The resettlement of the British landscape: Towards a chronology of Early Mesolithic lithic assemblage types

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Introduction

The early Mesolithic is a key time in British prehistory. During the preceding Upper Palaeolithic period – when sea-level was lower – Britain was a marginal upland area of northwest Europe. Occupation was climate dependent, usually relatively fleeting, with human groups often operating at the margins of their ranges. The Mesolithic by contrast represents the start of the continuous occupation of the British Isles. This process saw colonisation by groups moving along river systems in the south and along the coast in the north (Conneller and Higham 2015), and, over time, the gradual infilling of the British landscape. Places gained meaning and histories for the first time, and particular places were marked out as important, with evidence for long-term occupation, seemingly from the very start of the period (Conneller et al 2012).

However our understanding of the detail of these processes is currently extremely limited, due to poor chronological resolution for the period. Several researchers (eg. Spikins 1999, Reynier 2005, Waddington 2015) have linked changing settlement patterns over the course off the Mesolithic with environmental change, for example, yet the current poor temporal resolution of both sets of data raise problems of 'suck in' and 'smear' (Baillie 1991). Dating of the early Mesolithic period in particular is crucial for understanding processes of colonisation and infilling of the British landscape, yet precise and reliable radiocarbon measurements are few and mostly associated with only a few key sites. The impetus for this paper stems from a new programme of radiocarbon dating and Bayesian chronological modelling for Mesolithic activity at Star Carr, North Yorkshire (Milner et al. in press, chapters 3 and 17). This new analysis makes Star Carr the best dated Mesolithic site in Europe, but the level of detail revealed throws into stark relief the paucity of our knowledge of the chronology of the remainder of the early Mesolithic across Britain.

In this paper we formally model the chronologies of chipped stone assemblage types from the early Mesolithic, using the corpus of legacy radiocarbon dates and the same rigorous suite of scientific, statistical, and archaeological criteria for assessing the scientific reliability and robustness of archaeological association that we have employed in the analysis of the new dataset from Star Carr. This attempts to refine our understanding of early Mesolithic typochronologies, as a first step towards a greater understanding of the process of the settlement of the British Isles.

Early Mesolithic chronologies

The most recent review of the chronology of the Early Mesolithic (Reynier 2005) listed just 20 radiocarbon measurements from 10 sites that were judged to be reliable. The vast majority of systematic dating work on the Mesolithic was undertaken in the 1970s by Switsur and Jacobi (1975, 1979). At this time the large sample size required for conventional radiocarbon dating meant that many pieces of bone or charcoal had to be bulked together for analysis, perforce leading to the amalgamation of material of potentially differing ages in a dated sample. This meant that the resulting radiocarbon date would be an average of the dates of all the fragments of material in the sample and potentially reflect the actual age of none of them. Similarly the large amount of material needed for dating meant that in practice there was rarely any sample choice, simply those few samples of organic material that were large enough had to be submitted for radiocarbon dating. This led to many radiocarbon measurements that have poor or uncertain links with archaeological events. At this time charcoal samples were often not identified to age and species before submission for dating and, even when this was done, charcoal from tree species that might be several hundred years old when cut down was dated as an old-wood offset of a few hundred years was not deemed to be archaeologically important within the precision that could then be produced by radiocarbon dating. In consequence, a large proportion of legacy dates from Mesolithic samples represent *termini post quos* (hereafter TPQs).

This array of problems, coupled with the difficulty of dating bone this ancient, means that even key sites can be poorly dated: Thatcham III, the pre-eminent early Mesolithic site in Southern England, a palimpsest of repeated occupations, is represented by a single precise radiocarbon date, with the remaining three measurements on bulked material providing only TPQs at best (Table 1). In sharp contrast, Star Carr, following recent work, now has 223 associated radiocarbon dates (Milner et al. in press, Tables 17.1–17.3). This compares with only 123 measurements for all other sites combined across Early Mesolithic Britain, many of which come from just a few sites, such as Thatcham V (12 measurements)(Reynier 2005, Conneller and Higham 2015), Aveline's Hole (23 measurements) (Schulting 2005, tables 11–12 and fig. 37), Worm's Head Cave (7 measurements on four samples) (Meikeljohn *et al.* 2011) and Crammond (6 measurements) (Lawson 2001). This situation is depressing, but the is slowly improving: recent excavations have been able to take advantage of new techniques of radiocarbon pre-treatment and analysis, and focused dating by Accelerator Mass Spectrometry (AMS) on human bone (Meikeljohn *et al.* 2011; refs) and bone and antler tools (Bonsall and Smith 1990, Elliott ref) has revealed the potential for obtaining new evidence from old collections; a similar project is urgently needed to improve dating of settlements.

The vast majority of Mesolithic evidence, however, is recovered from contexts that lack organic remains suitable for radiocarbon dating. For these sites, we will always need to rely on typochronological schemes. It is unfortunate that these are less refined in Britain than on the Continent, although the situation is rather better for the early Mesolithic than the late. Work on the early Mesolithic over the past century has identified considerable variation in microlith forms. Clark (1934) was the first to point out the distinctive basally modified forms found in the area around Horsham. Radley and Mellars (1964) built on earlier observations by Francis Buckley, to suggest two main types of early Mesolithic industries in northern England. 'Star Carr' and 'Deepcar' types were distinguished by differences in microlith form and raw material useage. Subsequent work has highlighted that the differences in microlith form between these assemblages extends across England and Wales (Jacobi 1978, Reynier 2005). More recently the distinctive midlands assemblage, with inversely retouched Honey Hill forms have been defined (Saville 1981). While Jacobi (eg. 1981) saw variation over time in these groupings, a systematic survey and analysis by Reynier (1998; 2005) has had the effect of formalising and stabilising these assemblage types. Reynier suggested each assemblage grouping was also characterised by different technologies, settlement patterns and hunting strategies. Reynier also believed these assemblage types had a chronological component, with Star Carr-type sites appearing first, around 9700 BP, followed by Deepcar types after 9400 BP, and finally Horsham from 9000 BP.

Advances in radiocarbon dating since Reynier's analysis in the late 1990s, not least the advent of a radiocarbon calibration curve covering this period (Stuiver *et al.* 1998; Reimer *et* *al.* 2013), mean that, though relatively few new sites with organic preservation have been excavated in the intervening years, a new analysis of this material is now warranted. In attempting to place Star Carr within its contemporary British context, we have created Bayesian models for the chronological range of three types of Mesolithic lithic assemblages, based on the occurrence of certain key microlith forms. These are: Star Carr-type assemblages, Deepcar types, and basally modified microlith assemblages. We have also modelled the chronological range of the preceding Terminal Upper Palaeolithic Long Blade assemblages, in order to understand their relationship with the earliest Mesolithic. Finally we have modelled the start of Late Mesolithic assemblages containing small scalene triangle, though the entire span of this microlith form is beyond the scope of this paper. We note that these categories represent a considerable over-simplification of the nature of Mesolithic assemblage types. Microlith forms show regional differences and chronological change over time – for example, the appearance of curve-backed pieces in late Deepcar-type assemblages, such as Oakhanger V/VII and Marsh Benham (Jacobi 1981). It is also likely that each 'type' contains further possible divisions based on microlith form, however this needs to be the subject of further detailed techno-typological research which is beyond the scope of this paper.

Assemblage types

The assemblage types are defined as follows (see also Figure 1):

- Long blade assemblages. Terminal Upper Palaeolithic assemblages, characterised by the presence of long and giant blades, opposed platform technology, use of a soft stone hammer, platform faceting, the presence of bruised blades and a variety of different microlith types (obliquely blunted points, often with a pronounced concave truncation, trapezes, Blanchere or Ahrensburgian points) (Barton 1989; Barton 1991; Barton 1998).
- Star Carr-type assemblages. Defined by the presence of simple obliquely blunted points, large isosceles and scalene triangles and trapezes (Radley and Mellars 1964; Reynier 2005).
- Deepcar-type assemblages. Characterised by the presence of slender obliquely blunted points and partially backed points, often with retouch on the leading edge, and usually lateralised to the left (>70%). Also present at lower frequencies are rhomboids and triangles (Radley and Mellars 1964; Reynier 2005).
- Basally-modified assemblages, including Horsham-type and Honey Hill-type assemblages. This is defined by the presence of microliths with basal modification taking a variety of different forms, ranging from simple basal truncations, to assymetric concave truncation (Horsham points) or invasive inverse flaking (Honey Hill types). These are accompanied mainly by small obliquely blunted points, isosceles triangles and rhomboids, though a range of other types can also be present. Microliths in Horsham and Honey Hill assemblages are strongly lateralised to the left (95%). The rationale for subsuming two previously identified Mesolithic types, Horsham (Clark 1934) and Honey Hill (Saville 1981), into a single category is partly because of the small number of radiocarbon dates associated with these types, but also because there exists a range of microlithic assemblages that contain basally modified points that do not fit within these tightly defined groups. These include sites beyond the classic geographical range of Horsham and Honey Hill types, such as at Mother Grundy's Parlour, Derbyshire and Crammond in Edinburgh. Though this larger category encompasses considerable variation, so too do the Star Carr and Deepcar groups. The presence of basally modified points is taken as a chronological marker elsewhere in Europe, indicating the appearance of middle Mesolithic assemblages.
- Small scalene triangle assemblages. Defined by the presence of small scalene triangles (usually backed on two edge only during the earliest part of the late

Mesolithic) and narrow backed bladelets. Small obliquely blunted points are also occasionally present at the start of the period. This group has traditionally heralded the appearance of the late Mesolithic, though it is worth noting that small scalene triangles are also present in some basally modified assemblages, such as Longmoor I.

Bayesian modelling

In this paper we implement a Bayesian approach to modelling archaeological chronologies. This is an explicit, probabilistic method for estimating the dates when events happened in the past and for quantifying the uncertainties on these estimates. Lindley (1985) provides an accessible introduction to the principles of Bayesian statistics, Buck *et al.* (1996) introduce the approach from an archaeological viewpoint, and Bayliss *et al.* (2007a) more specifically provide an introduction to building Bayesian chronologies in archaeology.

All modelling has been undertaken using OxCal v4.2 (Bronk Ramsey 1995; 1998; 2009a; Bronk Ramsey 2009b) and the calibration curve of Reimer *et al.* (2013). Weighted means of replicate measurements have been taken before incorporation in the model (Ward and Wilson 1978).

The currency of each lithic-type is assumed to be a continuous, and relatively constant, period of activity (Buck *et al.* 1992). Only the earlier part of the chronological range of small scalene triangles, which were in use for a long period of time, is of relevance in comparison to Star Carr. For this reason, we have only included radiocarbon measurements associated with this type from sites which produced results before 8000 BP. Our modelled ending for the currency of small scalene triangles is thus arbitrary (but far enough from its beginning that the modelled estimate for the start of the type is probably robust).

A total of 305 radiocarbon measurements are included in our modelling, including the 200 measurements included in the chronological model for Star Carr reported by Milner et al. (in press, Appendices 17.1 and 17.2) and 27 measurements included in the chronological model for Howick reported by Bayliss *et al.* (2007b, fig 6.2 and table 6.1). Details of the other radiocarbon results included in the model are provided in Table 1. The overall form of the model is shown in Figure 2, with its individual components shown in Figures 3–7. It has good overall agreement (Amodel: 60).

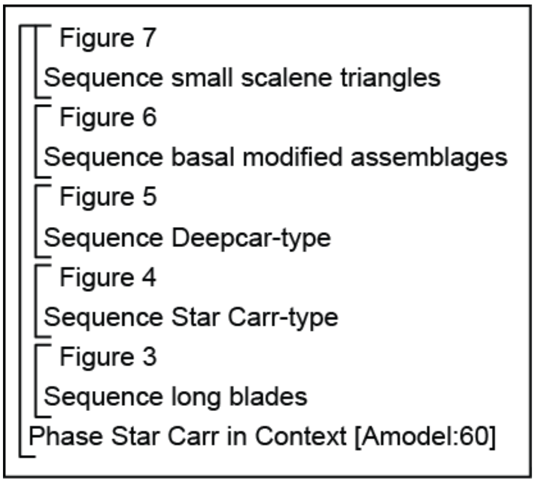


Figure 2. Overall form of the chronological models for the currency of different microlith types in Britain.

We have adopted various modelling approaches for each measurement dependent on the composition of the dated material and our understanding of the association between the dated sample and the relevant lithics. In a few cases, our perception of the accuracy of the reported measurement is also relevant. Our modelling approach for each measurement for Star Carr and Howick are described in by Milner *et al.* (in press, Chapter 17) and by Bayliss *et al.* (2007b) respectively, and those for the other radiocarbon dates included in the model are provided in Table 1. These are summarised by the following categories:

- samples of short-lived material (whether single-entity or bulk) that can be clearly associated with a particular microlith form are fully included in the model.
- samples which might include a component of material that could have had an age-at-death offset (most commonly unidentified charcoal) are included as *termini post quos* for the associated lithics. These dates are shown in grey in the figures.
- samples of peat which probably contained a component of aquatic plant macrofossils that might have incorporated hard-water error are included as *termini post quos*. These dates are also shown in grey in the figures
- samples which are not directly associated with particular lithic forms, but which stratigraphically underlie them, are included as *termini post quos* constraints on the calibration of dates which are directly associated with the lithics. These dates are shown in blue in the figures.
- samples of short-lived material which are not directly associated with particular lithic forms, but which stratigraphically overlie them, are included as *termini ante quos* constraints on the calibration of dates which are directly associated with the lithics. These dates are also shown in blue in the figures.
- dates which are considered inaccurate have been omitted from the modelling and are shown in red in the figures.

A total of 18 measurements fall in this latter category. As described in Milner et al. (in press, Chapter 17), 13 of these are from Star Carr. Three are from Howick, two samples that are considered to be residual and one that is considered to be intrusive (Bayliss *et al.* 2007b, 71). A further sample is one of the bones from Flixton II which was dated using the ion-exchange protocol at the Oxford Radiocarbon Accelerator Unit in 1996 (OxA-6329; Table 1; Hedges and Law 1989; Law and Hedges 1989). This measurement is 1000 BP later both than the other results on bones from Flixton II obtained by this method, and on the single result obtained on hydroxyproline (OxA-X-2395-14). It is also substantially later than the measurements on a waterlogged twig from the overlying peat (OxA-X-2495-12; Table 1). For these reasons, we regard OxA-6329 as anomalous. The considerable difficulties that have been encountered in obtaining reliable measurements on bone from this site should be noted (Marom *et al.* 2013). The last measurement that we consider inaccurate is Q-658 (10030±170 BP), a bulk sample of charred hazelnut shell from Thatcham III. This is almost 700 BP older than the re-colonisation of hazel directly dated by AA-55306 (9314±55 BP) at the near adjacent paleoenvironmental core from Thatcham reedbeds (Barnett 2009, 61–4).

We have constructed site-based model components for each site that has more than three radiocarbon dates. These sites are thus represented in the overall currency of the relevant lithics form by two parameters – the start and end of occupation at the site. This prevents our models being biased by the overwhelming number of measurements from just two sites. The model component relating to Star Carr is fully described and defined by Milner et al (in press, Appendices 17.1 and 17.2). Those for Howick, Cramond, and Kettlebury are fully defined respectively by Bayliss *et al.* (2007b, fig 6.2) and Waddington *et al.* (2007, figs 15.12 and 15.17). Those for Flixton II, Seamer C, Seamer K, and Oakhanger are described below.

We have been able to gather details of more than 100 other radiocarbon measurements from archaeological contexts that fall within the time span of the lithic assemblages considered here (Table 2). These have been excluded from the modelling for a number of different reasons. In the majority of cases we have no reason to doubt the accuracy of the radiocarbon measurements themselves, but the dated samples lack a demonstrable link to a particular type of microlithic assemblage. Several determinations come from published sites that have few or no microliths, or a small range of types that are not particularly typologically distinctive. Some sites are not fully published, so details of the microlith forms that may be present are not currently available to us. A large group of sites are palimpsests, with a range of microlith forms, of potentially differing dates. One such example is Thatcham Sewage works, where, though the majority of the assemblage is of Deepcar type, basally modified forms are also present. One radiocarbon date derives from this site, but there is currently no means of understanding with which type of lithics it is associated. Another is Kinloch, Rum, where, by contrast, the site is comparatively well-dated, but has yielded huge quantities of lithic artefacts, including a wide range of microlith forms. The spread of radiocarbon dates indicates it was a focus of activities for a considerable period of time. For some such sites, further archive work may be able to demonstrate an association between a particular microlith type and a particular radiocarbon date. The reason why each sample has been excluded from the modelling is provided in Table 2.

We also note radiocarbon dates on a number of unassociated organic finds of Mesolithic date, such as the Wandsworth barbed points (Bonsall and Smith 1990) and on human bones often from early cave excavations, where no contextual records remain (Meikeljohn *et al.* 2011). These cannot be associated with lithic forms and so are beyond the scope of this study.

Long Blades

The model for the currency of Long Blades is shown in Figure 3. Radiocarbon dates are available from only two sites. Eight measurements from Flixton II have been included. Four bones, one waterlogged twig and two samples of bulked sediment have been dated from the layer which included the butchered horse remains. One of the measurements on bone is considered inaccurate and it is probable that the samples of bulk sediment may have included aquatic macrofossils. This layer was sealed by an overlying sand which itself was covered by an overlying peat which produced a date on waterlogged twig. This stratigraphic sequence has been included in the model. From Three Ways Wharf, Uxbridge two dates are available on animal bone from lithic scatter A.

This model suggests that Long Blades first appeared in *11,575–9555 cal BC (95% probability; start long blades;* Fig 3), probably in *10,540–9790 cal BC (68% probability).* Long Blades disappeared in *9745–7840 cal BC (95% probability; end long blades;* Fig 3), probably in *9590–8940 cal BC (68% probability).* The imprecision of this estimate relates to the fact we have only two dated sites.

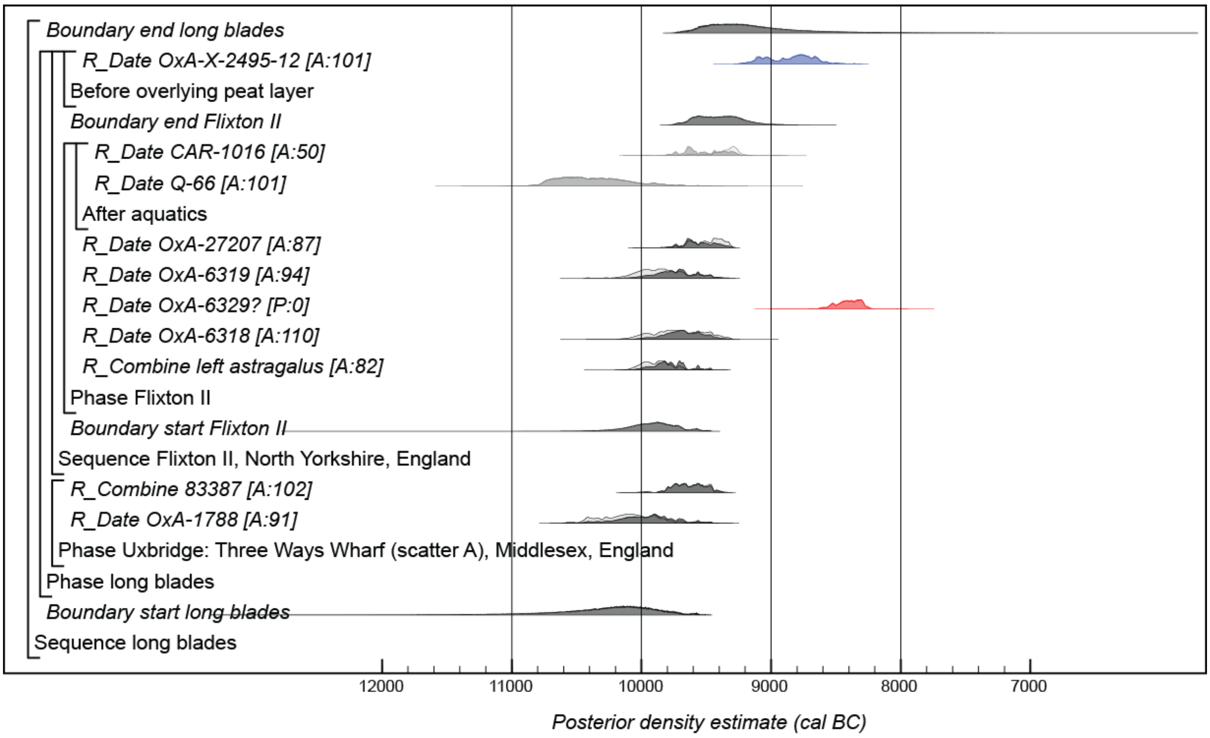


Figure 3. Probability distributions of radiocarbon dates associated with long blades. Each distribution represents the relative probability that an event occurs at a particular time. For each of the dates two distributions have been plotted: one in outline, which is the result of simple radiocarbon calibration, and a solid one, based on the chronological model used. Distributions other than those relating to particular samples correspond to aspects of the model. For example, the distribution '*start long blades*' is the estimated date when long blades were first used in Britain. Measurements followed by a '?' have been excluded from the model for reasons described in the text. The large square brackets down the left-hand side along with the OxCal keywords define the overall model exactly. (red: excluded from model; grey: TPQ possible old-wood effect or hard-water error; blue: TPQ/TAQ stratigraphic constraint; red: excluded from model)

Star Carr-type assemblages

The model for the currency Star Carr type assemblages is shown in Figure 4. Two sites have more than four measurements. The model for Star Carr is defined in Milner et al. (in press, Appendices 17.1 and 17.2). Seven measurements are available on six samples from Seamer C. Two samples of unidentified waterlogged and charred wood provide *termini post quos* for the lithic material, and a weighted mean has been taken of the two bulk samples of willow/poplar charcoal from 2018, the main Mesolithic occupation horizon. Occupation at this site has been modelled as relatively constant and continuous phase of activity. At Seamer K only two measurements are available from the Mesolithic occupation horizon, though their calibration is constrained by measurements from an underlying layer of peat (5085), which is itself below a Younger Dryas coversand which underlies the main Early Mesolithic occupation horizon (5012), and an overlying layer of peat.

This model suggests that Star Carr-type assemblages first appeared in *9805–9265 cal BC (95% probability; start Star Carr-type;* Fig 4), probably in *9495–9290 cal BC (68% probability).* Star Carr-type assemblages disappeared in *8230–7520 cal BC (95% probability; end Star Carr-type;* Fig 4), probably in *8165–7835 cal BC (67% probability)* or *7830–7815 cal BC (1% probability).*

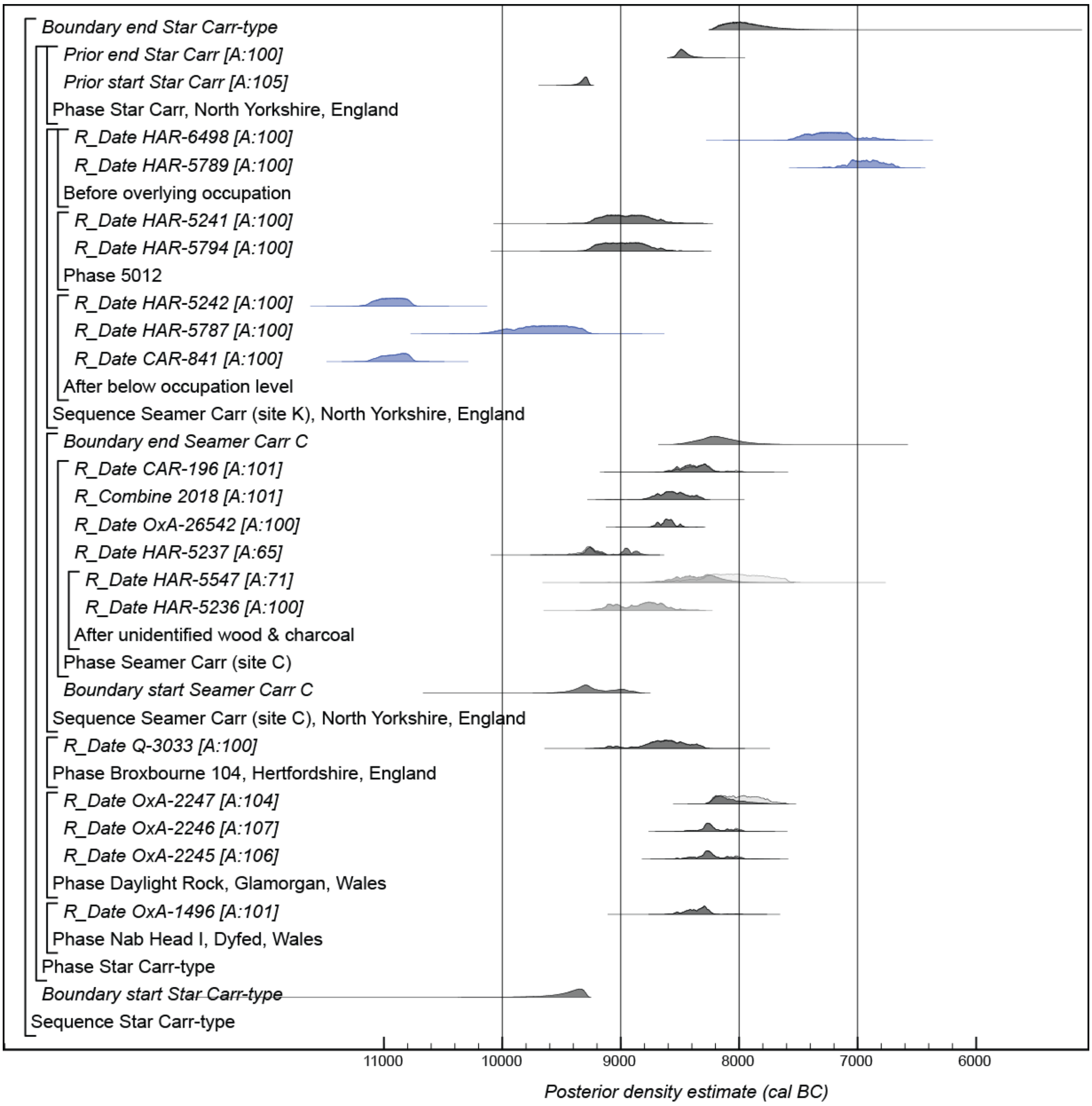


Figure 4. Probability distributions of radiocarbon dates associated with Star Carr-type microliths (the component relating to Star Carr is defined in Milner *et al.* (in press, Appendix 17.1 and key parameters only are shown)). The format is identical to Fig. 3.

Deepcar-type assemblages

The model for Deepcar type assemblages is shown in Figure 5. Dates are available from nine sites, although only Oakhanger V/VII has more than four measurements. Five of these, however, contained a component of unidentified or pine charcoal, and so may have an old wood offset. With this caveat, occupation at Oakhanger is modelled as a continuous period of occupation.

This model suggests that Deepcar type assemblages first appeared in *9460–8705 cal BC (95% probability; start Deepcar-type;* Fig 5), probably in *9090–8775 cal BC (68% probability).*

Deepcar type assemblages disappeared in *8200–7240 cal BC (95% probability; end Deepcar-type;* Fig 5), probably in *8075–7620 cal BC (68% probability).*

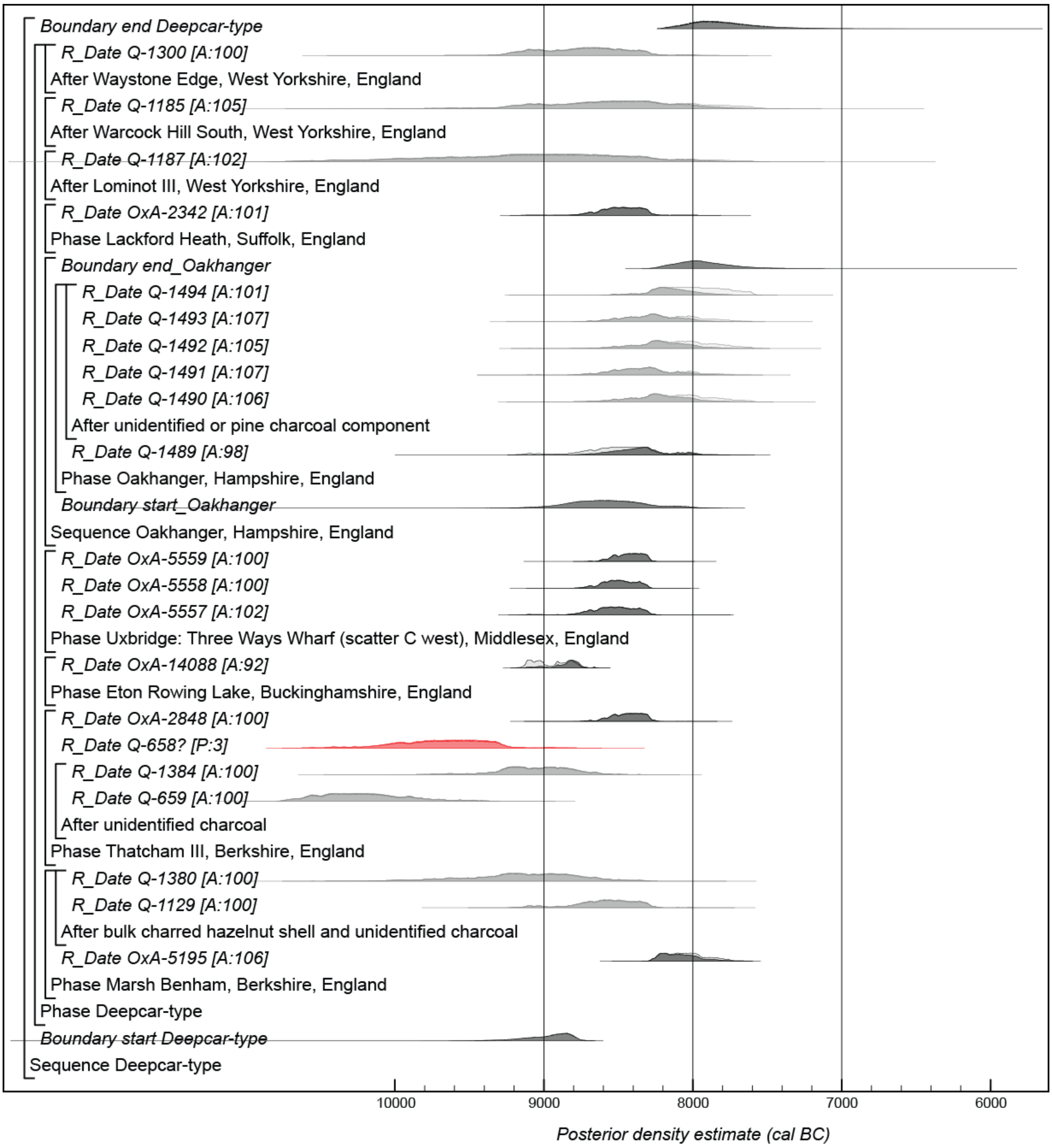


Figure 5. Probability distributions of radiocarbon dates associated with Deepcar-type microliths. The format is identical to Fig. 3.

Basally modified microlith assemblages

The model for basally modified microlith assemblages is shown in Figure 6. Dates are available from four sites. A sequence of deposits has been dated from Crammond (Waddington *et al*. 2007, 216-7, figure 15.12), and occupation there and at Kettlebury 103 has been modelled as a continuous phase of activity.

This model suggests that basally modified microlith type assemblages first appeared in *9280–8305 cal BC (95% probability; start basal modified;* Fig 6), probably in *8690–8335 cal*

BC (68% probability). Basally modified microlith type assemblages disappeared in *7030–5845 cal BC (95% probability; end basal modified type;* Fig 6), probably in *6960–6460 cal BC (68% probability).*

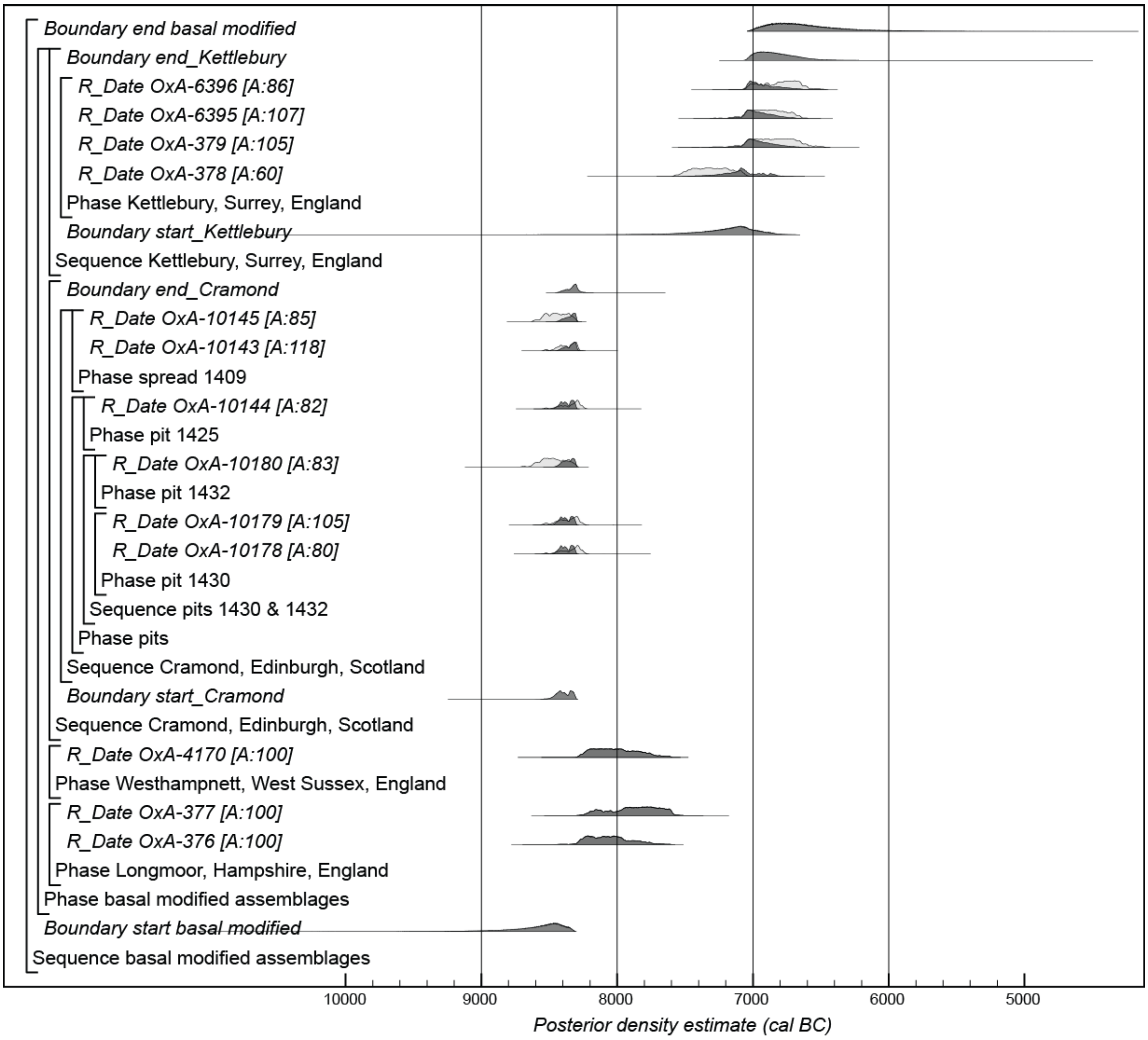


Figure 6. Probability distributions of radiocarbon dates associated with basal modified microliths. The format is identical to Fig. 3.

Small scalene triangles

Our model for the currency of small scalene triangles is shown in Figure 7. This contains dates from 11 sites, but only the Howick hut has more than three measurements. This component is defined by Bayliss *et al.* (2007b, figure 6.2).

This model suggests that small scalene triangles first appeared in *8315–7765 cal BC (95% probability; start scalene triangles;* Fig 7), probably in *8045–7795 cal BC (68% probability).* Our estimated date for the end of the use of scalene triangles has been arbitrarily defined so is not archaeologically meaningful.

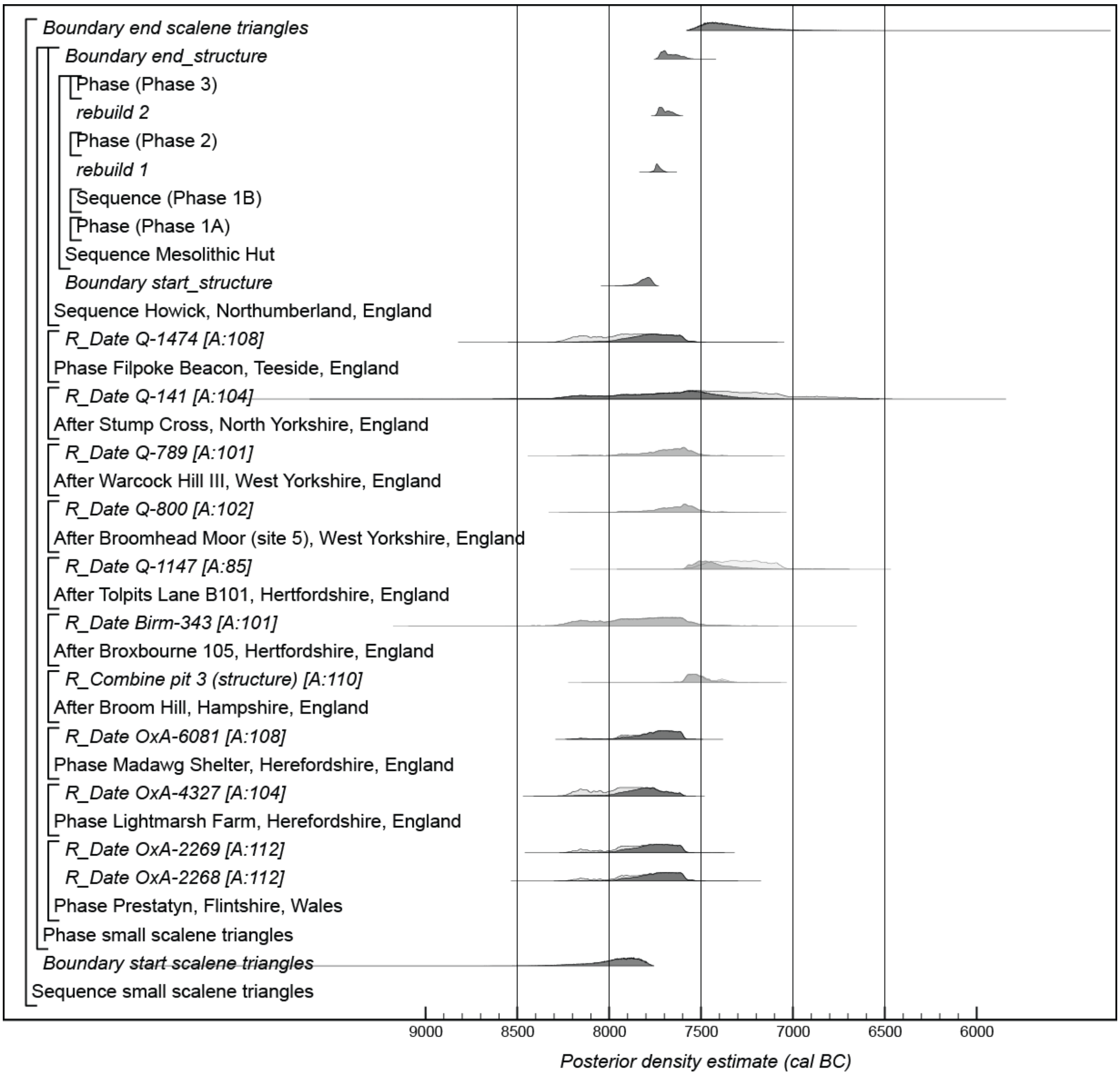
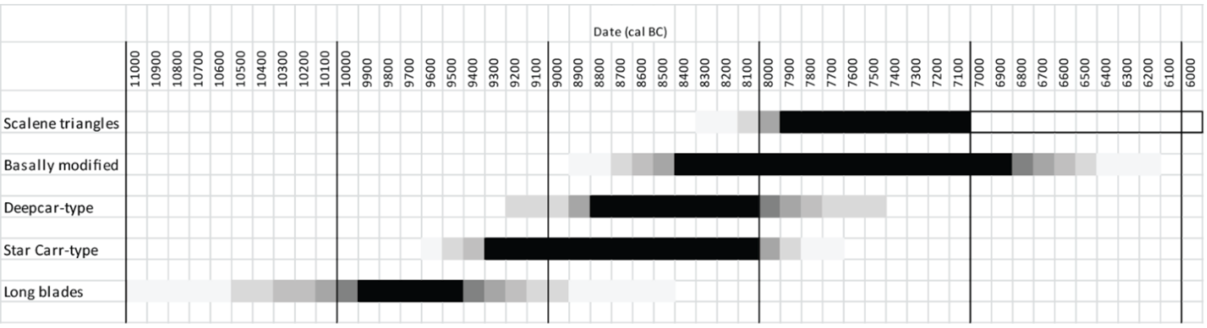


Figure 7. Probability distributions of radiocarbon dates associated with small scalene triangles (the component relating to Howick is defined by Bayliss *et al.* 2007b, fig 6.2 and key parameters only are shown). The format is identical to Fig. 3.

Sequences and transitions

A summary of the currency of different assemblage types is shown in Figure 8.



It is clear (*98% probable*) that Long Blades appeared before all other types considered in this synthesis. It is less clear whether their use overlapped with early Mesolithic types. On the basis of the model defined in Figures 2–7, it is *80% probable* that they continued in use after the first appearance of Star Carr-type assemblages. But the overlap (if it occurred) probably amounts to no more than a few centuries (Fig. 8).

The transition between Long Blades and the early Mesolithic was recently considered by Conneller and Higham (2015, fig 2) and a gap between the two industries was posited. This gap has been closed in the recent analysis, partly on the basis of new dates from Flixton and Star Carr, partly as a result of different measures of selectivity in determining association between dates and archaeological event taken by the two projects, and partially because the use of formal chronological modelling in this study allows us to quantify the uncertainties inherent in our small samples of dated sites.

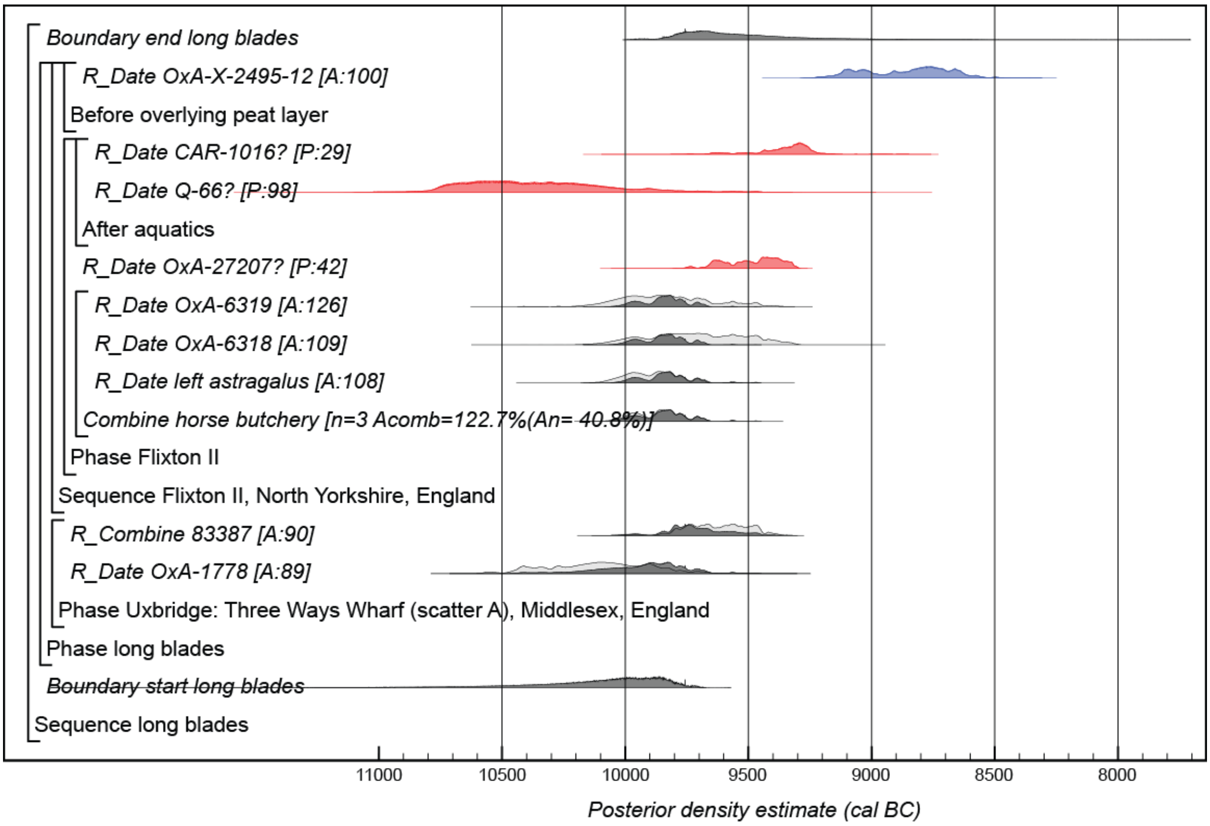


Figure 9. Probability distributions of radiocarbon dates associated with long blade assemblages according to the alternative model described in the text. The format is identical to Fig. 3.

An alternative model was constructed to explore the plausibility of the posited gap. This is of the form shown in Figure 2, with an alternative component relating to long blades shown in Figure 9. In this reading we interpret all the dates on horse bone from Flixton II as the result of a single hunt, and exclude the radiocarbon date on a waterlogged twig from the peat in which the bones were found and two measurements on bulk fractions of the same peat as not securely related to the anthropogenic event. This model also has good overall agreement (Amodel: 64). It suggests that Long Blades first appeared in *11,335–9675 cal BC (95% probability; start long blades;* Fig 9), probably in *10,320–9765 cal BC (68% probability)*, and ceased to be used in *9985–8465 cal BC (95% probability; end long blades;* Fig 9), probably in *9825–93500 cal BC (68% probability).* It suggests that it is *61% probable* that the use of long blade ended before the start of Star Carr-type flint (or, conversely, that it is *39%*

probable that their use overlapped). Within the resolution of the data currently available, both interpretations clearly remain open. The balance of probability between them very much depends on our reading of the accuracy of the various measurements on horse bones from Flixton II (Tables 1 and 2), and on our understanding of the relationship between the sediment unit in which the bones were found and the bones themselves.

Whatever the relationship between the final use of long blades and the introduction of Star Carr-typle assemblages, the model shown in Figure 2 suggests that it is *95% probable* that Deepcar-type assemblages first appeared after the first Star Carr-type assemblages, but it is *100% probable* that their use overlapped in time. Deepcar assemblages probably appeared around half a millennium after the first Star Carr-type assemblages. This finding echoes that of Reynier (2005), and it is interesting that despite a new and comparatively early date for Deepcar-type assemblages from the Eton Rowing Lake (*OxA-14088*; Fig. 5), this difference is still present.

After the appearance of Deepcar-type assemblages (*88% probable*), came the first basally modified assemblages. These assemblages certainly overlapped with the use of Star Carr type assemblages and Deepcar type assemblages (*100% probable*), at least in certain areas of the country.

Scalene triangles appeared next (*98% probable*). Their use certainly overlapped with basally modified assemblages (*100% probable*), and probably overlapped Deepcar-type assemblages (*75% probably*) and possibly Star Carr types as well (*54% probable*). These overlaps, if they occurred, were probably confined to a few centuries around 8000 cal BC (Fig. 8).

Discussion

This analysis provides clarity and greater resolution to the suggestions made by Reynier (2005) that there was a temporal dimension to the use of different Early Mesolithic assemblage types. This has been demonstrated by this study, as has overlap between their uses also suggested by Reynier. These results have a number of important implications. First, this modelling indicates that the use of Long Blade assemblages may have continued well into the Early Holocene. The faunal associations of Long Blade sites (mainly horse) are likely to indicate occupation in the earliest part of the Holocene when relatively open landscapes still persisted. The model also suggests that some Long Blade sites date to the Terminal Pleistocene. The presence of reindeer at Three Ways Wharf might support this. Currently our understanding of the chronology of Long Blade sites in Britain is very limited; our model here is based on two sites, widely separated in space. We cannot currently say whether northern and southern Long Blade sites shared similar settlement chronologies and histories. Our modelling currently suggests there may have been some overlap between Long Blades and the Earliest Mesolithic industries, but if so it would have been of short duration. The only site where there is a stratigraphic relationship (Flixton) would suggest a short gap between the two, though obviously we cannot say there was no activity spanning this gap elsewhere.

The earliest Mesolithic industries do not belong to the very start of the Holocene (c. 9700 cal BC) as often presumed, but begin two or three centuries later. The earliest dated sites, all Star Carr type, are found in Northern England, with the only dated southern Star Carr-type site, Broxbourne 104, falling in the mid-ninth millennium cal BC (*Q-3033*; Fig. 4), This is probably later (*85% probable*) than the earliest Deepcar type site in the south at Eton Rowing Course (*OxA-14088*; Fig. 5). These two sites however are not the earliest for Mesolithic activity in the south of England; earlier dates exist, but these do not have good associations with microlith types. For example, a humanly modified red deer bone from the lowest context (layer 5) of Thatcham V, dates to 9265–9915 cal BC (64% probability; OxA-26540, Table 2; Stuiver and Reimer 1993) or 9075–9055 cal BC (1% probability) or 9015–8910 cal BC (24% probability) or 8910–8845 cal BC (6% probability), probably to 9245–9135 cal BC (57% probability) or 8975–8940 cal BC (11% probability). This is probably earlier than the current dating of both Broxbourne 104 and Eton Rowing Course (*90% probable)*. It is, of course, extremely improbable that OxA-26540 dates the very earliest Mesolithic activity in southern Britain and, without formal modelling to account for the sample of data, it is difficult to determine whether Mesolithic groups really reached northern England first.

These earliest Mesolithic sites are associated with a more varied suite of fauna than Long Blade sites. Reindeer and horse were no more, instead, red deer, elk, aurochs and pig are all found in contexts predating 9000 cal BC. The environmental evidence suggests occupation occurred in lightly wooded landscapes, in contrast to the more open environments of Long Blade groups. Mesolithic groups are present earlier than in Britain further to the east, for example at Bedburg Konigshoven, in Germany (see Milner et al. (in press, chapter 7)). These sites are associated with a varied range of faunal resources, and it may be that Mesolithic groups were sufficiently economically and cosmologically intertwined with these animals, that movement into new areas depended on their presence.

The temporal overlap of these types demands some comment. Star Carr and Deepcar types overlapped, possibly for a millennium, and these two types also overlapped with basally modified types for several hundred years (Fig. 8). However, geography also needs to be considered. The latest dates for Star Carr-type sites derive from the Welsh sites. At this time, in the last centuries of the ninth millennium cal BC, there is no evidence for Star Carr-type sites in southern England and the Star Carr-type occupation of the Vale of Pickering was ending (Fig. 4). There does seem to have been overlap in the south of England in the early ninth millennium cal BC, as outlined above, with the Deepcar-type site from the Middle Thames at Eton Rowing Course and the Star Carr-type site at Broxbourne 104 on the Lea (*85% probable*). At Thatcham III, however, the patinated (and undated) Star Carr assemblage appears on stratigraphic grounds to predate the Deepcar material, so it may be either that in the south there was also chronological difference between the two assemblage-types, just on a more local level.

These hints at regional difference, which cannot yet be teased apart reliably with the few dated sites we have available currently, may have important implications. In northern England groups who made Star Carr assemblages represent pioneer colonisers, moving along the coast, who became established in the Vale of Pickering and made rarer forays into the adjacent uplands of the North York Moors and Central Pennines. These groups may have had a similar role (though at a later date) in south Wales. Star Carr-type sites are rarer in southern England and may represent small-scale pioneer incursions that did not become fully established. The earliest groups using Deepcar-type microliths would initially have been pioneers in southern England, moving along the major river valleys, before becoming fully established in these areas, and spreading into adjacent upland areas a few hundred years later (eg at Oakhanger; Fig. 5). Deepcar sites in the North are poorly dated, but in the Vale of Pickering appear to postdate Star Carr type sites on stratigraphic grounds. If this is also the case in the Pennines, the relatively sporadic Star Carr type visits to the area were succeeded by groups with Deepcar assemblages, for whom the Pennines became a familiar place, repeatedly visited, with Deepcar sites both larger and more numerous in the area.

Jacobi (pers comm.) saw these different microlithic styles as indicative of different Mesolithic groups, colonising Britain from different areas of Europe. This is not an unreasonable proposition to explain Star Carr and Deepcar types, given that Britain was either completely or mostly unoccupied immediately prior to the early Mesolithic, and these represent the earliest populations in the north and the south respectively. The appearance of basally modified microliths, which appear in Britain in the middle of the ninth millennium cal BC (Fig. 6), however, may represent something different. There are indications that these types relate to improvements in projectile technologies (Reynier ref). In this case, we may be seeing the incursion of new groups, or the take-up of advantageous or desirable technologies by existing groups, or perhaps a mixture of the two. A good case can probably be made for the latter, with the appearance of sites in the Midlands for the first time, but elsewhere the new projectiles were differentially adopted across Britain: As has long been noted (eg Clark 1934) groups on the Greensand were extremely enthusiastic in their take-up of these new forms, whereas these projectiles form a more minor component in assemblages from the north and southwest.

Finally, for the purposes of this study, assemblages with small scalene triangles, which traditionally mark the appearance of the late Mesolithic in Britain, appear in the first centuries of the eighth millennium cal BC (Fig. 7). It not possible to discern any geographical trend in their appearance across Britain on the basis of the data currently available (*contra* Waddington 2015), with these type appearing simultaneously in both north and south Wales and in north-east England. Given the more-or-less contemporary disappearance of both Star Carr-type and Deepcar-type assemblages at this time (Fig. 8), however, scalene triangles appear to have been adopted swiftly. The appearance of small scalene triangles has been argued to represent the appearance of refugees from Doggerland, pushed into Britain by rising sea-levels (Waddington 2007). However small scalene triangles have also been argued to represent improvements in projectile technology (Myers 1986), as the increase in number of components and use of smaller lithic elements in a single projectile that occurred at this time represented a technology that was both reliable and maintainable. Myers argues this was more suited to the shift from encounter to intercept hunting which occurred as denser woodland developed, and which led to a reduction in the time available for gearing up. In this context weapons that would not be rendered redundant if a single element became damaged would be an advantage. The decrease in microlith size also permitted a shift to smaller, poor quality raw material, also an advantage when less gearing up time was available and denser woodland might have inhibited travel. The rapidity of the appearance of smaller scalene triangles is likely to better support this latter interpretation, aided perhaps by perceptions of desirability - an early eighth millennium mania for scalene triangles.

Currently assemblages with small scalenes display temporal overlap with basally modified assemblages, entirely on the basis of the suite of late dates from Kettlebury 103. These measurements, on charred hazelnuts, have been re-run and clearly date these hazelnuts accurately. However on typological grounds one might expect the lithic material from Kettlebury to predate Longmoor. Without Kettlebury, there would be a strong case for relatively little overlap between traditionally early and late Mesolithic industries. With so few dates we have no way of understanding the significance of Kettlebury, yet it makes a major difference to how we periodise the British Mesolithic. If Jacobi's suspicions are true, and the dates from Kettlebury do not relate to the lithics, we can retain our current divisions of the Mesolithic, with a rapid shift between early and late Mesolithic at the start of the eighth millennium cal BC. If however the charred hazelnut shells do belong with the lithics we perhaps need to revise our terminology, and argue for the presence of a British Middle Mesolithic, similar to adjacent regions of Europe.

The issue of Kettlebury 103 highlights the problems of relying on so few radiocarbon dates, with interpretations shifting substantially on the basis of a single site, or even a single radiocarbon date. The paucity of dates also means that regional differences in chronology cannot yet be adequately explored. We have hints of regional patterning in the radiocarbon dates for different assemblage types which have important implications for how we understand these in human terms. While we have made what we can of the corpus of radiocarbon dates available to us, the current situation is inadequate; a new dating programme is urgently needed to provide the rich historical detail of Mesolithic lifeways that equivalent work has revealed for the Upper Palaeolithic (Jacobi and Higham 2009; Jacobi and Higham 2011) and Neolithic (Whittle *et al.* 2011).

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Table 1. Radiocarbon and stable isotopic measurements from samples securely associated with the lithic types considered in this study.

Site	Laboratory number	Material and context	Radiocarbon age (BP)	$\delta^{13}C$ (‰)	Modelling approach	Reference
Long blade						
Flixton II, North Yorkshire	CAR-1016	Bulk peat (probably containing aquatics) from around horse astragalus (Finds no. 2711) from test pit AE excavated in 1986.	9850±80	−27.2	TPQ, aquatics	Lane and Schadla-Hall forthcoming
Flixton II, North Yorkshire	Q-66	Organic mud containing scatter of horse bones with evidence for human modification. Too old in comparison with dates for the fauna it contains. Probably contains aquatics.	10413±210		TPQ, aquatics	Godwin and Willis 1959, 66
Flixton II, North Yorkshire	OxA-X-2395-14	*Equus* sp. left astragalus (XB23) from scatter of horse bones with evidence for human modification.	10155±55	−24.6	Fully modelled	Marom et al. 2013
Flixton II, North Yorkshire	OxA-6328	Replicate of OxA-X-2395-14	10150±90	−20.2	Fully modelled	Marom et al. 2013
Flixton II, North Yorkshire	OxA-6319	*Equus* sp. 1st phalanx from scatter of horse bones with evidence for human modification.	10150±80	−20.8	Fully modelled	Marom et al. 2013
Flixton II, North Yorkshire	OxA-6318	*Equus* sp. 1st phalanx from scatter of horse bones with evidence for human modification.	10090±90	−20.8	Fully modelled	Marom et al. 2013
Flixton II, North Yorkshire	OxA-6329	*Equus* sp. bone from scatter of horse bones with evidence for human modification.	9160±80	−20.3	Omitted, inaccurate result	Marom et al. 2013
Flixton II, North Yorkshire	OxA-27207	Waterlogged willow twig from peat [1010] containing horse remains	9975±45	−27.4	Fully modelled	Milner et al forthcoming
Flixton II, North Yorkshire	OxA-x-2495-12	Waterlogged willow twig from peat overlying sand and gravel lens that seals archaeological deposits	9480±90	−26.7	TAQ, constraint	Milner et al forthcoming
Three Ways	OxA-1788	*Equus* sp., molar 83390 from scatter A. F.309. Long	10270±100	−21.0	Fully	Lewis and Rackham

Wharf, Middlesex		blade lithic scatter			modelled	2011
Three Ways Wharf, Middlesex	OxA-1902	*Equus* sp., tooth 83387 from scatter A, F312. Long blade lithic scatter	10010±120	−21.0	Fully modelled	Lewis and Rackham 2011
Three Ways Wharf, Middlesex	OxA-18702	Replicate of OxA-1902	10060±45	−21.5	Fully modelled	Lewis and Rackham 2011
Star Carr						
Broxbourne 104, Hertfordshire	Q-3033	bulked sample of bovid and cervid bone (not examined for cut marks), associated with flint scatter	9350±120		Fully modelled	Jacobi archive
Daylight Rock, Glamorgan	OxA-2245	Charred hazelnut shell fragments in fissure filled with red clay and associated with abundant lithic artefacts on headland above cave	9040±90	−22.2	Fully modelled	David 2007
Daylight Rock, Glamorgan	OxA-2246	Charred hazelnut shell fragments in fissure filled with red clay and associated with abundant lithic artefacts on headland above cave	9030±80	−25.0	Fully modelled	David 2007
Daylight Rock, Glamorgan	OxA-2247	Charred hazelnut shell fragments in fissure filled with red clay and associated with abundant lithic artefacts on headland above cave	8850±80	−25.2	Fully modelled	David 2007
Nab Head I, Dyfed	OxA-1496	Charred hazelnut shell fragments NH80 02, from upper layers of solifluction deposit [context 12] underlying soil with Mesolithic artefacts in sqL6. This square contained mostly early artefacts and shale beads, though some late pieces were also present.	9110±80	−26.0	Fully modelled	David 2007
Prestatyn, Clwyd	OxA-2268	Charred hazelnut shells associated with flint tools, in thin black soil sealed by tufa	8700±100	−23.5	Fully modelled	Bell 2007
Seamer C,	HAR-5237	Bulk peat from context 2506, Trench C XIII (1982).	9800±80	−29.3	Fully	Lane and Schadla-

North Yorkshire		Described as either a 'mid-brown coarse detritus mud/peat with wood and reed frags', or 'upper wood peat', containing struck flint. This should be stratigraphically later than HAR 5236. Given areas of this trench are disturbed and it also contains long blade material, this may reflect mixing of material of different dates.			modelled	Hall forthcoming; Bayliss et al. 2012, 242
Seamer C, North Yorkshire	HAR-5236	Semi-charred, unidentified waterlogged wood from context 5012, trench C XIII (1982), scatter K2. Black-grey sand/peat interface with occasional rounded pebbles & a high organic fraction. Context contained struck flint & ?worked wood	9470±100	−28.6	TPQ, potential old wood offset	Lane and Schadla-Hall forthcoming; Bayliss et al. 2012, 242
Seamer C, North Yorkshire	OxA-26542	Elk/cattle-sized bone, one end charred, from scatter G bone dump, adjacent to early Mesolithic lithic scatter. Sample taken from uncharred end	9340±45	−22.4	Fully modelled	Conneller and Higham 2015
Seamer C, North Yorkshire	HAR-5238	Charcoal, *Salix/Populus* sp. from context 2018, Trench C XVIII. From sand with associated flint	9300±110	−28.2	Fully modelled	Lane and Schadla-Hall forthcoming; Bayliss et al. 2012, 243
Seamer C, North Yorkshire	HAR-5791	Charcoal, *Salix/Populus* sp. from context 2018, Trench C XVIII, From charcoal lens in sand layer 2018, with associated early Mesolithic flint	9340±160	−27.8	Fully modelled	Lane and Schadla-Hall forthcoming; Bayliss et al. 2012, 245
Seamer C, North Yorkshire	CAR-196	Bulked cattle and deer bones from detrital mud associated with mineral erosion deposit & hazelnut. 24.60m OD Context 2132 / 2177? Bone layer 2135, Trench C IX (1979) Seamer G bone layer?	9100±100	−24.2	Fully modelled	Lane and Schadla-Hall forthcoming
Seamer C, North Yorkshire	HAR-5547	Unidentified charcoal from context 5012, Trench C XI (1981) K2 Black-grey sand/peat interface with occasional rounded pebbles & high organic fraction. From immediately below dense flint concentration.	8910±200		TPQ, potential old wood offset	Lane and Schadla-Hall forthcoming; Bayliss et al. 2012, 244

Seamer K, North Yorkshire	CAR-841	Bulk peat from peaty organic layer [5085], top, below early Mesolithic flint horizon	10960±110		TPQ, constraint	Lane and Schadla-Hall forthcoming
Seamer K, North Yorkshire	HAR-5787	Bulk peat and mud from layer [5085] sealed beneath context 5084, and above basal gravels	10040±130	−29.7	TPQ constraint	Lane and Schadla-Hall forthcoming; Bayliss et al. 2012, 244
Seamer K, North Yorkshire	HAR-5789	Peat [5005] adjacent to sample of hafted microliths	8020±90	−28.9	TAQ, constraint	Lane and Schadla-Hall forthcoming; Bayliss et al. 2012, 244–5
Seamer K, North Yorkshire	HAR-6498	Waterlogged wood, *Salix/Populus* sp., possible haft of composite microlithic tool from [5005]	8210±150	−30.8	TAQ, constraint	Lane and Schadla-Hall forthcoming; Bayliss et al. 2012, 246
Seamer K, North Yorkshire	HAR-5794	Charcoal, *Salix/Populus* sp, from 5012 a grey peaty sand interface layer between the main beach/shoreline deposit 5014 & the overlying wood peat 5005. Important flint/bone bearing layer	9590±120	−26.3	Fully modelled	Lane and Schadla-Hall forthcoming; Bayliss et al. 2012, 246
Seamer K, North Yorkshire	HAR-5241	Bulk peat and sand from test-pit Z 306A, context 5067 (this equivalent to 5012 flint layer) Start of organic sedimeneation - from a reed peat 5067 above the sand/peat interface 5098	11000±130	−30.3	Fully modelled	Lane and Schadla-Hall forthcoming; Bayliss et al. 2012, 243
Seamer K, North Yorkshire	HAR-5242	Bulk peat and sand from layer 5069 (equivalent to 5085) black detrital peat beneath sand layer. Test-pit Z 306A, Context 5069	9560±120	−22.8	TPQ, constraint	Lane and Schadla-Hall forthcoming; Bayliss et al. 2012, 243
Warcock Hill South, West Yorkshire	Q-1185	Bulked unidentified charcoal curated from Francis Buckley's 1920s excavation. Believed to be associated with early Mesolithic microliths	9210±340		TPQ, potential old wood offset	Jacobi 1978

Deepcar						
Eton Rowing Lake, Buckinghamshire	OxA-14088	*Bos primigenius* sacrum, found in same layer as principle flint concentration. Context 1664 fn 378	9540±45	−22.2	Fully modelled	Allen et al. 2013
Lackford Heath, Suffolk	OxA-2342	Resin adhering to flint within coherent flint assemblage, within dark sediment originally interpreted as a structure	9240±110	−29.1	Fully modelled	Roberts et al. 1998
Lominot III, West Yorkshire	Q-1187	Bulked unidentified charcoal, believed excavated at same time as early Mesolithic flint assemblage(s)	9565±470		TPQ, potential old wood offset	Jacobi 1978
Marsh Benham, Berkshire	Q-1380	Bulked hazel charcoal and unidentified wood in apparent association with lithics	9690±240		TPQ, potential old wood offset	Switsur and Jacobi 1979, 57
Marsh Benham, Berkshire	Q-1129	Bulked hazelnut and unidentified wood in apparent association with lithics	9300±150		TPQ, potential old wood offset	Switsur and Jacobi 1979, 57
Marsh Benham, Berkshire	OxA-5195	Charred hazelnut shell in apparent association with lithics	8905±80	−23.7	Fully modelled	Reynier 2002
Oakhanger Warren Site VII, Hampshire	Q-1489	Bulked charred hazelnut shells from level 2 at Oakhanger Warren (Site VII)	9225±170		Fully modelled	Switsur and Jacobi 1979, 54
Oakhanger Warren Site VII, Hampshire	Q-1491	Bulked pine charcoal from level 2 at Oakhanger Warren (Site VII)	9100±160		TPQ, potential old wood offset	Switsur and Jacobi 1979, 54

Oakhanger V/ VII, Hampshire	Q-1493	Bulked pine charcoal from level 2 at Oakhanger Warren (Site VII)	9040±160		TPQ, potential old wood offset	Switsur and Jacobi 1979, 54
Oakhanger V/ VII, Hampshire	Q-1490	Bulked pine charcoal from phase 1 or 2	8995±160		TPQ, potential old wood offset	Switsur and Jacobi 1979, 54
Oakhanger V/VII, Hampshire	Q-1492	Bulked pine charcoal from phase 2?	8975±160		TPQ, potential old wood offset	Switsur and Jacobi 1979, 54
Oakhanger V/VII, Hampshire	Q-1494	Bulked pine and hazel charcoal from phase 2	8885±160		TPQ, potential old wood offset	Switsur and Jacobi 1979, 54
Thatcham III, Berkshire	Q-659	Bulked unidentified charcoal and hazelnut shells from hearth in square G5, 3-5, 7-8	10365±170		TPQ potential old wood offset	Wymer 1962
Thatcham III, Berkshire	Q-1384	Bulked unidentified charcoal from hearth in square E4.4	9665±170		TPQ potential old wood offset	Jacobi archive
Thatcham III, Berkshire	OxA-2848	Resin adhering to flake. No location information	9200±90	−28.8	Fully modelled	Roberts et al. 1998
Thatcham, Berkshire III	Q-658	Bulked charred hazelnut shells from hearth in square F3-4, 1&3	10030±170		Omitted, inaccurate result	Wymer 1962
Three Ways	OxA-5557	*Cervus elaphus* tooth (84084) from scatter C west	9280±110	−21.4	Fully	Lewis and Rackham

Wharf, Middlesex					modelled	2011; Bayliss et al. 2015, 189
Three Ways Wharf, Middlesex	OxA-5558	*Capreolus capreolus,* mandibular tooth (90377) from scatter C west	9265±80	−23.0	Fully modelled	Lewis and Rackham 2011; Bayliss et al. 2015, 190
Three Ways Wharf, Middlesex	OxA-5559	*Cervus elaphus*, maxillary tooth from scatter C west	9200±75	−21.3	Fully modelled	Lewis and Rackham 2011; Bayliss et al. 2015, 190
Waystone Edge, West Yorkshire	Q-1300	Bulked unidentified charcoal from hearth pit?	9396±210		TPQ, potential old wood offset	Jacobi 1978
Basally modified						
Crammond, Edinburgh	OxA-10180	Charred hazelnut shell from CR95/1066 [1431], the fill of a shallow scoop 1432 containing hazelnuts and lithic artefacts cut into side of pit [1430], sealed by [1409]	9250±60	−26.0	Fully modelled	Lawson 2001, Saville 2008
Crammond, Edinburgh	OxA-10145	Charred hazelnut shell from CR95/291 [1409] circular spread of silt with hazelnuts and lithic artefacts sealing rubbish pits under possible old topsoil	9230±50	−24.9	Fully modelled	Lawson 2001, Saville 2008
Crammond, Edinburgh	OxA-10143	Charred hazelnut shell from CR95/291 [1409] circular spread of silt with hazelnuts and lithic artefacts sealing rubbish pits under possible old topsoil	9150±45	−23.5	Fully modelled	Lawson 2001, Saville 2008
Crammond, Edinburgh	OxA-10179	Charred hazelnut shell from CR95/958 [1426] level K the fill of central pit [1430] containing hazelnuts and lithic artefacts	9130±65	−23.9	Fully modelled	Lawson 2001, Saville 2008
Crammond, Edinburgh	OxA-10144	Charred hazelnut shell from CR95/283 [1402] the fill of a small truncated pit [1425] sealed by [1409]	9110±60	−23.1	Fully modelled	Lawson 2001, Saville 2008

Crammond, Edinburgh	OxA-10178	Charred hazelnut shell from CR95/956 [1426] level M the fill of central pit [1430] containing hazelnuts and lithic artefacts	9105±65	−23.3	Fully modelled	Lawson 2001, Saville 2008
Kettlebury 103, Surrey	OxA-378	Charred hazelnut shells from box H10.7	8270±120	assumed −25.0	Fully modelled	Reynier 2002, 226
Kettlebury 103, Surrey	OxA-379	Charred hazelnut shells from box 18.9	7940±120	assumed −25.0	Fully modelled	Reynier 2002, 226
Kettlebury 103, Surrey	OxA-6395	Charred hazelnut shells from box 46A at 20cm depth	7990±90	assumed −25.0	Fully modelled	Reynier 2002, 226
Kettlebury 103, Surrey	OxA-6396	Charred hazelnut shells from box 16B at 27cm depth	8573±110	assumed −25.0	Fully modelled	Reynier 2002, 226
Longmoor, Hampshire	OxA-376	Charred hazelnut shell L1, from within scatter of flint artefacts in bleached horizon of humus-iron podsol	8930±100	assumed −25.0	Fully modelled	Gillespie et al. 1985, Reynier 2002, 226
Longmoor, Hampshire	OxA-377	Charred hazelnut shell, from within scatter of flint artefacts in bleached horizon of humus-iron podsol	8760±110	assumed −25.0	Fully modelled	Gillespie et al. 1985, Reynier 2002, 226
Westhampnett, Sussex	OxA-4170	Charred hazelnut shells from a shallow pit 40434 up to 50cm below topsoil, found with a number of Mesolithic flints and a wider flint scatter recovered by fieldwalking. Area 4.	8880±100	−24.6	Fully modelled	Fitzpatrick et al. 2008
Scalene triangles						
Broomhead Moor site 5, South Yorkshire	Q-800	Unidentified bulked charcoal from archaeological layer	7890±80		TPQ, potential old wood offset	Radley et al. 1974, Switsur and Jacobi 1975
Broomhill, Hampshire	Q-1192	Unidentified bulked charcoal from base of pit 3	8540±150	assumed −25.0	TPQ, potential old wood offset	O'Malley and Jacobi 1978

Broomhill, Hampshire	Q-1383	Unidentified bulked charcoal from base of pit 3	8315±150	assumed −25.0	TPQ, potential old wood offset	O'Malley and Jacobi 1978
Broomhill, Hampshire	Q-1528	Unidentified bulked charcoal from base of pit 3	8515±150	assumed −25.0	TPQ, potential old wood offset	O'Malley and Jacobi 1978
Broxbourne 105, Hertfordshire	Birm-343	Waterlogged wood (pine), from 0.51m. Base of wood peat, Mesolithic hearth also at base of wood peat. TPQ for hearth	8700±170		TPQ, potential old wood offset	Shotton and Williams 1973
Filpoke Beacon, Co. Durham	Q-1474	Bulked charred hazelnut shells from a black band of charred hazelnuts, beneath which is a white layer of ash and calcified bone fragments. The artefacts came from within or just above the black band	8760±140		Fully modelled	Jacobi 1976, 71
Lightmarsh Farm, Herefordshire	OxA-4327	Charred hazelnut shells from pit or tree throw containing late Mesolithic microliths	8800±80	−25.2	Fully modelled	Hedges et al. 1994, 352
Madawg Shelter, Herefordshire	OxA-6081	Charred sloe seed, found 1cm from charred scalene triangle	8710±70	−26.2	Fully modelled	Barton and Roberts 1996
Prestatyn, Clwyd	OxA-2269	Charred hazelut shells associated with flint tools, in thin black soil sealed by tufa	8730±90	−23.6	Fully modelled	Bell 2007
Stumps Cross, North Yorkshire	Q-141	Bulk unidentified charcoal from undisturbed organic mud of small pool associated with lithic scatter	8450±310		TPQ, potential old wood offset	Walker 1956
Tolpits B101, Hertfordshire	Q-1147	Bulked charcoal, probably oak and maple, from F1, a small pit	8260±150		TPQ, potential	Jacobi archive

					old wood offset	
Warcock Hill site III, West Yorkshire	Q-789	Bulked charcoal (*Quercus* sp. and *Betula* sp.) from 3 cooking pits, excavated by Francis Buckley. Charcoal from Pit 5 dug into underlying shale and thin overlying grey sand. Occurrence of distinctive banded chert on floor and in pits suggested they were contemporary and dug during the occupation.	8606±110		TPQ, potential old wood offset	Radley et al. 1974

Table 2. Radiocarbon and stable isotopic measurements from sites with radiocarbon dates and similar lithic assemblages to those considered in this study, where the typological character of the assemblage or association with the dated material is currently uncertain (some measurements with good lithic associations which we consider anomalous for scientific reasons are also listed).

Site	**Laboratory number**	**Context**	**Radiocarbon age (BP)**	**δ^{13}C (‰)**	**Reason for omission from Table 1**	**Reference**
Broomhill, Hampshire	Q-1191	bulked charred hazelnut shell from 5cm above pit 3 infill	7720±120	assumed −25.0	While the base of pit 3 is associated with scalene triangles, the top of pit 3 is associated with more complex microlith forms	O'Malley and Jacobi 1978
Broomhill, Hampshire	Q-1460	bulked unidentified charcoal from clay at top of pit 3	7750±120	assumed −25.0	While the base of pit 3 is associated with scalene triangles, the top of pit 3 is associated with more complex microlith forms	O'Malley and Jacobi 1978
Broxbourne 105, Hertfordshire	Birm-343	waterlogged wood (pine?) from 0.51m k9-20". Base of wood peat, above Mesolithic hearth	8700±170		6" above hearth, so possible TPQ, but old wood effect on pine/unidentified wood makes this problematic	Shotton and Williams 1973
Broxbourne 106, Hertfordshire	Q-1583	bulked unidentified mammal and pig bone with no definite association but Horsham	8780±150		Unpublished, lithic types uncertain	Jacobi archive

		point recovered from this section				
Broxbourne 106A, Hertfordshire	Q-1146	bulked waterlogged hazelnuts from same thin peat as microliths	9360±150		Unpublished, lithic types uncertain	Jacobi archive
Carrick, Midross 5.1, Argyll and Bute	SUERC-14309	charred hazelnut shell from a series of pits and hearths	8905±35	−26.5	Unpublished, lithic types uncertain	Macgregor 2009
Carrick, Midross 5.1, Argyll and Bute	SUERC-19337	charred hazelnut shell from a series of pits and hearths	8820±30	−23.9	Unpublished, lithic types uncertain	Macgregor 2009
Carrick, Midross 5.1, Argyll and Bute	SUERC-19340	charred hazelnut shell from a series of pits and hearths	8810±30	−24.5	Unpublished, lithic types uncertain	Macgregor 2009
Carrick, Midross 5.1, Argyll and Bute	SUERC-19345	charred hazelnut shell from a series of pits and hearths	8820±30	−21.4	Unpublished, lithic types uncertain	Macgregor 2009
Carrick, Midross 5.1, Argyll and Bute	SUERC-19356	charred hazelnut shell from a series of pits and hearths	8750±30	−25.0	Unpublished, lithic types uncertain	Macgregor 2009
Carrick, Midross 5.1, Argyll and Bute	SUERC-21267	charred hazelnut shell from a series of pits and hearths	8885±35	−24.3	Unpublished, lithic types uncertain	Macgregor 2009
Crathes, Warren Field, Aberdeenshire	SUERC-12266	sample S2006-19; bulked charcoal (Salicaceae and *Corylus* sp.) from context 06/11, from pit 6 in pit alignment.	8850±40	−26.1	No associated lithics	Gaffney et al. 2013
Daer Resevoir 2,	AA-30354	birch charcoal from pit	8055±75	−25.1	Unpublished, lithic types uncertain	Ward 1998

South Lanarkshire		associated with lithic scatters				
Daer Resevoir 2, South Lanarkshire	AA-30354	Pomoideae charcoal from pit associated with lithic scatters	9075±80	−26.7	Unpublished, lithic types uncertain	Ward 1998
East Barns, East Lothian	AA-54960	charred hazelnut shell from post hole	8985±70	−23.0	Unpublished, lithic types uncertain	Gooder 2007
East Barns, East Lothian	AA-54961	charred hazelnut shell from post hole	8830±70	−24.0	Unpublished, lithic types uncertain	Gooder 2007
East Barns, East Lothian	AA-54962	charred hazelnut shell from post hole	8835±70	−24.3	Unpublished, lithic types uncertain	Gooder 2007
Eton Rowing Course, Buckinghamshire	OxA-9411	waterlogged seeds (*Schoenoplectus* sp.) from context 16740, a layer which included charred bulrush seeds and stems	9560±55	−24.8	Not associated with lithics	Allen et al. 2013
Faraday Road, Berkshire	R-24999/2[1]	*Sus scrofa* bone from eastern occupation scatter	9418±60	−24.0	Contains basally modified material and deepcar type microliths	Ellis et al. 2003
Fife Ness, Fife	AA-25202	charred hazelnut shell from fill of pit F84	8275±65	−26.4	This assemblge is dominated by crescents, and very similar to Crammond, but however lacks basally modified types. It is likely to be of the same type as Crammond, but this type need to be more precisely defined by techno-typological study	Wickham-Jones and Dalland 1998
Fife Ness, Fife	AA-25203	charred hazelnut shell from fill of pit F84	8340±60	−24.5	see above	Wickham-Jones and Dalland

[1] This measurement was originally published under the internal laboratory tracking number (R-24999/2). This is incorrect and the measurement should in future be identified by its internationally agreed unique identifier: NZA-**** (ex info Rafter Radiocarbon).

						1998
Fife Ness, Fife	AA-25204	charred hazelnut shell from fill of pit F70	8505±75	−23.5	see above	Wickham-Jones and Dalland 1998
Fife Ness, Fife	AA-25205	charred hazelnut shell from fill of pit F70	8405±60	−24.9	see above	Wickham-Jones and Dalland 1998
Fife Ness, Fife	AA-25206	charred hazelnut shell from fill of pit F63	8355±60	−23.6	see above	Wickham-Jones and Dalland 1998
Fife Ness, Fife	AA-25207	charred hazelnut shell from fill of pit F63	8420±65	−24.2	see above	Wickham-Jones and Dalland 1998
Fife Ness, Fife	AA-25208	charred hazelnut shell from fill of pit F61	8510±70	−23.6	see above	Wickham-Jones and Dalland 1998
Fife Ness, Fife	AA-25209	charred hazelnut shell from fill of pit F61	8475±75	−26.8	see above	Wickham-Jones and Dalland 1998
Fife Ness, Fife	AA-25210	charred hazelnut shell from occupation layer F46	8410±60	−21.8	see above	Wickham-Jones and Dalland 1998
Fife Ness, Fife	AA-25211	charred hazelnut shell from occupation layer F46	8460±85	−25.7	see above	Wickham-Jones and Dalland 1998
Fife Ness, Fife	AA-25212	charred hazelnut shell from lower fill of pit F41	8545±65	−22.9	see above	Wickham-Jones and Dalland 1998

Fife Ness, Fife	AA-25213	charred hazelnut shell from lower fill of pit F41	8495±65	−25.2	see above	Wickham-Jones and Dalland 1998
Fife Ness, Fife	AA-25214	charred hazelnut shell from upper fill of pit F41	8510±65	−23.2	see above	Wickham-Jones and Dalland 1998
Fife Ness, Fife	AA-25215	charred hazelnut shell from upper fill of pit F41	8490±60	−24.7	see above	Wickham-Jones and Dalland 1998
Flixton II, North Yorkshire	OxA-20322	*Equus* sp. left astragauls (XB23) from scatter of horse bones with evidence for human modification	9626±39	−21.3	Humic acid contamination	Marom et al. 2013
Flixton II, North Yorkshire	OxA-20356	replicate of OxA-20322	9640±40	−21.2	Humic acid contamination	Marom et al. 2013
Flixton II, North Yorkshire	OxA-21175	replicate of OxA-20322	9290±45	−20.5	Humic acid contamination	Marom et al. 2013
Flixton II, North Yorkshire	OxA-20695	*Equus* sp. 1st phalanx from scatter of horse bones with evidence for human modification.	9920±45	−20.5	Humic acid contamination	Marom et al. 2013
Flixton II, North Yorkshire	OxA-20696	replicate of OxA-20695	9975±45	−21.0	Humic acid contamination	Marom et al. 2013
Flixton II, North Yorkshire	OxA-27340	*Equus* sp. tooth (Find no 100210), from scatter of horse bones with evidence for human modification.	9860±50	−21.1	Humic acid contamination	Milner et al. forthcoming
Flixton II, North Yorkshire	OxA-27341	*Equus* sp. bone (Find no 100865), from scatter of	10055±50	−20.7	Humic acid contamination	Milner et al. forthcoming

		horse bones with evidence for human modification.				
Fordhouse Barrow, Aberdeenshire	OxA-10057	charred hazelnut shell from pit 20	7890±50	−23.9	Unpublished, lithic types uncertain	Proudfoot 2001, 122
Fordhouse Barrow, Aberdeenshire	OxA-10058	charred hazelnut shell from layer 330	7920±50	−25.1	Unpublished, lithic types uncertain	Proudfoot 2001, 122
Fordhouse Barrow, Aberdeenshire	OxA-10059	charred hazelnut shell from pit 21	8255±55	−23.2	Unpublished, lithic types uncertain	Proudfoot 2001, 122
Fordhouse Barrow, Aberdeenshire	OxA-8225	charred hazelnut shell from pit 21	8100±45	−23.1	Unpublished, lithic types uncertain	Proudfoot 1999
Greenham Dairy Farm, Berkshire	OxA-5194	charred hazelnut associated with early Mesolithic microliths	9120±80	−23.2	Mainly deepcar but also contains basally modified forms	Reynier 2005
Greenham Dairy Farm, Berkshire	Q-973	bulked animal bone (*Cervus elaphus*, *Capreolus capreolus*, and *Sus scrofa*), not cut-marked. From unpublished Newbury Group excavations	8779±110		Bulked sample from unknown area of site, that despite Deepcar dominance also includes basally modified types	Switsur and West 1973
Greenham Dairy Farm, Berkshire	Q-973	bulked animal bone (*Cervus elaphus*, *Capreolus capreolus*, and *Sus scrofa*), not ot cut-marked. From unpublished Newbury Group excavations	8779±110		From unknown area of site, that despite Deepcar dominance also includes basally modified types	Switsur and West 1973, 542

Greylake, Somerset	Wk-30930	human bone (cranium E22) from probable cemetery site, found during quarrying in 1930s	9118±37	−19.4	No demonstrated association between lithics and human remains	Brunning and Firth 2012
Greylake, Somerset	Wk-30931	human bone (cranium E23) from probable cemetery site, found during quarrying in 1930s	9134±37	−20.4	No demonstrated association between lithics and human remains	Brunning and Firth 2012
Kinloch, Isle of Rhum	GU-1873	bulked charred hazelnut shell from pit AD5	8590±95	−24.9	Range of microlith types on this site, from obliquely blunted points, possible basally modified material and scalene triangles	Wickham-Jones 1990
Kinloch, Isle of Rhum	GU-1874	replicate of GU-1873	8515±190	−23.8	see above	Wickham-Jones 1990
Kinloch, Isle of Rhum	GU-2039	bulked charred hazelnut shell from fill of pit complex BA4/5	7925±65	−25.3	see above	Wickham-Jones 1990
Kinloch, Isle of Rhum	GU-2149	replicate of GU-2039	7570±50	−25.3	see above	Wickham-Jones 1990
Kinloch, Isle of Rhum	GU-2040	bulked charred hazelnut shell from lower fill of pit AJ	8560±75	−25.1	see above	Wickham-Jones 1990
Kinloch, Isle of Rhum	GU-2145	bulked charred hazelnut shell from fill of pit BA3	7850±50	−25.0	see above	Wickham-Jones 1990
Kinloch, Isle of Rhum	GU-2146	bulked charred hazelnut shell from fill of pit BA1	8080±50	−25.0	see above	Wickham-Jones 1990
Kinloch, Isle of Rhum	GU-2147	bulked charred hazelnut shell from fill of hollow BA10	7880±70	−25.5	see above	Wickham-Jones 1990

Kinloch, Isle of Rhum	GU-2150	bulked charred hazelnut shell from hollow BA S2	8310±150	−25.7	see above	Wickham-Jones 1990
Madawg Shelter, Herefordshire	OxA-6113	charred hazelnut shell in layer with late Mesolithic flint just above concentration of pierced cowries	8930±70	−25.9	Uncertain lithic associations	Barton and Roberts 1996
Manor Bridge, Peebles	SUERC-1177A	a single charred hazelnut shell (A) from medium brown sand deposit 007 (pit/scoop fill?) with hazelnuts, burnt lithics and heat affected rocks, overlying 106, natural with possible heat markings	9190±45	−24.6	A variety of microlith forms recovered	Warren 2001
Manor Bridge, Peebles	SUERC-1177B	a single charred hazelnut shell (B) from medium brown sand deposit 010 (pit/scoop fill?) with hazelnuts, burnt lithics, heat affected stone, overlying 106, natural with possible heat markings	9020±55	−23.2	A variety of microlith forms recovered	Warren 2001
Money Howe I, North Yorkshire	Q-1560	unidentified charcoal from margin of lithic scatter	9430±390		Microlith types uncertain	Switzur and Jacobi 1979
Mother Grundy's Parlour, Derbyshire	OxA-3394	charred hazelnut shells from E IV, B/C, scree deposits outside cave.	8730±95	−27.4	Possible associated with basally modified forms, but archive study needed to confirm this	Campbell 1977
Mother Grundy's Parlour, Derbyshire	OxA-3397	charred hazelnut shells from E IV, B/C, scree deposits outside cave.	8900±90	−27.7	Possible associated with basally modified forms, but archive study needed to confirm this	Campbell 1977

Mother Grundy's Parlour, Derbyshire	OxA-3399	unmodified bovid tooth from scree outside cave	9910±90	−18.9	Unmodified tooth, association with human activity undemonstrated	Campbell 1977
Mother Grundy's Parlour, Derbyshire	OxA-3453	large herbivore rib bone with embeded flint. From scree outside cave	8960±95	−18.3	Possible associated with basally modified forms, but archive study needed to confirm this	Campbell 1977
Mother Grundy's Parlour, Derbyshire	Q-551	bulked charred hazelnut shell and unidentified charcoal from outside cave, E-F, II-IV, layer B	8800±300		Possible associated with basally modified forms, but archive study needed to confirm this	Campbell 1977
Newbury Sewage works, Berkshire	BM-2744	bulked charred hazelnut shells from layer 3 at NW edge of square 108/510	9100±80	−23.3	Mainly Deepcar type but also contains basally modified and late forms	Healy et al. 1992
Redhill Marsh, Cornwall	GU-1739	waterlogged wood, *Salix* sp., from immediately above layer of birch bark strips, apparently human-laid	8685±85	−27.5	No associated artefactual material	Walker and Austin 1985, 15-21
Rhuddlan E, Clwyd	BM-691	bulked charred hazelnuts from lens of black sand and hazelnuts in hollow J104. Both early and late Mesolithic activity present	8739±86		Microlith types uncertain. This could be Star Carr-type, but the small obliquely blunted points, crescents and strong left lateralisation would fit best with basally modified assemblage type, though none of these types are themselves present	Quinnell et al. 1994
Seamer B, North Yorkshire	BM-1841R	aurochs bone from butchery site, context 5007. Possible humic acid contamination	8740±120	−23.2	No associated microlith forms	Lane and Schadla-Hall forthcoming
Seamer C, North Yorkshire	CAR-197	unidentified bulk charcoal sample 2157, Grid square 146/116, Trench C IX	9260±90	−26.0	No associated microlith forms	Lane and Schadla-Hall forthcoming

		(1979). Charcoal associated with flint layer at lake edge. 25.13m OD. This is supposed to be associated with flint scatter yet there isn't any flint in the square mentioned				
Seamer C, North Yorkshire	HAR-5790	bulk peat from alongside & below bone in deep peat (Zone IV/V), & near a pollen monolith - but where from?	9520±90	−29.3	No known microliths associated	Lane and Schadla-Hall forthcoming; Bayliss et al 2012, 245
Seamer C, North Yorkshire	HAR-5792	unidentified bulk charcoal from large pit of presumed early Mesolithic origin, but stratified above HAR-5793. Probably residual evidence of the Long Blade occupation of the site	9990±140	−29.2	Stratified in pit above HAR-5793, which produced a later date. May be residual from the Long Blade occupation	Lane and Schadla-Hall forthcoming; Bayliss et al 2012, 245
Seamer C, North Yorkshire	HAR-5793	bulk charcoal (*Salix/Populus* sp.) from same pit as HAR-5792 but from a greater depth	9320±150	−28.2	Stratified in pit below HAR-5792, which produced an earlier date.	Lane and Schadla-Hall forthcoming; Bayliss et al 2012, 245
Seamer F, North Yorkshire	HAR-5239	bulk peat from context 5005, below the mineral level and possibly signifying a zone V lake deposit; 27.057m OD	8730 ± 90	−30.1	Insufficient microliths	Lane and Schadla-Hall forthcoming; Bayliss et al 2012, 243
Seamer F, North Yorkshire	HAR-5240	unidentified wood and peat associated with bone	9100 ± 90	−25.9	Insufficient microliths	Lane and Schadla-Hall

		from zone V-VI deposit, Z441, context 5005				forthcoming; Bayliss et al 2012, 243
Seamer L, North Yorkshire	OxA-19511	*Equus ferus* from long blade flint scatter	10025±45	−20.7	Omitted on cautionary principle given anomalous results produced by ultrafiltration at Flixton II	Conneller and Higham 2015, 160
Seamer L, North Yorkshire	BM-2350	*Equus ferus* right mandibular ramus (NHM registration no. ARC 84.5103) from long Blade flint scatter. Context 5012/ 5100, sample 11933/4	9790±180	−24.1	Too young, humic and fulvic contaminants not properly removed	Lane and Schadla-Hall forthcoming
Seamer N, North Yorkshire	HAR-5243	bulk peat from context 5012, Z313A; from immediately above the mineral levels in an area where flint of early Meolithic type was recovered	10190 ± 110	−28.3	Date too young for context. No known lithics	Lane and Schadla-Hall forthcoming; Bayliss et al. 2012, 243−4
Seamer N, North Yorkshire	OxA-1030	*Canis familiaris*, vertebra (finds no. 20561), from bone group 5120 in context 5005, an upper wood peat that sealed the main early Mesolithic horizon. Co-ordinates: site N 86.40/68.60	9940±100	−14.7	No known microlithic associations	Lane and Schadla-Hall forthcoming
Sewerby Cottage Farm, East Yorkshire	OxA-11658	single fragment of alder charcoal, residual from Neolithic midden	9210±110	−26.5	No known microlithic associations	Fenton Thomas 2009, 294–301
Strawberry Hill Reservoir,	OxA-3040	charcoal (*Pinus* sp.), could represent residual early	9350±120	−22.1	No microlith associations	Hedges et al. 1992, 145

Wiltshire		mesolithic burning or relate to natural processes.				
Thatcham IV, Berkshire	OxA-732	*Cervus elaphus* antler from floodplain deposits; probably the edge of the same small pond as Thatcham V	9760±120		No microlith associations	Gowlett et al. 1987, 127
Thatcham IV, Berkshire	OxA-894	*Alces alces* burnt antler from wetland area dug by mechanical excavator	9490±110		No microlith associations	Gowlett et al. 1987, 127
Thatcham V, Berkshire	OxA-26538	*Sus scrofa*, cut-marked humerus (ARC 70.3014) from Th V layer 3, a peaty calcareous silt. Possible PVA contamination	9580±45	−22.4	Insufficient microliths	Conneller and Higham 2015
Thatcham V, Berkshire	OxA-26539	*Cervus elaphus*, metatarsal (ARC 70.3016) fractured for marrow from Th V layer 4. Grey marl containing artefacts and faunal remains. Possible PVA contamination	9560±45	−22.8	Insufficient mi5191 croliths	Conneller and Higham 2015
Thatcham V, Berkshire	OxA-26540	*Cervus elaphus*, metatarsal (ARC 70.3016) fractured for marrow from ThV layer V. White marl, lowest context of pond, containing artefacts and faunal remains. Possible PVA contamination	9675±45	−22.3	Insufficient microliths	Conneller and Higham 2015
Thatcham V,	OxA-5190	*Capreolus capreolus* bone	9430±100	−22.2	Insufficient microliths	Reynier 2005

Berkshire		and OxA-5191 are from lowest level, layer 5, of site. The human modification of the bones suggests settlement some time earlier than the main early Mesolithic settlement. Preservatives cannot be ruled out entirely.				
Thatcham V, Berkshire	OxA-5191	*Cervus elaphus* 1st phalanx from from lowest level, layer 5, of site. The human modification of the bones suggests settlement some time earlier than the main early Mesolithic settlement. Preservatives cannot be ruled out entirely.	9510±90	−21.8	Insufficient microliths	Reynier 2005
Thatcham V, Berkshire	OxA-5192	charred hazelnut shell from layer 2.	9400±80	−23.3	Insufficient microliths	Reynier 2005
Thatcham V, Berkshire	Q-650	unidentified waterlogged wood from layer 4 'grey marl' of pond infilled with peat and tufa. Contains artefacts and faunal remains	9670±160		Insufficient microliths	Wymer 1962
Thatcham V, Berkshire	Q-651	waterlogged wood (*Betula/Pinus* sp.), from layer V, white algal marl, lowest layer of small pond. Contains artefacts and faunal remains.	9840±160		Insufficient microliths	Wymer 1962

Thatcham V, Berkshire	Q-652	waterlogged wood (Pinus sp), from layer 2 or 3, nodular algal marl (probably tufa) or peaty calcareous silt	9480±160		Insufficient microliths	Wymer 1962
Thatcham V, Berkshire	Q-677	unidentified waterlogged wood from layer 4 'grey marl' of pond infilled with peat and tufa. Contains artefacts and faunal remains	9780±160		Insufficient microliths	Wymer 1962
Trwyn Du, Anglesey	HAR-1193	charred hazelnut shell from pit F16	7980±140		Uncertain microlithic associations, early and late types present	White 1978, 16–39
Trwyn Du, Anglesey	HAR-1194	bulked charred hazelnut shell from hollow F13	8590±90		Uncertain microlithic associations, early and late types present	White 1978, 16–39
Trwyn Du, Anglesey	Q-1385	bulked charred hazelnut shell from hollow F13	8460±150		Uncertain microlithic associations, early and late types present	White 1978, 16–39
Wawcott XXX, Berkshire	BM-2718	bulked *Alces alces* metacarpal and *Bos primigenius* femur (bones not cut marked) from same area (sq Q-7) and context as early Mesolithic lithic scatter. One of these bones may have derived from the underlying Pleistocene gravels. The other determination from this scatter (BM-2719) has yielded an anomalously young age. Collagen levels were low in both samples.	10960±100	−22.5	Low collagen and great divergence with date from adjacent square	Froom 2012

West Hartlepool, Co Durham	BM-80	antler, ?red deer, from West Hartlepool submerged forest. Associated with Mesolithic flints, possibly burnt.	8700±180		Insufficient material associated	Barker and Mackey 1961, 41, Trechman 1938
Westhampnett, Sussex	OxA-4168	3/W474, 19006H. Charred hazelnut shells from sol lessive.	9120±90	−22.4	Insufficient microliths present	Fitzpatrick et al. 2008
Westhampnett, Sussex	OxA-4169	3/W474, 19006H. Bulked charcoal (*Prunus* sp. Pomoideae, *Quercus* sp. and *Corylus* sp.), from sol lessive. As bulked sample this could be Neolithic or Mesolithic with some intrusive charcoal	4260±70	−25.1	insufficient microliths present	Fitzpatrick et al. 2008
Westhampnett, Sussex	OxA-4171	bulked charcoal (*Quercus* sp., *Fraxinus* sp., and *Corylus* sp.) from a shallow pit up to 50cm below topsoil, found with a number of Mesolithic flints and a wider flint scatter recovered by fieldwalking. As a bulked sample this could be Neolithic or Mesolithic with some intrusive charcoal	8300±90	−24.6	Insufficient microliths present	Fitzpatrick et al. 2008
Wetton Mill Minor, Staffordshire	Q-1127	bulk sample of unidentified bone splinters selected due to their proximity to Mesolithic artefacts	8847±210		Basally modified and later Mesolithic material present, associations of dated material uncertain	Switsur and West 1975, 45