Experimental Archaeology on the Afon Ystwyth, Wales, UK

R.T. Hosfield & J.C. Chambers

Introduction



Figure 1. *The Llanafan (Grogwynian Reach) site, Afon Ystwyth, mid-Wales, UK (October 2002)*

Results are presented for an experimental archaeology project exploring the hydraulic transportation of stone tools, conducted on the Afon Ystwyth in mid-Wales between 2000 and 2003 (Figure 1). These experiments are linked to the interpretation of British Palaeolithic sites in secondary contexts, where artefacts have been recovered from river terrace sand and gravel deposits. These types of sites form a key, but previously under-studied, component of the archaeological record (http://www.arch.soton.ac.uk/Research/Aggregates/arch-intro.htm [URL no longer available, checked 2018]; Chambers in prep). The fieldwork was undertaken by Dr Robert Hosfield and Ms Jenni Chambers (School of Humanities (Archaeology), University of Southampton) and the project is registered with the Welsh National Monuments Record.



Figure 2. *Emplacement of a pre-knapped flake scatter (colour-coded and numbered)*

Replica flakes and handaxes (tracers) were emplaced at two experimental sites on the Afon Ystwyth: Llanilar (NGR SN 628754) and Grogwynian Reach, Llanafan (NGR SN 709719). The handaxes were individually numbered, while a digital image archive documented cortex distributions and granular variations and inclusions in the flint and chert raw materials. The flakes were colour-coded by scatter and were individually numbered (Figure 2), to reduce the possibility of their being misidentified as genuine archaeological material.

https://doi.org/10.15184/S2978855200905237 Published online by Cambridge University Press

The Afon Ystwyth gravel-bed river sites were highly suitable for this experimental archaeology project:

- The absence of indigenous Palaeolithic material (there are no records of Palaeolithic artefacts having been recovered from the Afon Ystwyth valley, although Mesolithic and later prehistoric lithics have been recovered from the region).
- The river bed-load is dominated by Palaeozoic shales and gritstones, which aided the recovery of tracers produced in exotic raw materials (flint and chert), and further reduced the danger of their misidentification as ancient archaeological artefacts.
- The dynamic nature of the Afon Ystwyth channel at Llanafan (Figure 1), evident in barform development and the active transport of bedload materials (Harding *et al.* 1987: 116).

Tracer Experiments

Handaxe and flake tracers were emplaced throughout the three year period of the experimental programme (September 2000-July 2003), with bi-monthly monitoring of the experimental sites (excluding the period between January 2001 - December 2001 when the Foot and Mouth outbreak prevented access to the sites). The handaxe tracers were measured, weighed and photographed prior to emplacement, and their flake scar ridge (arête) widths were recorded, following the methodology of Chambers (Hosfield *et al.* 2000; Chambers in prep). The flake tracer sets were both knapped *in situ* on the floodplain and pre-knapped and then emplaced onto the sites. In both cases flake length, width, orientation and dip were recorded. In the latter case, flake thickness and weight were also recorded. All emplaced artefacts were 3-dimensionally surveyed and photographed (Figure 2).

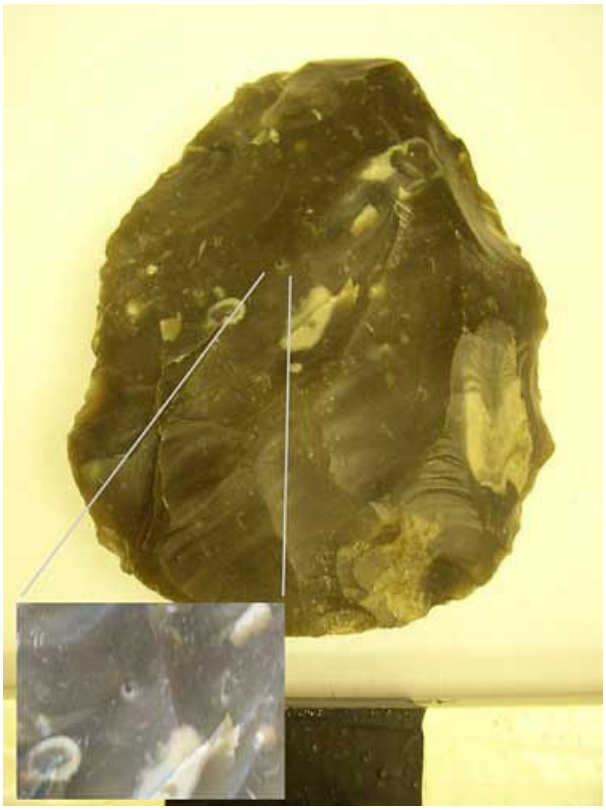


Figure 3. *Incipient percussion cone on a transported handaxe (the cone is in the centre of the inset)*

Handaxe tracer experiments were undertaken at both experimental sites. 49 handaxes were emplaced at the Llanilar site, of which 10 (20.4%) have currently been recovered. This recovery rate compares poorly with the 45% achieved by Harding *et al.* (1987), and may partly be due to the fieldwork interruption caused by the Foot and Mouth outbreak in 2001. 34 handaxes were emplaced at the Llanafan site, of which 10 (29.4%)

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have been recovered, with four showing evidence of fluvial transport. Handaxe transport distances ranged between less than 1m and up to 330m for the recovered artefacts. The experiments clearly demonstrated the highly stochastic nature of core-tool transport within fluvial environments. At the Llanilar site for example, two handaxes were emplaced 2m apart across the channel bed. The first handaxe (#6; Figure 3) was transported 137.70m downstream (straight-line distance) and was recovered from the channel bed surface, while the second (#7) travelled just 0.40m downstream (straight-line distance), and was buried by other clasts. In general, the handaxe experiments revealed a series of observations:

- There was no apparent relationship between handaxe size (using weight as an index of size) and transport distances, supporting previous non-archaeological tracer research (Einstein 1942; Church & Hassan 1992).
- The tendency of handaxes towards transportation or burial was dependent not only upon flow velocity, but was also influenced by the local channel bed morphology and related processes such as bed armoring (e.g. Malmaeus & Hassan 2002; Hunziker & Jaeggi 2002).
- Shackley (1974) emphasised flake scar ridge (arête) abrasion as a product of fluvial transport. In the current experiments however, abrasion of the arête ridges rarely exceeded 100μm (0.1mm) over transportation distances of up to 300m. By contrast, incipient percussion cones were present on most artefacts, irrespective of transportation distances (Chambers in prep; Figure 3).
- Handaxe abrasion development and related damage (e.g. edge micro-flaking) developed during phases of partial burial, as well as during periods of active fluvial transport.

Flake tracer experiments were only undertaken at the Llanafan site. 13 scatters were emplaced (four were knapped *in situ* and nine were pre-knapped). Flakes were recovered from 11 scatters, with only two scatters providing no data return. Recovered flake transport distances ranged between less than 1m and up to 85m. As with the handaxe experiments, the highly stochastic nature of flake-tool transport was demonstrated, and overall a series of observations were noted:

- There was no clear relationship between flake size (using either weight or dimensions as an index of size) and transport distances. The trapping of flakes of all sizes between channel bed clasts was common (Figure 4).
- Flakes survived transportation over distances of *at least* 80m, with only minor breakages occurring (although this clearly only applies to the recovered flakes).
- The flake scatters demonstrated initial structural integrity, with flakes being transported short distances (generally less than 10m) in the early phases of fluvial dispersal. However, these flakes were subsequently transported significant distances during later dispersal phases (to a demonstrated minimum of 80m).
- Edge micro-flaking occasionally produced relatively large flake scars (e.g. > 15mm in at least one dimension - Figure 5).
- Sustained episodes of edge micro-flaking produced scar patterns that were reminiscent of intentional retouch (Figure 6).

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Figure 4. *Flake trapped between bedload clasts*



Figure 5. *Micro-flaking on a transported flake*



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Figure 6. *Sustained edge micro-flaking on a transported flake*

Overall, this fieldwork has identified a range of patterns in stone tool transportation, modification and deposition, providing important insights for the current and future interpretation of extant archaeological assemblages:

1. In the case of handaxes transported over short distances, the presence of incipient percussion cones was a potentially more valuable diagnostic indicator than arête abrasion (Chambers in prep). However, it is stressed that these cones are often obscured by patination on archaeological specimens.
2. Fluvially-generated edge flaking during transportation can produce micro-flakes that would normally be interpreted as evidence for *in situ* knapping activity. Their presence in fluvial sand and gravel deposits should therefore be cautiously interpreted.

Finally, a second phase of this experimental archaeological programme is currently in preparation, and seeks to employ 'smart' tracers (utilising magnetic and radio transmitter technology) to explore new questions and provide high-resolution modelling of tracer transport.

Acknowledgements

This research has been funded by the University of Southampton (School of Humanities (Archaeology)), English Heritage (Aggregates Levy Sustainability Fund), and the Arts and Humanities Research Board (the funding body for J.C. Chambers' doctoral research), all of whose support is gratefully acknowledged. Special thanks to Professor Mark Macklin and Dr Paul Brewer (Institute of Geography and Earth Sciences, University of Wales, Aberystwyth).

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https://doi.org/10.15184/S2978855200905237 Published online by Cambridge University Press