The Upper Palaeolithic and Mesolithic Periods

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Resource Assessment

1. Introduction

For the South-East, grouping both the Upper Palaeolithic and Mesolithic periods as a single period for discussion is justified at both academic and practical levels. The nature of the resources and histories of research in the region for both periods have followed similar paths in recent years, with the relatively meagre Upper Palaeolithic record having more in common generally with the Mesolithic, in terms of technology and distribution, than with the Middle Palaeolithic. It must however be noted that the national Research Framework for the Palaeolithic (Pettitt et al 2008) separated the Mesolithic from the process, firmly re-framing Palaeolithic archaeology within the study of Pleistocene processes. This was followed by the Mesolithic Research and Conservation Framework (Blinkhorn and Milner 2013), which identified challenges and opportunities presented by the early Holocene archaeological record. The implication of this administrative severance is a divergent character of the research agendas for the Mesolithic and Upper Palaeolithic. While there is not the space here to explore the validity of this approach it is possible to say that, in terms of history of research, the nature of the resource, and future approaches to the record there is far more to unite the Upper Palaeolithic and Mesolithic record of south-east England than there is to separate them. This can be seen most clearly in examining the nature of the resource for the region. The archaeology of the periods lacks the clearly defined site-types or monument classes that exist for later periods; these would allow us to frame a resource assessment on such classes. Instead we have a record comprised of single surface finds, collected lithic scatters, a broad distribution of early excavations of variable quality but only a handful of modern, scientific excavations.

2. The Upper Palaeolithic Record of south-east England. (38,000 – 11,500 years BP)

The Upper Palaeolithic comprises a range of industries which date to the last glacial period, commonly referred to as the Devensian, but covering a wide range of climatic variation and including at least two significant occupation hiatus episodes. These industries are generally associated with the appearance of anatomically modern humans in Britain and are characterised by tool kits largely manufactured on blade blanks and containing projectile points of one distinctive style or another. Two broad periods can be determined during the British Upper Palaeolithic, an earlier phase (Early Upper Palaeolithic) dating to between 38,000 and 27,000 BP and a later phase (Late Upper Palaeolithic) dating between 14,600 BP and 11,500 BP. Some 40 find spots are recorded on regional Historic Environment Records (HERs) as having produced Upper Palaeolithic material within the region. This record is however flawed in that it contains sites which are of clear Middle Palaeolithic origin (e.g., Oldbury), at least one of Lower Palaeolithic date (Newhaven, East Sussex) and currently omits a number of recorded find spots (N=12) which remain to be incorporated into these records. These problems flag an immediate and serious impediment to undertaking an adequate account of the Upper Palaeolithic resource for the region. There is an urgent need to take stock of the current HER, rectify misidentifications, cross-reference with both the CBA gazetteer of sites for the region, with the PaMELA database of the Jacobi archive (Wessex Archaeology, Jacobi 2014) and the Portable Antiquities Scheme record. While these issues also exist for the Mesolithic record, these factors are particularly important when dealing with the archaeological record of the Upper Palaeolithic in the region. The small and dispersed nature of the record, both in terms of its intermittent distribution in both time and space, places particular emphasis on developing an accurate and definitive gazetteer of existing find-spots for the Upper Palaeolithic in the region.

The Upper Palaeolithic record of south-east England, while small and with obvious short-comings, does provide an important indication of human activity during a wide time-span covering almost 30,000 years. This covers the appearance of early blade-point assemblages to the hunter gatherer groups of the Ahrensburgian techno-complex dating until around 11,500 BP. This is a period in which human activity in the region may have been extremely episodic, with Britain only being accessible during short periods as climate and season allowed. Low sea levels prevalent during the period allowed reasonably unconstrained access across the exposed land mass of Doggerland under the current North Sea, however access to south-east England across the English Channel River system or from the north across the Thames would have been severely restricted by deeply incised fluvial channels. It is therefore possible that south-east England represented an area marginal to primary occupation, set away from direct routes for migrating game to the upland grazing areas of central and western England. These upland zones also provide karstic environments which would offer caves and rock shelters suited to both occupation and preservation of human activity. The degree to which these affordances account for the relatively rich record of areas such as the Peak District and south-west Britain remains to be tested. Recently work at Beedings, Glaston and Ightham has indicated fissure contexts capable of preserving Upper Palaeolithic material might be more prevalent in lowland Britain than previously thought. Again the research agenda points the way to testing this possibility.

Given the sparse distribution of Upper Palaeolithic activity in the region the key sites and nature of the record are presented in chronological order.

2.1. Early Upper Palaeolithic

Blade-points, shaped from prismatic cores with localised ventral thinning, probably used as projectile tips, are a feature of the earliest Upper Palaeolithic of Northern Europe. They form part of the Lincombian-Ranisian-Jermanovician techno-complex of sites and find spots extend from Kent's Cavern in the west to Poland in the east (Jacobi 2007). They date to in excess of 35,000 BP and may represent either very early colonisation of northern latitudes by anatomically modern humans or the last of the Neanderthal hunters of this region using a blade-based technology. Four find spots exist in the south-east region; these comprise the Earls of Dysart's Pit (Surrey), Golding Cross (East

Sussex), Ightham (Kent) and the site of Beedings in West Sussex. At Beedings in excess of 2300 lithic artefacts, including blade-points and associated debitage, were originally discovered in a fissure within the Hythe Beds of the Cretaceous Lower Greensand. While only 180 of these artefacts now survive, an assessment by Roger Jacobi firmly placed the leaf point within the Lincombian-Ranisian-Jermanovician techno-complex. New work undertaken at the site in 2008 revealed further fissures containing both Upper Palaeolithic and Middle Palaeolithic material (Pope et al 2013). The potential for other similar fissures containing lithic material, which are thought to be prevalent across the Lower Greensand and which offer an untapped resource, is high.

Currently no Aurignacian find spots have been recorded in the region, these are nationally limited to south-west Britain and southern Wales. A single Gravettian find, a Font-Robert point, is recorded from Peper Harow Hill near Godalming (Winbolt 1926; Ellaby 1987; Jacobi 2007). The shouldered point from High Hurstwood, East Sussex (Woodcock 1978; Jacobi 1980; Barton 1992) might also date to this period. This virtual absence of Early Upper Palaeolithic finds dating to before the Last Glacial Maximum (LGM) in the south-east region attests to the lack of established occupation in an area which might have been marginal to accessible entry points into Britain during this period of the Late Pleistocene.

2.2. Late Upper Palaeolithic.

Given the virtual absence of Aurignacian and Gravettian finds in the region, a prolonged hiatus of occupation spanning, and possibly predating, the LGM might be postulated for the region. Reoccupation of the British Isles after the LGM is marked by the appearance of artefacts categorised as Late Magdalenian (Creswellian sensu latu), a localised variant of the European Magdalenian industry. Radiocarbon dates from these sites elsewhere in Britain show them to span c 14,600 to 14,000 BP (Bølling/Meiendorf chronozone).

Only three clear Late Magdalenian sites have been identified in the region: from Oare, Kent, Guildford Fire Station, Surrey and from Wey Manor Farm, Surrey (Pettitt et al. 2012); to this we might add Brockhill, Surrey. These finds form spatial outliers to the wider distribution of British Late Magdalenian finds. These cluster in the North Midlands (including the eponymous site of Creswell) as well as in the Mendip Hills, south-west Wales and Devon. These clusters broadly coincide with upland karstic environments and thus we are inevitably seeing distribution patterns at least partially biased by the excellent preservation conditions and habitation affordances caves offer. What is yet to be determined is whether these areas also offered environmental pull-factors (e.g. game concentrations through upland grazing opportunities) which simply weren't present to the same extent in south-east England. The situation is the same for the Final Upper Palaeolithic with only two recorded find spots, including the now lost site of Brock Hill, which might be included within the Federmesser (Penknife Point) industries that are dated to the Allerød (after c. 14,000 BP). These sites are located in Surrey on the fringes of the Weald and

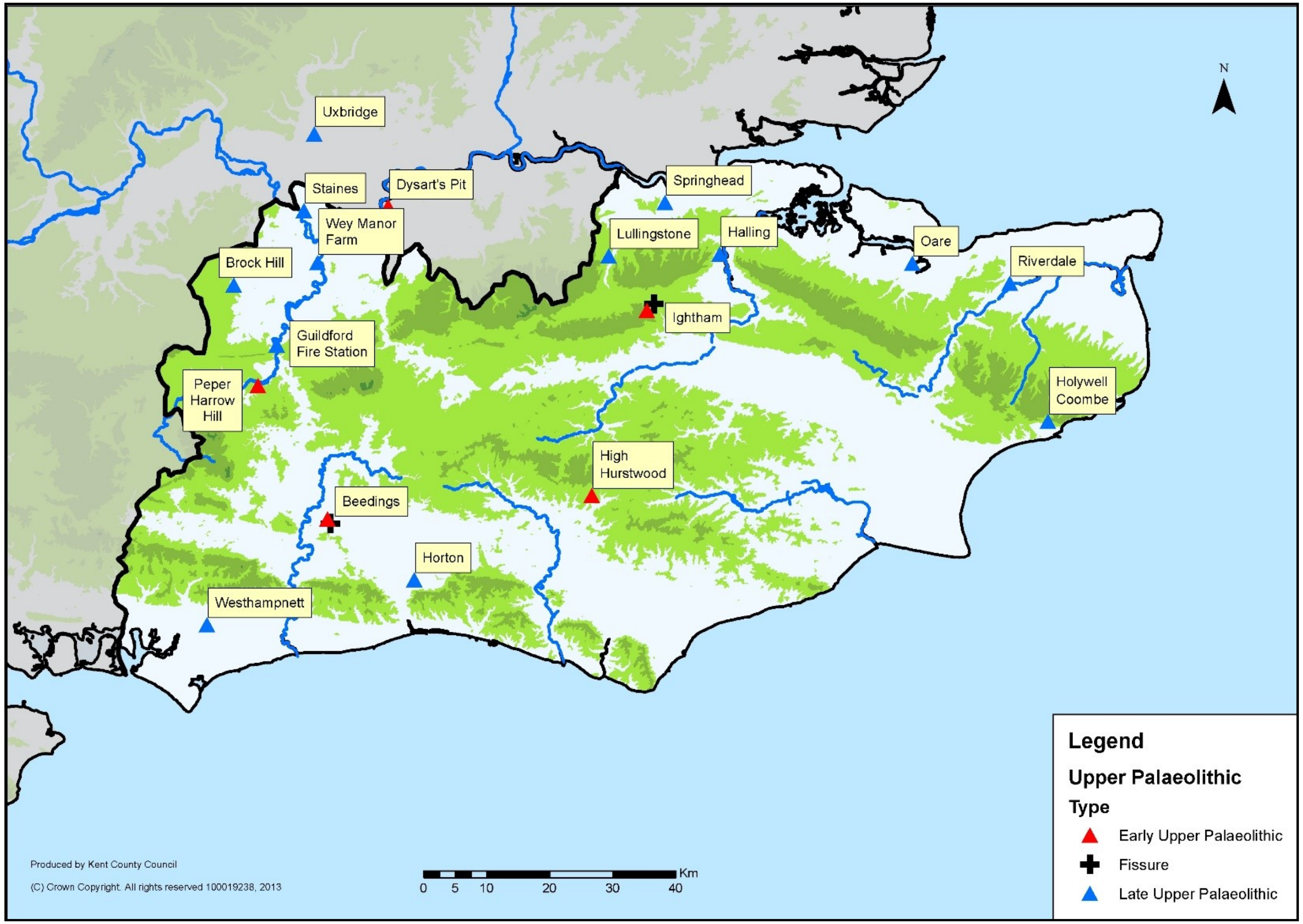

Figure 1 Map of Upper Palaeolithic sites discussed in the text

might represent something of the limit of penetration into Britain by groups fanning out westward from colonisation routes, following game migration patterns, across Doggerland. As with the Creswellian find spots for the country as a whole, Federmesser material is concentrated in karstic upland areas of the Midlands, south Wales and south-west England.

After a further hiatus of occupation, caused by global cooling associated with the Younger Dryas between c. 12,900 and 11,500 BP, a final period of Upper Palaeolithic recolonisation is marked by the appearance of lithic assemblages comprising a distinct long-blade component. The technological characteristic of these assemblages, notably the bruised blade component, marks this material as belonging to the Ahrensburgian industry with other key British sites including Avington VI (Berkshire), Sproughton (Suffolk) and Swaffham Prior (Cambridgeshire). This recolonisation event occurs in southern Britain from 11,500 BP. Some eight find spots dated to this period occur in the south-east region and include the sites of Springhead, Riverdale, and Lullingstone in Kent (Anderson-Whymark et al 2016), and Staines in Surrey.

The exceptional archaeology of the Uxbridge (Three Ways Wharf) site points the way to the potential that terminal Upper Palaeolithic sites hold. While the site sits outside the scope of the SERF area, its importance as a modern, multi-disciplinary investigation is central to discussions of human activity in region. Firmly within the region, the nearby and contemporary site of Church Lammas, Staines, shows the potential for further rich sites to deliver both lithic and faunal remains for this period. Church Lammas AMS dated to around 11,570 BP, produced a rich assemblage of bruised blade, retouched pieces and broad-bladed microliths. Forming part of a wider distribution of long-blade sites along the southern bank of the Thames which suggests the penetration of fluvial environments within the region and presents a pattern of colonisation for the South-East distinct to that for earlier Upper Palaeolithic periods. This period of occupation would have seen rapid temperature rises and associated environmental transformation. By 9,600 cal BC temperate climatic conditions were starting to emerge, with a process of vegetational succession that resulted in increasing forest cover across south-east England (Scaife 1988).

In addition to archaeological sites, suites of Quaternary deposits exist within the region that provide potential in the form of palaeoenvironmental evidence for the Late Pleistocene. Whether or not this evidence is associated directly with artefactual material, the presence of palaeoenvironmental evidence is of enormous significance to the study of Palaeolithic archaeology and should be considered as part of the archaeological resource. Contexts include river valley sequences (e.g. Milton, Kent; Horton, West Sussex), open air sites (Westhampnett Bypass, Fitzpatrick et al. 2009, Halling, Kent), fissure sites (e.g. Ightham, Kent; Beedings, West Sussex) and Head Deposits (e.g. Holywell Coombe, Preece and Bridgland 1999). These sites have produced environmental sequences and/or extensive collections of Late Pleistocene faunal material. The evidence from sites such as these can help to provide both a palaeo-ecological and chrono-stratigraphic framework for understanding in detail the timing and phasing of human occupation within our region. As a matter of course such sites should be routinely included as part of the HER. However, compared to the early Holocene, we are not in a position to present a regional framework for climate change during the last glaciation in the south-east region, and this is a necessary research priority in the years ahead.

To summarise, the Upper Palaeolithic record for the region is small, the number of sites which have been assigned even to broad chronological phases comprises less than 20 and of these only four have been subject to modern, multidisciplinary investigations. These facts underline the need for detailed and urgent reassessment of existing databases, integration of existing parallel gazetteer information, and a consideration of the Portable Antiquities Scheme records and the wider grey literature. These undertakings, combined with an audit of existing museum collections and a regional environmental review, should be considered the starting point for a wider resource assessment that is beyond the scope of the current study.

3. The Mesolithic Record of south-east England. (c.9,600 – 4000 cal BC / 10,000 - 5,200 –years ^{14}C BP)

The Mesolithic record of the South-East is characterised by an extensive number of find locales and a long history of active collection and research extending back into the early twentieth century. The region as a whole played an important part in the development of the overall framework for the lowland British Mesolithic, coming under considerable attention by Grahame Clark from the 1930's and Roger Jacobi from the 1970's. There are, within the region, some broad differences in the nature of the record across different counties. Some of these differences result from the specific histories of research, while others may be a product of actual landscape use patterns in the past. Kent, for example, still appears to have an under-representation of either directly-dated or typo-technologically early Mesolithic sites, while West Sussex and Surrey have a very apparent dense concentration of sites on Lower Greensand geologies. Only a truly regional investigative approach to these distribution patterns can unpick the underlying controls over these differences.

County and regional surveys of the Mesolithic period in the South-East have appeared at regular intervals during the last half century (Curwen 1954; Jacobi in Drewett 1978; Pitts 1980; Drewett et al. 1988; Gardiner 1990; Drewett in Leslie and Short 1999; Holgate in Drewett 2003). There is now, however, a need for a detailed reanalysis of these known find spots, especially pulling together finds from the grey literature of commercial archaeological reports. Recent palaeoenvironmental work has proved very successful in shedding light on the ecology and environment in the Mesolithic and assessing anthropogenic activity (see below).

Clark (1932) was one of the first to notice chronological depth in the typology and make-up of Mesolithic assemblages. In particular, his work on assemblages from the South-East resulted in the identification of 'Horsham points' and their position within a chronological succession of microlith and assemblage types (Clark 1934; Jacobi 1978). In Jacobi's later review of the region's Mesolithic assemblages, he classified Sussex assemblages into three main chronological groups:

i. Early Mesolithic 'Maglemosian' broad blade industries dominated by simple obliquely blunted points and less elaborate shapes, concentrated on Lower Greensand sites;

ii. 'Middle' Mesolithic industry peculiar to the Weald, east of Horsham, not found elsewhere in Britain. Assemblages reflecting this technology include obliquely blunted points, isosceles triangles and large proportions of basally retouched 'Horsham points'.

iii. Late Mesolithic 'Sauveterrian' smaller narrow blade industries dominated by geometric shapes including narrow scalene micro-triangles and rod-like backed bladelets. Assemblages such as these are much more widespread within the South-East, including Wealden and coastal plain sites;

More recent work by Reynier on assemblages across England divided the Early Mesolithic into three stages: Star Carr, Deepcar and Horsham type assemblages (Reynier 2005). The review by Holgate in 2003 mapped some of the known Mesolithic sites of Sussex and was able to make a distinction between the early 'Star Carr' and 'Deepcar' types and the slightly later 'Horsham point' assemblages (Holgate 2003, Figs. 2-3). Assemblages with rod and geometric microliths types are characterised as 'late' Mesolithic (Jacobi 1978).

Microlith typology is important for the region, as Mesolithic sites tend, in the absence of dating material, to be interpreted in terms of where their lithic assemblage fits within the Clark/Jacobi/Reynier chronologies. It is important that these chronologies are tested through the isolation of datable assemblages and compared with continental data, especially that of northern France

The regional archaeology of the Mesolithic has largely developed with reference to sites with abundant lithic finds but generally a lack of high quality palaeoenvironmental records or associated faunal material. The record as it stands is dominated by surface scatters and augmented by sites of variable stratification, either within rock shelter contexts of the central Weald or landscapes of the Lower Greensand. No systematic research has been undertaken focusing on the Mesolithic of the region in over 30 years, and gaps in our understanding appear to be stark, notably concerning the potential held by deeply buried alluvial contexts that are rarely encountered in the course of commercial development in the region and have not yet been subject to systematic research. Further to this, the submerged record of the English Channel region needs to be approached and integrated into our future

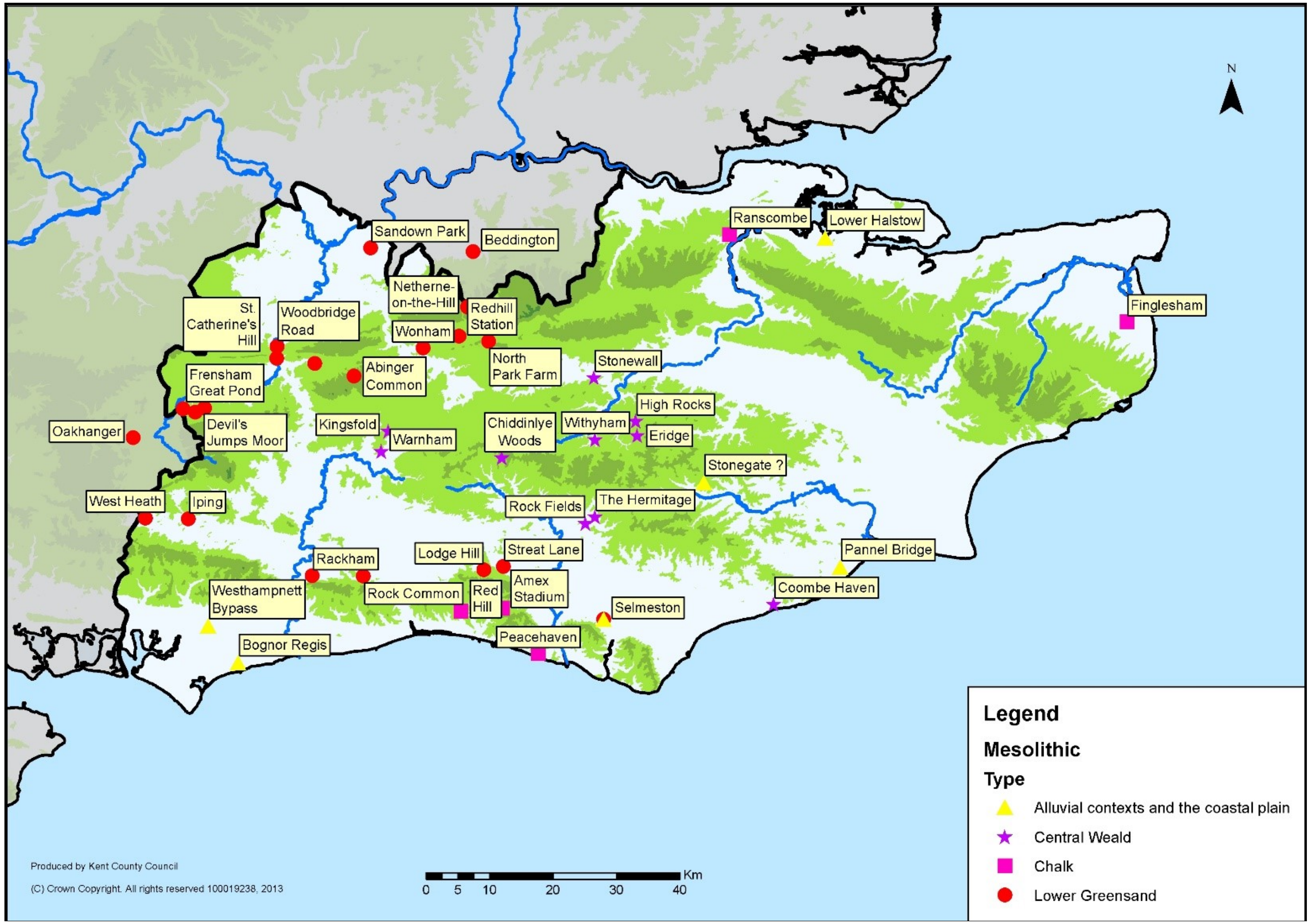

Figure 2 Map of Mesolithic sites discussed in the text

research frameworks, drawing on the potential illustrated by research mapping of the palaeo-Arun Valley (Gupta et al. 2007).

The record is presented in this assessment on the basis of geological context, the Wealden region being structured by a series of concentric outcrops of Cretaceous geology, each geological outcrop giving rise to similar topography, soil, drainage and vegetation conditions. The majority of key Mesolithic sites can be defined as coming from four main geological contexts (Lower Greensand, Tunbridge Wells Sandstone, the Chalk including Lambeth Group Tertiary deposits, and Alluvial contexts of the major river valleys and coastal plain). Other geological outcrops (e.g., Gault, Weald Clay) also have Mesolithic signatures but at far lower densities. Reynier (2005, 91) suggests that colluviation in the chalk downlands may have removed much existing evidence from the hilltops, whilst concomitantly sealing deeply any remains in the valleys below. Similarly, many coastal deposits of early Mesolithic date are minimally accessible, having been inundated as the English Channel flooded, although some survive within valleys around Romney Marsh (Waller and Long 2003). The result is that distribution maps are only a guide to former landscape use. Much evidence may have been lost or remains hidden in deep colluvial and alluvial sequences requiring geoarchaeologically-led research to locate and investigate.

3.1. Lower Greensand

The Lower Greensand forms a virtually continuous outcrop around the margins of the Weald, separated from the Chalk by the Gault Clay. The outcrop is divided into two principal beds, the Folkestone and Hythe Beds, which are more differentiated and form more conspicuous scarps in the western parts of the region and through Kent. In East Sussex, the outcrop is less conspicuous as a landform.

Grahame Clark (1932) first noted a predominance of Mesolithic sites located on the Lower Greensand of south-east England and the outcrop has been the focus of much collection and research since. The podsolised heathland soils of the Lower Greensand formations along the western Rother valley were later subject to excavation and palynological research in the 1960’s-1980’s with work at Iping, West Heath, Rackham and other sites (Keef et al. 1965; Dimbleby and Bradley 1975; Macphail 1985). This work further indicated the apparent importance of the Lower Greensand to Mesolithic hunter-gatherer communities. This was later supported by work done by Mellars and Reinhardt (1978) who concluded (having analysed the density and concentration of Mesolithic find spots recorded by Wymer (1977)), that there were particular concentrations of microliths on coarse-textured sand deposits. Mellars and Reinhardt went on to note that, although many sites were located on these types of deposits, they were also in ‘catchment’ areas close to the boundary of contrasting geological formations, which would be ideally suited to exploit these ecotones (ecologically distinct areas) and the differing ecological habitats and resources of the various ecological zones.

In the region, strong correlations have long been noted between Horsham-type assemblages and local geology (e.g. Clark 1936; Evans 1975, 102; see also Jacobi 1978), these being concentrated upon Greensand outcrops such as are only present as a west to south-east trending strip across the middle of Kent. It has been suggested that the soils which formed upon such outcrops were light and ‘comfortable’ (cf. Tindale 1972, quoted in Jacobi 1978, 77) and that water was immediately available, and that such soils would only have been lightly wooded. However, it has also been noted that such outcrops interface locally with adjacent chalk and clay, and in fact lie on the margins of ecotones, providing a variety of affordances (Reynier 2005, 99).

Of the Mesolithic sites in East Sussex, Selmeston is one of the earliest and best known after Clark (1934) located three so-called ‘pit-dwellings’ cut into the Lower Greensand (sadly no further settlement traces were uncovered in excavations undertaken more recently (Rudling 1985)). While the interpretation of dwelling features has been called into question (see Newell 1981; Woodman 1985) for Selmeston, and for Farnham and Abinger in Surrey, understanding these features demands reconsideration (Blinkhorn et al 2017). The site at Selmeston benefits from access to springs and views over the Cuckmere Valley and is also located on the boundary of the Lower Greensand and Gault Clay. This may have afforded easy access to different, but complementary, ecological habitats. More recently, a concentration of sites has been noted on the Lower Greensand ridge immediately north of the South Downs, east from Hassocks (Butler 1989), of which Lodge Hill (Garrett 1976) and Streat Lane (Butler 2007) are examples in East Sussex. Streat Lane is of particular interest because of the excavation of a dished oval area defined by irregular flints with a single post hole in the middle, pointing to the possible existence of a simple hide shelter. It is also one of the few Sussex open-air Mesolithic sites to have been radiocarbon dated (c. 6,300 cal BC / 7,500±40 ^{14}C BP). The single shelter and 3,226 worked flint assemblage indicate a short-stay hunting camp used for the production and repair of hunting equipment. However, four large ‘cooking’ pits and huge quantities of burnt flint would seem to point to more intense activity and may contradict this assumption.

Mesolithic flintwork is recorded from many other similar places in the landscape through West Sussex (Beedings-Pulborough, Sullington Warren, Hassocks, Henfield, etc.). Topographic situation and dry soils preference remain likely, as is the common link of being close to water in the form of small streams, springs, or the River Arun/River Rother and River Adur. The small Rackham flint and hearth sites were located near the lower reaches of the Arun valley. Developer-funded excavation examined the flint scatter site from a similar topographic location on the Lower Greensand at Rock Common, Washington (Harding 2000), revealing Late Glacial and Early Mesolithic flintwork (including Deepcar-type assemblage indicators). The preservation of Mesolithic activity traces under later archaeology on the Lower Greensand was found at the site of West Heath barrow cemetery (Drewett 1976, 1985), indicating research of museum flint collections from excavated later monuments might reveal unnoticed artefacts.

In Surrey, Early Mesolithic sites include Frensham Great Pond (Rankine 1946), a site on the Folkestone beds that produced sixteen obliquely-backed points and included tools manufactured on Portland chert, indicating movement of populations beyond the region or exchange networks (Bradley 1972; Jacobi 1982). Other sites include Sandown Park, Esher (Burchell and Frere 1947), and the now lost assemblage from Buckland and Redhill Railway station where thirteen obliquely blunted points and a large blade element were discovered. Consideration of the Mesolithic of the Surrey area should also take into account the site of Oakhanger, which sits just across the border in Hampshire (Rankine 1952; 1956; 1960; Rankine and Dimbleby 1960). The site is of key importance in the literature of the region and of course forms part of the contiguous Mesolithic landscape of the Weald. Surrey has also produced several sites with microlith forms characteristic of the Horsham industry, including two sites on Devil's Jumps Moor, four sites on Kettlebury Common, Woodbridge Road, and another on St Catherine's Hill near Guilford (Gabel 1976).

Later Mesolithic sites, characterised by small microlith forms including rods and geometric forms, are also common on the Lower Greensand and include Abinger Common (Leakey 1951), Weston Wood (Machin 1976), Beddington (Bagwell 2001), Netherne-on-the-Hill, Banstead (Cotton 2006), Woodbridge Road, which also included a hearth, and Wonham near Reigate (Ellaby 1977). Some of these later Mesolithic assemblages are associated with pits that have been previously interpreted as possible settlement structures. In the main however these features are too small and steep-sided to offer dwelling space and might be interpreted as either resulting from raw material extraction or from their use as storage. The only possible dwelling site might be Weston Wood where the pit was both broad and shallow and associated with stake holes.

The excavations at North Park Farm, Bletchingley provide a site excavated under modern, controlled conditions that demonstrates the potential of sites fringing the Weald. Here, lithic scatters were excavated from sealed, chronologically discrete contexts within a valley head depression that was in-filled with windblown sand (Hayman et al. 2003). This site also included several small pits which appeared to have been speedily back-filled after excavation. Charcoal assemblages produced principally oak charcoal, with Maloidae and hazel also well represented. Modest numbers of hazel nutshell fragments were also recovered. The dominance of oak charcoal in contexts dated to between c.7450 and 7060 cal. BC appears to suggest some degree of selective foraging, given that contemporaneous pollen records appear to document considerable quantities of pine in local woodland.

3.2. Central Weald (Tunbridge Wells Sandstone and Hastings Beds)

There are several important sites located on the sand-yielding deposits of the Weald and High Weald, principally comprising sites associated with distinctive outcrops of hard Tunbridge Wells Sandstone that were utilised by Mesolithic groups as rock shelter habitation sites. There are two main areas of interest, landscapes of the Horsham area (St Leonard's Forest to the east, and Southwater-Nutley to the south), where the twentieth century collectors Piffard, Attree and Honeywood worked (Curwen 1954; Jacobi 1978), and the rock shelter sites associated with outcrops of sandstone in East Sussex and Kent.

Tebbutt (1975) did much to pull together the record of numerous Mesolithic flint scatters within the Ashdown Forest and the immediately surrounding farmland. He also noted several rock shelter sites situated on and around the sandstone outcrops that populate the High Weald, which had produced evidence of Mesolithic activity. These include High Rocks on the Kent-East Sussex border (Money 1960) and, in East Sussex, The Hermitage (Jacobi and Tebbutt 1981), Rock Fields (Hemingway 1980 bib; 1981), Withyam (Harding and Ostoja-Zagórski 1987) and Eridge (Greatorex and Seager-Thomas 2000). Not only have large lithic assemblages been uncovered (for example over 10,000 pieces at Uckfield and 4,000 at the Hermitage) but hearths have been located with associated preserved charcoal, sealed within in-situ soil horizons. The Hermitage and High Rocks have both provided material suitable for C14 dating and have produced evidence of post-holes that may be associated with temporary shelters. These sites offer valuable potential in providing lithic material in datable sealed contexts and would benefit from modern re-excavation. Likewise, further consideration should be given to the Stonewall rock shelters, near Chiddingstone in the Kentish Weald (Money 1960, 221; Jacobi 1978): while none produced any animal bone, environmental information, or material suitable for dating, the potential of this locality has not yet been fully explored through deep excavation.

Further potential still exists for the continued investigation of rock shelter sites. Following cues from the findings at Uckfield (Hemingway 1980; 1981), where a substantial flint scatter was located at least 25m from the base of the rocks, and on the basis of recommendations by Greatorex and Seager-Thomas (2000), the focus of investigation should be widened out from the immediate vicinity of these rock shelters in order to understand their wider context and to test their potential in providing evidence of different 'activity areas'. Recent excavations have also been carried out at Chiddinlye Woods, West Sussex, which offered a geoarchaeological basis for understanding the complexity of slope processes associated with rock shelter sites (Carter, Allen and Maxted, in prep).

Work in the Horsham area remains dominated by flint collectors. Collections made by Sylvia Standing in the 1940's and noted by J.P Gardiner in her thesis (1988) have been re-evaluated, categorised and quantified by Butler. Following recognition of their locations in the landscape by Gardiner, Caroline Wells would stress that although broadly within the landscape of 'Wealden clay', all are actually situated on Horsham stone outcrops and higher, gently- sloping ground, often south-facing. Flint collection by the late Lewis Gordon at Warnham (200m east of Ends Place) and Bonet Farm (uphill and south-east of the farmhouse), at Kingsfold, Surrey, on the county border, again demonstrates site preferences for higher ground on Horsham stone or local sandstone outcrops within the Weald clay area. These sites perhaps gave good visibility or were preferred as drier underfoot or for sitting and sleeping upon.

Extensive work has been undertaken at Coombe Haven, near Bexhill, East Sussex. This was a large-scale excavation of a landscape underlain by Hastings Beds and Wadhurst clay, fringing an alluviated valley (Champness 2007). The work has revealed multiple Mesolithic scatters, in apparent primary contexts, on both the valley sides and the edges of the floodplain, with scatters sealed under later Holocene alluvium. The earliest scatters probably date from the late Upper Palaeolithic and from the final or terminal Palaeolithic. There are at least 21 primary context scatters attributed to the Deepcar and Horsham industries, and two scatters in apparent association with stake holes indicative of structures. There are at least 124 primary context scatters of late Mesolithic date with radiocarbon dates indicating overlapping phases of complex patterns of technological change. The flint scatters have a high potential to more precisely define the chronology of Mesolithic flint industries in southern England. Pollen, insects, waterlogged plant remains and geoarchaeological data provides evidence of environmental change extending from the early Holocene to the end of the middle Bronze Age. Significantly, evidence for the relationship between Mesolithic and Neolithic traditions has potentially been identified. The latest Mesolithic flint scatters span the transition to the Neolithic, and both pottery and charred grain have been recovered from these, although direct association is currently unproven.

The Combe Haven landscape is typical of many fringing the central Weald outcrops and highlights the potential for entire early Holocene landscapes to lie locally preserved in topographies yet to be subject to systematic survey, and rarely impacted upon by modern development.

3.3. The Chalk (including Lambeth Group Tertiary deposits)

A considerable quantity of material has been collected from the chalklands of the South-East. However, close inspection of ground conditions suggests a possible correlation between either outcrops of Tertiary deposits capping the chalk or localised clay-with-flints deposits. A key research question is whether such deposits were favoured, or whether they represent areas where intact archaeology, unaffected by later Holocene slope processes, are left in place. Calkin (Calkin 1924) studied substantial collections of Mesolithic material from Peacehaven, a site situated on an outcrop of early Tertiary sands within the chalk downland. It has long been recognised as a flint working site and has produced evidence of three ‘cooking sites’, including large quantities of heat-affected white flint. Excavations by Archaeology South East in 2007 recovered substantial amounts of Mesolithic struck flint in this area (Hart 2015). Redhill (Barber and Bennett 2002, Holgate 2003) is a large Mesolithic site situated on deposits of Clay-with-Flints that cap the Upper Chalk. Taking into account recent finds there and those from the area in the Toms Collection, it has produced one of the largest Mesolithic assemblages recovered from the South Downs.

On the Chalk, the ‘background noise’ of flints makes spotting the very small diagnostic types of Mesolithic flint working less easy, but where intensive survey and collection or other archaeological interventions have taken place, finds can be made.

The A27 Brighton bypass work re-investigated Toms’ site at Red Hill, Dyke Road (Holgate in Rudling 2003), revealing concentrations of Mesolithic material and burnt flint. Investigations by Butler led to the identification of a flint extraction site or area at West Hill, Pyecombe (Butler 2001), where intensive survey, plus excavation, produced 5500 flints and recorded axe roughouts and preparation flaking. One can observe from Holgate's distribution map of sites in Sussex that Mesolithic flintwork has been recorded across downland north of Chichester and these finds relate to work on later archaeological sites such as North Marden, Stoughton 1 and 2 long and oval barrows, and various Roman villa or Saxon cemetery excavations (Chilgrove I & II, Batten Hanger, Appledown; Holgate 2003, fig. 3.3). Again, this shows the potential for Mesolithic material to be present as part of later period excavations.

Finds of core axes/adzes are common across the Chalk and particularly noticeable in Kent; it has been suggested that these forms were produced from flint 'quarried' from the chalk but were not generally carried very far by mobile hunter-gatherer groups (Jacobi 1978). Flint core axes/adzes are generally regarded as occurring in inverse proportion to microlithic forms; however, it must also be borne in mind that most such find spots relate to surface collection, and that microlithic pieces might be better represented within excavated collections, which are few and far between (Jacobi 1978, 18). An excavated example of such an axe/adze dominated site is Finglesham, within the east Kent marshes between Deal and Sandwich. The site produced a large flint assemblage (c.1600 pieces), including many whole and broken axe/adzes, together with 39 tranchet sharpening flakes, perhaps suggesting repeated axe/adze use and re-sharpening (Parfitt 1983). Eight TL dates were obtained from the site, centring on 4600 ±_600 BC (Parfitt and Halliwell 1988). No microliths were recovered from the site (Parfitt and Halliwell 2014), despite careful excavation, and no environmental analyses were undertaken. Awaiting publication is a site at Lyminge (Thomas and Knox 2012) which similarly produced a low proportion of microliths given the size of the assemblage, thought to be in excess of 10,000 pieces.

Projects at Shorne Woods Country Park and Ranscombe Farm, Kent (Mayfield 2012), have yielded large lithics assemblages. At the latter site, in excess of 13,500 pieces were recovered, with re-fits identified across 425 of these. The microlith component of the assemblage points to Later Mesolithic activity at c. 125m AOD on the North Downs.

Recent work at Falmer near Brighton (Garland and Anderson-Whymark 2016) showed hitherto unprecedented production of Late Mesolithic microliths in East Sussex. within a 7000+ piece assemblage. The site is especially notable for its clusters of pits, distinguished by subtle differences in the microlith forms, and defining an open, circular space. Continued discoveries resulting from the planning process show the continued potential for dense accumulations of Mesolithic flintwork to be discovered across the Chalk and the need to develop systematic research frameworks to deal with such material.

3.4. Alluvial Contexts and the Coastal Plain

There has been little work in the region directed at actively researching the alluvial archaeologies of the Weald, Sussex coastal plain and Kent marshes. Dynamic sedimentation occurred in the major river valleys during the Holocene, leaving the contemporary early- to mid-Holocene coastlines and estuaries either submerged or deeply buried. In Kent it is to be expected that further occurrences may be found within the east Kent marshes from organic-rich deposits (Long 1992) that would permit environmental reconstruction (Long et al. 1992); the same is true of the Upchurch Mashes around Lower Halstow Creek, from which a very different (microlith dominated) assemblage has been recovered. Further results will be also be forthcoming from work recently carried out in the Ebbsfleet Valley.

Landscape-scale investigations of alluvial contexts are to be strongly encouraged, in order to explore and contextualise human activity. Investigations in the Vale of Pickering are an exemplar of such approaches, through which variation and change over time in Mesolithic activity has been reconstructed in a nuanced fashion, within a changing environmental and landscape context (see Conneller and Schadla-Hall 2003; Milner et al 2018a). Such approaches also require an interpretative shift, away from a typology of sites ('hunting camp, base camp' etc.) towards an appreciation of variable human action within specific places (Conneller 2005). Again, it cannot be emphasised strongly enough that given the mobility of Mesolithic hunter-gatherer groups, no matter how well-preserved individual sites are, they are interpretatively limited and must be related to a broader picture of human activity within the landscape – a landscape which itself requires detailed reconstruction, not just as a backdrop to human activity, but as the medium within which their lives were lived.

On the Sussex Coastal plain, a low-lying area dissected by streams with deep alluvial sequences feeding into modern estuaries, important finds have been made in the last decade or so. The A27 Westhampnett Bypass improvement work revealed Mesolithic activity at an elevation of 5m above local flat countryside, adjacent to streams, each site conforming with the 'local elevation' and 'near-to-water' preferences noted above. Quantities of 4,500, and 6,000 flints were recorded from each respectively, and radiocarbon determinations ranging from the late 9th to the end of the 8th millennium cal BC (Fitzpatrick et al. 2009; Holgate 2003).

Mesolithic features dated by flintwork have been found at Bognor Regis (Priestley-Bell 2006). A Saxon grubenhaus lies at the centre of the excavated complex perhaps destroying some evidence, but a series of short curving gully-like and circular features with similar fills were excavated. Some of these features were dated by diagnostic Mesolithic flintwork, while all the rest contained flintwork similar in character or patination. Hazelnut shell was also recovered along with indeterminate charred material (Hinton 2006). The features are not immediately easy to interpret, but some could be seen as forming a rectangular arrangement 7m by 8m and others may represent a 5m diameter configuration.

Elsewhere on the Sussex coastal plain, flintwork of Mesolithic specific types or character have been recorded by excavation (Chadwick 2006; Butler 2006) or survey (Graves and Hammond 1993). The flintwork noted at the Rolls Royce factory site near Westhampnett was both residual and incorporated into the fills of Bronze Age and other features on site but was also located in a small undisturbed pocket of brickearth uncovered during site stripping (Chadwick 2006). Mesolithic activity may have been widespread across the excavation trench area which augments the A27 Westhampnett excavation evidence for intense, long-term and perhaps locally shifting centres of landscape use.

For example, work on the alluvial deposits in the Ouse Valley (Scaife and Burrin 1983) provided evidence of the removal of some vegetational cover in the Mesolithic. Palynological studies (e.g. at Selmeston (Macphail 1985) and Pannel Bridge (Waller 1993)) have also led to a greater understanding of the vegetational succession on differing geological zones during the Mesolithic. From these and similar studies, Scaife and Burrin discussed the important environmental impact prehistoric man had on the Sussex Weald, evidence of which was found within river valleys in the area.

Investigation of a new Mesolithic locality at Stonegate by Bertie Haycon provides an example of the type of site we should actively seek. Small-scale work on a small bluff above the floodplain of the River Rother revealed a deep alluvial sequence of gytjja (organic mud) separating different peat sequences. Ploughsoil yielded struck flint directly from a peat deposit revealed by a drainage ditch. Underlying the peat, a charcoal-rich layer containing burnt hazelnuts and over 100 Mesolithic lithics including an obliquely retouched microlith was identified. Early Deepcar Mesolithic activity is associated with the establishment of pine woodland where river valleys may have acted as corridors through the landscape, allowing an important breadth in dietary availability from restocked riverine and animal and plant resources (Reynier 2005). The Stonegate site should serve to make us aware that the margins of deeply-incised river valleys offer the best scope for large, complex Mesolithic sites with associated palaeoenvironmental archaeology.

4. Environmental Archaeology and Mesolithic studies in south-east England

The role of environmental archaeology data in detailing our understanding of Mesolithic activities is well accepted, and the greatest advancements in British Mesolithic archaeology have been achieved using a multidisciplinary approach (e.g. Simmons 1996; Mithen 2000a and 2000b; Innes and Blackford 2003; Milner et al 2018a and 2018b). These studies have enabled the modelling of seasonal resource exploitation and strategic woodland clearance, for example, which now characterise our understanding of Mesolithic Britain.

Unfortunately, the majority of multidisciplinary investigations have been carried out in northern England and Scotland. In comparison south-east England has few explored Mesolithic palaeoenvironmental archives (e.g. Devoy 1979; Waller 1993 and 1994; Branch et al. 2003; and Preece and Bridgland 1998), and only a handful of known archaeological sites with preserved environmental remains (e.g. Reynier 2002; Butler 2007). The resulting situation is that big Mesolithic research questions, such as possible landscape management practice, have generally not been addressed at a regional level in south-east England. Additionally, without a better option, extra-regional subsistence modelling attempts (e.g. Clark 1972; Simmons 1996) are used as interpretative frameworks for Mesolithic studies in south-east England, perhaps inappropriately.

This document will report on the existing Mesolithic environmental archaeological resource in south-east England and will review the significance of these datasets in relation to region-specific research scenarios. The untapped potential of the region's ecofactual resource will then be summarised and possible themes of investigation will be suggested.

4.1 Palaeoenvironmental Datasets and Regional Environmental History

The south-east region's catalogue of environmental archaeology datasets has grown in recent years and a summary of the existing palynological literature is listed in Table 1. With data obtained from these sites, four main biostratigraphic zones can be distinguished for the Mesolithic period (Table 2) that broadly correlate to those defined by Branch and Green (2004) for Surrey and the Thames Valley region.

***Table 1**: Palaeoenvironmental (pollen) sites in the south-east region dated to the Mesolithic period.*

Region	Number of sites	Site Names
Thames Valley (Surrey/Kent)	9	Crossness (Devoy 1979) Dartford Tunnel (Devoy 1979) Stone Marshes (Devoy 1979) Broadness Marshes (Devoy 1979) Runneymede Bridge (Scaife, 2000) Staines Moor Farm (Keith-Lucas 2000) Meadlake Place (Branch and Lowe 2001) Staines ABC Cinema (Branch et al. 2003) Mead Lane (Branch et al. 2003)
Chalk Downs	5	Broom (Kearney 1964) Lewes I and II (Thorley1981) Holywell Coombe (Preece and Bridland 1998) Caburn (Waller and Hamilton 2000)
Lower Greensand	2	New Pond (Scaife 2001) Elstead Bog, (Carpenter and Woodcock 1981; Farr 2009) Nutfield Marsh (Farr 2009)
Weald	10	Sharpsbridge (Scaife and Burrin 1983) Pannel Bridge (Waller1993) Brede Bridge (Waller 1994) Rye bypass 11 (Long et al. 1996) Rye bypass 31 (Long et al. 1996) Chapel Bank (Long et al. 1998) Old Place 80 (Waller 1998) Horsemarsh Sewer (Waller et al. 1999) The Dowels (Waller et al. 1999) Tillingham Valley (Waller 2002)

***Table 2:** Biostratigraphic zones for the Mesolithic period in south-east England. (Adapted from Branch and Green, 2004).*

c. cal. years BC	c. ^{14}C BP	Vegetation zone
9500-8200	10,000 - 9000	*Pinus* and *Betula* on dryland

		Sedge and reedswamp on wetland gradually replaced by *Salix*
8200-6900	9000-8000	Mixed deciduous woodland on dryland (*Quercus, Ulmus, Betula* and *Corylus*) Wetland dominated by *Salix*
6900-4700	8000-5800	*Quercus, Ulmus, Tilia* and *Corylus* on dryland *Alnus* expanded in wetland zone
4700-4300	5800-5500	Pocaeae and herbaceous plants increase and an overall decrease in arboreal pollen (*Quercus, Ulmus* and *Tilia*) is noted in the dryland areas *Alnus* Carr in wetland zone

Whilst this biostratigraphic model (Table 2) is an extremely useful benchmark synthesis, it does require a greater amount of detailed resolution and analytical definition, which pertains to the: 1) climatic (particularly hydrological) shifts in the Early Holocene observed in Global Circulation Models (GCM) and a variety of proxy datasets; 2) smaller-scale spatial and temporal variations in the region's vegetation history (i.e. those related to spatially restricted landscape zones); 3) possible human-induced woodland clearance episodes; 4) human responses to environmental change during the Mesolithic period, and 5) the vegetation history of the Mesolithic-Neolithic transition, including the effects of animal and crop husbandry, and unintentional landscape impacts caused by changes in subsistence practice.

In particular, there is a need to highlight the following key scenarios:

1) The Pinus rise at c. 8900 cal. BC and possible climatic causes (e.g. Reynier, 2005)

The Early Holocene *Pinus* rise is observed in palynological datasets from Cranes Moor, Hampshire (Barber and Clarke 1987); Holywell Coombe, Kent (Preece and Bridgland 1998; 1999); Pannel Bridge, East Sussex (Waller 1993); Staines Moor Farm, Surrey (Keith-Lucas 2000); Elstead Bog, Surrey and Nutfield Marsh, also in Surrey (Farr 2009). This phase of vegetation history is thought to have been stimulated by a shift to drier environmental conditions and this theory is supported by climatic records from the Wateringbury tufa in Kent, where trace elements (Mg/Ca/Sr/Ca) and $\delta^{13}C$ isotope values indicate a regional trend towards drier conditions prior to c. 8450 cal. BC (Garnett et al. 2004). The *Pinus* rise is implicit in the Early Mesolithic hunter-gatherer behavioural models that Reynier (2005) produced, where it is theorised that *Pinus*-dominated vegetation would support minimal plant foodstuffs and concentrated faunal resources, forcing the majority of human activity at this time into the river valley areas (i.e. valley-bottom Deepcar assemblages at Kennet Valley, Berkshire, Ellis et al. 2003; Thatcham- Healy et al. 1992).

2) The Corylus rise in response to warmer and drier conditions at c. 8250 cal. BC (e.g. Huntley and Prentice 1993)

From the regional palynological datasets available in southern England, it appears that there are two main phases of *Corylus* establishment apparent at c. 8500 cal. BC: Cranes Moor (Barber and Clarke 1987); Pannel Bridge (Waller 1993), and Elstead Bog (Farr 2009), and c. 7500 cal. BC: Church Moor, Hampshire (Clarke and Barber 1987); Bramcote Green, Southwark (Branch and Lowe 2004), and Staines Moor Farm (Keith-Lucas 2000). Various theories have been postulated to account for this marked vegetation change, principally: anthropogenic interference (burning and clearance) aimed at increasing the amount of *Corylus,* a necessary Mesolithic food resource (Smith 1970); anthropogenic clearance episodes, i.e. to encourage open space for browsing animals (*sensu* Mellars 1976), which had the unintentional effect of providing suitable conditions for *Corylus* expansion, and a climatic shift to warmer and drier conditions that favoured the expansion of *Corylus* (Huntley and Prentice 1993).

3) The 8.2 ka (c. 6200 cal. BC) event (Alley et al. 1997) and the Early-to-Mid Holocene transition, with the sustained emergence of thermophilous tree species (Tinner and Lotter 2001)

The records from Elstead Bog (Farr 2009) show some very marked changes in sediment and vegetation histories at c. 6200 cal. BC with a distinct influx of minerogenic material and the intermittent absence of thermophilous taxa (*Quercus* and *Ulmus*). Other records from the region are also observed to show changes at this time, for example the high-resolution peat sequence from Cranes Moor records a continuous sequence of *Sphagnum* and algal-rich mud which is briefly interrupted at c. 6015-5731 cal. BC (7000 $\pm$ 80 ^{14}C BP- SRR-1916). This is thought to represent a short period of drier conditions on the mire surface (Barber and Clarke 1987). Molluscan assemblages from Holywell Coombe (Rousseau et al. 1998) and δ^{18}O Isotopic and Mg/Ca trace element records from the Wateringbury tufa in Kent (Garnett et al. 2004) also independently indicate a short-lived deterioration of temperature (c. 1-1.7 ºC) together with signs of aridity at c. 6200 cal. BC. More frequently, suggestions of the 8.2ka event and its possible role in regional environmental history are provided by the Early-to-Mid Holocene vegetation transition and the sustained emergence of thermophilous tree taxa at c. 6000 cal. BC (*sensu* Tinner and Lotter 2001) (e.g. Bramcote Green, Branch and Lowe 1994 and Meadlake Place, Surrey, Branch et al. 2001). Perhaps significantly, the 8.2 ka (c. 6200 cal. BC) event and the Early-to-Mid Holocene transition are also broadly contemporaneous with the Early-to-Late Mesolithic transition (depicted by changes in lithic technologies and settlement patterning).

4) Early Holocene vegetation migration

Using existing pollen data from north-east Europe, palaeovegetation maps have been produced which document the migration of vegetation taxa in response to Early Holocene climate warming (e.g. Birks 1989).

Recent research in south-east England has provided evidence to suggest the occurrence of *Alnus* at c. 9960 $\pm$ 110 BP (SRR-2892, 10,020-9240 cal. BC), Pannel Bridge (Waller 1993); by 9567 $\pm$ 51 BP (Wk-1631, 9220-8750 cal. BC), Nutfield Marsh (Farr 2009), and by 9460 $\pm$ 140 BP, Holywell Coombe (Preece and Bridgland 1998; 1999). Other sites from areas proximal to the south-east region also document early examples (before c. 7000 cal. BC) of *Alnus* pollen, such as: Dorney, Buckinghamshire (Parker and Robinson 2003); Bramcote Green, Enfield Lock and West Silvertown, Greater London (Branch and Lowe 1994; Chambers et al. 1996 and Wilkinson et al. 2000), and Gatcombe Withy, Isle of Wight (Scaife 1982). The palaeovegetation models proposed by Birks do not account for the occurrence of *Alnus* in south-east England until c. 8000 BP (c. 6900 cal. BC). Additionally, records of *Fraxinus* and *Tilia* at c. 8000 BP (c. 6900 cal. BC) exist at Pannel Bridge (Waller 1993) - up to 1000 radiocarbon years before the spread of these taxa mapped by Birks (1989). These studies demonstrate that Early Holocene vegetation in the south-east region is likely to be much more variable than assumed from early palynological studies.

5) Variation in regional vegetation patterns

The wide variety of geological substrates and associated soil types in south-east England are likely to have supported a range of different vegetation communities during the Mesolithic period (i.e. Branch and Green 2004). There are growing bodies of evidence to detail our understanding of vegetation in: Thames alluvial floodplain (e.g. Scaife 2000; Keith-Lucas 2000; Branch and Lowe 2001; Branch et al. 2003) and the south-east England Weald/coastal zone (e.g. Scaife 1983; Waller 1993; Waller and

Kirby 2002). However, other areas within the south-east region are less well investigated and there are few studies from edaphic catchments, such as the Lower Greensand substrate (e.g. Farr 2009) and chalk Downs (e.g. Kearney 1964; Thorley 1981; Preece and Bridgland 1998).

6) The Ulmus decline

A regional overview of the *Ulmus* decline palynological datasets, suggests an interesting scenario that appears to depict at least two phases of *Ulmus* decline in south-east England at c. 4500 cal. BC: Bramcote Green (Branch and Lowe 2004), and Nutfield Marsh (Farr 2009), and at c. 3750 cal. BC: Stone Marsh, Essex (Devoy 1979 and 1980); Pannel Bridge (Waller 1993); Bryan Road, Rotherhithe (Sidell et al. 1995), and Elstead Bog (Farr 2009). The overall evidence suggests that more than one *Ulmus* decline (some with associated cereal pollen) occurred in south-east England and this suggests that there is promising potential in attempting to regionally characterise the timing, nature and relationships of the *Ulmus* decline and the Mesolithic-Neolithic transition in south-east England.

7) Mesolithic woodland clearance

South-east England has had little to contribute to theories of Mesolithic human impact on vegetation, although there is a poorly researched and circumstantial argument to suggest that the genesis of the region's heathlands may be associated with Mesolithic woodland clearance (e.g. Simmons, et al. 1981; Garton 1980). Other studies in Sussex (Waller 1993) have seemingly more conclusive results and depict the main decline in arboreal pollen as being associated with the beginning of the Neolithic period (c. 4000 cal. BC) and in some cases a little later (Waller 1993; Preece and Bridgland 1998).

However, regional archives are not in complete agreement and recent research has provided palynological and sedimentary evidence of possible Mesolithic woodland clearance at Elstead Bog at c. 6900 cal. BC (Farr 2009). Similarly, minor declines in arboreal taxa during the Mesolithic period have been noted in one pollen diagram from the south-east region, Lewes 1 (Thorley 1981), and it has been suggested that human activity may be the cause of this (Bush 1988). Interestingly, geoarchaeological evidence from Lower Greensand archaeological sites in Surrey and Hampshire (Oakhanger VII and VIII, Hampshire; Iping Common, Surrey; North Park Farm, Surrey) have recorded the deposition of large volumes of sand in relatively short periods of time (at c. 8000 ^{14}C BP) and it is possible that the agency causing the mobilisation of this material is the human clearance of forested areas (Rankine and Dimbleby 1960; Keef et al. 1965; Farr 2009).

4.2. Archaeological Sites with Environmental Material

The south-east region's catalogue of on-site Mesolithic ecofactual datasets is very small, which is mainly due to: the paucity of actual occupation sites that have been excavated; post-depositional factors which have prohibited the preservation of ecofactual material, particularly faunal remains (e.g. acidic sediments at Kettlebury 103, (Reynier 2002) and North Park Farm, (Green et al. 2013)), and post-depositional factors which have caused the chronological mixing of Mesolithic and later ecofactual material.

The absence of faunal material is the largest deficit in the region's Mesolithic environmental archaeological record. There are only three examples of bone retrieved from Mesolithic contexts, these being Farnham, Surrey (Rankine 1936), Charlwood, Surrey (Ellaby 2004) and Darenth (Kent, HER). The Farnham and Charlwood assemblages contained only a few items (identified with uncertainty as sheep or roe deer) and are of little research value. However, Kent's HER records suggest that the Darenth assemblage is more substantial.

Mesolithic botanical remains are more frequently represented in the region's environmental archaeology records, although provide only limited evidence for human use of plant resources. Small amounts of charcoal and hazelnut shell have been found in association with Mesolithic sites at: High Rocks 54-6, Sussex (Balfour Browne 1960); Selmeston, Sussex (Clark 1934); Kettlebury 103, Surrey (Reynier 2002), and Upper Bognor Road, West Sussex (Priestley-Bell 2006), and two more substantial charcoal assemblages exist from Streat Lane, East Sussex (Butler 2007) and North Park Farm, Surrey (Farr 2013). Both of these case-studies show a predominant use of oak (*Quercus*) and hazel (*Corylus*) as fuel wood around c. 6390-6220 cal. BC (Streat Lane) and c. 7480-6240 cal. BC (North Park Farm).

There is an on-going need to acquire good quality palaeoenvironmental, archaeological and environmental archaeological datasets to enable the formation of subsistence models equivalent to those in existence for northern England. As it stands, possible behavioural patterns in Mesolithic landscape studies have been hinted at for the south-east England region, but have lacked a defined modelling approach because of the lack of actual 'sites' and dominance of isolated find-spots, which form the archaeological record, and the paucity of faunal and macrobotanical material.

4.3. Chronological Resources

Problematically under-pinning all Mesolithic research in south-east England is the extreme lack of chronological data for the period. There is an ongoing need to improve both archaeological and palaeoenvironmental chronologies in the region.

Chronometric dating results listed in the CBA Radiocarbon Index for Great Britain (CBA, 2012, doi: 10.5284/1017767) and documented in available grey literature and published sources are summarised in Table 3. Further details of the region's absolute dating catalogue can be found in Appendix 1.

Table 3: *Absolute dating records for the Mesolithic period.*

Dating Technique	Archaeological Sites	Palaeoenvironmental Sites
Radiocarbon	72	61
Thermoluminescence	8 *(Finglesham)*	-
Optically Stimulated Luminescence	2	-

Table 3 details a dataset of 83 known absolute dates which are reported from Mesolithic archaeological sites in the south-east region. Of these, thirteen are in association with the Mesolithic occupation site at North Park Farm, Surrey (Branch et al. 2013; Bayliss et al. 2008; Marshall et al. 2013). A more widespread (both spatially and temporally) series of absolute dates is required to support the region's existing artefactual datasets. The current lack of a regional chronological framework means that observed changes in tool typology, site distribution patterns, and resource exploitation patterns remain broadly divided into earlier, middle and later Mesolithic portions, with little understood about the detailed timing and duration of these behavioural changes.

A total of 61 known radiocarbon dates exist for the region's palaeoenvironmental archives, which have permitted the construction of vegetation history sequences, sometimes in association with other environmental variables such as sea level change (e.g. Waller 2003). However, additional chronological refinement is necessary in association with region-specific research questions.

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Research Agenda

5. Overview

The Mesolithic and Upper Palaeolithic Resource Assessment highlights the range and distribution, but also the deficiencies in the current record of known archaeological and palaeoenvironmental work in the South-East. Although similar problems exist with the known resource across all periods, deficiencies of the Late Pleistocene and Early Holocene records are perhaps quite distinct from these and are of a different order. HER records, which today form the basis of our current inventory of known archaeological find spots, are both inconsistent and incomplete across the counties. Upper Palaeolithic find spots have been misidentified, and Mesolithic records are neither complete nor consistently described, with distinctions between excavated sites, recorded scatters and isolated finds not made explicit. In addition to this there are clear inconsistencies and omissions when comparing the county HERs with our two other sources of primary inventories: the Mesolithic Gazetteer (Wymer 1977) and Jacobi's database of finds curated by the PaMELA project (Wessex Archaeology, Jacobi 2014).

The south-east region incorporates a wide range of landscapes (Thames alluvial floodplain; Inland and Coastal Weald; Chalk Downs and the Greensand) and these geological catchments are highly likely to have different environmental, economic and settlement histories throughout the Mesolithic period. This is beginning to be demonstrated by 1) Palaeoenvironmental studies from various parts of the region that detail differences in the timings and nature of vegetation history (e.g. Waller 1993); 2) Archaeological investigations at occupation sites that appear to show discreet variations in lithic assemblages, which may be associated with landscape setting (e.g. Reynier 2005); and 3) Landscape archaeological investigations which have illustrated possible correlations between sandy substrates (Lower Greensand) and an intensity of Late Mesolithic activity (Mellars and Reinhardt 1978).

The south-east region's palaeoenvironmental records also have unique scope for addressing issues such as 1) Possible Mesolithic woodland clearance, where there is research potential in investigating Early Holocene alluvial sequences, particularly from the Sussex Ouse and Cuckmere catchments, where loess deposits would have been susceptible to erosion from forest clearance (Scaife and Burrin 1985; Macklin 1999), and 2) Vegetation histories of the Early Holocene and related human activity, where specific taxon responses to possible environmental change are only seen in palaeoenvironmental records in southern England (i.e. The *Pinus* Rise, Farr 2009).

Currently the region suffers from a paucity of excavated faunal material, but sites such as the Early Mesolithic site at Thatcham, in the Kennet valley (Healy et al. 1992), indicate a likelihood of finding similar valuable assemblages in south-east England's valley bottom locations. Similarly, the plant macrofossil resource has provided only limited evidence for human use of vegetation resources, particularly for diet for which the evidence consists of charred hazelnut shell fragments. Waterlogged plant remains could potentially provide evidence for dietary plants that are less well represented. A deposit of waterlogged plant material associated with human activity recovered from Westwood Ho!, North Devon, included possible food plants such as dogwood (*Cornus sanguinea*) stones, recovered in large numbers, sloe (*Prunus spinosa*) stones, blackberry (*Rubus fruticosus* agg.) and wild strawberry (*Fragaria vesca*) seeds (Vaughan 1987), as well as charred fragments of hazelnut shell. Archaeological sites located in waterlogged environments such as intertidal peats may provide similar datasets which would improve our understanding of Mesolithic diet. The region's full range of preservation locales (related to soil types: acid, basic, neutral, acid/basic anoxic, O'Connor and Evans 2005) provide great scope for characterising the Mesolithic environmental archaeology resource in the South-East. They also provide a unique opportunity for designing flagship, multidisciplinary, Mesolithic landscape research projects which integrate a wide variety of datasets and seek ways to maximise research output in these settings.

The single biggest challenge to Mesolithic and Upper Palaeolithic Research in the south-east region is the lack of direct and active research. There is currently no academic project focusing on either the Late Glacial or Early Holocene archaeology in the region, nor any addressing the transition from the Mesolithic to the Neolithic. This is directly affecting our ability as a discipline to collate and consolidate existing records, interpret new finds as they emerge and to plan future research. Consequently the absolute priority must be to engage directly with this skill deficit by seeking funding, with support of Historic England as a strategic partner. To develop post-graduate and post-doctoral research, this funding must not only cover developing qualified new researchers but developing their skills through active field and collections-based research. We propose that two funded PhDs and a single funded post-doc are required. Ideally these should be packaged as a single research project with budgets for fieldwork, radiometric dating and resources for travel.

> PhD1: Late Glacial and Early Mesolithic human settlement of the Wealden and English Channel Regions.
> PhD2: Late Mesolithic and the transition to the Neolithic in the Wealden Region.
> Post Doc1: Late Glacial and Early Holocene Environmental change in the Wealden and English Channel Regions.

It is important that this new generation of researchers takes a wider view of the record for this period, developing familiarity with the record both in northern France and wider areas of Britain. Only in this way can the region's record be properly contextualised and understood. It is also important that new generation researchers engage with geomorphological processes in understanding the development of the Wealden landscape in the Late Glacial and Early Holocene. While Cretaceous geomorphology is an under-researched discipline in modern geography, it is absolutely key to our understanding of the relationship between known find spots and the actual patterns of past population.

It has been demonstrated before that renewed vigour in the study of a period at a regional or national level is more effectively achieved through the galvanisation of a multidisciplinary team around a flagship site. Typically, such sites will offer excellent time resolution, a high degree of spatial resolution, in-situ archaeology, a wide variety of palaeoenvironmental resources and organic preservation of material. Excavations at Thatcham, Boxgrove, Uxbridge, and most recently Star Carr provide examples of the kind of key site which can attract a dedicated team, justify the funding this entails and develop independent cutting-edge research agendas which take the whole region forward. The discovery of such a site is of course rare and not something which can be guaranteed, even with generous resources and time. Nevertheless, the following approaches offer the best chance to identify the presence of such sites within the region and deliver research-driven responses to their discovery.

The following Research Agenda items for the Upper Palaeolithic and Mesolithic in the South-East derive from expert panel meetings and contributions, and public consultation. These are not exhaustive and should be read in combination with the national frameworks for the periods (Pettitt et al 2008; Blinkhorn and Milner 2013).

6. Primary Research Aims for The Upper Palaeolithic and Mesolithic

Theme A Data Management

Continued research relies on well-maintained and accurate archives. Attention must be given to the consistency, accuracy and ambiguity of HER records and the presence, accessibility and storage conditions of existing Upper Palaeolithic and Mesolithic material.

A.1 Can existing data be integrated better to enable meaningful database queries?

A.1.1 Existing databases (HER, PaMELA, Wymer Gazetteer, PAS records) of all relevant archaeological and palaeoenvironmental data should be integrated into a single unified Geographical Information System.

A.1.2 Use of existing data from all fields (and questions arising from this) as a guide for new multidisciplinary research projects (i.e. Farr 2009).

A.2 Is a single coherent system of classification devisable whereby different classes and subclasses of evidence (e.g. find spots, scatters, palaeoenvironmental datapoints, preserved sites, landscapes, and potential flagship sites) are distinguished?

A.3 How can grey literature and the output of developer-led archaeology be highlighted, and rapidly integrated and disseminated?

A.4 What collected evidence exists but is unrecognised?

A.4.1 Audit of museum, local society, and private collections to trace, confirm and document existing find spots.
A.4.2 Cross reference and integrate data in a unified database.
A.4.3 Arrange for integration of dispersed collections and removal of poorly curated collections to central storage facilities employing recognised standards of good practice (e.g. The Discovery Centre, Fishbourne; the KEEP store, East Sussex).

A.5 Can existing records be updated and enhanced as part of renewed research?

A.6 What threats and challenges exist in the curation of existing material within the region? Can collections and archives be collated, and curation enhanced?

A.7 Achieve archive order and publication of Upper Palaeolithic material recovered from Goldsworth Park

Theme B Environmental Studies.

B.1 Integration of existing palaeoenvironmental reports into a gazetteer for Late Pleistocene and early Holocene environments.

B.1.1 Fostering of doctoral or post-doctoral research to extend the excellent work already achieved for Surrey across the region (e.g. Farr 2009).

B.2 How can the near-shore, inter-tidal and submerged evidence and records be reconciled with terrestrial data?

B.3 To what extent did Mesolithic activity result in the formation of Heathland ecology?

B.3.1 Question early Holocene involvement in heathland formation through targeted modern examination of the palaeoenvironmental record

B.4 Can phases of small-scale woodland clearance (and/or woodland management practices) be confidently identified in the region's palaeoenvironmental records, and can they be related to known Mesolithic activity?

B.5 How can the lack of high resolution palynological studies be rectified?

B.5.1 Targeted high-resolution palynological analysis on archives that are likely to be minimally affected by taphonomic processes (e.g. Pingo Basins - Farr 2009).

B.5.2 As a minimum, targeted high-resolution palynological analysis at critical points in Mesolithic human-environment history (e.g. The Early-Mid Holocene transition).

B.5.3 Standardise recording of microcharcoal, spore records and pollen preservation in palynological sequences.

B.6 Can the absence of Upper Palaeolithic and Mesolithic faunal and macroscopic botanical data in the region be approached in an informed way?.

B.6.1 Use of applied GIS, geophysical and geomorphological modelling (e.g. Bates and Bates 2000; Farr 2009) to identify key landscape parcels that are likely to yield Mesolithic sites with in-situ faunal and waterlogged plant macrofossil remains.

B.7 Investigating the Pinus Rise:

B.7.1 Is the Pinus rise a synchronous, climatically driven event?

B.7.2 Are Mesolithic people responding to climatic and landscape change at this time?

B.8 Investigating the Corylus Rise:

B.8.1 What evidence is there to suggest that these were climatically driven 'events'?

B.8.2 Are there any contemporaneous changes in human activities that can be observed in the archaeological record, i.e. changes in settlement patterning or on-site evidence of resource exploitation?

B.9 How many phases of Ulmus decline are observed in regional pollen diagrams and is the Ulmus decline at c.3750 cal. BC, a good biostratigraphic marker for the beginning of the Neolithic period in the south-east England region?

B.10 What are the vegetation histories of the Greensand and Chalk downland in the south-east region, and does the genesis of these landscapes relate to human activity during the Mesolithic period?

B.11 Can the 8.2 ka event be confidently identified in palaeoenvironmental sequences in south-east England and what relationship does this have with the Early-to-Mid-Holocene vegetation transition?

B.12 How are Mesolithic people responding to climatic and landscape change at the 8.2 ka event?

B.13 What evidence exists to support theories of Early Holocene vegetation diversity in south-east England?

B.14 What is the relationship between palaeoenvironmental sites and known early Mesolithic activity?

B.15 What evidence is there for the introduction of domestic animals?

B.16 What evidence is there for the local extinction/introduction of faunal species?

B.17 Is plant macrofossil for cereal production shortly after 4000 cal. BC (e.g. Westwood Cross, Stevens 2011, and Whitehorse Stone, Allen et al. 2006) temporally consistent across the region and can it be tied to the palynological record?

B.18 How do the region's palaeoenvironmental records relate to the landscape archaeological record?

B.19 What evidence is there for hunting strategy/technology?

Theme C Site Prospection and Distribution of Evidence

Prospection

C.1 How can Upper Palaeolithic and Mesolithic evidence be targeted?

C.1.1 Direct support for investigation of Upper Palaeolithic and Mesolithic sites and landscapes, whether or not a clear development threat is present

C.1.2 Systematic survey of Lower Greensand fissure sites and recognition of potential in the planning process

C.1.3 Targeted prospective survey of valley edge, flood plain and periglacial landforms to recover further palaeoenvironmental sequences and establish derived regional models for environmental change, such as that undertaken by Simmonds (2017) at wetland-dryland interfaces in Surrey across the Late Glacial and Early Holocene boundary.

C.1.4 Targeted prospection, excavation and environmental sampling to characterise various archaeological and/or palaeoenvironmental evidence on regional geomorphologies (e.g. fluvial, rock shelter/fissure, heathland contexts, Greensand podzols, pingos, valley-bottom sites). These can be achieved through low-cost university driven research or wider prospective survey of likely contexts.

C.1.5 Continued fostering of amateur collectors within the region through liaison with Finds Liaison Officers, regional universities and research projects. The continued collection of large quantities of low-resolution data outside of research-driven landscape projects, which can create, needs to be addressed. The endeavour, enthusiasm and professionalism of the amateur collector should be targeted into areas which can deliver high-resolution records (e.g. quarry workings, areas of fluvial/marine erosion, fissure contexts).

C.1.6 Implement systematic field-walking across transects encompassing areas of known Mesolithic occupation and perceived absence. Can controls be established to actively filter biases in the ease of collection on different sediment types?

C.1.7 Fostering of research projects directed towards the active prospection and multi-disciplinary investigation of sites providing palaeoenvironmental evidence.

C.1.8 Identification of key sites (using GIS, e.g. Farr 2009) that are: 1) likely to contain maximum ecofactual information and in-situ archaeology, and 2) able to temporally and spatially enhance data from other data sources (e.g. landscape archaeological data).

Lacunae

C.2 Is the contrast between the relatively wide distribution of EUP blade points and the virtual absence of Aurignacian and Gravettian finds in the region real or due to the greater size and distinctiveness of the EUP material?

C.3 Does the scant evidence for Late Upper Palaeolithic south of the Thames and east of the Surrey Hills indicate that south-east England is an area of marginal occupation during the Late Glacial?

C.4 Are apparent absences, including the relative lack of sites in Kent and on the Weald Clay geology real or an artefact of research history?

C.5 Is the absence of sites related primarily to the lack of centralised preservation contexts, such as the caves present within upland Britain, or through lack of prospection efforts?

Landscape Processes

C.6 To what degree are plateau and slope sites under-represented due to Late Glacial and Early Holocene erosion?

C.7 To what extent are land surfaces from this period buried beneath Head and Colluvium?

C.7.1 Enhancing, within developer-funded archaeology, the provision for targeted, detailed work aimed at the recovery of Mesolithic material, with particular attention paid to the potential for buried land surfaces and primary context assemblages.

C.8 To what extent does the timing of Holocene sea-level rise affect the visibility of sites?

C.8.1 Use of flint provenance to identify movement into and out of the now-submerged English Channel region

C.9 What mechanisms can be put in place to detect threats to archaeology through coastal erosion and the ability to respond to such threats?

C.10 Can a systematic assessment of threats (e.g. agriculture and arboriculture) to known flint scatter sites in the central Weald be established?

Planning Process

C.11 How can support for geoarchaeology, environmental archaeology, off-site palaeoenvironmental work and targeted prehistoric archaeology in developer-funded contexts be delivered best?

C.11.1 Development provides perhaps the best opportunity for the discovery of key flagships sites of this period. The will and flexibility should be fostered to deal with these projects effectively within the planning process while at the same time utilising regional research driven projects and associated expertise to augment the programme of developer-funded work. Establishing teams of regional expertise is seen as the effective way of providing this value-added support to the commercial process.

C.12 Now geoarchaeological and palaeoenvironmental studies are well-established and valued disciplines within archaeology, what standardised provision for their assessment can be delivered within the planning process, irrespective of direct human evidence?

C.12.1 Sites such as Horton (West Sussex) and Holywell Combe (Kent) provide the essential evidential base for understanding the environmental conditions prevalent in south-east England during the Late Pleistocene and Early Holocene. This is of immense importance to our understanding of human activity, arguably more so than recorded surface finds which might more routinely trigger an archaeological response ahead of development.

C.13 How can the lack of regional coherence in excavation, environmental sampling and analytical methods be addressed?

C.13.1 Formation of taphonomic models for distinct geomorphological catchment types and the production of guidelines on methodological techniques (so that ecofactual information is regionally comparable).

Theme D Specific Upper Palaeolithic and Mesolithic Research Questions for south-east England

D.1 Can material with only broad LUP affinity be identified in terms of its technological affinity with discrete techno-complexes?

D.1.1 Reassess Mesolithic and later lithic assemblages for the presence of possible Upper Palaeolithic archaeology

D.2 What was the limit of Long Blade industries in the South-East: did these extend into the Weald?

D.2.1 Establish possible ecological controls (e.g. reindeer and horse migration routes) and dating evidence for Long Blade industries

D.3 Is there evidence of later prehistoric re-use of Mesolithic flint working sites, particularly in the Bronze Age (perhaps through Bronze Age discovery of these sites during forest clearance)?

D.3.1 Fieldwork and museum collection driven research into the collocation of Mesolithic and later prehistoric archaeology.

D.4 Can lithic techno-complexes in the region be further refined?

D.4.1 Doctoral research into later, geometric-dominated assemblages echoing earlier focus on Early Mesolithic typologies (e.g. Reynier 2005)

D.5 What habitat preferences existed in the Upper Palaeolithic and Mesolithic?

D.5.1 At both regional and local scales, develop research approaches which can discern relationships between past occupation and the current distribution of known sites.

D.5.2 Quantitatively test past models of land-use based on preferences for particular types of geological substrate and topographic position through systematic site prospection and model testing.

D.5.3 At a wider scale examine and model patterns of human land-use at an inter-regional scale to develop models to explain factors such as A) the general lack of Upper Palaeolithic evidence in south-eastern England, B) the concentration of final UP long blade sites along the Thames valley, C) the low-density occupation of the region during the Mesolithic.

D.6 To what extent is the English Channel Region an area of active human activity in the Last Glacial and Early Holocene?

D.7 Are groups resident in the Weald or entering the region as an area on the limits of their seasonal movement patterns?

D.8 Should Mesolithic pit features (e.g. Abinger, Hassocks and Selmeston) be interpreted as a signature of settlement?

D.9 Are techniques in lithic-provenancing studies achievable, through examination of geo-chemical, micro-fossil, or other signatures, which establish the sources of lithic tools in the Upper Palaeolithic and Mesolithic?

D.10 How can lithic analysis reveal choices of local or distant sources, chronological patterning, potential travel distances, exchange mechanisms or preferential selection for specific tool types?

D.11 Do we know enough about lithic patination and soil chemistry, and what potential is there for study of this topic?

D.12 Which developer-funded sites demand research-level techniques (e.g. isotope, phytolith and microwear analysis)?

D.13 What approaches to Upper Palaeolithic and Mesolithic social archaeologies are appropriate for the region?

D.13.1 Determining whether the absence of clear settlement and burial evidence is real, or is the result of preservation/prospection bias

D13.2 Interrogating lines of evidence (e.g. raw material transport, insularity of typological components of the lithic assemblages, deposition practices) which can deliver research direction for looking at links with other regions and the Continent.

D13.3 Assessing evidence for continuity or re-use of sites between the Mesolithic and Neolithic to provide directions for assessing the role of indigenous cultures in developing agricultural and monumental practices in the region.

Theme E Dating

An overall lack of chronological data associated with critical artefactual and ecofactual assemblages, and 'events' observed in the palaeoenvironmental record means that objectives, rather than questions, best target deficiencies in Upper Palaeolithic and Mesolithic datasets.

E.1 Revisiting known archaeological and palaeoenvironmental sites of interest and applying absolute dating techniques (e.g. Horton (West Sussex), Ightham (Kent). Elstead (Surrey)).

E.2 The identification of key points in the region's Mesolithic archaeological and palaeoenvironmental records and application of absolute dating, where possible (i.e. the Pinus rise; Corylus rise).

E.3 Reassessment of existing faunal material from archaeological sites using AMS and Ultra-filtration techniques to refine our dating evidence.

E.4 To refine and construct dated sequences of technological change for the Mesolithic of south-east England.

E.5 Work should be targeted to build upon the dating of microlith typologies to test and enhance existing models of technological change.

E.6 To reanalyse existing and known sites in the region using OSL/TL dating techniques to increase the sample size of dated sites for the region. This would be especially useful for known sites from the Greensand where cover sands would provide good effective contexts for OSL dating.

E.7 Update the CBA radiocarbon index and EAB database with new data.

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