ScienceDirect

Quaternary International

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

Long thin blade production and Late Gravettian hunter-gatherer mobility in Eastern Central Europe

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ARTICLE INFO

Article history:
Available online 10 February 2016

Keywords:
Knapping experiment
Long blade technology
Antler percussor
Upper Palaeolithic

ABSTRACT

The regular and systematic production of long blades (>120 mm) that maintain a thickness (<10 mm) of regular blades (<120 mm) is a particular phenomenon of the Upper Palaeolithic (40–10 ka BP) archaeological record of Eastern Central Europe. However, the mechanical underpinnings of manufacturing these long blades are still not fully understood. This paper presents experimental research that used heavy (~800 g) and light (~570 g) antler percussors to test the effect of percussor weight on the manufacture of Upper Palaeolithic type blades. Statistical analyses showed that a heavier percussor effectively increased the ability to achieve a fine thickness for long blades. The results are then compared to other experimental and archaeological assemblages to suggest that the use of heavy percussors may have played a role in lithic economy of Upper Palaeolithic mobile hunter-gatherers.

1. Introduction

In prehistoric technology, soft hammer percussion techniques were common in the Upper Palaeolithic (UP) (40–10 ka BP) when modern humans used them to produce long, narrow, and flat removals commonly referred to as blades (Bar-Yosef and Kuhn, 1999; Pelegrin, 2011).

Variations in blade technologies are most striking through the metric attributes of the products (Nigst, 2012; Zwyns, 2012). In the UP of Eastern Central Europe, hunter-gatherers rarely manufactured blades longer than 120 mm (Hahn, 1977, 1988; Otte, 1981; Sobczyk, 1996; Otte et al., 2007; Wilczyński, 2007; Moreau, 2009; Noiret, 2009; Nigst, 2012). According to the regional archaeological record, a systematic long blade (>120 mm) production first appeared in the Late Gravettian (24–21 ka BP) at Willendorf II Layer 9 (WII9), where a collection of long blades was recovered (Felgenhauer, 1956–1959; Haesaerts et al., 1996). Long blade technology became more prevalent later in the Western European Middle and Upper Magdalenian (15–12 ka BP) where it remained in use until the end of the Palaeolithic (Adouze et al., 1981; Pigeot, 1987; Fouches and San Juan, 1991; Karlin et al., 1993; Valentin, 1995; Bodu et al., 1997, 2006; Angevin and Langlais, 2009; Janny, 2010; Caron-Laviolette, 2013).

The systematic production of long blades (>120 mm) is uncommon in UP blade assemblages (Hahn, 1977, 1988; Otte, 1981; Sobczyk, 1996; Otte et al., 2007; Wilczyński, 2007; Moreau, 2009; Noiret, 2009; Nigst, 2012), so they do not represent the usual blade type for UP hunter-gatherers. Manufacturing long blades requires high-level technical skills to manufacture the blade as a single unbroken piece (Bodu et al., 1990; Bodu, 1993; Karlin et al., 1993). Long blade technology is thought to be related to highly mobile Western European groups, such as those found during the Magdalenian when lithic tools were commonly transported from one site to another across a broad ecological niche (Angevin and Langlais, 2009). There, long blade production may have played a chief role in the organization of mobile technology (Debout et al., 2012).

Compared to regular size blade production, long blade technology requires increased percussive force (Crabtree, 1972; Dibble and Whittaker, 1981; Tixier, 1982). This is achieved either by increased percussor velocity (Dibble and Pelcin, 1995), or by greater percussor weight (Crabtree, 1972; Dibble and Whittaker, 1981; Tixier, 1982; Whittaker, 1994). Controlled experiments (Dibble and Whittaker, 1981) suggest that increased percussive force can simultaneously increase blade thickness. However, a striking feature of the Central European Late Gravettian long blade

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http://dx.doi.org/10.1016/j.quaint.2016.01.020
1040-6182/

technology was the ability to retain the thickness (<10 mm) of the regular blades (Felgenhauer, 1956–1959).

This paper presents the results of a knapping experiment that explores the maintenance of regular blade thickness for long blades using soft organic percussors. The results directly shed light on a technological efficiency that may have aided hunter-gatherers to cope with the logistical challenges of their high degree of mobility.

2. Materials and methods

Experiments on lithic tool production follow two different methodologies. One, *authentic experiments*, use genuine materials and the skills of modern knappers (Crabtree, 1972; Pelegrin, 1991; Whittaker, 1994; Eren et al., 2008, 2014; Eren and Lycett, 2012; Tixier, 2012; Lycett and Eren, 2013; Driscoll and García-Rojas, 2014). Others, *controlled experiments,* substitute humans for apparatus and chert for modern siliceous materials isolating individual dependent variables while attempting to keep other controlled variables constant (Speth, 1972; Dibble and Whittaker, 1981; Dibble and Pelcin, 1995; Dibble, 1997; Pelcin, 1997a, 1997b, 1997c; Magnani et al., 2014).

Here, an authentic experiment was conducted to reproduce UP blade technology, with the aim to accommodate a fuller range of variables that influence knapping that cannot be replicated with machines such as strike accuracy, lithic inhomogeneity, and knapper error (Whittaker, 1994; Inizan et al., 1999; Pelegrin, 2000, 2011). According to the technical skills in the UP (Karlin et al., 1993) the experimenter (G. L.) was a medium level knapper that able to produce 10–20 cm long blades.

Because inhomogeneity in siliceous rocks can negatively affect knapping success (Crabtree, 1972; Roche and Tixier, 1982; Andrefsky, 1994; Tixier, 2012; Lengyel, 2013), fine-grained isotropic chert was chosen as the raw material in this experiment. Chert nodules were taken from the Lithic Raw Material Reference Database of Eötvös Loránd University of Budapest in Hungary (Mester et al., 2012), which had been collected at the outcrops of Kremenec, Ternopil, Western Ukraine (Mester and Faragó, 2013).

In the WII9 archaeological long blade collection, most specimens were no longer than 150 mm except for two specimens of 174 mm and 180 mm in length (Felgenhauer, 1956–1959). Thus this experiment aimed to produce a comparable sample of 60–150 mm blades to study changes in blade thickness formation through the transition from regular to long blade, while manipulating percussive force by increasing the weight of percussor and the percussor velocity. Two sets of blades were produced from fourteen cores with two percussors of different weights.

Antlers were used as percussors (Fig. 1) as they are widely thought to have been used in UP blade technology (Pelegrin, 2011). The appropriate weight for the percussors was estimated from previous authentic experiments (Tixier, 1982; Eren et al., 2008) as well as from our own experiences. Both suggested that a percussor best able to produce a blade of the length studied here is between 500–900 g. Thus, the light percussor (LP) was a 570 g North American moose antler. To obtain blades >120 mm with the LP, percussive force needed to be increased. This was achieved by increasing percussor velocity, which we were unable to measure as in controlled experiments (Dibble and Pelcin, 1995), and the increment was based on the experimenter's estimation. The heavy percussor (HP), 802 g, was an Eastern European red deer antler that was able to remove blades between 120 and 150 mm without increasing force by accelerating the percussor as it was necessary with LP. The percussors heads were prepared by removing the antler burrs and the percussor faces were rasped into a convex surfaces.

Fig. 1. Percussors used in this experiment: (a) light, moose antler; (b) heavy, red deer antler (scale is in cm).

Knapping was performed seated in a chair. Cores were held in the left hand with the flaking surface in the palm and the left elbow resting on the left thigh. The percussor was held in the right hand and the elbow was supported with the right thigh (Fig. 2). Supporting the elbows with the thigh enabled a constant trajectory to precisely hit the edge of the core's striking platform. This setting provided a comfortable position that frequently resulted in successful blade production.

Fig. 2. The position of knapping holding the heavy percussor.