## 5. LITHIC MICROWEAR ANALYSIS (WRITTEN 2009)

*Randolph E Donahue and Adrian A Evans*

### 5.1 Introduction

The objectives of the proposed lithic microwear study were:

- To identify lithic artefact use and its relationship to tool types
- To identify the diversity of activities (as identified by microwear analysis on the tools) and their spatial locations across the site
- To examine the implications of activities at the site regarding the duration and season of occupation and hunter-gatherer mobility strategies
- To improve understanding of site formation processes including post-depositional disturbance and modification.

### 5.2 Method

A sample of 291 lithic artefacts, including 192 retouched tools and cores of various types, 82 unmodified blades and bladelets, and 14 unmodified flakes, was taken for wear analysis (Appendix 1). Although not a simple random sample, the only selection criterion was that the tools should appear to be in reasonable condition to retain evidence of wear. Other than that, all retouched tools unboxed for consideration had an equal chance of being selected. In addition to the tool forms, a small sample of unmodified blades and flakes were selected for analysis. All artefacts were gently washed in water with a soft nylon brush to remove adhering sediment, and then photographed. This was followed by bathing the artefacts in 10% HCl for 10 minutes, rinsing them in water, then bathing them in water for a further 10 minutes. They were then patted dry with a clean, lint-free towel. Ethanol and acetone were used where necessary to remove finger grease from artefacts during microscopic examination.

All artefacts were viewed principally at 200× magnification with an Olympus KL-BH2-UMA metallurgical microscope with incident-light and long working-distance objectives. Microscopic characteristics of edge fracture scars, striations, pitting and surface polishing were recorded and analysed to interpret tool use, resharpening, recycling and hafting (following Donahue 1994: 2002; Burroni et al 2002). In addition to use-wear features found on the edges of the tools, microscopic characteristics of ridge rounding, plastic deformation, thermal alteration (micro-cracking, potlidding and crazing) edge fracture scars, striations, pitting and surface polishing that resulted from post-depositional modification were recorded. The roundedness of ridges, caused by post-depositional movement of artefacts or sediments, and by chemical dissolution, was measured following Burroni et al (2002) and Donahue (2002). These data provided the means to evaluate further use-wear

**Table 13** Microwear analysis: association between artefact use and artefact type

| | Artefact use (material) | | | | |
|---|---|---|---|---|---|
| Artefact type | Impact | Meat | Hide | Bone/antler | Total |
| Burin | 0 | 0 | 0 | 2 | 2 |
| End scraper | 0 | 0 | 28 | 1 | 29 |
| Truncation | 0 | 0 | 1 | 0 | 1 |
| Piercer | 0 | 0 | 1 | 0 | 1 |
| Microlith | 32 | 1 | 1 | 0 | 34 |
| Backed tool | 0 | 1 | 0 | 0 | 1 |
| Unmodified blade | 0 | 4 | 1 | 0 | 5 |
| Total | 32 | 6 | 32 | 3 | 73 |
| | 43.8% | 8.2% | 43.8% | 4.1% | 100.0% |

interpretations and to improve understanding of the variability of post-depositional modifications within and between contexts.

### 5.3 Results

Of the 291 lithic artefacts studied, 73 showed evidence of how they were used. The remaining artefacts were too badly affected by post-depositional processes to permit interpretation with an adequately high degree of confidence. Of tool uses, 32 of the artefacts showed evidence for hide working, 32 were used as points or barbs on projectiles. Six artefacts were identified as having been used for cutting meat or meat and some hide, and three artefacts were used to work the hard organic materials of either bone or antler (Table 13). The low frequency of meat cutting is viewed as a direct result of the impact of post-depositional processes; wear features resulting from meat cutting are very superficial and tend to be the first kind of wear to be eliminated or modified beyond identification from such processes. Wear produced by the cutting of silica-rich herbaceous plant fibre survives such processes very well, so the lack of artefacts with such wear is indicative that silica-rich plant fibre was not being worked, at least not with the flaked stone tools. That there is no evidence for wood working is surprising, as there are almost always a few such tools at British Mesolithic sites. It is suggested that this results from sampling error, which is further supported by the lack of notches and denticulates in the sample. The frequency of bone/antler working tools is about what would be expected.

### 5.4 Discussion

#### 5.4.1 Tool type and tool use

Microwear analysis often leads to the identification of associations between tool types and tool uses in site assemblages (eg Donahue 1988). At East Barns such associations also exist. The fronts of end scrapers were consistently used for scraping hide (Table 14), with 28 of 29 indicating use on hide. The one exception noted was interpreted as having been used for scraping bone. This predominance of scraping hide with the fronts of end scrapers is typical of Stone Age sites dating from the Upper Palaeolithic to the Neolithic (Donahue 1988; 2002).

Another tool form found in other studies to be associated with a particular use is the microlith. Of the 34 microliths and microlith fragments with identifiable use, 32 microliths appear to have been used as armatures (points and barbs) on projectile weapons, like arrows, or on equipment like leisters (a pronged fishing spear). They tend to display evidence of impact damage at their tip (eg invasive scars, burinations, long striations parallel to the microlith axis and initiated near the tip) and, importantly, virtually no other evidence of use. Thus, while a microlith used as a knife might show some tip damage, it will have a variety of other wear features. Of the remaining two microliths with use-wear traces, one was used for the cutting of meat, and one was used for the piercing (drilling motion) of hide, similar to that of the piercer that also appears to have been used for drilling holes in hide.

**Table 14** Microwear analysis: association between artefact use and spatial context

| | | Use | | | | |
|---|---|---|---|---|---|---|
| | | Impact | Meat | Hide | Bone/antler | Total |
| Context | 2549 | 7 | 5 | 9 | 3 | 24 |
| | 2553 | 2 | 0 | 0 | 0 | 2 |
| | 2561 | 6 | 1 | 7 | 0 | 14 |
| | 2564 | 9 | 0 | 11 | 0 | 20 |
| | 2573 | 8 | 0 | 5 | 0 | 13 |
| Total | | 32 | 6 | 32 | 3 | 73 |

**Table 15** Microwear analysis: tool use percentile distributions for a sample of Mesolithic sites in Britain (Lismore Fields is a mixed Mesolithic and Neolithic site and North Park Farm may have some Neolithic artefacts in its assemblage)

| | Sites | | | |
|---|---|---|---|---|
| Use | East Barns | North Park Farm | B&Q | Lismore Fields |
| Meat/butchering | 8.2% | 19.1% | 0.0% | 41.4% |
| Hide working | 43.8% | 38.3% | 53.3% | 28.6% |
| Herbaceous plant | 0.0% | 4.3% | 3.3% | 17.1% |
| Soft material | 0.0% | 0.0% | 10.0% | 0.0% |
| Wood working | 0.0% | 2.1% | 0.0% | 0.0% |
| Bone/antler | 4.1% | 2.1% | 3.3% | 10.0% |
| Hard material | 0.0% | 0.0% | 6.7% | 0.0% |
| Impact (projectile) | 43.8% | 34.0% | 23.3% | 2.8% |
| Per cent total | 99.9% | 99.9% | 99.9% | 99.9% |
| Total count | 73 | 47 | 30 | 70 |

### 5.4.2 Diversity and location of activities

The 73 artefacts with identifiable use-wear come from five contexts. There is substantial consistency in artefact use across these contexts, except for the prevalence of meat cutting evident in C2549 (Table 14). This may reflect more on the amount of post-depositional modification than tool use in the different contexts, since wear from meat is the most susceptible to post-depositional modification. However, since bone and antler working is only found in C2549, it does suggest that this context is somewhat unique with regard to activities. Armatures seem to be discarded or replaced in all contexts, and hide scraping also seems well distributed, being found in four contexts. Hide piercing as opposed to hide scraping occurs in C2561 and C2564 (one tool in each context).

### 5.4.3 Post-depositional modification

The degree of post-depositional modification was studied as part of the preliminary analysis of this assemblage and was undertaken on only a small sample of material from various contexts. This preliminary report can be found in the site archive.

### 5.4.4 Comparison with similar sites

Microwear analysis has been applied to numerous Mesolithic assemblages in Britain, but rarely have large samples been studied with equivalent techniques which would permit statistical comparison. Furthermore, such ancient sites undergo quite different kinds of amounts of post-depositional modification, which will affect the distributional frequencies of tool uses. As a result, a side-by-side comparison is not really meaningful. One British Mesolithic site that has undergone lithic microwear analysis is the B&Q site excavated by MoLAS (Donahue 2002). The size of the Mesolithic locality 'B' displayed evidence of more activities than what is observed at East Barns (Table 15). Lismore Fields, located in the Peak District National Park near Buxton and better known for its Neolithic component, provides a large Mesolithic sample, but one that includes the Neolithic component as well (Donahue nd). The high percentage of plant cutting at Lismore Fields reflects this Neolithic contribution to the assemblage and impacts on the percentage of tools used as armatures for projectiles. Another Mesolithic site, of substantial size and quantity of material is North Park Farm in Surrey. Extensive excavations by the Surrey Archaeological Unit revealed large areas of artefact clusters. A large

sample of artefacts was analysed for wear, but only 47 (less than 10%) had identifiable use-wear. This site also had a diverse set of activities represented (Donahue & Evans 2013).

### 5.4.5 Conclusion

The site of East Barns has undergone some post-depositional modification, even though this may principally be the result of trampling during its occupation. This modification, however, may have seriously affected the frequency distributions of activities indicated at the site, so generalisations dependent on relative tool frequencies need to be considered cautiously. The microwear analysis of the East Barns assemblage indicates that a relatively small range of activities was performed at the site. These include hide working, butchering, tool/ornament manufacturing, and the maintenance of weapons. It would seem that this site was repeatedly visited but may have had a fairly specialised role in the subsistence-settlement system or that it was occupied during a season when only a few activities were performed, and which required use of flaked stone tools. Male- and female-associated activities are well represented, so there is good reason to assume that one or more family units are represented at the site.