The distribution of early Palaeolithic sites in Britain

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Abstract

This paper provides an initial examination of the distribution of handaxe sites compared to Levallois sites in Britain based on the recently digitised Palaeolithic site records at the British Museum. The pattern suggests a wide distribution of handaxe sites across southern and eastern England in contrast to a more limited distribution of Levallois sites in London and Kent. Collector bias and differential access to geological deposits are examined as factors in determining the pattern, but the conclusion drawn is that there is still an underlying pattern that relates to Lower and Early Middle Palaeolithic land-use. It is suggested that this may reflect the changing palaeogeography of Britain from MIS 13 through to MIS 7.

Introduction

The early human occupation of northern Europe has been primarily controlled by the cyclical changes in climate with repeated human colonisations punctuated by either retreats or possibly local extinctions as climate cooled (Stringer 2005). It would seem that through time the development of technology and to some extent physical adaptation led to increasingly successful and more sustained settlement of these areas; the earliest forays from c. 800 ka into northern Europe such as at Happisburgh (Norfolk, UK; Parfitt *et al.* 2010) and Pakefield (Suffolk, UK; Parfitt *et al.* 2005) seem to have been sporadic and short-lived, whereas by the last glaciation, humans had adapted to all but the cold extremes of Marine Isotope Stage (MIS) 4 and the Last Glacial Maximum (Roebroeks *et al.* 2011).

Recent research has shown that the record for Britain is somewhat different to that of mainland Europe with a suggested decline in population in Britain during each warm stage from MIS 11 and a probable absence during MIS 6-4 (Ashton & Lewis 2002; Ashton & Hosfield 2010; Ashton *et al.* 2011; Lewis *et al*. 2011; Davis 2013). This has been primarily based on the numbers of Lower Palaeolithic and Middle Palaeolithic sites, but also on regional studies in the Middle Thames and Solent river basins. The regional studies used the varying densities of Lower Palaeolithic handaxes and Early Middle Palaeolithic Levallois artefacts in the flights of river terrace gravels as a proxy for relative human population. The suggested decline in population is argued to have been due to the changing palaeogeography with the creation of the Strait of Dover at the end of MIS 12 (Smith 1985; Gupta *et al.* 2007; Toucanne *et al.* 2009) and the subsidence of the floor of the North Sea Basin (Ashton *et al.* 2011). The effect of the breach was to make Britain an island during high sea-levels, while the down-warping of the North Sea Basin meant that larger drops in sea-level were required in each successive cold phase to reconnect Britain to the continent.

One of the criticisms levelled at the Middle Thames and Solent regional studies was the use of handaxes and Levallois pieces as equivalent artefact types (White *et al.* 2006; Pettitt & White 2012). It was argued that they probably had different functions and would therefore have had different life histories. This would have resulted in significant variation in the numbers produced and where they might have been discarded in the landscape. A second criticism was that handaxes were more likely to have been picked up by gravel quarry workers and were more prized by many collectors, therefore producing an inevitable bias in the numbers of handaxes now held by museums (McNabb 2007). The final main criticism of this research was the dominance of some sites (or 'super-sites') in the record providing a skew to the data (White *et al.* 2006; McNabb 2007). It was argued that once locations became known for producing handaxes, positive feedback would encourage disproportionate collecting at those sites.

Some of these criticisms have been dealt with through examination of just the handaxe records for the Solent and Middle Thames, by studying the collecting habits of some of the collectors and by the removal of 'super-sites' from the analysis (Ashton & Hosfield 2010; Ashton *et al.* 2011; Davis 2013). Taking these potential problems into account, the pattern of declining artefact numbers has stood up to more detailed scrutiny and overall it can still be suggested that there is an underlying pattern of population decline through the late Middle Pleistocene in both the Solent and Middle Thames areas.

This paper takes a new approach to past shifts in population by examining the changing distribution in artefact types in Britain through the Middle Pleistocene. It uses sites rather than artefact numbers to avoid the potential problems of 'super-sites' dominating the record. In particular the study focuses on the differences between the distribution of handaxe and Levallois sites. Work over the last 20 years suggests that most handaxe assemblages date to between c. 500 and 300 ka and are attributed to the Lower Palaeolithic, whereas most Levallois assemblages date from c. 300 to 200 ka and are now termed Early Middle Palaeolithic (Ashton & Lewis 2002; Ashton *et al.* 2003; White *et al.* 2006; Scott 2011;

Scott *et al.* 2011). The apparent rapid replacement of handaxe technology by Levallois technology at c. 300 ka allows investigation of the differences in distribution for the various periods. One important exception to this division is the use of handaxe technology during the Late Middle Palaeolithic with the appearance of *bout coupé* handaxes (White & Jacobi 2002). However, the comparatively small number of 180 *bout coupés* listed by these authors is far outweighed by the estimated 40,000 of both Lower and Middle Palaeolithic handaxes (Roe 1968) and should not therefore affect the distributions.

Any differences in site distribution might be attributable to a number of factors including collector bias in recovery of artefacts, but potentially might throw light on favoured access routes into Britain, the geographical extent and sustained occupation of different colonisation events and changes in the use of the landscape through time. This approach should bypass most of the criticisms that have been levelled at the regional studies of past demography.

The starting point for this study was work undertaken by Roger Jacobi in the early years of the *Ancient Human Occupation of Britain Project* (AHOB; Stringer 2006), when he went through the entire British Lower and Middle Palaeolithic collections at the British Museum (BM) and created a catalogue of all the Levallois artefacts. This list has now been supplemented with details of all the handaxe locations in the BM collections. Together these form the main dataset for this initial study and it seems appropriate that this work should appear in a book dedicated to Roger.

The handaxe and Levallois datasets

The BM collections consist of over 80,000 artefacts from the British Lower and Middle Palaeolithic with 559 finds locations containing handaxes and 84 locations with Levallois material. Defining a 'site' or a 'find location' is not without problems and is dependent on the level of detail given by the finder. This study has used the BM collection as currently catalogued. Sometimes a finds location will be as vague as a parish or village, but other times could be a street name or gravel pit. For this paper, well known sites even with multiple levels have been given as a single finds location. Virtually all the material in the BM collection comes from England and therefore only English sites have been included.

The advantage of the BM dataset is that all the material has been recently scrutinised and in some cases re-identified. In addition it contains material from most of the excavations undertaken in the last 50 years such as High Lodge (Ashton *et al.* 1992), Hoxne (Singer *et al.* 1993), Swanscombe (Conway *et al.* 1996), Barnham (Ashton *et al.* 1998), Boxgrove (Roberts & Parfitt 1999) and Elveden (Ashton *et al.* 2005). Furthermore it has recently been digitised which has facilitated interrogation of the data. The potential disadvantage of using the BM dataset is that the collections might not be representative of England as a whole with potential biases in some regions where local museums rather than the BM have acquired significant collections.

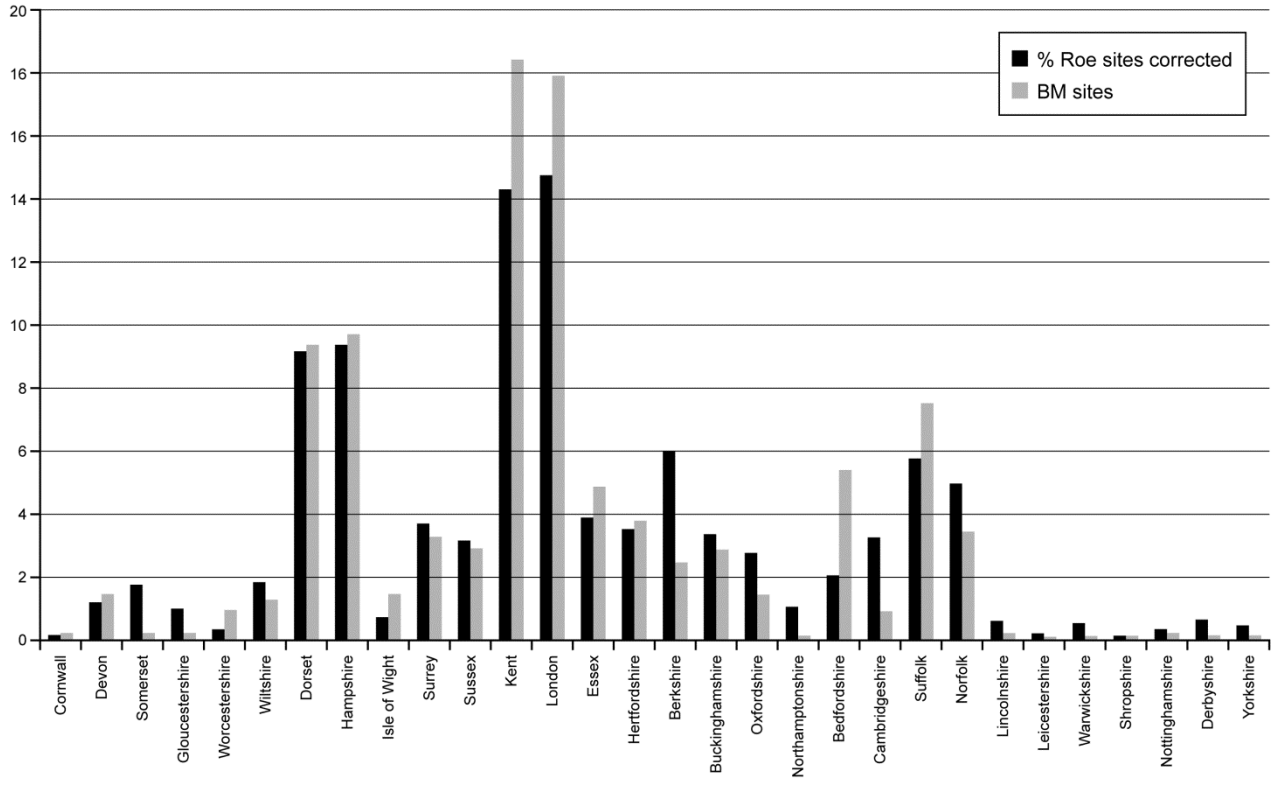

Figure 1. The distribution of British Museum (BM) sites by county compared to the distribution of sites listed in Roe (1968) by county. The Roe figures have been amended to take account of the 1974 boundary changes.

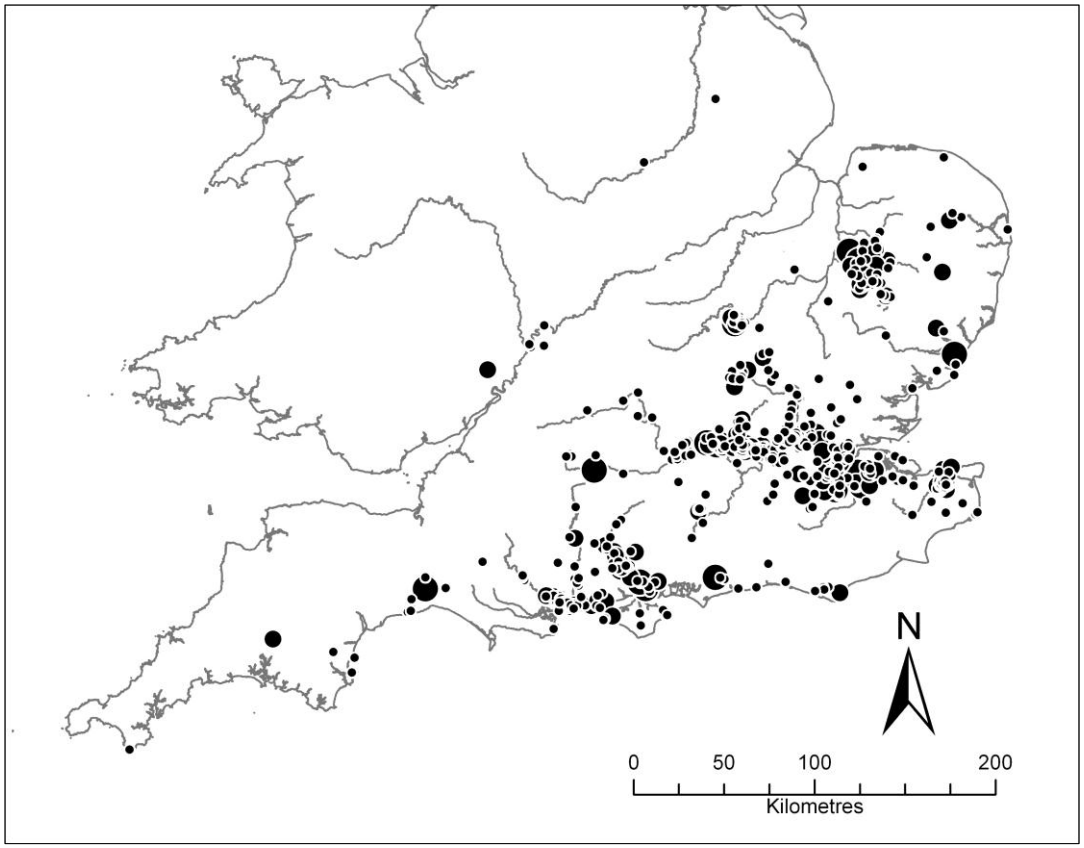

Figure 2. Distribution of handaxe sites in BM Collection from England. Large circles = >100 handaxes; medium circles = 10-100 handaxes; small circles = <10 handaxes.

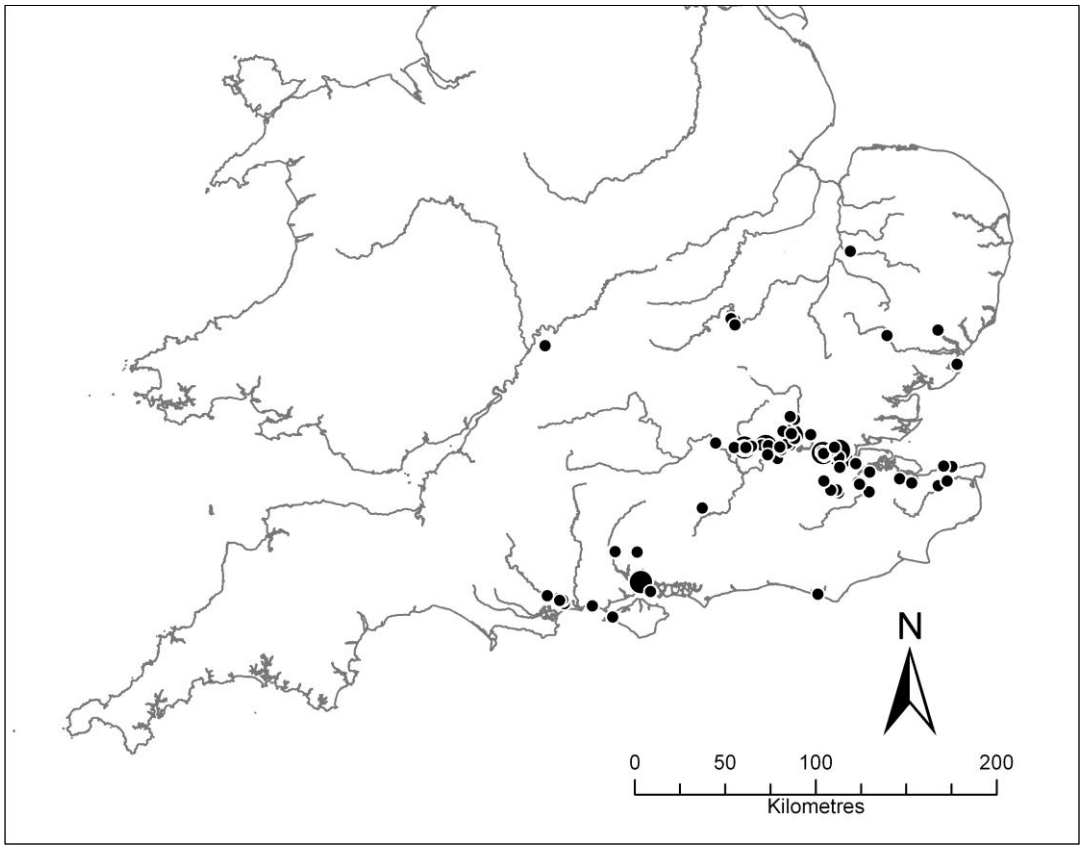

Figure 3. Distribution of Levallois sites in BM Collection from England. Large circles = ≥10 Levallois pieces; small circles = <10 Levallois pieces.

In order to evaluate the representative nature of the BM collections, the dataset has been compared to the listings given in Roe's 1968 Gazetteer. A simple test was performed comparing the number of sites listed for each county in Roe (1968) with the number of sites per county in the BM dataset. The Roe listings were adjusted to account for the 1974 boundary changes, which particularly affected the Dorset and Hampshire border and that of Greater London with neighbouring counties. The results (Fig. 1) suggest that the BM collections are broadly representative of England as a whole, with the main concentrations being in London and Kent, with further peaks in Dorset and Hampshire, and in Suffolk and Norfolk. As would be expected south-east England and East Anglia dominate in both the Roe and the BM datasets, reflecting the underlying Chalk geology and the resulting flint gravels across those regions. This contrasts in both datasets with a paucity of evidence from the south-west, west, Midlands and north of England.

There are however several slight differences to note. There are higher percentages in Kent and London in the BM dataset, which probably reflects the geographical position of the BM in London, attracting more local collections. Berkshire, Cambridgeshire and Norfolk have higher percentages in Roe's Gazetteer, which probably reflects the strength of some of the regional museums with large collections held by Reading Museum, Cambridge Archaeology and Anthropology Museum and Norwich Castle Museum respectively. Finally, the BM's higher percentage of collections from Suffolk is probably due to the BM's own fieldwork and also the acquisition in 1919 of the Sturge Collection, which contains a great deal of material from that county.

Although there are small differences in distribution, overall the comparison between the BM and Roe datasets suggests that the BM collections are broadly representative of England as a whole and can be used to look at variations in distribution through time.

Distributions of handaxe and Levallois locations

All the handaxe and Levallois site locations have been geo-referenced and imported into a Geographical Information System (GIS). The resulting distributions are shown in Figs 2 and 3. The first aspect to note is the much higher number of sites containing handaxes (559) compared to those containing Levallois material (84). It has already been noted that some of this disparity may be due to a bias towards recovering handaxes by some collectors and therefore may not simply reflect relative population levels.

The second aspect to note is the preponderance of Levallois sites in areas of Kent and London compared to the broader spread of handaxe sites, which can be examined further by comparing the percentages per county for the two site types (Fig. 4). The pattern suggests that Levallois sites are over-represented in Kent and London, but under-represented in most other counties, particularly in Dorset, Hampshire, Hertfordshire, Berkshire, Suffolk and Norfolk. The differences in distribution require explanation and there are three potential contributing factors:

1. *Collection bias*. Are there differences in regional collection histories that might be producing the pattern? For example were there particularly good collectors in London and Kent who were more likely to recover Levallois artefacts, compared to those further afield?
2. *Sediment distribution*. Are there differences in the distribution of geological sediments and their exploitation, which has led to the pattern? For example, are the MIS 8-7 fluvial gravels in London and Kent more prevalent compared to other areas and quarried to a greater extent?
3. *Palaeolithic land-use*. Does the distribution reflect regional land-use patterns and distribution of past human populations?

The influence of collection bias and differences in sediment distribution need to be investigated first. Only then can the possibility that the pattern relates to past human behaviour be entertained. It should be noted that distinctions in upland or plateau sites from those in the river valleys is beyond the scope of this study, but rather it focuses on the broader patterns of site distribution across southern and eastern England.

Bias in collection history

One of the possible explanations for the differences in distribution is that the late 19th and early 20th century collectors based in London and Kent were more likely to encounter the well-known Quaternary scientists and archaeologists of the day, with London being a hub for Palaeolithic research. This may have led to better collecting habits in this region with the recovery of a greater range of material, including Levallois artefacts.

One way of investigating this problem is to use only the sites from the 'good collectors' who are known to have recovered Levallois material. For London these included Allen Brown and Worthington Smith, with the latter also collecting in Bedfordshire (Brown 1887, 1895; Smith 1894, 1916; Scott 2011). For Kent the principal good collectors were Marston, Burchell and Chandler (e.g. Chandler 1930; Burchell 1931; Marston 1942), while Essex was covered by Hazzeldine Warren (e.g. Warren 1951; McNabb 2007). Lacaille worked extensively in Berkshire and Buckinghamshire, and he also bought material for the Wellcome Institute, which had extensive collections across England (e.g. Lacaille 1961). Sturge also bought and collected extensively, but particularly in Suffolk (Sturge 1911; Smith 1931). Calkin collected predominantly in Dorset, while Hampshire was covered by collectors such as Draper, Druitt and Mogridge (Burkitt *et al.* 1939; Calkin & Green 1949; Draper 1951; Davis 2013). These main collectors have been combined with others known to have recovered Levallois artefacts

as well as handaxes. The filtering of the BM dataset reduces the number of handaxe sites to 438 locations.

The percentages for each county (Fig. 5) indicate similar distribution biases to that of Fig. 4, with an over-representation of Levallois in London and Kent and under-representation in Dorset, Hampshire, Hertfordshire, Berkshire, Suffolk and Norfolk. Despite screening for the better collectors known to have recovered Levallois material, there is still a dominance of Levallois sites in London and Kent, suggesting that there is more to the pattern than collection bias.

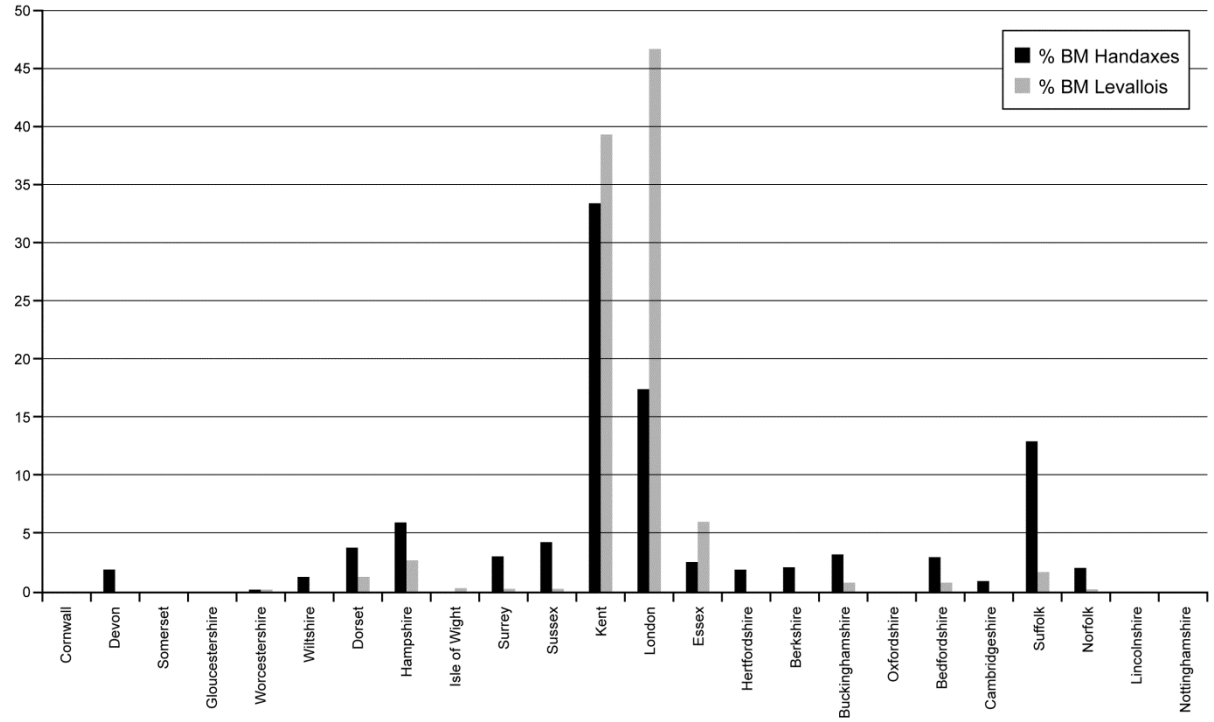

Figure 4. The distribution of BM handaxe sites compared to the distribution of BM Levallois sites by county.

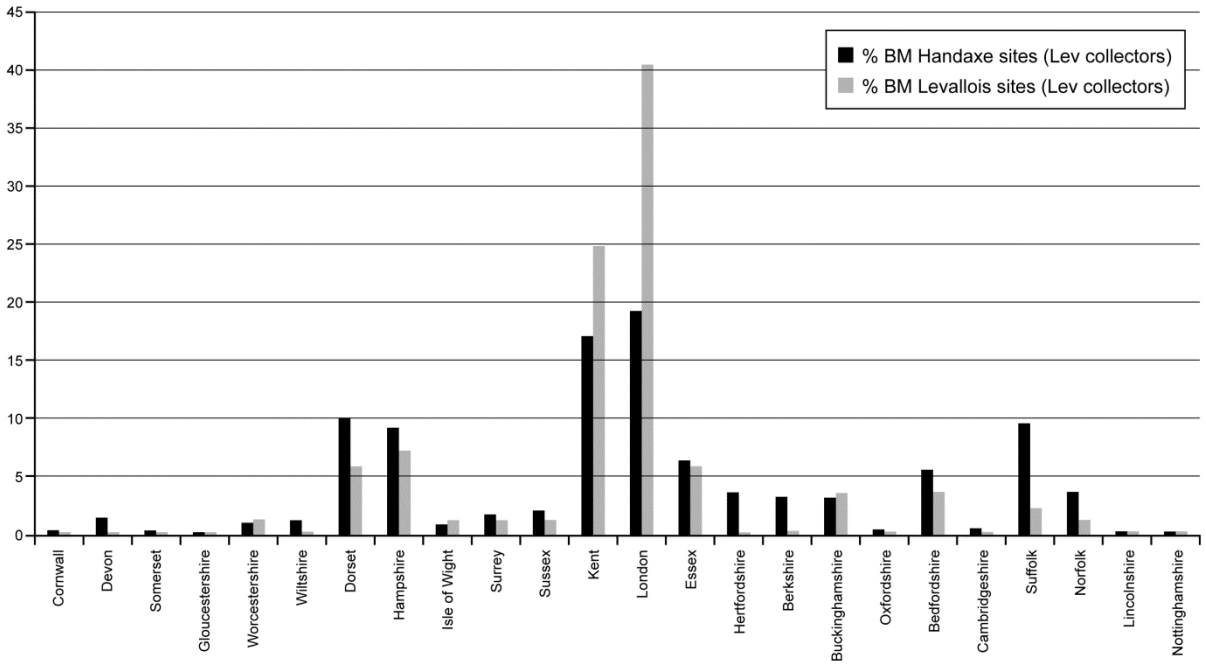

Figure 5. The distribution of BM handaxe sites compared to the distribution of BM Levallois sites by county, only using sites from the better collectors who are known to have recovered Levallois artefacts.

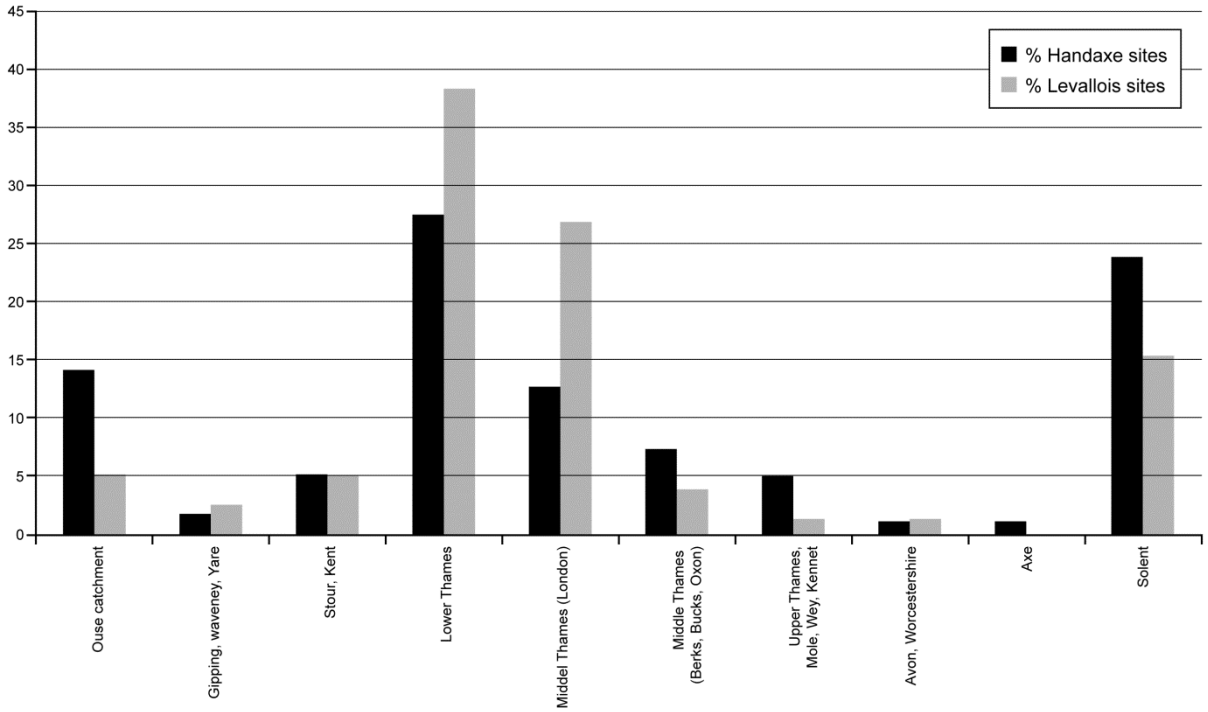

Figure 6. The distribution of BM handaxe sites compared to the distribution of BM Levallois sites by major river catchments.

Bias in sediment distribution and exploitation

Another possible contribution to the overrepresentation of Levallois sites in London and Kent is the difference in the distribution of geological sediments and their exploitation; if the river terraces that relate to MIS 9 to 6, where Levallois is most likely to occur, were differentially exploited in London and Kent compared to other regions, then this might explain the pattern.

It is beyond the remit of this paper to study in detail the extent of the terraces of the different river systems and the extent of the quarrying within them. However, a few comments can be made about the three main river catchments of the Thames, Solent and Ouse that contribute to the majority of the English record. In the Middle Thames the Lynch Hill and Taplow terraces and their equivalents in the Lower Thames cover the period from MIS 9 to 6 (Gibbard 1985, 1994; Bridgland 1994). For the Solent the equivalent terraces are likely to be terraces 10, 9 and 8 in the Stour and terraces 3 and 2 in the Test (Briant *et al.* 2006; Ashton & Hosfield 2010; Davis 2013; Hatch 2014). The mapping and dating of the Ouse catchment is less well understood, but there are certainly two terraces above the floodplains of the Great Ouse, Little Ouse and Lark that are probably attributable to MIS 9-6 (Lewis 1998).

All the terraces listed above have had large-scale exploitation with the opportunities for recovering Levallois material (see quarry mapping in The English Rivers Palaeolithic Survey, e.g. Wessex Archaeology 1993, 1996). Indeed there are good examples of the more assiduous collectors operating in each of the three areas. John Allen Brown collected extensively in west London in the late 19th century and was responsible for the Levallois material that comes from sites such as Creffield Road in Acton and from the surface of the Lynch Hill terrace in the Yiewsley and West Drayton area (Brown 1887, 1895). During the 1930s and 40s John Calkin, the excellent amateur archaeologist, recovered large collections, including Levallois material, from terraces 9 and 10 in the Bournemouth area (Calkin & Green 1949). Around Warsash in Hampshire C.J. Mogridge of Winchester Museum also collected handaxes and Levallois material from terraces 2 and 3 of the Test valley during the middle years of the 20th century (Burkitt *et al.* 1939). Finally, in the late 19th and early 20th centuries Worthington Smith was responsible for collecting material from terraces 2 and 3 of the Great Ouse around Bedford (Smith 1894). In the valleys of the Little Ouse and Lark, Sturge acquired and personally collected from active quarries together with extensive surface material. Although much of the latter was later-prehistoric, it also incorporated Palaeolithic material that was eroding out of terrace deposits (Smith 1931).

More detailed study of terrace areas, the extent of quarrying and more research on how material was recovered is needed before this factor can be properly assessed. However, this initial appraisal suggests that differences in access to the relevant geological deposits by the better collectors were not major contributing factors to the distribution pattern of Levallois sites in England and their apparent over-representation in London and Kent.

Distribution of Lower and Middle Palaeolithic Populations

The discussion above would suggest that the handaxe and Levallois distribution patterns reflect differences in the behaviour of Lower and Early Middle Palaeolithic populations. In fact if individual artefacts are taken into account, the patterns are considerably enhanced. London, Kent and Essex account for an estimated 54% of handaxes in the BM, in contrast to a staggering 92% for Levallois artefacts. The Levallois record is dominated by sites such as Ebbsfleet and Baker's Hole in Kent, Creffield Road in Acton, together with material from the Yiewsley-West Drayton area of west London. This highlights how individual sites can potentially skew the record and validates the more cautious approach in using site distributions (see above).

Before looking further at the distributions it should be noted that there are significant Levallois collections not held by the BM that lie outside the south-east, in particular Caddington Site C in Bedfordshire has 162 Levallois pieces (Bradley & Sampson 1978; Beccy Scott pers. comm.), Pontnewydd Cave in North Wales has 93 Levallois pieces (Green 1984; Aldhouse Green *et al.* 2012), while Barnham Heath in Suffolk has a small assemblage of 11 Levallois artefacts (Roe 1968; Beccy Scott pers. comm.). Nevertheless the dominance of Levallois sites in London and Kent still stands.

It has already been suggested that the Lower and Middle Palaeolithic record is dominated by the river catchments of the Thames, Solent and Ouse. In order to understand the role that these and other river valleys play, the sites have been divided into different catchments (Table 1; Fig. 6). When the technologies are compared between the different catchments, the same pattern emerges. However there is also a sharp contrast between the Middle and Lower Thames in London and Kent with the Middle and Upper Thames, together with various tributaries in Buckinghamshire, Berkshire, Oxfordshire and Surrey. The lower reaches of the rivers have a disproportionately high level of Levallois sites. There is also a disproportionately high level of Levallois material in the eastward-flowing East Anglian rivers (the Stour, Gipping, Waveney and Yare), due to the sites of Hadleigh Road in Ipswich and Brundon on the Gipping and Stour rivers respectively. Therefore there appears to be a pattern developing of the vast majority of Levallois locations being in the lower reaches of eastern rivers, with a dearth in southern, Midland and western river systems.

Discussion

So what does this pattern mean in terms of past population distribution and landscape use? The complex changes in the palaeogeography of Britain have certainly influenced the access to Britain through these time periods. Palaeogeography is therefore the main focus of discussion. Three time-frames can be examined.

Pre-Anglian palaeogeography and site distribution (MIS 13)

Studies over the last 30 years have established that the Strait of Dover was created by the overflow of a pro-glacial lake in the southern North Sea Basin, breaching the Chalk of the Kent-Artois anticline towards the end of the Anglian glaciation in MIS 12 (Smith 1985; Gibbard 1995; Gupta 2007; Toucanne *et al.* 2009). Prior to the breach, Britain was a peninsula of mainland Europe with large embayments in the southern North Sea and the north-east Channel region. Access was therefore independent of sea-level rise or fall. The main river systems at this time were the Solent, flowing into the English Channel embayment, the Thames flowing through the Vale of St Albans, across central East Anglia into the North Sea embayment and the now-extinct Bytham River, flowing from the Midlands also into the North Sea embayment, perhaps at times as a tributary of the Thames (Rose 2009).

The difficulty of attributing many of the handaxe locations to this period means reliance on a few sites of known age. Although they might be unrepresentative of the overall pattern, they do at least indicate some of the regions that were inhabited. On the south coast the sites of Boxgrove and Valdoe indicate occupation near the mouth of the Solent (Roberts & Parfitt 1999; Pope *et al.* 2009). The dating of sites within the Solent system is not secure, but it has been suggested that Corfe Mullen might date to MIS 13 alongside St Catherine's Hill, Christchurch (Ashton & Hosfield 2010; McNabb *et al.* 2011; Davis 2013), although an MIS 11 age estimate has also been suggested (Hatch 2014).

Virtually no sites are known from deposits of the pre-MIS 12 Thames, other than handaxes recovered from fluvial sediments at Benacre (Suffolk). These deposits have been suggested to be attributable to the pre-MIS 12 Thames (Ashton *et al.* 2009). More sites are known from Thames deposits of MIS 12 age, principally from the Caversham Ancient Channel, near Reading. These include Highlands Farm Pit and Kennylands Pit, which contain rolled handaxes that probably derive from pre-MIS 12 sediments (Wymer 1968, 1988).

The Bytham River is more prolific with several sites containing handaxes, including Waverley Wood in the Midlands (Shotton *et al.* 1993; Lang & Keen 2005; Keen *et al.* 2006), Maidscross Hill, Brandon Fields, Warren Hill and Rampart Fields in the Mildenhall area (Bridgland *et al.* 1995; Ashton & Lewis 2005), while further east there is Flixton (Silva *et al.* 2009). Happisburgh Site 1 also occurs in fluvial sediments and might be attributable to the Bytham or a similar eastward-flowing river (Ashton *et al.* 2007). Finally in Devon there is Kent's Cavern, which has handaxes from pre-Anglian deposits (Cook & Jacobi 1998).

Overall, sites seem to have been distributed across large areas of southern and eastern England and extending into the Midlands being found in all the major river systems. Occupation extended into the south-west as shown by Kent's Cavern.

Post-Anglian palaeogeography and Lower Palaeolithic site distribution (MIS 11 to 9)

The palaeogeography of Britain changed in several ways after the Anglian glaciation. First, the breach of the Strait of Dover created the Channel River (*Fleuve Manche*) and, during subsequent rises in sea-level, a marine barrier formed in the Channel region. Second, the Thames was forced into its present valley through London with its estuary in northern Essex near Clacton. Finally, the Bytham River system was destroyed and a new drainage system was established with rivers flowing from both the Midlands and central East Anglia into the newly established Wash Basin (Rose 1989, 1992).

The changes in palaeogeography had a major impact on access to Britain during this period. The Strait of Dover and Channel would have been formidable barriers. The Channel region has been an area of uplift and therefore would have been deeper than the current depths of up to 60 m. The uplift has been estimated at between 30 and 40 m since MIS 11, providing a total depth of 90-100 m (Lagarde *et al.* 2003). A dry land crossing in this area would have been possible only in major periods of eustatically lowered sea-level during glacial periods. Even during these periods the Channel River would have formed a major barrier.

In contrast, the North Sea Basin might have been an easier route for humans to traverse. During MIS 11 the floor of the southern North Sea Basin seems to have been of a similar height to modern sea-levels as shown by the migration of the 'Rhennish' molluscan fauna from north-west European rivers into the Thames during Pollen Zone IIc of the Hoxnian interglacial (MIS 11c; Ashton *et al.* 2011; White *et al.* 2013). Progressive down-warping of the southern North Sea Basin made crossing of this area increasingly difficult after MIS 11 during times of high sea level. Therefore in terms of human migration during MIS 11 and to a lesser extent during MIS 9 the easiest access into Britain would have been via the southern North Sea Basin.

The vast majority of the handaxes recovered from the 464 locations can probably be attributed to this period. A large proportion of the record can be related to terrace aggradations which are post-Anglian in age. Well known sites include Swanscombe (Conway *et al.* 1996), Dartford (Bridgland *et al.* 1995), Purfleet (Schreve *et al.* 2006), Furze Platt (Wymer 1968), Wolvercote (Tyldesley 1986; Ashton 2001), Red Barns (Wenban Smith *et al.* 2000), Dunbridge (Harding *et al.* 2012), Warsash (Davis 2013), Kings Park and Brixey & Goods Pit in Bournemouth (Davis 2013), Beeches Pit (Preece *et al.* 2006, 2008), Barnham (Ashton *et al.* 1998), Elveden (Ashton *et al.* 2005) and Hoxne (Singer *et al.* 1993; Ashton *et al.* 2008). The distribution covers all the major river valleys of southern, central and eastern England. Although the easiest routes into Britain were probably across the southern North Sea Basin or via the Rhine and Scheldt into the Thames valley, populations were also clearly established in the Solent River system either by a more difficult Channel or Channel River crossing, or a westwards migration, perhaps via the coast from the Thames, or a route from the Thames via the Kennet valley into the Solent.

Palaeogeography and Early Middle Palaeolithic distribution (MIS 8 to 7)

The palaeogeography of Britain from MIS 8 to 7 was largely unchanged from that established after the Anglian glaciation other than the increasing difficulty of getting to Britain during periods of high sea-level (see above). The down-warping of the floor of the North Sea Basin probably meant a significant drop in sea-level of perhaps 20 m to establish a dry land crossing (Ashton *et al.* 2011). It is also likely that there was progressive widening and deepening of the Strait of Dover making a crossing in this area increasingly difficult. The Channel or Channel River would have continued as difficult barriers to cross.

As discussed above, the distribution of Levallois sites is heavily concentrated in the lower reaches of the Thames and to some extent other eastern-flowing rivers such as the Kentish Stour and the Gipping, Orwell and Stour in Suffolk. This suggests that populations entered Britain from the southern North Sea area. The age of most of these sites, such as Ebbsfleet, West Thurrock, Creffield Road and locations in the West Drayton/Yiewsley area has been suggested to be towards the end of MIS 8 or early MIS 7 (Ashton *et al.* 1997; Schreve *et al.* 2003; White *et al.* 2006; Scott 2011; Scott *et al.* 2011, 2008). This might suggest that at the time of colonisation sea-levels were slightly lower than during the peak interglacial periods of MIS 7, perhaps allowing a dry-land crossing of the southern North Sea Basin into south-eastern England. If the dating of these sites is correct, it also suggests a comparatively short occupation, as there is little evidence of humans in Britain during the later stages of MIS 7. The apparent short duration of the occupation might also explain the small number of sites further inland or in the west. It could be suggested that as climate warmed, the populations were cut off from mainland Europe, becoming extinct with too small a gene-pool to have a sustainable population.

The site of Pontnewydd Cave in north Wales stands out as an exception to this pattern, having Uranium Series dates of 230 ka, suggesting occupation during MIS 7b (Green 1984; Aldhouse Green *et al.* 2012). It is intriguing that the archaeological signal is different to the Early Middle Palaeolithic sites in the Thames, with the assemblage having both handaxes and Levallois. Whether this represents a population arriving later from a different source area is unclear. There are hints that handaxe production survives elsewhere in western Britain into late MIS 8 or possibly early MIS 7, in particular at the site of Harnham in Wiltshire (Bates *et al.* 2014) and possibly at Broom in Dorset where an MIS 8 or 9 age has been suggested (Hosfield & Green 2013). So there is again the possibility that these populations arrived from different source areas bearing a different

technology to that found in south-east England (Ashton & Hosfield 2010; Ashton *et al.* 2011; Scott *et al.* 2011). The lack of dating for most handaxe locations may be masking a clearer pattern of distribution with possibly more handaxe sites attributable to MIS 8 or 7. In the Solent, for example, many of the later terraces, probably attributable to MIS 8 to 7 contain handaxes, although it has been argued that their condition suggests derivation from higher terraces (Ashton & Hosfield 2010; Davis 2013).

This possible pattern of a west-east difference in technologies might also be reflected in the French, Belgian and Dutch records with most Levallois sites being in northern France, Belgium and the Netherlands, but with handaxe sites being more dominant in north-western France (Ashton & Hosfield 2010; Ashton *et al.* 2011; Scott *et al.* 2011). If populations did colonise from western France into western Britain then they would either have had a substantial sea-crossing or colonised under cold conditions with successful negotiation of the Channel River.

Conclusions

The conclusions of this study must be tentative at this stage. However, the initial research suggests that collection bias through the preferential collection of handaxes over Levallois artefacts or varying access to river terraces of different ages in the various regions does not fully explain the pattern of a preponderance of Levallois sites in the lower reaches of the Thames and other eastward flowing rivers in Kent, Essex and Suffolk. The suggestion here is that this pattern, at least in part, relates to the changing palaeogeography of Britain from MIS 13 through to MIS 7 with changing access routes from mainland Europe. It also hints at a more sustained occupation during MIS 13 to MIS 9, with a shorter occupation in late MIS 8 and early MIS 7. With improved dating of more sites it is hoped that such hypotheses can be addressed and that the patterns suggested in this paper can reveal more about the complex colonisation history of Britain.

Acknowledgments

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