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Kettlebury 103: a Mesolithic 'Horsham' type stone assemblage from Hankley Common, Elstead

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'Horsham' type assemblages are among the most enigmatic of Mesolithic stone assemblages found in the United Kingdom. Beyond the fact that they appear to be concentrated in south-east England, almost nothing is known about them. Partly, this is because so few of the known assemblages have been fully published, and where they have, they invariably lack supplementary data in the form of absolute dates or spatial patterning. This paper goes some way to correcting this lacuna. It comprises a detailed report on the stone assemblage from the 'Horsham' site of Kettlebury 103, on Hankley Common, together with new radiocarbon dates and a limited spatial analysis for the site.

Introduction

The Surrey heathland commons have proved a rich vein for researchers into the British Mesolithic for over 60 years. This is partly because of their reserved status, which means there has been no heavy construction in these areas and hence the subsurface has not been disturbed or built upon, and partly a result of the sandy subsoil itself which, upon exposure, erodes readily allowing easy observation and excavation of stone scatters. The drawback to this situation is that since virtually no features or organic material are preserved in sandy soils, it has proved particularly difficult to date these sites radiometrically and ascertain any intra-site spatial patterning. This has severely hindered our understanding of these sites and how they may have functioned in antiquity.

The excavation at Kettlebury 103 in 1977/8 is distinctive in that the standard of work was extremely high for the time. This has allowed tiny organic fragments suitable for accelerator mass spectrometry (AMS) dating to be recovered and has provided detailed on-site artefact distributions to be compiled, making it possible, for the first time, to examine detailed spatial patterning across a heathland site. The stone assemblage has never been published, although it has been referred to in a number of review papers (Jacobi 1981; Ellaby 1987; Reynier 1997a). Therefore, the present paper seeks to collate as much information on Kettlebury 103 as possible. Beginning with background, locational and raw material data, it includes a full typological and technological inventory of the stone assemblage and concludes with discussion of the affinities, chronology and intra-site spatial patterning. The stone assemblage and paper archive are held in the British Museum (acc no: P1988.5–2:1–527).

To clarify some minor stratigraphic details and obtain organic remains suitable for radiometric dating, a keyhole excavation was carried out by the author in 1995 with funding from the British Museum. A small amount of lithic material was also recovered during this excavation and has been published elsewhere (Reynier 1997b). The excavation was successful in locating the original trenches at site 103 and it has been possible to tie the 1995 material directly into the 1977/8 excavation grid. However, the 1995 lithics have not been included in this analysis on precautionary grounds: differences in excavation methodology, personnel and a twenty-year gap between the collections all militate against lumping the two sets of material together. There is however no doubt that the two collections do come from the same scatter, and on this understanding the stratigraphic data from the 1995 excavation has been used to corroborate original observations made in

1977/8, and the organic remains recovered in 1995 have been used to augment the dating of the whole site. All other data presented here relate solely to the original 1977/8 excavations.

HISTORY OF RESEARCH ON HANKLEY COMMON

The earliest reported research into Mesolithic activity on Hankley Common dates from the late 1930s. Fortunately, the area seems first to have come under the attention of W F Rankine, whose meticulous researches into the Surrey Mesolithic spanned some 30 years and are still among the most valuable field data recorded. During 1936 he conducted two controlled excavations – among the first of their kind – at Kettlebury sites I and II (fig 1, no 2). In the same year L S V Venables located further scatters *c* 1.6km to the north-east at Lion's Mouth (fig 1, no 3). These latter sites were excavated in part by Venables (Lion's Mouth I) and later, in more detail, by Rankine himself (Lion's Mouth I and II). The Second World War curtailed further work in the area until 1948 when Rankine excavated two more scatters *c* 3km east of Hankley Common at Frensham Great Pond (fig 1, nos 4 and 5). All six excavations were published by Rankine in 1949.

Thereafter, there is little recorded research at Hankley until the mid-1970s when fieldwalking by H E Martingell and R E Ames led to the discovery of the first of at least eight surface flint scatters, numbered as sites 103 to 110 (fig 2). The largest of these scatters, site 103, was excavated under the direction of R M Jacobi in 1977/8 and forms the basis of this report.

LOCATION (figs 1–2)

Hankley Common is an undulating plateau dotted with low hillocks (fig 2). Site 103 is located in a shallow basin at a height of *c* 95m OD (SU 878 396). The plateau extends briefly to the north of the site before dropping into the valley of the river Wey, *c* 4km distant (fig 1), beyond which lies the chalk escarpment of the Hog's Back. However, within 1km to the south and west the land starts to rise sharply to the high points of the Devil's Punch Bowl (*c* 250m OD) and the Devil's Jumps (*c* 126m OD). A small spring-fed stream flows within 0.5km to the south of the site. To the east the plateau stretches some 10km before rising gently as it meets the Weald Clay. Apart from the local scatters mentioned above, the well-known Mesolithic sites at Farnham (Rankine & Clark 1939) and Oakhanger (Rankine & Dimbleby 1960) lie west of site 103, at *c* 9km and 11km respectively, while a series of sites at Longmoor (Reynier in prep) and, to the east, the surface collection from St Catherine's Hill (Gabel 1976) are both within 15km.

STRATIGRAPHY (fig 3)

The solid geology in the area of site 103 is sandstone of the Lower Greensand series (Folkestone Beds). Thus, the surface geology is dominated by loose sands. Field notes from the original excavations indicate that the artefacts originated in the top part of an iron-humus podzol, and in 1995 a sample excavation (Reynier 1997b), tied in to the 1977/8 grid, confirmed this observation (fig 3a), recording the following measurements: layer 1, humus (0–*c* 0.03m); layer 2, dark grey sand and humus (*c* 0.04–0.1m); layer 3, light grey sand (*c* 0.11–0.2m); layer 4, white sand (*c* 0.21–0.35m); layer 5, iron pan (>0.35m).

In the 1995 sample excavation, *c* 90% of struck flint was concentrated in the top 0.25m of the deposit, mainly in the grey sand (layers 2 and 3) and in the top few centimetres of white sand (layer 4). At the latter level there occurred a band of small to medium sized sandstones. In the west of the site the iron pan rose in level, reducing the white sand to only 20–30mm and, in one part, separating it into two thin bands (fig 3b). Few flints were

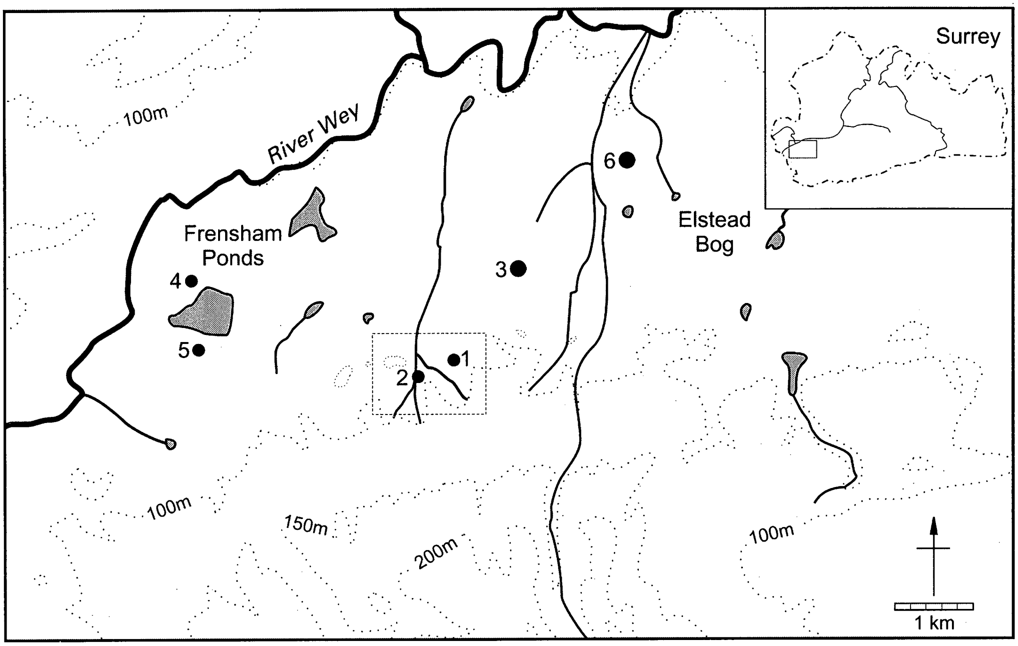

Fig 1 Location of Kettlebury 103 in relation to key Mesolithic sites in the area that are referred to in the text.

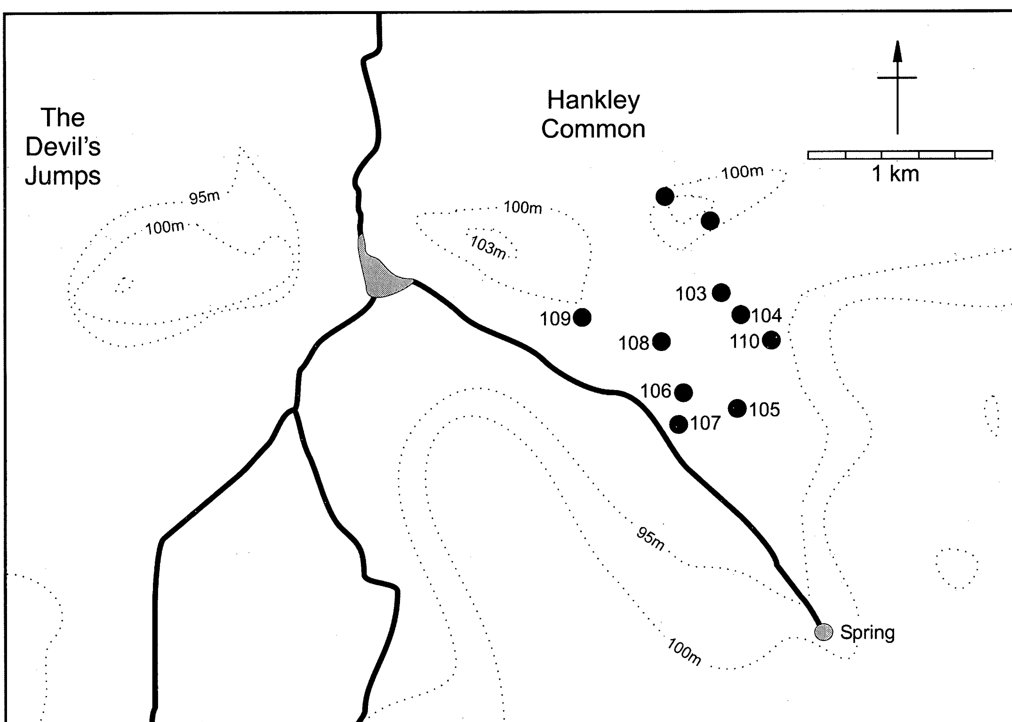

Fig 2 Kettlebury 103: location of stone scatters identified by H Martingell and R M Jacobi on Hankley Common, showing generalized modern topography and hydrology. The two scatters to the north of site 103 are unnamed, but may be W F Rankine's sites I and II (1949, 31).

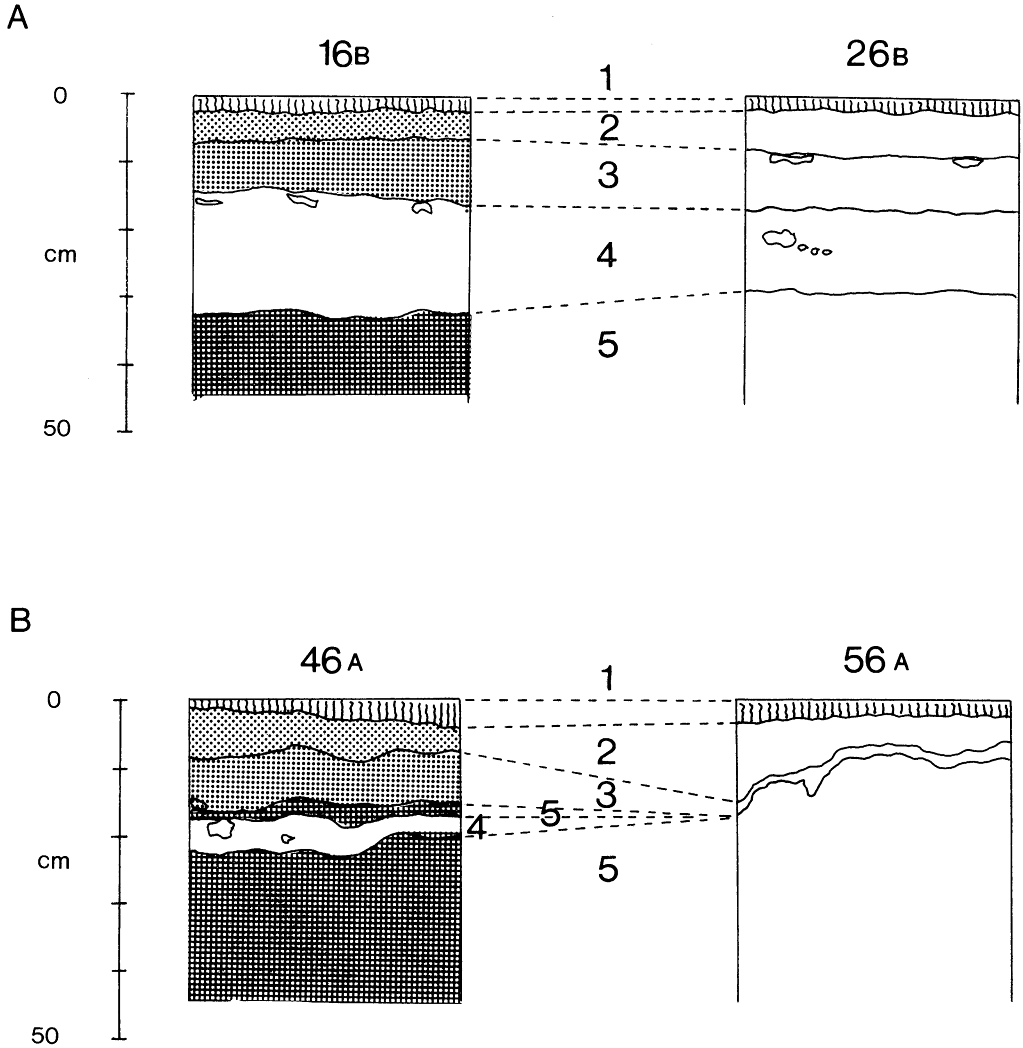

Fig 3 Sections of deposits at Kettlebury 103 (1995). 1: humus; 2: dark grey sand and humus; 3: light grey sand; 4: white sand; 5: iron pan. The line of the section is marked by the letters a and b on figure 4.

found below the stone band or the iron pan(s) and these lithographic features are not believed to be of chronological significance.

THE 1977/8 EXCAVATION (fig 4)

The site was originally excavated in 53 boxes, each of one square yard – a total area of *c* 44m^2. Each yard box was also sub-divided into nine units of one square foot, the finds being recorded and stored with reference to these foot units as well as to the yard boxes. Consequently, any artefact can be placed to within *c* 0.3m of its actual position. Excavation

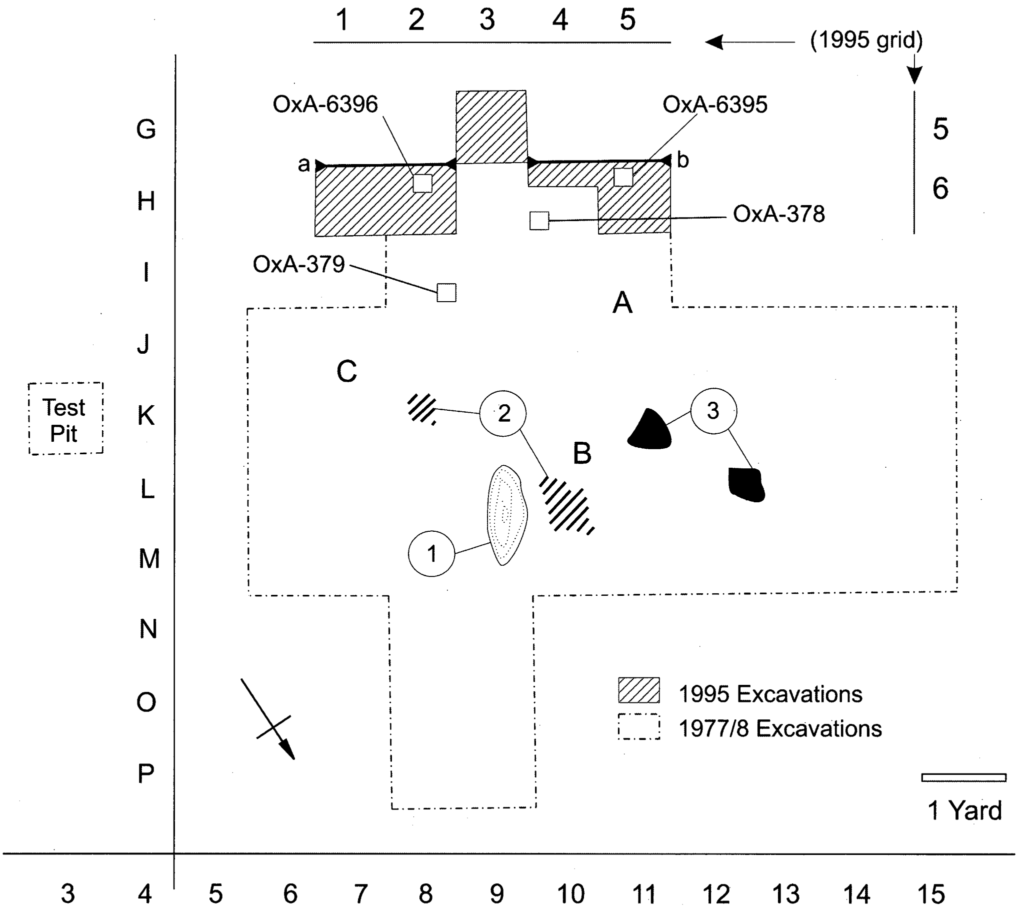

Fig 4 Plan of Kettlebury 103 (1977/8). The plan shows the chief features recorded during the 1977/8 excavations, as reconstructed from the site archive. Also shown are the relative positions of samples taken for radiometric assay during both the 1977/8 (OxA-378, OxA-379) and the 1995 (OxA-6395, OxA-6396) excavations. The line of the section (fig 3) is marked by the letters a and b.

in each square proceeded down to, but not significantly into, the iron pan, with all material being passed through a 5mm sieve. The site was not fully excavated and the material discussed here represents a non-random sample of approximately 50% of the estimated total assemblage.

Few features were observed. These included two areas of burnt stone and charcoal (fig 4, no 2), an oblong depression *c* 1.27m long, 0.53m wide and *c* 0.08m deep (fig 4, no 1) and at least two large (*c* 0.5m) sandstone blocks (fig 4, no 3). While the burnt areas may represent former hearths, the shallow depression could be a natural tree-throw hole and need not, necessarily, be man made. Similarly, the sandstone blocks (no 3) most likely originated from the stony band. This band is a feature of the Folkestone Beds which typically have veins of ferruginous sandstone or 'carstone' within them (Gallois 1965). So whether these blocks were utilized as anvils or other site furniture, or are just natural features again cannot be determined.

RAW MATERIAL (table 1)

The 1977/8 excavations recovered a total of 5317 pieces of struck stone. Virtually all this material is flint. A sample, including all recognized artefact-types, as well as complete blades and flakes (708 in total), shows that *c* 98% are of flint, while *c* 2% are of flinty-chert. In colour/staining the flint is predominantly grey (*c* 73%) with a smaller proportion of brown flint (*c* 24%), the remainder being orange; the flinty-chert is almost white in colour.

Examination of the cortex on primary flakes and blades shows it to be relatively thick (>2mm) and chalky, the surface being generally smooth but moderately contoured; a small proportion of cortex is thin and pebble-like. These characteristics point to the main source of raw material being from a secondary surface deposit, with a smaller proportion of flint presumably coming from river gravels. A possible source for the latter is the river Wey, *c* 4km north of the site. Most of the flint, however, seems to have originated from a local Head deposit, the precise location of which is not currently known.

TABLE 1 Breakdown of raw material type and colour/staining from Kettlebury 103, Surrey (Jacobi Collection)

Raw material	Total	%
Flint	691	97.59
Flint/chert	17	2.40
Unclassified	(4609)	–
Total	5317	99.99
Colour/staining	**Total**	**%**
White	20	3.06
Light grey	315	48.31
Light brown	151	23.15
Orange	2	0.30
Dark grey	158	24.23
Dark brown	6	0.92
Burnt	(55)	–
Unclassified	(4610)	–
Total	5317	99.97

The standard tool assemblage

The typological and technological details of the Kettlebury 103 stone assemblage are presented below. Inevitably, certain technical terms have been used for which a number of possible meanings exist in the literature. The definitions used here are as follows:

1 the microlith typology is based on Jacobi (1978);
2 blades are taken to be removals with a length:breadth ratio of greater than 2:1 (Wymer 1977);
3 fully cortical pieces are defined as primary removals, partially corticated pieces as secondary removals and fully decorticated pieces as tertiary removals (Saville 1981).

Complete definitions of these, and all other artefact-types and terms, can be found in Reynier (1998b). As usual, the use of functional terms, such as scraper and piercer, is in accordance with archaeological tradition and does not necessarily mean that these artefacts were used as such. The figures given in brackets are absolute frequencies and refer to the number of artefacts for which the given attribute can be classified beyond doubt; where no classification can be made, or the classification is doubtful or irrelevant the figures are not presented.

MICROLITHS (fig 5, nos 1–36)
23 complete; 76 broken

Obliquely truncated points (18); partially-backed points (2); isosceles triangles (24); rhomboid (1); obliquely-based point (1); hollow-based points (14); scalene micro-triangle (1); unclassified (38). The microliths have a tendency to be short and angular in outline. Most are lateralized to the left (91), while 21 have additional retouch applied to the leading edge. Four points exhibit damage consistent with impact against a hard object, such as bone or wood (Fischer *et al* 1984) and a further thirteen have damaged margins. Although a high proportion (*c* 77%) of microliths are broken, there is no constant pattern to breakage with proximal (29), medial (19) and distal (27) fragments evenly represented. The mean dimensions of complete, or nearly complete, microliths are: length = 21 ± 4mm (33), width = 8 ± 2mm (33) and thickness = 2 ± 1mm (33).

SCRAPERS (fig 6, nos 1–2)
6 complete; 10 broken

Short end-scrapers (8); nosed scrapers (5); unclassified (3). The scraper population displays considerable variation. Where recorded (7 in total) the scraper facets are convex (4) or irregular (2) in shape, there being one transverse example. All bar one are developed at the distal extremity of the support, the exception being an example where the working edge was placed more to the right lateral margin; one specimen had its scraper facet on the ventral surface. A single scraper has heavy additional retouch around the proximal extremity, while four others possess light damage along parts of the left and right lateral margins. Supports, where recorded (10 in total), are mainly secondary flakes (8), there being just one example on a tertiary flake and one on a crested piece. Breakage is restricted to distal fragments only (10). The mean dimensions of complete, or nearly complete, scrapers are: length = 30 ± 6mm (7), width = 25 ± 5mm (7) and thickness = 10 ± 3mm (7).

BURINS (fig 6, no 6)
3 complete; 2 broken

Corbiac burins (3); on truncation (1); on natural termination (1). Burins are not well represented in the assemblage and they are all poorly characterized. Most are made at the distal extremity of various supports. None has any additional retouch, although one example has a notch made in the right lateral margin. One burin has a worn distal extremity and three others exhibit light damage in the same area. The broken burins are both distal fragments. The sample size is insufficient to calculate reliable mean dimensions.

PIERCERS
3 complete; 2 broken

Unilateral (4); awl (1). Piercers, or 'pointed flakes', can be made naturally as well as deliberately and it is often difficult distinguish between the two. Where recorded (4 in total) these examples are all made at the distal extremity of secondary blades (2), flakes (1) and tertiary flakes (1). None has additional retouch, although a single specimen has heavy damage along the right lateral margin. The two broken pieces are a distal and a proximal fragment. The mean dimensions of complete, or nearly complete, piercers are: length = 28 ± 7mm (4), width = 17 ± 11mm (4) and thickness = 6 ± 4mm (4).

CORE TOOLS
1 broken

?Strike-a-light (1). This artefact is a thick, rectangular proximal fragment, with several removals made from the dorsal surface. The butt end exhibits crushing consistent with repeated impact, hence the tentative classification. The sample size is insufficient to calculate reliable mean dimensions.

CHAMFERED PIECES (fig 6, nos 4–5)
7 complete; 11 broken

Unifacial (16); bifacial (2). The function of these distinctive artefacts – a flake with a transverse removal made across one extremity (Bordes 1970) – is unknown. Of those recorded (17 in total), the majority (15) are developed at the distal extremity of the support; the two remaining cases being proximal examples. The supports themselves are mostly secondary (5) and tertiary (3) flakes (remainder unclassified). There is no additional retouch on any of the series, but almost all (12) have light damage along one lateral margin, most often the right (6). Breakage is biased towards distal fragments (7), there being just two proximal fragments and two lateral fragments. The mean dimensions of complete, or nearly complete, chamfered pieces are: length = 31 ± 4mm (9), width = 20 ± 7mm (8) and thickness = 7 ± 2mm (9).

TRUNCATED PIECES (fig 6, no 3)
5 complete; 2 broken

Single truncations (7). As with the class of piercers, truncated pieces can be made by natural processes (Newcomer 1976). The majority of the Kettlebury truncations are oblique (5), there being one

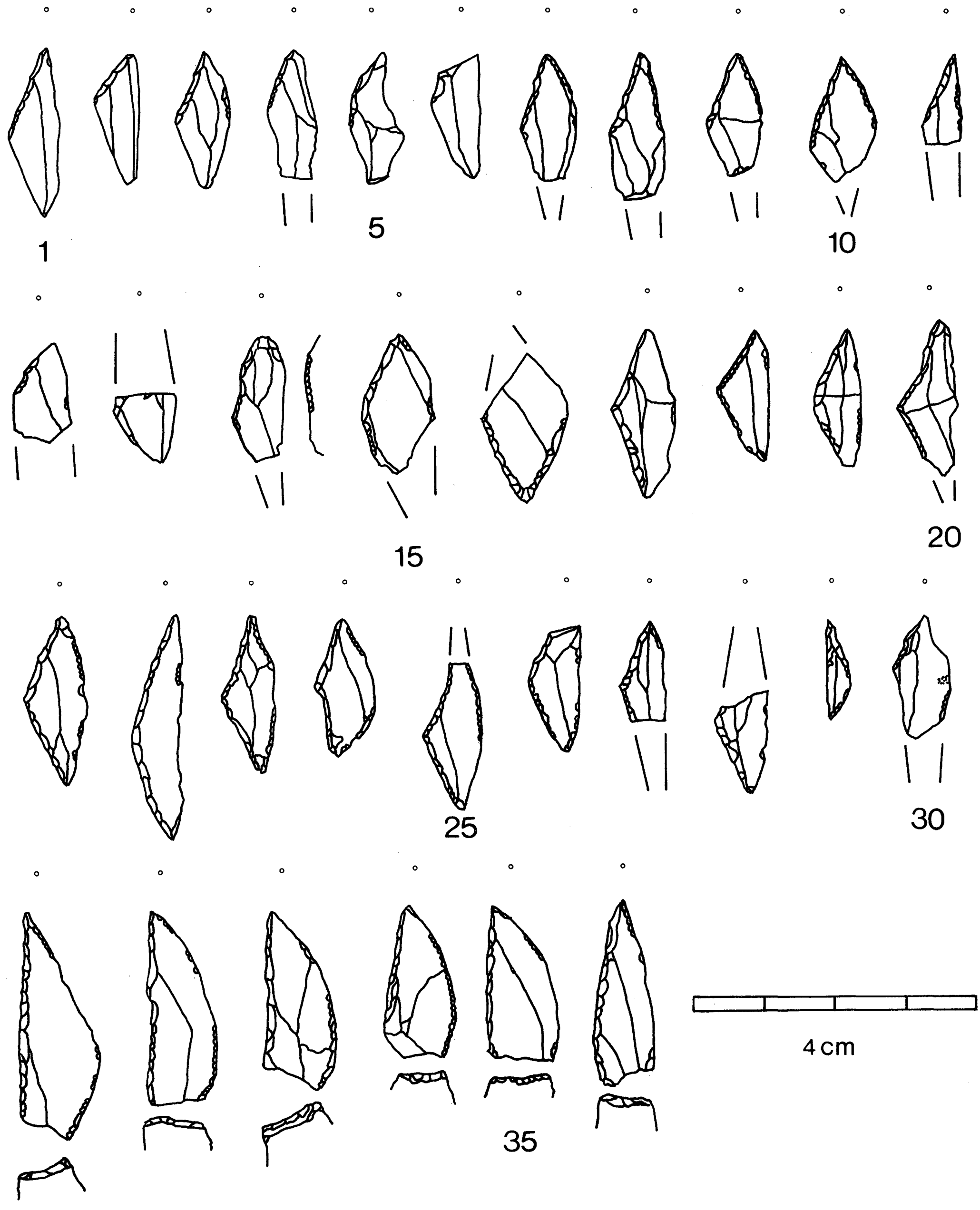

Fig 5 Microliths from Kettlebury 103 (1977/8): obliquely truncated (1–14); partially-backed (15); isosceles triangles (17–28); rhomboid (30); obliquely-based point (16); hollow-based points (31–16); scalene micro-triangle (29). The open circles indicate the assumed position of the detached bulb of percussion.

transverse and one concave example. These are mostly developed at the distal extremity (4) of the support, although one was placed at the proximal end and one other was indeterminate. The supports, where recorded (5), are tertiary (3) and secondary (1) blades; one example was made on a secondary flake. One specimen has heavy retouch applied to the left lateral margin, while three others have light damage on the right hand margin. The two broken truncated pieces are a distal fragment and one piece

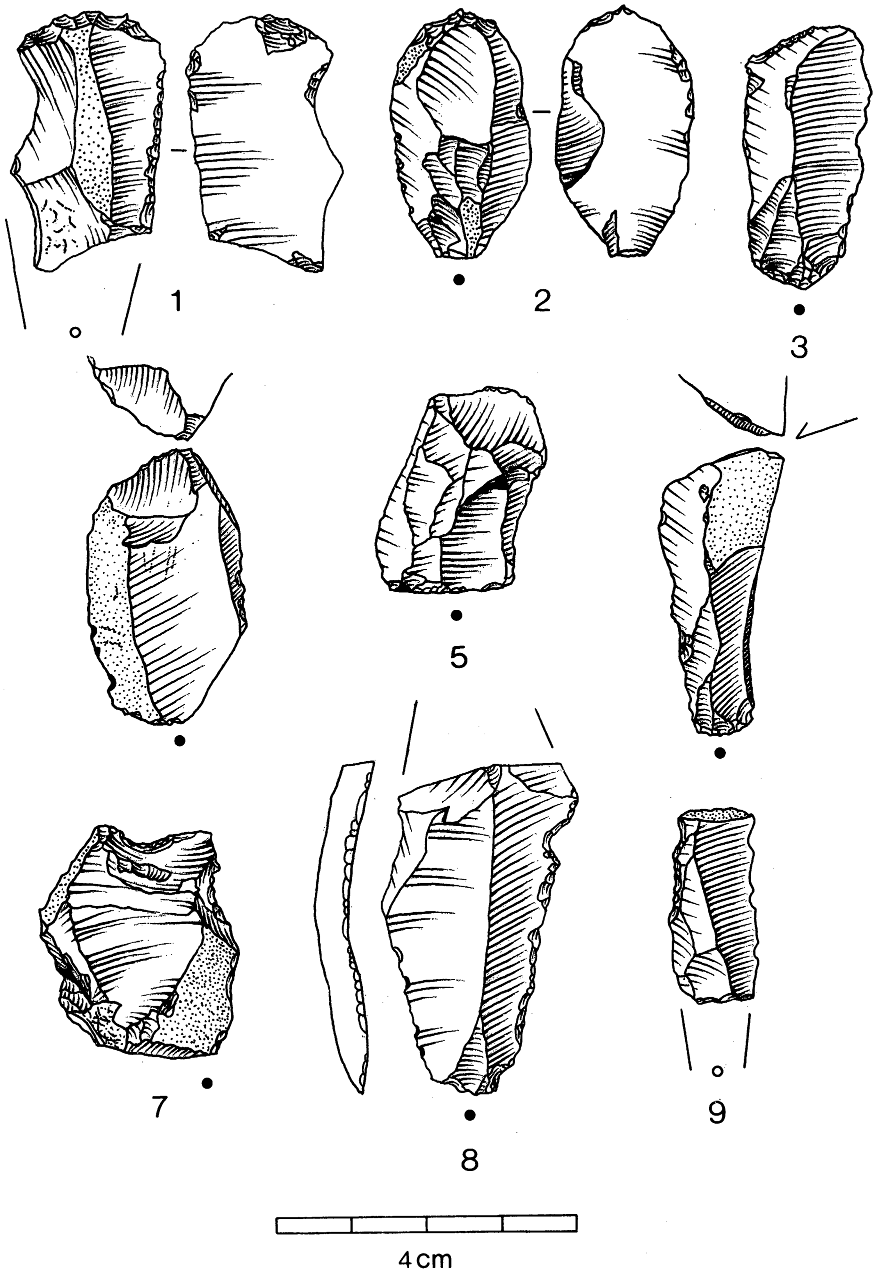

Fig 6 Standard tools from Kettlebury 103 (1977/8): short end scrapers (1–2); truncated blade (3); chamfered pieces (4–5); burin on natural termination (6); notched piece (7); retouched pieces (8–9). Filled circles indicate the position of the bulb of percussion where it is present; open circles indicate the assumed position where it is absent.

with part of the left lateral margin missing. The mean dimensions of complete, or nearly complete, truncated pieces are: length = 28 ± 8mm (6), width = 14 ± 3mm (6) and thickness = 4 ± 2mm (6).

The non-standard tool assemblage

The non-standard tool assemblage comprises those artefacts with irregular working edges or facets, the distinction between these artefacts and standard tools being that non-standard tools can also be made naturally or accidentally, whereas with the category of standard tools, the working edge is regular and more consistently maintained, generally indicating deliberate manufacture. Hence the non-standard tool assemblage may contain higher frequencies of pseudo artefacts and consequently less emphasis is placed upon them. It should be noted, however, that use-wear analysis can often resolve these problems.

RETOUCHED PIECES (fig 6, nos 8–9)
2 complete; 7 broken

Heavily retouched (6); lightly retouched (2); unclassified (1). This category includes those artefacts with miscellaneous or diverse retouch applied variously about the margins of the support, but in no consistent pattern. Retouch is most often applied to the left lateral margin (6) of the support, as opposed to the right hand margin, the distal extremity, or the proximal end (1 each). In three cases the retouch is inverse. Two specimens are heavily damaged along parts of their left and right lateral margins, respectively, and one other has light damage around the distal extremity. The only recorded support is a tertiary flake. The mean dimensions of complete, or nearly complete, retouched pieces are: length = 26 ± 6mm (2), width = 29 ± 13mm (2) and thickness = 5 ± 1mm (2).

EDGE-DAMAGED PIECES
14 complete; 19 broken

Heavily damaged (8); lightly damaged (21); worn (4). Although an attempt has been made to identify correctly genuine edge-damage it is recognized that this class of artefact can easily be made naturally or accidentally. Of those included here the damage occurs equally on the left and right lateral margins (11 each); one is damaged on both lateral margins, three at the distal extremity only and one at both proximal and distal ends. Of these, the damage is inverse on seven examples. One specimen has a single ventral notch in the right margin, and two more have additional heavy damage around the proximal base and on the right lateral margin. Where recorded (12 in total) the supports are mostly tertiary flakes and blades (4 each), there being three on secondary blades and one on a plunging piece. The mean dimensions of complete, or nearly complete, edge-damaged pieces are: length = 35 ± 6mm (14), width = 17 ± 5mm (14) and thickness = 5 ± 1mm (14).

NOTCHED PIECES (fig 6, no 7)
5 complete; 13 broken

Single notch (10); two notches (7); denticulate (1). Notches can also easily be made naturally or accidentally. In this series notches appear on the left (4), right (5) or both (2) lateral margins, as well as at the distal and proximal extremities (1 each) – the remainder being various combinations of the above. No notched piece possesses additional retouch but one has heavy damage along the right lateral margin. The supports, where recorded (7 in total), are evenly distributed between secondary and tertiary blades (3) and flakes (3); one specimen is made on a quartered nodule. The mean dimensions of complete, or nearly complete, notched pieces are: length = 35 ± 8mm (7), width = 22 ± 14mm (7) and thickness = 7 ± 6mm (7).

The debitage assemblage

The debitage assemblage comprises the remainder of the flint material and can be defined as the by-products resulting from the manufacture of the tool assemblage. Usually debitage represents 90–95% of all struck stone in a scatter and its importance to the archaeologist lies in its direct relationship with reduction strategy employed by the knappers at the site. The core typology used here is based on Froom (1976). These and all other terms are defined in Reynier 1998b.

CORES (fig 7, nos 1–2)
16 complete; 4 broken

One platform, partly worked (3); orthogonal (4); two platforms, opposed (5); three platforms (3); randomly worked (1); unclassified (4). The core population is diverse. Bi-platformed cores dominate; however, there are notable frequencies of cores with two striking platforms located at right angles to one another (fig 7, no 1) and cores with three contiguous platforms (fig 7, no 2). Platform preparation is inconsistent: all opposed platform cores have both platforms prepared (5), but five cores have one only platform prepared and five others have no preparation at all. Two cores have crushing at the base and two more have heavy damage in the same area. The

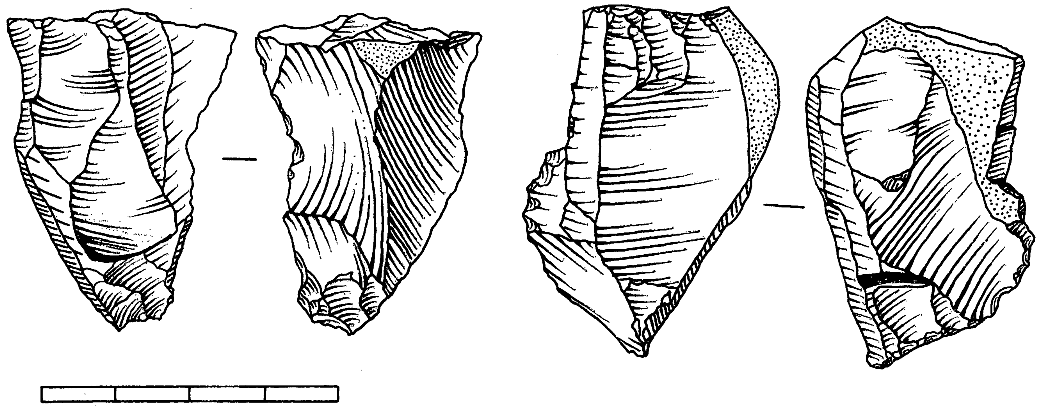

Fig 7 Cores from Kettlebury 103 (1977/8): orthogonal (1); helix (2)

removals themselves are generally made parallel to one another (8) with the exception of the orthogonal cores (4). The mean dimensions of complete, or nearly complete, cores are: length = 37 ± 6mm (15), width = 29 ± 8mm (15) and thickness = 24 ± 7mm (15).

CORE DRESSINGS (fig 8, nos 1 and 7)
24 in total

Crested pieces (10); core tablets (3); face dressings (5); plunging pieces (6). No further details were recorded, it being sufficient to observe that all recognized classes of core dressing are present.

MICROBURINS (fig 8, nos 3–4)
120 complete; 62 broken

Proximal (145); distal (8); double (1); miss-hit (26); unclassified (2). The frequency of microburins is relatively high, illustrated by the fact that they outnumber microliths by nearly 2:1. Predominantly this series of microburins have the notch made in their right lateral margins (171), while eight others (all distal), and the double microburin, have their notches made in the left margin. This corresponds with the microlith population, most of which were lateralized to the left (microliths = *c* 97%; microburins = *c* 95%). Three specimens have retouched margins and one other has heavy damage along the right margin. Where recorded (96 in total), the bulb of percussion is mostly diffuse (94) and butt morphology (96 in total) is predominantly plain (67), although there are notably frequencies of linear (12) and punctiform (14) butts; three examples possessed worked butts. The mean dimensions of complete, or nearly complete, microburins are: length = 15 ± 5mm (106), width = 10 ± 3mm (106) and thickness = 3 ± 1mm (106).

SPALLS (fig 8, nos 5–7)
74 in total

Krukowski- (9); burin- (7); chamfer- (34); ?axe- (2); notch- (12); microburin- (1); retouch- (8); unclassified (1). The overall frequencies of the spall population are not considered to be representative of the stone assemblage as a whole but are presented simply to indicate the range of spall types at the site. The two putative axe spalls are bi-facial flakes and are *not* typical axe sharpening pieces; their presence should not be taken as definitive evidence for axes. No further details were recorded.

BLADES (fig 8, no 2)
96 in total

Primary (3); secondary (25); tertiary (58); slivers (10). All complete blades were examined. The category of slivers comprises complete bladelets less than 20 mm in length. No blades recorded had additional retouch but one specimen had crushing on the left lateral margin and ten others had light damage around the edges. Where recorded (77 in total) the majority of blades (73) have diffuse bulbs of percussion, while their butt types (73 in total) are predominantly plain (54), there being twelve punctiform butts and seven linear butts. In most cases the dorsal scar pattern (85 in total) indicates that removals were made from one direction only (70) and these were most often struck parallel to one another (46) as opposed to at converging (22) or diverging (9) angles; eight blades exhibited irregular sequences of dorsal scars. The mean dimensions of complete, or nearly complete, blades are: length = 33 ± 8mm (86), width = 13 ± 4mm (86) and thickness = 4 ± 2mm (86).

FLAKES
192 in total

175 complete flakes were examined yielding the following information: primary (17); secondary (35);

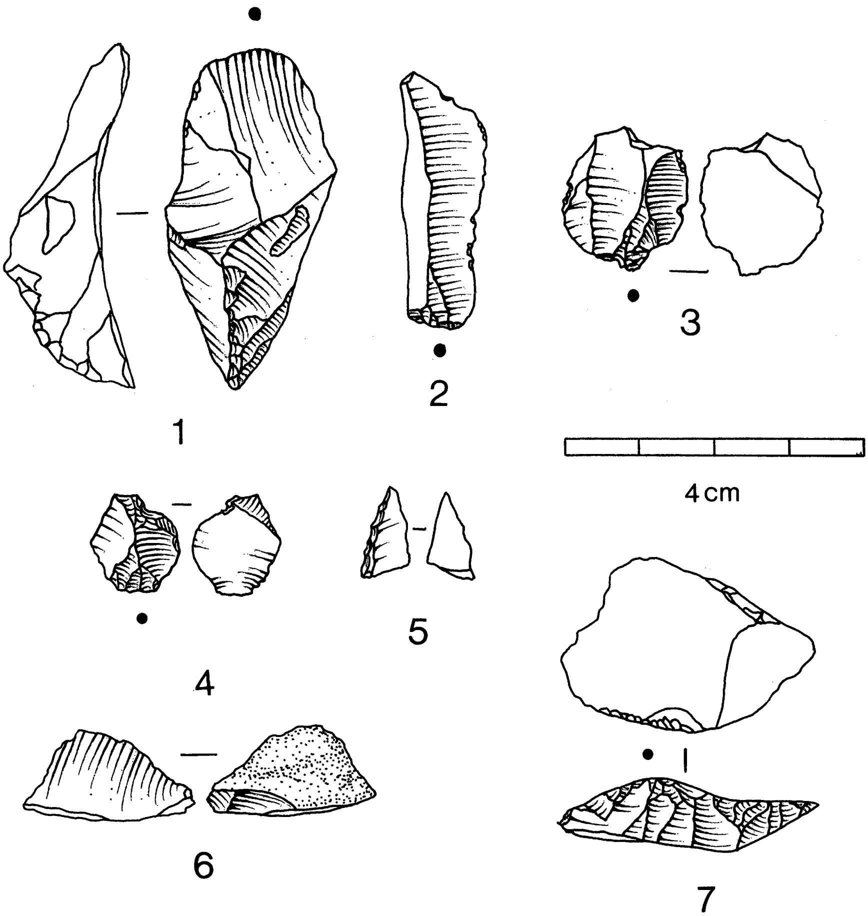

Fig 8 Debitage from Kettlebury 103 (1977/8): plunging piece (1); blade (2); proximal microburins (3–4; Krukowski piece (5); chamfer spall (6); core tablet (7). Filled circles indicate the position of the bulb of percussion where it is present; open circles indicate the assumed position where it is absent.

tertiary (52); slivers (67); others (4). No flakes had additional retouch but one had heavy damage along the right lateral margin and one other on the ventral surface at the distal extremity. Where recorded (88 in total) the bulb of percussion is evenly distributed between diffuse (42) and pronounced (46) forms. Butt morphology (83 in total) is predominantly plain (59), with a notable frequency of cortical butt types present (14); there are only five linear, two punctiform and three worked butts in the sample. The dorsal scar pattern on sampled flakes (100 in total) indicates that most removals were made from one direction only (81), but that the sequence of removal (99 in total) was variable with parallel (37), diverging (27) and converging (20) angles all represented; fifteen flakes displayed irregular dorsal scar sequences. The mean dimensions of complete, or nearly complete, flakes are: length = 26 ± 9mm (108), width = 20 ± 8mm (108) and thickness = 5 ± 4mm (108).

FRAGMENTS
4501 in total

Fragments >10mm in size (1855); fragments <10mm in size (2557); quartered nodules (8); unclassified (81). No further details were recorded.

ORGANICS
unknown number

In addition to the struck stone assemblage a quantity of charred hazelnut shells and charcoal (unidentified) was also recovered. No bone, antler, wood or other organic material was preserved.

Discussion

The Kettlebury 103 stone assemblage has been presented in some detail so that the relevant information is available for future research. Here, discussion of these data will be limited to general comments on the typology, chronology and distribution of the stone assemblage.

TYPOLOGY (table 2)

The complete stone assemblage is presented in table 2. This shows that the Kettlebury 103 standard tool assemblage is dominated by microliths and that the debitage assemblage contains both bladelet cores and microburins. These artefact-types in themselves are normally enough to place an assemblage in the Mesolithic period (*c* 9700–5500BP). When one also considers the short end-scrapers, truncated pieces and bladelets present – artefact-types commonly associated with, although not necessarily exclusive to, Mesolithic assemblages – this conclusion is confirmed. Indeed, there is no artefact in the assemblage that belongs to an earlier or later period. So, in as far as it can be stated with any confidence, site 103 appears to be a pure stone assemblage of Mesolithic affinity.

The Mesolithic period in Britain is currently sub-divided into two chronological stages: an Early and a Later Mesolithic (Jacobi 1973; Mellars 1974). The distinction between the two is based on differences in the microlith assemblage and most particularly on differences between populations of oblique point – the simplest, easiest to classify and often most abundant type of microlith in the British Mesolithic. In simple terms oblique points are larger and more common in the Early Mesolithic than in the Later Mesolithic. In fact, statistical analyses indicate that in the Early Mesolithic the average length of oblique points lies between 30mm and 43mm and that they represent *c* 80% of all classified microliths, while in the Later Mesolithic their mean length decreases to between 18mm and 24mm and they represent as little as 21% of the microlith assemblage (Pitts & Jacobi 1979, 169–70).

Using these simple statistics it is possible to place the Kettlebury 103 assemblage more precisely within the Mesolithic time frame. It was observed above (see Microliths) that the mean length of all microliths at site 103 was *c* 21mm. However, if one takes just the oblique points this figure falls to *c* 19mm (10 in total), ie within the Later Mesolithic range. Similarly, it can be determined that of the 99 microliths present in the assemblage 61 were complete enough to be classified to type-level. Of these, *c* 33% are oblique points, somewhat more than would be expected in a typical Later Mesolithic assemblage, but notably less than in Early Mesolithic assemblages. So it appears, on the basis of these simple statistics, that although the Kettlebury 103 oblique points do not match known Early Mesolithic examples, neither do they fall entirely within the Later Mesolithic range. This seems to suggest that the Kettlebury 103 stone assemblage lies somewhere between a typical Early and Later Mesolithic assemblage-type.

This situation is resolved when one examines the remainder of the microlith population (see Microliths above). Intriguingly, there is only a single microlith at Kettlebury 103 that can categorically be associated with a purely Later Mesolithic context: the scalene micro-triangle. The rest of the classified microliths are dominated by small isosceles triangles (*c* 39%), which are, in fact, the dominant form of microlith at the site, and a number of basally modified points, most of which are of the hollow-based variant (*c* 23%). It is well known that isosceles triangles occur in stone assemblages throughout the Early Mesolithic, but they only appear in association with hollow-based points towards the end of the Early Mesolithic in a distinctive group of stone assemblages termed the 'Horsham' industries. This distinctive assemblage-type was defined by J G D Clark who observed the repeated association of oblique points, isosceles triangles and hollow-based points in a number of stone assemblages centred around the town of Horsham in West Sussex, after which he labelled the assemblage-type (Clark 1934, 63). This association of microlith types is

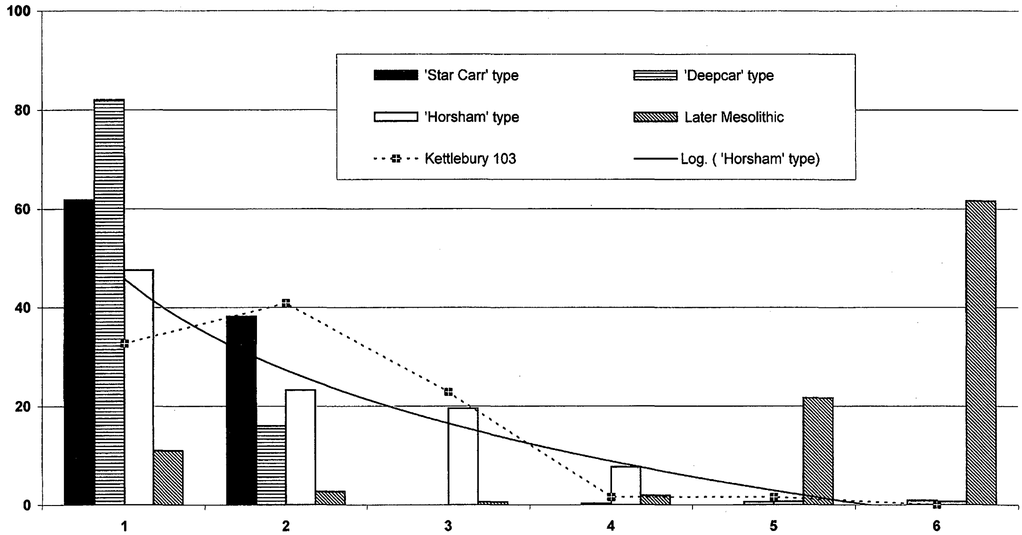

Fig 9 Microlith typogram for Kettlebury 103. The diagram compares microlith data for Kettlebury 103 (dashed line) with key attributes of selected known microlith assemblage-types (12 in total). A regression curve is given based on the 'Horsham' assemblage-type (solid line). The microlith criteria are: 1 – percentage of oblique points; 2 – percentage of other typical Early Mesolithic microliths (excluding oblique points); 3 – percentage of hollow-based points; 4 – percentage of other basally modified points; 5 – percentage of scalene micro-triangles; 6 – percentage of other typical Late Mesolithic microlith shapes. Data for 1–4 are taken from Reynier (1998b); data for 5–6 are taken from Pitts & Jacobi (1979).

precisely what is present at Kettlebury 103, leaving no doubt that it too belongs to the 'Horsham' assemblage-type.

Unfortunately, there are very few pure 'Horsham' type assemblages with which to compare the Kettlebury 103 material directly as a crosscheck. In part this is because the 'Horsham' type assemblages are restricted in distribution to south-east England, thereby reducing the potential recovery rate, but in the majority of cases it is because existing 'Horsham' type assemblages are mixed in with other assemblage-types belonging to the Early or Later Mesolithic. Figure 9 compares the Kettlebury 103 microlith data (dashed line) with corresponding data from three known Early Mesolithic assemblage-types (the 'Star Carr', 'Deepcar' and 'Horsham' type assemblages) and those typical of Later Mesolithic assemblages. The figure shows that the Kettlebury 103 microlith assemblage does not differ notably from the 'Horsham' assemblage-type data, indeed it follows the regression curve for these assemblages remarkably closely. Conversely there are marked differences between the Kettlebury 103 microlith assemblage and those characteristic of Later Mesolithic assemblages and, to a lesser degree, those attributed to the Early Mesolithic *sensu stricto*. A similar picture emerges when stylistic and technological attributes (eg lateralization, addition retouch or length) are compared (not shown).

It is important to note that the differences observed above and in figure 9 are not precise in every respect. It is clear that there is considerable variation even within the 'Horsham' assemblages and there are obvious divergences from the norm, notably in the higher percentage of non-oblique type points of Early Mesolithic character (principally isosceles triangles) in the Kettlebury 103 assemblage (fig 9, no 2). However, when the overall trend of microlith variation across the Mesolithic is considered the evidence points to the following conclusions:

1 the Kettlebury 103 microlith assemblage does not fall comfortably into any known Early or Later Mesolithic assemblage-type; and

2 the Kettlebury 103 assemblage matches, within acceptable bounds, the microlith signature of the 'Horsham' type group of assemblages.

CHRONOLOGY (table 2)

The typological evidence, then, places the Kettlebury 103 stone assemblage within the 'Horsham' assemblage-type. It is also apparent from the above analyses, however, that these assemblages share at least some traits with both Early and Later Mesolithic assemblages in Britain. In terms of chronology, a reasonable assumption, therefore, is that the 'Horsham' assemblages date to a point in time somewhere between traditional Early and Later Mesolithic assemblage-types. In fact, this observation is not new. Both Clark (1934; Clark & Rankine 1939) and after him A G Woodcock (1972) drew attention to the mixture of Early and Later Mesolithic elements in 'Horsham' type assemblages, Woodcock arguing that the 'Horsham' assemblages were probably younger in age than traditional Early Mesolithic assemblages. More recently, R M Jacobi has gone so far as to suggest a likely age of not long after *c* 9000BP for the 'Horsham' type assemblages, based on radiocarbon evidence from continental Europe (Jacobi 1981, 12) – this date falling close to the assumed division between the Early and Later Mesolithic in Britain at that time, ie *c* 8700BP. Finally, Ellaby (1987) has suggested a specific time-frame for the 'Horsham' type assemblages of between *c* 9000BP and *c* 8000BP, based on typological evidence from Surrey.

TABLE 2 Stone inventory from Kettlebury 103, Surrey

Artefact-type	Total	%
Microliths	99	65.56
Scrapers	16	10.59
Burins	5	3.31
Piercers	5	3.31
Core tools	1	0.66
Microdenticulates	0	0.00
Chamfered pieces	18	11.92
Truncated pieces	7	4.63
Backed pieces	0	0.00
(Standard tools)	*(151)*	*(99.98)*
Notched pieces	18	30.00
Retouched pieces	9	15.00
Edge-damaged pieces	33	55.00
(Non-standard tools)	*(60)*	*(100.00)*
Cores	21	0.41
Core dressings	27	0.52
Microburins	182	3.56
Spalls	87	1.70
Blades	96	1.88
Flakes	192	3.76
Fragments	4501	88.15
(Debitage)	*(5106)*	*(99.98)*
Total	5317	

Confirmation of these observations has been sought through radiometric dating. The difficulty here has been the poor catalogue of 'Horsham' type-sites available for this kind of research. Ideally, radiocarbon dated stone scatters should be reliably provenanced and excavated, typologically pure and securely associated with the organic remains used as samples. These criteria have been approached in only two 'Horsham' type assemblages, both the result of excavations by Jacobi: Longmoor 1 in east Hampshire and the present assemblage. Beyond these two sites no 'Horsham' assemblage has yet been found suitable for radiocarbon assay. The resulting radiocarbon database comprises just six dates, four initially obtained by Jacobi – two from Longmoor 1 and two from Kettlebury 103 – while two further dates have since been run on additional samples recovered from Kettlebury 103 in recent keyhole excavations (Reynier 1997a). All six dates are presented in table 3.

TABLE 3 Radiocarbon determinations for Kettlebury 103, Surrey and Longmoor 1, Hampshire

Lab no	Years (uncal) BP	Sample	Context	Layer	Ref
Kettlebury 103					
OxA-378	8270 ± 120	charred hazelnut shell	Box H10.7	unknown	1
OxA-379	7940 ± 120	charred hazelnut shell	Box I8.9	unknown	1
OxA-6395	7990 ± 090	charred hazelnut shell	Box 46A	3/4 (*c* 20cm)	2
OxA-6396	7890 ± 080	charred hazelnut shell	Box 16B	?4 (*c* 27cm)	2
Longmoor					
OxA-376	8930 ± 100	charred hazelnut shell	Box L1	unknown	1
OxA-377	8760 ± 110	charred hazelnut shell	Box L3	unknown	1

Ref: 1 = Gillespie *et al* (1985); 2 = unpublished

The oldest dates are the two determinations from Longmoor 1 (OxA-376 and OxA-377), at *c* 8700 and *c* 8900BP. These dates match precisely Jacobi's estimate. However, the four determinations from Kettlebury are markedly younger in age, three (OxA-379, OxA-6395 and OxA-6396) coming out at *c* 7900BP and one (OxA-378) slightly older at *c* 8200BP. Indeed, the pooled mean of all four Kettlebury dates is: 8021 ± 49BP, almost a thousand radiocarbon years younger than the Longmoor 1 dates and Jacobi's initial estimate of the age of the 'Horsham' type assemblages. In trying to account for this discrepancy in age three possibilities exist:

1 the Kettlebury samples are not contemporary with the deposition of the stone scatter;
2 the Longmoor 1 samples are not contemporary with their associated settlement; or
3 both datings are correct and the 'Horsham' assemblage-type persists from *c* 9000BP, at Longmoor 1, through to at least *c* 8000BP at Kettlebury.

The fact that all six radiocarbon determinations were run on single charred hazelnut shell fragments may at first sight appear to favour one of the first two options, since isolated shell fragments of no more than 10mm in size are highly mobile, especially in sandy subsoils. If one chooses to accept this argument then the dates from Kettlebury are certainly the more reliable, since here there are four dates indistinguishable in age at two standard deviations – an unlikely event if the samples originated from different levels in the soil profile. Under this scenario one would have to accept the second option (above). However, Jacobi's arguments in favour of an age around *c* 9000BP are compelling. All around the North Sea basin microliths with modified bases, some similar to hollow-based points, appear almost simultaneously around *c* 9000BP. Given the general parallels in microlith sequences that can be demonstrated across this area (Reynier 1998b) and the fact that Britain was still connected to continental Europe, it is not unreasonable to assume that basally modified points developed in Britain at a similar point in time, ie around *c* 9000BP.

Under these circumstances, and until further radiometric dates can be made, a provisional explanation best lies with the third option above – that in Britain the 'Horsham' type assemblages may occupy an extended time-frame, between *c* 9000 and *c* 8000BP. If proved correct, this would support the conclusion drawn by Ellaby (1987) in his typological review of the Surrey Mesolithic. The corollary of this observation is that the 'Horsham' assemblages do indeed, as Ellaby has suggested, span the 8700BP boundary between the traditional Early and Later Mesolithic assemblage-types. The present author would go further in suggesting that the existence of such a distinction may have outlived its usefulness. Indeed, if typical Later Mesolithic assemblages have been correctly dated to *c* 8700BP in northern Britain but, as has been suggested here, 'Horsham' type assemblages persist until *c* 8000BP in southern England, then the development of Later Mesolithic stone-working technology is not a simultaneous, or as some have inferred catastrophic, event across Britain. Instead it may have been time-transgressive: a gradual evolution across time and space. In this context it may be pertinent that even earlier radiocarbon dates for 'true' Later Mesolithic assemblages appear in western Britain at around *c* 9000BP, suggesting that the transition from the Early to the Later Mesolithic in Britain may have taken up to a millennium to achieve.

SPATIAL ANALYSIS (fig 10)

The level of artefact recovery at Kettlebury 103 is extremely high, a fact borne out by the observation that nearly half the struck stone assemblage (*c* 48%) is less than 10mm in size. The 'box and unit' method of recording struck flint (see the 1977/8 excavation above) also ensures accurate provenancing at two levels: firstly, by the square yard (*c* 0.8m^2), and secondly, by the square foot (*c* 0.09m^2). In order to explore the horizontal distribution of artefacts across the site, flint density maps were produced using UNIRAS sub-routines available at the Cripps Computing Centre, University of Nottingham. The technique takes data from each context (yard boxes or foot units) and interpolates them, allowing contours of equal density to be drawn. It should be noted that with this procedure the contours are not always confined to the area of excavation and that the maps are only a representation of relative flint densities rather than an absolute distribution. As an experiment, spatial analyses were conducted at both levels of resolution (yard and foot squares) and the results compared.

Perhaps not surprisingly the maps differed markedly according to the resolution used. When the context was set at square yard boxes all indices – the categories of total flint, microliths, standard tools, microburins and burnt flint were selected for each analysis – produced maps with a single area of peak concentration (the number of cores (21 in total) was insufficient to allow interpolation). The position of this area varied moderately with certain indices, but generally centred around square K9: microliths peaked in squares L8–9; total flint in square H9; microburins across squares L9–J10; and standard tools across a similar area. Only the index of burnt flint differed notably in that its peak was located further west around squares I9/10. In most cases, bar the index of total flint, the peak contour represented fewer than ten artefacts.

When the context was set at the higher resolution of square foot units a different set of maps was produced. Each of the indices (total flint, microliths, standard tools, microburins and burnt flint) recorded two areas of peak concentration. The relationship of these concentrations, one to the other, is best observed when the highest density contours are superimposed (fig 10). Total flint, standard tools and microburins all returned maps with two discrete concentrations, occurring in squares J11 (fig 10, A) and L10 (fig 10, B). Precisely the same areas of concentration were observed for the burnt flint distributions (not shown). Interestingly, the microliths recorded a separate concentration to the east of areas A and B, in square K7 (fig 10, C); this was also accompanied by a small cluster of standard tools.

In interpreting areas A, B and C, it must be remembered that at this higher level of resolution the contours represent low densities of artefacts. The highest, and therefore

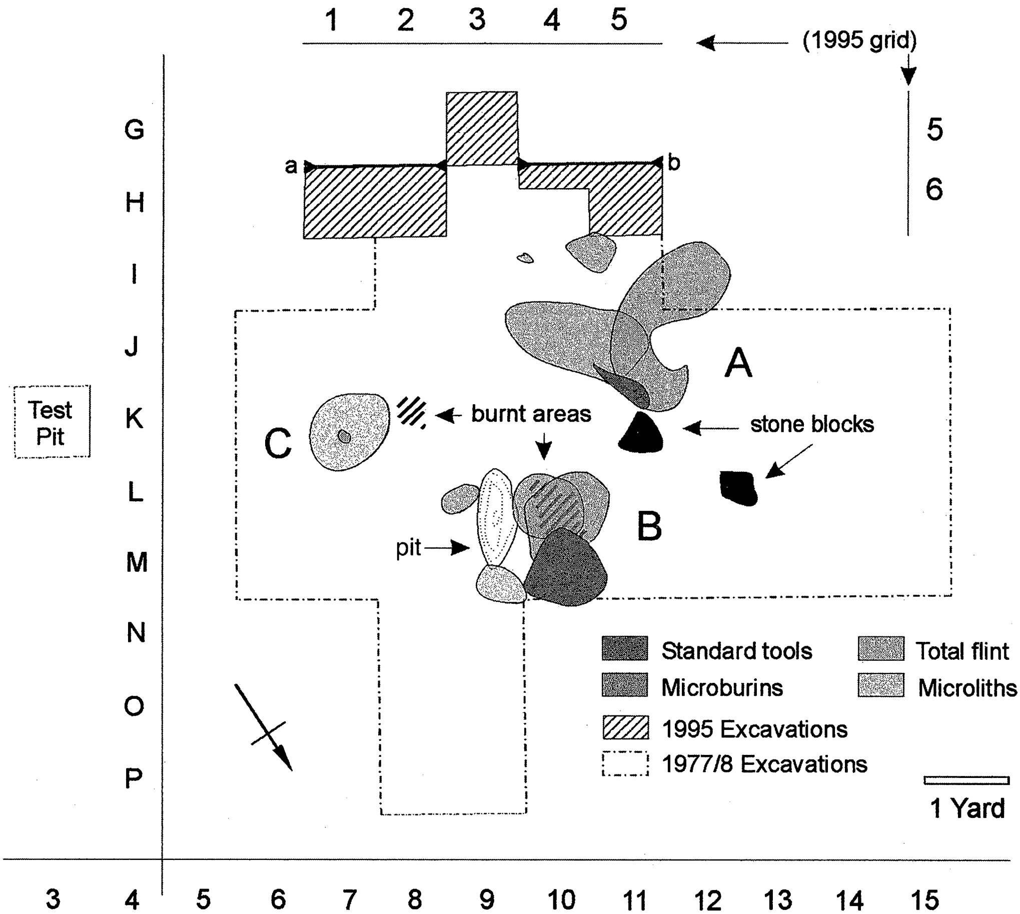

Fig 10 Spatial distribution of artefacts at Kettlebury 103 (1977/8). Only the highest density contours have been shown for clarity. The line of the section (fig 3) is marked by the letters a and b.

most reliable contours, are those for total flint (30 in total); the remainder, however, are much lower (2 in total) and consequently may not be meaningful to the same extent. This said, an interesting pattern does emerge when the density contours are overlaid on the site plan (fig 4, A–C). Area B corresponds precisely with the larger of the two charcoal scatters (fig 4, no 2) immediately adjacent to the pit (fig 4, no 1), while area C, the microlith concentration, lies next to the smaller charcoal scatter. Area A is not directly associated with any site feature, but lies instead close to the two large stones (fig 4, no 3).

The precise meaning of this patterning can only be guessed at. One interpretation may be to envisage two stone-working areas (A and B), represented by peaks in the concentration of struck flint (total flint). Whether these areas represent the workspace of two individual flint knappers or are specialized knapping locations used by groups of flint knappers is uncertain. More interesting is the isolated cluster of microliths (area C) set to one side of the two knapping areas and associated with a small concentation of hearth material. The intriguing aspect of this pattern is that neither of the two putative knapping areas (A and B) contains notable microlith concentrations, although both have marked clusters of microburins and standard tools. This tends to suggest that microliths were being made in areas A and B, but removed elsewhere, since microburins are the by-product of microlith manufacture. If so, there are two subsequent options: either the microliths were stored elsewhere – for instance, cached around area C, or they were hafted at areas A and B and taken (and deposited) off-site.

Three lines of evidence support the second option that the microliths made in areas A and B were hafted and removed from the site. First, attempted refitting of microliths to microburins failed, indicating that the microlith and microburin assemblages were not produced at the same location. Secondly, it was observed (see Microliths above) that *c* 77% of the microliths at Kettlebury 103 are broken; this higher than expected fracture incidence favours the argument that the microliths were discarded as waste and not cached as complete artefacts. And thirdly, the microlith concentration (area C) is associated with a small spread of putative hearth material; this detail, together with its isolated position, again points to area C representing a waste dump. Drawing these threads together it is tempting, although purely conjectural, to envisage Kettlebury 103 functioning as a re-tooling station, with broken or damaged equipment dumped in area C, and the new components manufactured and presumably hafted in the two knapping areas A and B. The absence of microdenticulates and backed pieces from Kettlebury 103 (table 2) may have some further bearing on this argument. There is evidence that both these tool types may have been used primarily for food processing (Barton 1992). If the Kettlebury 103 site really was used as a specialist re-tooling location this may explain their apparent absence.

Conclusions

In summary, the stone assemblage from Kettlebury 103 has provided valuable information on an intriguing part of the Mesolithic period. The key points to emerge are as follows:

1. Typological analysis indicates that the Kettlebury 103 stone assemblage conforms to the 'Horsham' assemblage-type.
2. Radiometric dating places the Kettlebury 103 assemblage around *c* 8000BP and based on this, it is suggested that the 'Horsham' assemblage-type as a whole may occupy a time-span between *c* 9000BP and some time after *c* 8000BP.
3. Spatial analysis indicates the presence of at least two flint-knapping areas and it is suggested that the site may have functioned as a re-tooling station.

Kettlebury 103 is, then, one of only a handful of stone scatters known to belong to the 'Horsham' assemblage-type, and one of only two that has been radiometrically dated. Its importance, therefore, cannot be over-emphasized. As to the wider aspects of the 'Horsham' assemblage-type – its social and economic patterning – research is still in its infancy (Reynier 1998a; 1998b). This work is severely hindered by the general lack of 'Horsham' type sites, and there is an urgent need for more sites of this type to be located and excavated. Currently the most intriguing result to have emerged is that 'Horsham' assemblages appear to be restricted in distribution to south-east England and that in this region they consistently avoid valley floor locations, preferring the valley margins or low plateaux; it is also notable that they seem to be the first Mesolithic assemblages to be repeatedly associated with landscape fixtures, such as rock shelters and cave sites. It is hoped that the discovery of more sites of this type will encourage further synthesis of these observations.

Note

In addition to this archaeological research, the area east of Hankley Common has attracted limited environmental analyses. This work has centred on Elstead bog (fig 1, no 6), where two pollen diagrams have been compiled (Seagrief & Godwin 1960; Carpenter & Woodcock 1981). Unfortunately neither diagram has associated radiocarbon dates so it is not possible to relate them directly to Kettlebury 103. However, pollen samples have now been taken from the archaeological site itself and it is hoped that in the future these will be assessed formally so that it may be possible to relate all three pollen diagrams.

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