

Chapter 3

An Archaeological Resource Assessment and Research Agenda For the Mesolithic in the East Midlands

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1 Introduction

The first stage in the East Midlands Archaeological Research Framework (EMARF) project has seen the production of five papers providing assessments of the Mesolithic resource for Nottinghamshire (Bishop 2000), Leicestershire and Rutland (Knox 2000), Lincolnshire (Membury 2000), Derbyshire (Myers 2000) and Northamptonshire (Phillips 2000). As part of Stage 2 of the EMARF project the present paper will draw upon the county-based assessments and attempt to provide a coherent synthesis of the Mesolithic archaeological resource for the region as a whole. The regional resource will be assessed in the light of national research issues and agendas with a view to identifying a regional research agenda for the Mesolithic period.

The East Midlands region embraces considerable variation in topography, geology, soils, drainage, demographics, historical and contemporary land-use patterns. In discussing the Mesolithic resource for such a diverse, contemporary and artificial construct as the East Midlands region we need to be aware that the archaeology relates to groups whose patterns of subsistence, settlement and social interaction almost certainly resulted in mobility and relations well beyond the boundaries of the region. Consequently, in setting out to provide an assessment of the Mesolithic resource in the East Midlands it is essential that this is done with a view to the wider geographical context.

The East Midlands region occupies an interesting geographical position regarding the history of research into the Mesolithic period. The north-west of the region includes the southern end of the Pennine upland gritstone environments that have provided an important and enduring focus for studies of the Mesolithic and in national discussions of the period. Numerous excavations of Mesolithic sites, mainly just to the north in South and West Yorkshire (Radley and Mellars 1964;

Radley and Marshall 1963, 1965; Jacobi *et al.* 1976), have established the importance of this upland archaeology and ensured a continuity of academic research interest (Jacobi 1978a; Jacobi *et al.* 1976; Myers 1989b; Spikens 1999; Williams 1985). To the south and east lie the Eastern Counties and the South-East regions. In the Eastern Counties region academic interest into the Mesolithic also has a long established history, benefiting through having Cambridge University located within its boundaries. Important publications of early excavations (Clark 1955; Clark *et al.* 1935; Warren *et al.* 1934) and the more recent production of county and regional overviews of the archaeology (Jacobi 1980, 1984, 1996; Smith *et al.* 1989; Tilley 1979) have reinforced a tradition of research interest into the Mesolithic period. The Eastern Counties region has also seen the recent publication of an archaeological resource assessment (Glazebrook 1997) and research agenda and strategy (Brown and Glazebrook 2000) that includes a section dealing with Palaeolithic and Mesolithic archaeology (Austin 2000). In the South-East region a similarly long established history of research interest can be identified in the various published syntheses of the period specific to the area (Clark 1934b; Clark and Rankine 1939; Jacobi 1978b; Jacobi 1982; Rankine 1949).

To the west lies the West Midlands region. As with so much of the rest of central England the Mesolithic here received relatively little research interest prior to the 1970s. Much of what had been discovered and published came from incidental finds during field investigations of later Prehistoric sites (Gunstone 1962, 1964, 1965a & b). Even when found Mesolithic material was not always immediately recognised as such (Saville 1972-3). In the 1970s cave excavations in north Staffordshire provided important Mesolithic evidence (Kelly 1976). More recently fundamental typological work on lithic assemblages has been undertaken (Saville 1981a). Yet in spite of this as far as the Mesolithic is concerned the West Midlands remains one of the most under-researched regions of England.

From this it can be appreciated that the East Midlands region sits astride historical fault-lines dividing areas with very different Mesolithic research histories. Some areas have well-established traditions of fieldwork and research interest whilst others do not. The East Midlands combines areas with these very different regional research histories. Developing the East Midlands regional research agenda will hopefully provide a stimulus for Mesolithic research across the region.

2 The Mesolithic Background

The Mesolithic covers the period from the end of the Devensian glaciation (c. 10000 BP) to the first appearance in our archaeological record of what we recognise as the Neolithic (c. 5500 BP). The intervening four and a half thousand years was a time of dramatic environmental change in Britain. The end of the ice age saw a rapid warming of the climate. Climatic warming and amelioration initiated widespread successional changes in vegetation patterns with open late glacial environments being replaced by forests of birch and pine that in turn gave way to more thermophilous species such as oak, elm, and lime. The forests of the postglacial attracted a range of suitably adapted animal species – red deer, roe deer, aurochs, boar and elk – replacing the horse, arctic hare and reindeer that had populated the more open late-glacial landscapes. Sea levels began to rise, gradually inundating the extensive low lying plains, wetlands, lakes, coasts, river valleys and estuaries of the North Sea basin and other low lying coastal areas culminating with the insularisation of Britain. Throughout this period of major environmental change the populations of the Mesolithic pursued their lives and made their living through the hunting of animals, fishing and gathering plant foods. At around 5500BP the material culture associated with the Mesolithic disappears from the archaeological record to be succeeded by that of the earlier Neolithic. Apart from new types of stone tool there is the first use of pottery, of the construction and use of burial mounds and the first undeniable evidence for the exploitation of domesticated animals and plants.

The archaeological record of the Mesolithic period in England is overwhelmingly comprised of lithic technology. The necessary conditions for the preservation of organic cultural materials or food remains have only rarely been encountered on Mesolithic sites (Clark 1954; Mellars and Dark 1998; Wymer 1962). Human skeletal remains are virtually unknown (but see below). Evidence for structural features only occasionally survives (Clark 1954; Higgs 1959; Radley and Mellars 1964), and then is often limited (Radley *et al.* 1974) or highly ambiguous (Clark 1934a; Clark and Rankine 1939). Furthermore, although the list of reliable radiocarbon determinations for the Mesolithic has grown steadily opportunities for encountering features preserving carbon from which secure determinations can be obtained generally only come through a combination of careful excavation and good luck. In contrast, lithic assemblages survive to provide the most durable, widespread and readily recoverable form of evidence for this period.

2.1 The First Mesolithic

Current evidence suggests that the extreme cold conditions of the Younger Dryas (LGIII) may have forced late glacial populations to abandon Britain altogether. From around 10300 BP lithic industries described as ‘long blade’ appear to represent the first recolonisation from the continent. This event was almost certainly achieved in tandem with the remarkably rapid climatic amelioration, perhaps no more than 50 years in duration (Mellars and Dark 1998, 237) that marked the end of the Younger Dryas. These industries are characterised as the name suggests by the production of long (12cm or more) blades made from very large bipolar cores (Barton 1997) and are sometimes associated with small, stout obliquely blunted points. Some association with the hunting of horse can be claimed (Moore 1954; Clutton-Brock and Noe-Nygaard 1990), and sites have been recognised from a significant number of open-air sites. Often thought to represent the final phase of the late Upper Palaeolithic these industries are poorly understood. The similarity between some long blade lithic forms and those of what is traditionally recognised as the earliest Mesolithic together with a recognised compression of dates in the relevant part of the calibration curve (Mellars and Dark 1998, 238) has raised issues regarding the relevance of such distinctions (Barton 1997, 1998).

However one regards the long blade technology, by about 9700 BP industries that are recognisably Mesolithic had replaced them. The lithic industries of the first Mesolithic characteristically contain a range of large microlith types manufactured using the micro-burin technique. These so-called non-geometric microliths include varieties of obliquely blunted point, isosceles triangles and elongated trapezoids. One characteristic of these types is that their final shapes depend greatly upon the shape and size characteristics of the blades from which they were made. The blades tend to be quite long, with parallel single or double ridges. These earliest Mesolithic industries are also associated with transversely sharpened flint axes/ adzes, scrapers made upon the ends of blades, and a range of burins.

At sites such as Star Carr (Clark 1954) and Thatcham (Wymer 1962) the association between these industries and the hunting of a range of forest-adapted species confirms the explicitly post-glacial adaptation that these eighth millennium BC assemblages represent. Typologically they have been recognised as belonging to a complex that can be traced across the dry land bridge of the North Sea basin, or ‘Doggerland’ (Coles 1998), to sites in northern France, the Low Countries, northern Germany, Denmark and southern Sweden. Together these earlier Mesolithic assemblages belong to what has been called the Maglemosian techno-complex (Jacobi 1978a).

In England recent accelerator radiocarbon dating of resin residues adhering to microliths (Roberts *et al.*, 1998) has indicated that assemblages combining obliquely blunted points and elongated trapezoids– in northern England, the so-called ‘Star Carr-type’ (Jacobi 1978a) – may represent the earliest Mesolithic. Other earlier Mesolithic assemblages characterised by the dominance of obliquely blunted points, often exhibiting opposed retouching at the tip, and in which elongated

trapezoids are absent – the so-called ‘Deepcar-type’ (Jacobi 1978a) - may represent a slightly later chronological phase. The latter extend across northern England from the Pennines (Radley and Mellars 1964) to sites in East Yorkshire (Manby 1966), the North Yorkshire Moors and Lincolnshire (Jacobi 1978a) and at least as far south as southern Derbyshire (Manby 1963). Debate concerning the significance of these typological variants amongst earlier Mesolithic assemblages has also raised the possibility that they represent distinct social groupings within the Maglemosian techno-complex (Jacobi 1978a). This debate has been fuelled by observations regarding their spatial distribution and contrasting patterns of raw material use.

Analysis of ‘Deepcar-type’ assemblages (Myers 1986; 1989b) has indicated that large blade cores of Wolds flint, a distinctive opaque mottled grey/ white material, were preformed at and transported from sites in the Trent valley such as Misterton Carr (Buckland and Dolby 1973) to bases established within the valleys of the Pennines, represented by sites such as Deepcar (Radley and Mellars 1964). Here it is argued that the cores were used to gear-up the technology in anticipation of task-group activity undertaken away from the bases at a series of temporary field camps and hunting sites located at higher altitude. This activity chain is traced through the debitage, by-products and discard patterns of material from excavated sites. The ability to follow raw material reduction sequences from lithic procurement to site discard patterns across the region provides important data that can contribute towards the development of perspectives on the scale and character of earlier Mesolithic mobility.

Discussions on the nature of earlier Mesolithic subsistence and mobility have of course been significantly shaped through the interpretations placed upon the faunal evidence recovered from Star Carr (Caulfield 1978; Clark 1972; Clutton-Brock and Noe-Nygaard 1990; Day 1996; Dumont 1989; Legge and Rowley-Conwy 1988; Mellars and Dark 1998; Pitts 1979). It is interesting to note that analyses of the faunal assemblage have given rise to very different interpretations regarding the seasonality and nature of activity at Star Carr. However, most authors would subscribe to a view of earlier Mesolithic mobility that incorporates sizeable territories within annual movements. Much of the mobility of these communities will have been in the form of task-groups moving from and ultimately returning to a small number of established residential bases. Underway these task-groups will have created a series of base camps and activity locations (*sensu* Binford 1978). The integration of upland and lowland environments within a single annual cycle of exploitation is a theme common to most discussions of this period in northern England.

The great unknown regarding these settlement systems is the full extent of activity that was undertaken within lower lying environments. Heavily alluviated river valleys, such as the Trent, and the inundated lowlands of the continental landbridge fulfilled an uncertain role in the lives of earlier Mesolithic populations of the area. That earlier Mesolithic artefacts have been trawled up from the North Sea (Godwin and Godwin 1933) is well known. It must be suspected that these variously deeply buried or drowned lowland landscapes were critical to the settlement systems, if not for the primary residential sites themselves, of at least some earlier Mesolithic communities with whose archaeology we are engaged. Consequently our field evidence may itself be biased, providing glimpses of only selected parts of the total settlement system.

2.2 Characterising the Earlier to Later Mesolithic Transition

Ever since Clark’s seminal works (1932, 1934b) sub-division of Mesolithic industries on typological grounds into *at least* two chronological phases has been generally accepted. The increasing numbers of radiocarbon determinations (Jacobi 1973, 1976; Mellars 1974; Myers 1989a) have in general supported this typological sub-division. The typological characteristics of earlier Mesolithic tool

assemblages have already been discussed. At around 8650 BP the assemblages characteristic of the Maglemosian techno-complex disappear. In their place assemblages exhibiting different typological and technological characteristics become widespread. The large non-geometric forms of microlith are replaced by a wide variety of smaller, so-called geometric forms. These include scalene and isosceles triangles, varieties of backed rods, small oblique points, rhomboids, crescents and micro-denticulated forms. In contrast to earlier Mesolithic types the shapes of later Mesolithic microliths generally owe less to the shape and size of the flake/ blade from which they were made than to the use of retouching. For certain types of microlith, such as rods, the micro-burin technique for the careful detachment of the bulb of force was not always applied. The tranchet axes/ picks and their distinctive re-sharpening flakes that feature in earlier Mesolithic assemblages also virtually disappear after 8650 BP.

Although the transition from earlier to later Mesolithic industries does appear to be a widespread and more or less synchronous phenomenon there is a possibility that in some areas of south-east and central England that an intermediate development can be distinguished. In and around the Wealden district of the south-east of England it has long been recognised (Woodcock 1973) that there are assemblages containing a range of distinctive microlith types - hollow-based points, points with inverse basal retouch – alongside other, typically earlier Mesolithic forms. These ‘Horsham’ industries have been recognised as possibly representing a localised intermediate industrial phase between the earlier and later Mesolithic (Jacobi 1978b). As with their chronology the overall spatial distribution of these distinctive assemblages remains to be firmly established.

Typological research in the midlands has indicated that assemblages bearing some similarities to those of the ‘Horsham’ industries may be present (Saville 1972-3, 1981a; Phillips 2000). Over how wide an area of the midlands such assemblages may be found is not known. Certainly, assemblages containing obliquely blunted points with inverse basal retouch have been reported from within the East Midlands region. The evidence from sites as far north as West Keal in Lincolnshire (Jacobi 1984, 56) and as far south as Duston, Northamptonshire (Jacobi 1984, 56; Saville 1981b) implies that such industries may be found over a large part of the region. Reynier (1994, 1998) has examined the chronological and spatial characteristics of the ‘Star Carr’, ‘Deepcar’, ‘Horsham’ and midland assemblage varieties. He suggests that it is possible through these assemblages to begin to recognise the gradual infilling of much of the landscape with evidence for Mesolithic activity. In developing a research agenda the possibility that the region contains such typologically and potentially chronologically distinctive industries should certainly be considered for future attention (Phillips 2000).

2.2.1 Microliths

Detailed typological study and cluster analysis of later Mesolithic microlith assemblages in England (Jacobi 1976, 1979) has identified a series of ‘style zones’ based on variations in the representation of differing microlith types. Some of the zones identified are suggested as possibly reflecting social territories within which traditions of microlith manufacture evolved and were sustained. Reynier (1994, 1998) has proposed that the initial formation of these regional territories can be traced back to the earlier Mesolithic assemblage varieties discussed previously. Interestingly, the size of the territories indicated by Jacobi’s analysis appear to be significantly smaller than the areas covered by the Maglemosian sub-types. In northern England, for example, Jacobi’s backed-bladelet grouping is largely confined to upland regions of the Pennines and North Yorkshire. The stylistic evidence that later Mesolithic territory sizes in England may have been smaller than those of the earlier Mesolithic complements similar analyses elsewhere in continental Europe (Gendel 1984, 1987).

The function of microliths in Mesolithic assemblages has long excited debate. In response to the long established tradition in British archaeology of regarding them as weapon armatures Clarke (1976) provided a timely reminder of the diversity of functions to which such composite technological components could be usefully combined and applied. That they may have served a range of functions is not in question. However, there is a great deal of evidence that positively links microliths to hunting weaponry. The changes in microlith styles that characterise the earlier to later Mesolithic transition appear to be associated with an increase in the complexity of Mesolithic projectiles (David 1998; Myers 1989a). It is suggested that the after 8650BP the numbers of armatures being fitted onto projectile shafts increased dramatically. An understanding of the different demands placed upon the scheduling of weaponry manufacture and maintenance by differing hunting strategies may provide some explanation for these observed technological changes (Eerkens 1994; Myers 1989a,b; Zvevlebil 1984). Recent research has also begun to examine our understanding of alternative strategies in the production of microliths (Finlay 2000).

2.2.2 Debitage

It is also important to recognise that the changing microlith styles that characterise the earlier to later Mesolithic transition represent just one aspect of a series of observed changes that occur in technology at or around the mid-seventh millennium bc. It has long been recognised (Buckley 1924) that the morphology of debitage in Mesolithic assemblages changes in parallel with the changes in microlith styles. In the past this has been misleadingly characterised as being a shift from 'broad-blade' (earlier) to 'narrow-blade' (later) assemblages. Metrical analyses of site assemblages, predominantly from southern England, have subsequently demonstrated that in comparison with those of the later Mesolithic assemblages up to c.8650BP actually contain a higher proportion of pieces that are longer in relation to breadth (Pitts and Jacobi 1979).

The change in the morphology of flakes and blades provides a useful approach in lithic analysis for assigning general chronological phases within or between assemblages. Yet it must be acknowledged that until the metrical analysis of dated Mesolithic assemblages has been extended to the midlands and the north serious doubts must remain concerning the utility of this approach outside of southern England. Even so, there is a general consensus that throughout England, earlier Mesolithic assemblages demonstrate a greater emphasis upon the production of longer blades with parallel margins and straight dorsal ridges.

2.2.3 Raw Materials

In many regions of Britain it has also been observed that varieties of stone being exploited for the lithic technology also changes (Jacobi 1978a, 1979; Radley and Mellars 1964) during the mid-seventh millennium bc. From south-west (Jacobi 1979; Pitts and Jacobi 1979), southern (Care 1982; Pitts and Jacobi 1979) and northern England (Jacobi 1978a; Myers 1989b; Radley and Mellars 1964) it has been reported that the earlier to later Mesolithic transition coincides with a change in the balance of lithic raw materials being exploited in assemblages. In the south a heavy dependence upon chalk flint is reduced through a pronounced increase in the use of low-grade river gravel flint and Greensand cherts. The south-west sees high-grade translucent flint and Cretaceous flint from eastern sources supplemented or replaced in later Mesolithic assemblages through the use of low-grade beach flint and various cherts. A similar pattern of change has been identified amongst Pennine assemblages where, after 8650 BP, assemblages dominated by cherts obtained from the various Pennine limestones are found throughout the area.

It is hard to generalise satisfactorily about the nature of the raw material changes that take place during the mid-seventh millennium. Higher quality materials continue to be used. They are however supplemented and locally replaced by a range of lower grade materials. The area over which any particular raw material is used appears to relate more closely to the procurement

source after 8650bc. This observed change in raw material distributions may bear some relationship to the changing sizes of territories exploited by Mesolithic populations (Spikens 1999, 10). In areas where better quality materials do not occur naturally this may have prompted an increased reliance upon lower grade materials. These chronological shifts in raw material procurement may also relate to changes in the scheduling of technological activity (Myers 1989a,b).

2.2.4 Reduction Sequences

Observations on Mesolithic raw material use and distribution patterns have, over many years, stimulated discussion regarding the mechanisms responsible. As already discussed with regard to the use of wolds flint in earlier Mesolithic assemblages in northern England, it is possible through the analysis of reduction sequences to look in more detail at the structure and movement of raw materials and their use across regions. As yet little detailed work of this kind has been done on later Mesolithic assemblages. However, it has been suggested that the use of black Derbyshire chert during the later Mesolithic may involve the transportation away from sources of relatively unmodified nodules or lenticular slabs (Myers 1986). Evidence for the initial setting-up and use of cores appears to be represented at many sites in differing locations and at widely varying distances from the source area.

Although much more detailed work is needed in differing regions it is tentatively suggested that the scheduling of later Mesolithic technological activity was designed to meet more short-term goals. This would contrast with the planned and structured procurement and reduction sequence discussed for earlier Mesolithic assemblages. It would be of great interest to know if other researchers had established through the refitting of later Mesolithic site assemblages the condition of the nodule/ core prior to reductive activity.

2.2.5 Inter-Assemblage Variability

The comparative statistical analysis of Mesolithic tool assemblages has received remarkably little attention over the years. Mellars' (1976a) study remains the only substantive, large-scale study attempting to define site-types primarily on the basis of variations in the representation of a range of tool forms. This important work was based upon the quantitative analysis and comparison of assemblages using a restricted number of recognised tool types. The analysis compared Mesolithic assemblages without reference to their typological or chronological position within the period.

The analysis produced a series of assemblage types ranging from 'balanced assemblages', in which a wide range of the tool types were represented through to more specialised assemblages where individual tool types predominated and the range of tool types represented was restricted. Amongst the balanced assemblages were a distinct grouping of sites from the Pennines that are all earlier Mesolithic in date. Amongst specialised assemblages were a small number in which scrapers dominated. A much larger number of sites classified as 'microlith-dominated' were also recognised. Significantly, the majority of the latter were also from upland excavations and proved to be later Mesolithic in date. It has been suggested that the increase in the complexity of composite weapons after 8650 BP may be substantially responsible for the statistical grouping of earlier Mesolithic balanced assemblages and later Mesolithic microlith-dominated sites (Myers 1987) in this analysis.

2.2.6 Settlement Patterns

Observations on the nature of the earlier to later Mesolithic transition have also been made regarding non-technological characteristics. In particular, contrasting spatial patterns in earlier and later Mesolithic settlement evidence have been recognised. A number of authors have identified a tendency for later Mesolithic evidence to be both more widespread, occupying a greater variety of environments, and more numerous at a regional (Jacobi 1973, 1979; Morrison 1980, 136; Shennan

1985, 49) and more local scale (Myers 1986, 226; Spikens 1998; Williams 1985, 17). Drawing attention to the evidence from well-surveyed areas Jacobi (1973) drew attention to the predominance of later Mesolithic sites in the Cotwolds, the Weald and Kent, Surrey and Sussex, and in the upland Pennines and Cleveland. Later Mesolithic distributional evidence is “in sharp contrast to that gained for the earlier period where sites are both fewer...and appear restricted to a limited area.” (247). Jacobi (1976) calculated that there is a six-fold increase in later assemblages over those of the earlier Mesolithic (Spikens 1998, 8). Manby’s (1963, 11) survey of Mesolithic settlement evidence across South and West Yorkshire, Derbyshire, Nottinghamshire and Lincolnshire indicates a similar preponderance of typologically later assemblages.

Others have also noted that there is an impression that in comparison with earlier sites the later Mesolithic sees a general reduction in site size (Care 1982; Myers 1986). While the earlier Mesolithic also has small sites, such as those along Mickleden Edge (Radley and Marshall 1965), there appears to be a significant increase in the representation of such small sites during the later Mesolithic, both in terms of area and assemblage size (Mellars 1976a; Myers 1987). It must be acknowledged however that the analysis and interpretation of site sizes, either in terms of area or quantities of material is notoriously complex (Mellars 1976a, 377-8).

In characterising the structure of settlement patterns across a region it will be necessary to look at both the spatial and the compositional elements of lithic scatters (Spikens 2000). Characterising assemblages through the analysis of tool assemblages may represent one possible approach, but the effects of changes in composite tool complexity will need to be considered from the outset. Separate analyses of at least the earlier and later Mesolithic would seem justified. Research that combines the consideration of inter-assemblage variability in both tools and the reduction evidence provided by the debitage provides a more broadly based approach that can shed light upon the dynamics of lithic reduction and tool manufacture/ discard patterning.

To summarise, widespread changes in the archaeological record have been identified that coincide with the earlier to later Mesolithic transition at around 8650 BP. In some areas an intermediate technological development may be recognisable. The transition involves changes covering aspects of tool typology and design, assemblage content, debitage and reduction sequences, and raw material procurement and distribution. Patterns of settlement also appear to reflect changes at this time. The number of sites increases significantly, with a wider range of environmental locations producing evidence for activity than was previously found. The increase in site numbers may be associated with a higher representation of smaller sites in the archaeological record. The development of regionally defined styles in microlithic assemblages may be traced from the earlier to later Mesolithic. Such style zones appear to become smaller in area through time. Understanding the significance of these changes in the form, content and distribution of material cultural must be an important consideration in the development of a research agenda for the period, and is reflected in the research priorities identified by the Prehistoric Society’s Working Party for the Palaeolithic and Mesolithic of Britain and Ireland (1999).

2.3 Thoughts on the Earlier to Later Mesolithic Transition

Despite the widespread and far reaching nature of the changes that take place in the archaeological record at around 8650 BP surprisingly little attention has been given to examining why these changes occur and what they may signify. The comparative absence of faunal and floral economic data from later Mesolithic sites for much of England has not entirely discouraged attempts at modelling later Mesolithic economy. Yet the lack of direct economic data has created considerable room for uncertainty and debate concerning the characterisation of later Mesolithic economy. Views on the nature of Mesolithic economy in England have diverged significantly with some authors

contemplating a heavy dependence upon plant foods (Clarke 1976; Jacobi 1978c; Wymer 1991). Others remain convinced that hunting and fishing provided the essential basis for Mesolithic economy (Myers 1986; Smith 1992). The potential role of coastal resources has also attracted a great deal of discussion (Bonsall 1981; Jacobi 1979). Yet few have attempted to account for the changes in the technology and settlement patterns of Mesolithic groups during the mid-seventh millennium.

Myers (1989) has argued that changes in the spatial and temporal structure of environmental resources, and particularly game species, during the seventh millennium saw a shift in hunting strategies. It is argued that in place of a mixed strategy of logistical and encounter hunting operated during the earlier Mesolithic, strategies became almost wholly encounter-based. The implications for technological structure and organisation are considered alongside those for changing patterns of settlement. Spikens (1998) has considered the spatial evidence for Mesolithic activity against detailed supra-regional modelling of environmental, and specifically vegetational change. Her approach has placed the mid-seventh millennium transition against the backdrop of a long-term increase in population density, increasing territoriality and competition for resources. It is perhaps worth noting that while these two models provide different perspectives they are not mutually exclusive.

2.3.1 Environmental Manipulation

Environmental evidence, in the form of pollen sequences or charcoal, for the apparent disturbance of Mesolithic forest ecosystems and the creation and/ or maintenance of clearings through the use of fire has been widely reported (Jacobi *et al.* 1976; Jones 1976; Simmons 1964, 1969, 1975; Smith 1970; Turner and Hodgson 1983; Williams 1985). Although the possibility of identifying such evidence in earlier Mesolithic contexts has been discussed (Bush 1988) the overwhelming majority of available evidence indicates such activity after c.8650BP. Indeed, a number of authors have pointed out that the evidence for forest burning increases dramatically after c.7000BP (Myers 1989, 135; Simmons and Innes 1987, 389; Spikens 1998).

The regeneration of cleared or burned areas of forest promotes, through increased floristic productivity and diversity, conditions that benefit and attract game. The significance and potential benefit of such deliberate forest burning strategies to hunter-gatherer populations has been discussed in detail (Mellars 1975, 1976b). That such strategies may have become a widespread component of later Mesolithic activity is an interesting and potentially significant consideration. Clearly, evidence that might contribute towards an understanding of the chronology, nature and extent of this activity is potentially of great value. Why does the evidence for such strategies increase, particularly after 7000BP? Archaeologists should consider what impact upon the spatial distribution of activity the creation and maintenance of such clearings would have had over time. Are such patterns detectable in the known or the recoverable archaeological record?

2.4 The Last Mesolithic

Our radiocarbon evidence for the critical few hundred years when the later Mesolithic ends and the early Neolithic appears is patchy. It is generally accepted, as a 'rule of thumb', that at around 5500 BP across England and Wales the industries of the later Mesolithic disappear. In terms of material culture of course the early Neolithic brings the first appearance of pottery in the archaeological record. The core and bladelet industries and complex composite weaponry of the late Mesolithic, are replaced by flake core industries and a range of distinctive, bifacially thinned and shaped arrowheads. Yet earlier Neolithic flint industries across southern England also can exhibit a relatively high proportion of bladed pieces (Pitts and Jacobi 1979). Archaeological survey may demonstrate a degree of spatial coincidence between later Mesolithic and early Neolithic industries. In his analysis

of data from north-east England Young (1989, 167-8) has detailed the interpretive problems with such patterning. The chronology of the replacement of later Mesolithic industries by those of the early Neolithic is far from clear. The detail of this missing chronology represents perhaps the most important and archaeologically recoverable data that we could obtain in advancing our efforts to understand the significance of this cultural change mid-way through the fourth millennium.

Beyond chronology however there are fundamental conceptual problems to be overcome. Research looking at the character of hunter-gatherer / farmer contacts (Zvelebil and Rowley-Conwy 1984; Zvelebil 1986) provides useful perspectives that may have some general relevance in describing what happens at frontiers between farmers and hunter-gatherers. Archaeologists dealing with the later Mesolithic – early Neolithic transition have found some utility in the 3 defined phases used to describe the processes of hunter-gather and farmer contacts – availability, substitution and consolidation (Young 1989). Yet despite their conceptual clarity they do not overcome the uncertainty that exists over the very character of the frontier between later Mesolithic and early Neolithic cultures in England.

On the one hand there is a body of thought that looks for traits traditionally associated with the Neolithic in late Mesolithic contexts. Evidence for the use of recognisably domesticated resources by technologically later Mesolithic groups has been sought, but sites of this period have thus far offered infamously poor conditions for the physical preservation of faunal and floral evidence. Pollen spectra have also failed to provide unambiguous evidence for the cultivation of crops by technologically later Mesolithic groups. There is also a singular absence of tools that can be unambiguously assigned to vegetable food processing - mortars, pounders or grinders - and of structural evidence that might suggest the bulk storage that might accompany an emphasis on plant foods. Yet interest in the possible role of plant foods in the economies of the late Mesolithic and their significance in the transition to the Neolithic has grown in recent years (Zvelebil 1994). The issues surrounding selective forest burning and the manipulation of game populations have also raised the possibility of discussing issues of intensification and the control of animal populations. Yet despite the potential for discussing early moves towards domestication Mesolithic sites and assemblages of the early fourth millennium, where recognised through carbon dating, still look very much akin to those dating to just after 8650 BP.

On the other hand there is a long-running, fundamental debate concerning the very nature of early Neolithic society in Britain (Bradley 1984; Thomas 1991; Whittle 1977). Whereas Neolithic societies were once assumed to have been sedentary exploiters of domesticated plants and animals archaeologists are now invited to consider early Neolithic society not only in terms of pots, leaf arrowheads, agriculture, cattle and collective burial but also mobility, hunting, and seasonality – themes more traditionally at home with hunter-gatherer research.

In discarding old assumptions about the character of late Mesolithic and early Neolithic communities archaeology has stimulated renewed interest into the significance of the changes in material culture that take place in the mid-fourth millennium. It is no surprise therefore that in the face of such uncertainty the transition from the late Mesolithic to early Neolithic in Britain should be one of the research priorities identified by the Council for the Prehistoric Society's Working Party for the Palaeolithic and Mesolithic of Britain and Ireland (1999).

3 East Midlands Regional Resource Assessment

Having discussed the Mesolithic background it is possible to attempt an assessment of the Mesolithic resource in the East Midlands region. A broadly historical consideration of the state of the resource will assist in placing the current position into a developmental context. In this way it is hoped that historical bias in fieldwork and research traditions may be overcome. Using the county assessments

as a starting point the rest of this paper will seek to identify how fieldwork and other research in the region can make the greatest contribution towards the wider study of the Mesolithic period.

3.1 The County Assessments

The county assessments confirm that for the East Midlands the character of the Mesolithic archaeological record largely mirrors the situation found elsewhere; organic evidence of diet or technology is virtually absent, structural evidence is very limited, numbers of secure radiocarbon determinations are few, and lithic findspots and scatters provide the overwhelming preponderance of the available evidence. The county assessments present a picture of an archaeology consisting of a relatively small number of excavated sites and a great deal of information from surface collections.

There is a general consensus within the county assessments that in defining topics for an East Midlands research agenda the transitional archaeologies of late glacial – early postglacial hunting and gathering and of the Mesolithic to Neolithic are of great importance and should be included. Both of these topics have been identified as research priorities by the Council for the Prehistoric Society's Working Party for the Palaeolithic and Mesolithic of Britain and Ireland (1999) and are echoed in the Eastern Counties Research Agenda (Austin 2000: see also French 1992 for Fenland research priorities). There can be little doubt that in defining a research agenda for the East Midlands these two important transitional themes will be represented.

It is however of some concern that in their assessments of the known resource only limited significance appears to be attached to the consideration of the earlier and later Mesolithic periods. Indeed, the impression might be gained that the archaeology of this four and a half thousand years during which the environment of Britain changed so fundamentally is to be handled as a single undifferentiated phenomenon. Yet it must be at least suspected that the adaptations of the first thousand years of the postglacial are not necessarily the same as those of the fourth millennium bc. This raises a fundamental issue concerning the SMRs and Mesolithic research. Does the lack of such a discussion reflect a general absence of chrono-typological detail in SMR coverage of the Mesolithic?

SMRs may be forgiven for a lack of chronological or typological refinement in their Mesolithic data when it is remembered that the *Gazetteer of Mesolithic Sites* (Wymer 1977) also offered no chronological refinement amongst its entries. For many SMRs the gazetteer will have been the primary source for Mesolithic data when SMRs were first established during the eighties. Nonetheless, the absence of any such distinction, either in the records and/ or in the assessment of those records carries important implications for the development of the East Midlands research agenda. All agree the importance of including the key transitional issues of the late-glacial to early post-glacial adaptations and of the Mesolithic to Neolithic. Yet the lack of detail in records raises serious questions concerning the utility of SMRs for addressing such important issues. Furthermore, it denies any research utility for the SMR in addressing a third topic identified by the Council for the Prehistoric Society's Working Party for the Palaeolithic and Mesolithic of Britain and Ireland (1999) as a research priority but left largely unexplored by the county assessments and completely left out of the Eastern Counties research agenda – namely that of identifying and understanding continuity and/ or change during the Mesolithic.

The county assessments illustrate the contrasting historical backgrounds to research across the region. They show how the differing research environments, compounded by differing patterns of land-use and opportunities for site recognition have influenced the development of the known Mesolithic resource in the East Midlands. They also emphasise the importance of environmental evidence in developing an understanding of the Mesolithic across the region. Whilst highlighting the relatively small number of sites that have actually produced relevant environmental evidence all

acknowledge that palaeo-environmental information is essential in understanding the character of Mesolithic activity. Attention is focussed upon the potential that exists across the region for the preservation and recovery of such evidence.

3.2 History of Archaeological Endeavour

3.2.1 Early Investigations

Up until the 1960s little was known about the Mesolithic for most of the East Midlands. The generally small number of pre-1960s published accounts reporting, often incidentally, on the presence of Mesolithic material from Northamptonshire, Leicestershire, Lincolnshire and Nottinghamshire (Barley 1959; Bowen 1945-47; Browne 1888; Dudley 1949; Everard 1946; Hunt 1908; Posnansky 1955, 1956; Pickering 1918; Rankine 1951) suggests that the known archaeological resource was extremely limited.

The main exception to this was to be found in the north of the region. The presence of caves in the Magnesian limestone of north-eastern Derbyshire bordering with Nottinghamshire, and the Carboniferous limestone of the White Peak attracted archaeological interest from the 1800s onwards. The caves provided archaeologists with obvious targets for investigation by excavation. Although primarily focussed upon the potential for discovering Palaeolithic remains a number of cave excavations provided evidence of Mesolithic activity. On the Magnesian limestone excavations at Mother Grundy's Parlour (Armstrong 1925), Pin Hole Cave (Armstrong 1926, 1929a & b, 1937), Yew Tree Shelter (Armstrong 1938), Ash Tree Cave (Armstrong 1956, 1957) and the Whaley rockshelters (Radley 1967) all produced Mesolithic material. Similar if rather ephemeral discoveries were made in the Carboniferous limestone caves of the upper Dove Valley at Dowel Cave (Bramwell 1959) and Foxhole Cave (Bramwell 1971; Jackson 1952).

The long established tradition of flint collecting from erosion patches in the upland peat moorlands of the Pennines around Huddersfield gave rise to some of the earliest published regional syntheses of Mesolithic material in England (Buckley 1924; Petch 1924). The erosion of peat in the upland moors of northern Derbyshire (Radley 1962) combined with improved public access to the moors prompted a growth of interest in flint collecting and an increased awareness of Mesolithic evidence in the area (Radley 1963). Selected areas of northern Lincolnshire (Armstrong 1932a, b and c; Dudley 1949; Gatty 1902) also had a long established history for unsystematic flint collection from eroding cover sands and peat.

Garrod's *The Upper Palaeolithic Age in Britain* (1926) and Clark's *The Mesolithic in Britain* (1932a) represented the first national syntheses of the archaeology of these early periods. As such they were instrumental in establishing the wider academic context within which the research agendas of contemporary and subsequent generations of archaeologists were to develop. They drew heavily upon the cave excavations in northern Derbyshire, particularly those at Creswell. They also made known to a wider academic audience the Mesolithic discoveries in the Pennines and Lincolnshire. In particular, Clark was able to make use of information from the Huddersfield and Marsden districts obtained through Francis Buckley's excavations, collections and related publications (Buckley 1924; Petch 1924).

Once established in such national period discussions subsequent researchers have been drawn back to the same areas to re-examine existing collections or undertake new fieldwork. In this sense, the known Mesolithic resource of these areas has benefited historically through their early recognition as established contributors to national syntheses. Other parts of the region have also seen early examples of field walking collections, as with the extensive assemblage from fields around Duston, Northamptonshire (Phillips 2000). Yet such work has only recently been drawn into regional and national syntheses. Consequently these areas have not attracted further field

research and have been slow to impact upon perceptions regarding the importance of Mesolithic archaeology in the region.

The resulting historical bias in research interest and fieldwork encouraged a widely held impression in the region that Mesolithic fieldwork was very largely a phenomenon of caves and upland areas. Outside of such locations Mesolithic material tended to come to light only by chance during the investigation of more recent archaeological sites. The paucity of pre-1960s published accounts for the southern half of Derbyshire (Lomas 1959) also reflects this bias in the history of fieldwork and research interests and is more akin to the position experienced elsewhere in the East Midlands region. For the vast majority of the region it is fair to say that, as with the West Midlands, the Mesolithic has historically received little attention. The consequences for the discussion of research priorities within the East Midlands has been all too obvious. The last published attempt to define research priorities for the East Midlands region (Mahany 1977) illustrates that even as late as the 1970s Mesolithic research was assigned a low priority. Even today the region does not appear to contribute substantively to the profile of Mesolithic research (Young 2000) in England.

3.2.2 1960s - Present

The bias that developed in fieldwork patterns during the first half of the last century resulted in a lack of attention for the Mesolithic of lowland areas within the East Midlands. In practical terms this has meant that for much of the East Midlands little concern for Mesolithic archaeology has been demonstrated. Since the 1960s however a series of developments have seen new patterns of fieldwork develop.

The discoveries made at Star Carr (Clark 1954) in the Vale of Pickering, East Yorkshire, represented a major turning point. The chance discovery of a site providing extraordinary conditions of organic preservation did much more than broaden our knowledge concerning Mesolithic diet and organic technology. The evidence recovered from the site has served to fuel debate and differing interpretations on the evidence and upon the Mesolithic ever since (Caulfield 1978; Clutton-Brock and Noe-Nygaard 1990; Clark 1972; Day 1996; Dumont 1989; Legge and Rowley-Conwy 1988; Mellars and Dark 1998; Pitts 1979; Wheeler 1978). Crucially, the discovery of such an important site in a lowland location represented a major stimulus for archaeologists to begin actively searching for the Mesolithic in similar, previously under-researched localities (Radley 1968; Wymer 1962). A generation of archaeologists were prompted to re-evaluate their Mesolithic evidence.

For the East Midlands, Manby's (1963) review of Mesolithic evidence from the Peak District and Trent basin represented an important step in encouraging data collection from parts of the landscape other than caves and the gritstone uplands. His paper identified a more widespread distribution to Mesolithic activity across Derbyshire, Nottinghamshire and Lincolnshire. He drew attention to the small but increasing body of evidence for open-air sites away from the gritstones. Specifically, he discussed the evidence from a number of open air sites that had been identified on the Carboniferous limestone of northern Derbyshire, and in more low lying areas such as the coal measures and the Trent valley in the south of the county.

The revision of thinking about Mesolithic distributional evidence illustrated by Manby's work was instrumental in encouraging the collection of data from open air locations. In particular, those parts of the landscape that had previously been largely ignored and which offered the potential for good preservation became a target for research. In 1966 the attention of Doncaster Museum was drawn to a collection of flints made by a local farmer from eroding lowland fen peats and sandy soils between

the Trent and the Idle. Subsequent annual and more systematic collections led to a limited excavation in 1971. This work produced evidence for a substantial earlier Mesolithic assemblage at Misterton Carr (Buckland and Dolby 1973). Although the excavation did not reveal any structural evidence or organic preservation the assemblage has provided a rare opportunity for studying the character of earlier Mesolithic activity in the Trent Valley. The assemblage from this site has subsequently attracted research attention and has been generally incorporated into discussions of the period across northern England (Jacobi 1978a; Myers 1989b; Spikens 1999).

This general reappraisal of the Mesolithic and fieldwork in low lying regions did not result however in the traditional patterns of fieldwork being abandoned. In the south Pennines surface collection was supplemented by a series of very important excavations of Mesolithic sites (Radley and Marshall 1963, 1965; Radley and Mellars 1964; Radley *et al.* 1974; Stonehouse 1986), including the small site at Red Rafter (Stonehouse 1976) located at 500m OD in the very north of Derbyshire. The 1920s and 30s excavations of Buckley also continued to provide a valuable resource from which new information was gleaned (Radley and Mellars 1964). Radiocarbon dates were obtained from excavated charcoal that had been kept and placed by Buckley in small glass boxes (Switsur and Jacobi 1975). Cave and rockshelter excavations in Derbyshire continued to provide new Mesolithic evidence, as with the work at Foxhole Cave (Bramwell 1971a & b, 1972), the rock-fissure site at Sheldon (Bramwell 1968; Radley 1968) and the so-called rockshelter site at Roystone Rocks (Myers 1992). In the moorland environments of Pennine Derbyshire flint collecting continued to identify new sites (Henderson 1973; Pierpoint and Hart 1980).

The southern Pennine peat deposits also provided the basis for early work on the reconstruction of post-glacial vegetational patterns through pollen analysis (Tallis 1964). Such work continued with the additional analytical benefit of associated radiocarbon dating of pollen sequences (Tallis and Switsur 1973). At about the same time evidence for the potential role of Mesolithic activity in modifying vegetation patterns through the use of fire was being recognised in upland northern Derbyshire (Hicks 1972). As such evidence became more widely recognised the southern Pennines became a focus for more detailed research examining the role of clearance in Mesolithic activity (Williams 1985).

Throughout the East Midlands Mesolithic evidence continued to come to light through excavations of later prehistoric and historic sites. In Northamptonshire stratified Mesolithic material was recognised during the Ministry of Public Building and Works excavations at Thrapston ironstone quarry, Aldwinckle, (Jackson 1976, 1977). Similar rescue excavations within Northampton at Chalk Lane identified a series of intersecting gullies cut into the gravel terrace and containing earlier Mesolithic material (Williams and Shaw 1981). Excavations of Neolithic sites at Briar Hill (Phillips 2000) and Ecton (Moore 1975) also produced small quantities of Mesolithic material. Limited excavations were also undertaken of a Mesolithic scatter at Beadle Quarry, East Goscote, Leicestershire (Saville 1976).

Occasionally, such chance encounters produced remarkable evidence. In Derbyshire, a trial trench was excavated by Trent and Peak Archaeological Trust during 1984, at a site called Lismore Fields, Buxton, in advance of a housing development. Situated at a point in the Wye Valley where it widens to form a bowl shape Buxton lies at 300m O.D. on the junction of the Carboniferous limestone and the millstone grits. Lismore Fields, an area of (then) surviving pasture within Buxton's south-western suburbs, occupies a low, 175m wide plateau between two tributaries of the River Wye. The soils of the plateau are capped by a Head deposit, derived from the gritstones, and would have been heavy and wet before the insertion of field drains in the post-medieval period (Garton 1991, 13). The trench was excavated in the belief that a Roman road crossed the area. Instead, four seasons of excavation

revealed a later Mesolithic flint industry, possibly associated with a ring-slot and post structure, and an earlier Neolithic settlement with evidence for 3 rectangular houses (Garton 1987a; 1991, 12-13). A posthole associated with the ring-slot produced a date on charcoal of 5270 +/- 100 BP (OxA-2433). As yet the excavation report has not been published.

Environmental evidence from Lismore Fields has also made a contribution to the debate on the manipulation of the environment through deliberate burning of forests. Wiltshire and Edwards (1993) were able to look at a pollen sequence that included evidence contemporary with the Mesolithic activity. The presence of charcoal in the sediments suggested that fire had been used, but the pollen analysis indicated localised clearance impacts of relatively small scale and duration.

In terms of extending our knowledge of Mesolithic activity and settlement across the East Midlands region the most significant development has been the increased and more widespread use of surface collection from ploughed fields. Of course, as an approach to data gathering surface collection has benefited the study of all prehistoric and early historic periods. Yet when comparing Mesolithic structural evidence with that of later periods it appears to be both rare and ephemeral in character. Other techniques for site recognition that benefit the study of later periods, such as aerial photography or geophysical survey, are consequently of little value. Surface collection therefore occupies a particularly important position when prospecting for Mesolithic activity across the landscape and has therefore been invaluable in overcoming some of the historical biases that existed in our distributional knowledge of the Mesolithic resource across the region.

The adoption of more systematic approaches to surface collection has provided a method by which prehistoric activity and settlement evidence can be accurately located and recorded. Its widespread adoption in fieldwork has been critical in transforming approaches to the study of prehistoric activity across previously under-researched landscapes (Clay 1989). The impact of the growth in such fieldwork upon the sheer quantity and distribution of the known Mesolithic resource in the East Midlands region can be readily demonstrated.

Since the publication of Wymer's (1977) gazetteer of Mesolithic sites the total number of sites listed, be they scatters or individual findspots, has increased from 177 to 753 – an increase of 425%. It can be seen (table 1) that even where the increase has been lowest, in Nottinghamshire and Lincolnshire, there has still been a significant growth in the number of recorded sites. For Leicestershire and Derbyshire the increase has been greater than 500%. The numbers of recorded sites reflected in the records held by SMRs within the region have increased largely in response to the greater emphasis placed upon systematic surface collection as a fieldwork technique since the 1970s. The development of the systematic and controlled collection of worked lithics from ploughed fields during the 1960s (Radley and Cooper 1968) has been followed by the routine incorporation of the technique into research designs and field evaluation strategies. Programmes of surface collection in Derbyshire (Barnatt *et al.* nd; Evison 1988; Gerrish 1982; Garton and Beswick 1983; Hart 1981; Knight *et al.* 1998; Phillips and Guirr 1985a and b), Leicestershire (Liddle nd; Liddle and Hartley 1995; Liddle and Knox 1991, 1997), Nottinghamshire (Phillips and Guirr 1985a and b; TPAT 1992), Lincolnshire (Hayes and Lane 1992) and Northamptonshire (Hall 1985; Martin and Hall 1980) have all been identified in the county resource assessments as being to a greater or lesser extent responsible for these dramatic increases in site numbers.

County	No. of Sites in Wymer	No. of Sites (current)	% change on 1977	Area Sq. km	Sq. km per Known Site
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	1977				
Derbyshire	49	280	+ 571	2641	9.43
Leicestershire/ Rutland	33	175	+ 530	2548	14.56
Lincolnshire	*54	140	+ 259	5915	42.25
Northamptonshire	27	117	+ 433	2370	20.25
Nottinghamshire	14	41	+ 293	2214	54.00
Total	177	753	+ 425	15688	20.83

Table 1: Representation of Mesolithic Sites in the East Midlands Region: *adjusted to exclude those parishes in North Lincolnshire and North East Lincolnshire.

The current average density of sites across the region's landscape (table 1) of 1 per 20.83 km² compares with a figure of 1 per 88.63 km² for 1977. The present figures can however be seen to conceal significant variations between the counties. The highest densities are found in those counties where, judging by the county assessments, systematic surface collection programmes have been most actively pursued. The densities of 1 per 20.25km², 14.56km² and 9.43km² for Northamptonshire, Leicestershire and Derbyshire respectively confirm the impact and importance of such survey work in enhancing the numbers of known sites and in producing some of the highest densities of evidence in the region.

The systematic surface collection of worked lithics, supplemented in areas of pasture by systematic test-pitting (Edmonds *et al.* in prep.; Garton and Kennet 1996a; Torrence and Edmonds 1988) is an invaluable method for testing the validity of existing patterns in our distributional knowledge. In particular, such surveys can be used in the landscape to examine if patterning in our distributional data relates to Mesolithic activity or historical patterning in the fieldwork endeavours of archaeologists. The county assessments illustrate how across the region the increased body of information coming from surface collection surveys has provided new and important data on the character and distribution of Mesolithic evidence.

The Derbyshire county assessment (Myers 2000) emphasises the overall historical bias in fieldwork within the county with certain geologies having been largely ignored by archaeologists. The assessment is still able to draw attention to the varied topographical locations in which Mesolithic evidence has been identified. Whilst prominent or even slightly elevated locations may have attracted activity, areas with heavy soils such as Lismore Fields have also produced important evidence. In some areas proximity to water may have been a critical factor determining activity location. In north Derbyshire the work of Hart (1981, 25-6) was designed to look for Mesolithic evidence across the main geological divisions. His work confirmed the presence of Mesolithic sites on "all of the geological regions" (Hart *op cit.* 25). Similarly, a survey (Barnatt *et al.* nd) designed to look at lithic distributions along a transect from the Carboniferous limestone, across the Wye and Derwent River valleys and onto the gritstone East Moors of northern Derbyshire has established the presence of Mesolithic material in all major zones including floodplain locations.

For Nottinghamshire Bishop (2000) draws attention to the impact of survey along the line of the A46 (TPAT 1992). The survey identified sites within the Wolds, an area previously thought to be devoid of Mesolithic evidence. Membury (2000) notes the quantitatively small but highly significant impact intensive fieldwalking along the Fen edge in Lincolnshire (Hayes and Lane 1992) has had upon known Mesolithic distributions. He draws specific attention to a series of sites located by survey in

lower lying areas despite a widespread coverage of alluvium, and a number located on ridges and sand isles at places such as Spilsby, Dogdyke, East and West Keal.

In Leicestershire a series of intensive surveys have been undertaken with the assistance of volunteer groups since the mid-1970s. The heavy clay soils that cover so much of Leicestershire have traditionally been dismissed as having little potential for locating prehistoric settlement and consequently attracted little fieldwork (Clay 1989, 111). Yet the surveys at Lutterworth/ Misterton, Brooksby Estate (Liddle and Knox 1991), Grace Dieu priory (Liddle and Hartley 1995) and Medbourne (Liddle nd) have demonstrated the previously unsuspected extent of prehistoric activity and transformed the known Mesolithic record for Leicestershire. Again, one of the strengths of this survey work has been that it set out to address a range of topographies and soils including the clay areas. In reviewing the survey evidence Knox (2000) states that the Mesolithic evidence appears to be fairly well spread and not restricted to any particular topography or drift geology. Some topographical preferences for site location have however been identified. In particular, the Medbourne survey has revealed some preference for Mesolithic site location on prominent ridge ends along the northern bank of the Welland as well as in small valley bottoms (Knox 2000).

In Northamptonshire surface collection surveys (Hall 1985; Martin and Hall 1980; Parry nd) have once again sought to examine the distribution of evidence across different geologies. Phillips (2000) recognises a similar pattern along the flanks of the River Nene to that revealed with the Leicestershire Medbourne survey. Mesolithic activity appears to be preferentially located upon prominent topographical locations on exposed permeable geologies. With reference to the survey work of Hall (1985) and Martin and Hall (1980) he notes that permeable geologies generally appear to have preferentially attracted Mesolithic sites with clay soils being avoided. Certainly, the Northamptonshire surveys do appear to demonstrate how lithic evidence of all prehistoric periods has been most frequently discovered on light soils (Hall 1985, 31). Phillips also suggests that in Northamptonshire concentrations of sites along river valleys and in the north-west uplands of the county may relate to the number of rivers that have their headwaters in these uplands and the use of these valleys for movement and exploitation. He suggests that the north-west uplands may have provided an important crossing point between the adjacent river valley systems.

The positive impact that surface collection survey has had upon the known Mesolithic resource of the East Midlands region is undeniable. The impressive quantitative impact upon the known record has also allowed some preliminary observations to be made concerning distributional patterns. It would however appear that despite the extensive use of surface collection since the 1960s there have been just a handful of instances where large-scale collection survey evidence has been used for targeting the detailed excavation of a Mesolithic scatter.

As a result of pioneering surface collection fieldwork on the Coal Measures, another historically neglected part of the East Midlands landscape, the North Derbyshire Archaeological Trust undertook a rescue excavation of one of the more promising scatters identified along a south and easterly facing prominence above the River Drone, north of Chesterfield. The excavations during 1977 and 1978 at Unstone 1 produced some 4066 flints, with the majority coming from an area of c. 120m². The assemblage was 'balanced' (*sensu* Mellars 1976a) with microliths, scrapers, awls and burins all represented along with cores, core maintenance flakes, retouched and unretouched flakes and blades. A series of features, possibly of Mesolithic date were recorded. There were also indications of surviving stratigraphy within the features suggesting at least two phases of occupation. Unfortunately, the excavations at the Unstone 1 site have yet to be published (Ataman 1978; Courtney nd, 1977).

Scatters located through fieldwalking are however sometimes used for locating mechanically excavated trenches in the hope of identifying buried features. Between 1991 and 1995 the Fenland Survey in Lincolnshire identified through fieldwalking a concentration of Mesolithic flintwork at Mexican Bridge, Midville. A trenching excavation established that although there was a Mesolithic scatter and an intact prehistoric landsurface preserved beneath later alluvium there were no features identifiable (Crowson et al. 2000; Membery 2000).

3.2.3 PPG16 (1990)

The introduction of Planning Policy Guidance note 16 in 1990 (DoE 1990) has probably been the most influential development in promoting the excavation of Mesolithic sites in environments that have historically received little archaeological attention. A similar benefit can be seen in the increasing numbers of investigations of sites across the region presenting a potential for the preservation of environmental data. The critical change with PPG16 has been the introduction of a developer-funded, development-led spatial agenda to archaeological fieldwork. The distribution of developer funded archaeological fieldwork has little or no relationship to the traditional patterns of fieldwork established in the first half of the last century. In this way development pressure has imposed a new spatial discipline upon archaeological fieldwork. The archaeological evaluation of areas offering nothing but 'potential' has become possible throughout the East Midlands region.

Recent evaluations at Lordsmill Street, Chesterfield, in advance of the construction of a motel uncovered a remarkable example of prehistoric survival in the midst of intensive 19th and 20th century development. Originally thought to offer potential for Roman and Medieval archaeology the evaluation resulted in the identification and excavation of Medieval cess pits and a series of features, possibly tree throws, containing a substantial lithic assemblage dating to the later Mesolithic (Foundations Archaeology 1999). The site occupied a low, pronounced headland on the west side of the River Rother and bounded immediately to the south by the River Hipper. It would have originally occupied a position commanding views of the floodplain, instead of the disused railway and by-pass that currently occupies the view from the site. The assemblage, dominated by varieties of Derbyshire chert, included a small obliquely blunted microlith, five scrapers, an awl, blade cores, core rejuvenation material, retouched and unretouched flakes and blades. It is only the second excavated Mesolithic site on the entire Derbyshire Coal Measures. As yet the excavation report has not been published, although a report has been lodged with DCC.

In South Derbyshire evaluation work in the vicinity of a scheduled a Bronze Age barrow cemetery and an Iron Age cropmark complex led to the recognition of an earlier Mesolithic assemblage on Swarkestone Lowes (Elliott and Knight 1999). The site was located on the eastern end of the narrow east-west ridge of Triassic Mercia Mudstone that forms the Lowes. Here the Lowes are capped by the Etwall sands and gravels, providing improved drainage. The location has commanding views of the surrounding landscape, being about 10m above the level of the River Trent to the south, the Cuttle Brook to the east and Sinfin Moor to the north. The assemblage, predominantly made from Wolds flint, contains a fairly broad range of knapping evidence including core maintenance debris, cores, blades, flakes and end scrapers. This represents the first excavated Mesolithic site, and one of only a handful of known Mesolithic findspots in the whole of South Derbyshire (Myers 2000).

In Northamptonshire developer funded archaeology has seen the excavation of small quantities of Mesolithic material at Brixworth (Ford 1994, 1995; Jackson 1990) and at Towcester Meadow (Walker 1992). The latter site has demonstrated the high potential for site survival in alluviated deposits within low energy streambeds and river valleys (Phillips 2000). At Burton Latimer (Foundations Archaeology 2000) deposits preserving evidence for forest clearance that is thought to

be anthropomorphic in origin, but containing no cultural materials, have been dated to 5910 +/- 40 BP.

In Leicestershire an evaluation of land proposed for development adjacent to Thurlaston Brook at Croft Quarry was undertaken in 1993 (Cooper 1993). Located at 67m OD the site lay just upstream of the confluence with the River Soar on a geology of Mercian mudstone, glacial boulder clay with some sands and gravels. The evaluation and subsequent excavation (Hughes and Roseff 1995) were hampered by dewatering problems in the trenches, but managed to identify a series of pit-like features containing varying quantities of charcoal flecks, and two shallow curvilinear features thought to represent palisade gullies associated with post-ring roundhouses. The small lithic assemblage from the evaluation and excavation may be Mesolithic or Neolithic and included pieces from three of the pit-like features. Unfortunately, the excavation difficulties severely limited the extent of the sampling of deposits in the features. The Croft site has however provided environmental samples for analyses of pollen, macro-floral and beetle analysis. Preliminary investigation of the pollen indicates undisturbed forest environments dating to the Atlantic period (Hughes and Roseff op. cit. 103). Information from sites such as Croft is adding to the range of Mesolithic environmental data available from other Leicestershire sites such as Narborough (Brown 1999), Austin Friars (Shackley and Hunt 1985) and Birstall (Ripper 1998), and making a significant contribution towards the development of our understanding of post-glacial vegetational patterns in the area.

In acknowledging the benefit that developer-funded archaeology is bringing to Mesolithic and palaeoenvironmental research in the East Midlands it must also be recognised that such work will remain vulnerable to criticism for being piecemeal until strategies for integrating the results into broader research agendas have been developed. The present EMARF initiative will hopefully contribute towards reducing such criticism. Recent research based largely upon developer funded work on geomorphological and palaeoenvironmental data (Knight and Howard 1994) provides a good example of the strategic application of developer-funded work in developing our understanding of the complex fluvial landscape history of the Trent and Idle river valleys (Bishop 2000). Such work not only provides an explicit, detailed model of the development of the environment along these river valleys, but also provides a predictive framework for identifying where the potential for the survival of sub-alluvial archaeological and palaeoenvironmental evidence is greatest. Developer-funded archaeology thereby contributes towards the constructive targeting of further PPG16 and other research-funded fieldwork.

In Nottinghamshire the proposed construction of a power station at Staythorpe, south-west of Newark, recently gave rise to a programme of archaeological works (Davies 2001) in an area identified as offering important sub-alluvial potential. Located in the Trent valley on alluvium and river gravels overlying Mercian mudstones the development required the excavation of two gravel borrow pits. Initial coring confirmed the presence of organic deposits, deeply buried beneath alluvium, providing the potential for the preservation of palaeoenvironmental evidence. Subsequent trenching identified three palaeochannels containing organic evidence of which two proved to be later Mesolithic in date. These have provided a series of four dates on wood and reeds ranging between 6640 +/- 60 BP (Beta-142217) and 6040 +/- 70 BP (Beta-1442218). Pollen and insect data indicates that during the latter half of the fifth millennium the area was a mixture of alder, willow and aspen carr, with limited grassland and a background of oak, elm and lime on the adjacent gravel terraces. The later Mesolithic deposits also produced animal bones for a range of species including Roe deer and aurochs. Two of the recovered bones bore clear signs of cut marks.

However, the most remarkable find at Staythorpe was the recovery from one of the later Mesolithic palaeochannels of a well preserved human femur, probably from an adult female, that has

subsequently provided a radiocarbon determination of 6790 \pm 40 BP (Beta-144016). At the outset to this paper it was noted that in England human remains dating to the Mesolithic are exceptionally rare. Indeed, to my knowledge this represents the first demonstrably Mesolithic human bone from an open air location in England, and the first not to come from a coastal or cave location in the United Kingdom.

The Staythorpe femur has been analysed for stable isotopes of carbon and nitrogen (Richards 2001). Stable isotope analyses of bone collagen provides evidence of the protein sources in human diets (Richards 2000) for a period of approximately the last 10 years before death. Carbon isotope values ($\delta^{13}C$) provide information on the levels of marine (fish, shellfish) versus terrestrial (animal meat, plants) sources of dietary protein. Nitrogen isotope values ($\delta^{15}N$) provide data on the relative importance of plant versus animal protein sources. The Staythorpe sample provided a $\delta^{13}C$ value of -20.4 and is indicative of a diet where all of the protein came from terrestrial sources. This indicates that in the 10 years before death this individual spent little if any time at coastal locations consuming marine foods. The $\delta^{15}N$ value was 9.3., indicating a diet very high in animal protein. Together the results suggest that this individual spent the 10 years before death obtaining the vast majority of protein from terrestrial animal sources.

The discovery at Staythorpe and the resulting stable isotope data contributes to our perspectives on the character of later Mesolithic diet and mobility. Previous stable isotope data on Mesolithic human remains in Britain has come from caves or shell middens in coastal locations. They have demonstrated an emphasis upon marine sources of dietary protein. The Staythorpe sample provides, for the first time, a clear indication that there were populations whose dietary protein came predominantly from terrestrial sources. Taken together, we have clear dietary evidence for the establishment of varied subsistence strategies by at least the seventh millennium BP. Some groups clearly had an emphasis upon coastal resource exploitation while others appear to have been primarily engaged in exploiting non-coastal resources. The evidence may also provide support for the recognition from the Mesolithic archaeological record for the establishment of spatially discrete or territorial patterns. Furthermore, whatever else the Staythorpe individual had eaten in the decade before her death it does not appear that sources of vegetable protein, such as hazel nuts, played anything else but a small and probably seasonal role. The predominance of animal protein in her diet emphasises the importance we should attach to evidence for change in Mesolithic hunting strategies.

3.3 Observations on the East Midlands Mesolithic Resource

The known Mesolithic resource in the East Midlands region has, in recent decades, been transformed by changes in field practise and planning guidance. Spatial bias in the historic distribution of archaeological endeavour left large areas of the region uninvestigated. Systematic surface collection from ploughed fields has demonstrated that in the East Midlands region evidence for Mesolithic activity is widespread. Developer-funded archaeology is beginning to provide excavation detail. The impact has been to transform the assessment of the resource in the region. No longer can discussions of the period comfortably characterise the region as an area that was avoided or only thinly populated (Smith 1992: Smith and Openshaw 1990). The case for integrating PPG16 fieldwork into wider, more strategic frameworks for research has also been demonstrated. The work at Staythorpe has illustrated how such work can produce nationally important and novel evidence concerning the character of subsistence and mobility in the early fifth millennium.

This is not to imply however that under PPG16 all is well in the region. The East Midlands faces a persistent problem with important resources from excavated sites not being adequately published. The archaeological resource represented by upland caves and rock shelters have

frequently received only interim reporting of the various excavations. Curatorial concerns for the preservation by record of many of these sites dictates that there should be a determined effort to conserve for future research the records from such excavations. Where deemed appropriate, projects to preserve and analyse such archives and publish the results should be considered. The problem of non-publication is not confined to cave excavations. The county assessments identify a number of important sites that have yet to be published. Quite apart from any moral issues that can be advanced, raising the Mesolithic research profile of the region will require the publication of such excavations.

The apparent lack of chronological refinement in much of the survey data and/or in SMRs restricts the utility of that data for addressing certain important research issues. The changes in technology which define the earlier to later Mesolithic transition provide a variety of opportunities in the analysis of lithic assemblages for the assignment of material to one or other of these phases. Notwithstanding the multiplicity of problems that beset the analysis and interpretation of lithic assemblages recovered as scatters of material it is possible through the application of typological, metrical and raw material analyses to obtain some indication of the presence of earlier and/ or later Mesolithic activity. Future project briefs should specify the need for an appropriate level of analytical detail in lithic analysis to be provided for SMRs.

The surface collection surveys have however given rise to a number of intriguing observations regarding the overall distribution of Mesolithic evidence. Throughout the East Midlands region there is an observed tendency for Mesolithic activity to be found on high points, ridges, prominences or headlands. Specific observations on this pattern have been made with regards to the gritstone uplands, coal measures and Mercian mudstones of Derbyshire, the Fen edge of Lincolnshire, the River Nene of Northamptonshire and the River Welland in Leicestershire. Some of these locations provide vantage points offering views, vegetation permitting, along deeply incised valleys whilst others look out across extensive areas of relatively flat land.

A similar preference for well-drained locations has also been noted in a number of the county assessments (Membury 2000; Phillips 2000). That locations with free draining soils appear to have preferentially attracted Mesolithic activity has long been recognised (Rankine 1949; Mellars and Reinhardt 1978). At the same time however surface collection surveys in Derbyshire, Lincolnshire and Leicestershire have demonstrated that Mesolithic activity is spread across the landscape in a wide range of locations and on varied geologies and geomorphologies including those with heavier soils. It is interesting that in Leicestershire the long-held assumption that clay areas would have been avoided in prehistory has been dispelled by survey. In Derbyshire, the chance discovery at Lismore fields also points to later Mesolithic and earlier Neolithic settlement, not just activity, on heavy soils. Yet in Northamptonshire extensive surveys of varied geologies and geomorphologies have left an impression that the claylands were actively avoided by Mesolithic populations.

Accounting for this seemingly fundamental difference in the distribution of Mesolithic activity is perhaps an issue that needs to be addressed through further research and fieldwork. However, it is perhaps worth noting that the majority of survey in Northamptonshire has been done using 30m interval transects, whilst in Leicestershire the bulk of survey has used a 20m interval. It follows that the Northamptonshire surveys will have been less likely to identify smaller sites than the surveys in Leicestershire. Prominences and well-drained locations may well have attracted repeated activity or occupations and thereby generated palimpsests of sufficient size to be well represented in all surveys. Extensive forested areas of clayland however may not have provided conditions where specific locations were reoccupied. With fewer palimpsests the clayland site record would consist of numbers of small, spatially discrete sites. We know that in upland areas

excavations have identified Mesolithic sites where the lithics were concentrated into an area of 5m diameter or less. It may be that a narrower transect interval provides sufficient coverage to identify a good proportion of such small sites.

The impact of developer-funded work on the known Mesolithic resource in the East Midlands region has been considerable. The funding of such fieldwork outside of those areas where tradition has dictated the Mesolithic is to be found is providing data that will contribute directly to national research agendas. Programmes of fieldwork are identifying sites in previously neglected locations. It is important however that once defined, concentrated scatters should be investigated for the scatter evidence itself, and not just with respect to the survival of buried features. The need for typological and metrical analysis of assemblages across the region has been identified and discussed. For the region to contribute to perspectives on inter-assemblage variability, reduction sequences and raw material distributions we need to have data from well sampled lithic assemblages.

4 Towards a Research Agenda

Throughout this paper reference has been made to the importance of the 3 relevant research priorities identified by the Prehistoric Society's Working Party for the Palaeolithic and Mesolithic of Britain and Ireland (1999). These essentially transitional/ chronological issues can be broadly characterised as follows ,

- The transition from late-glacial to early post-glacial hunting and gathering
- Continuity and change during the Mesolithic
- The transition from the later Mesolithic to the earlier Neolithic

In one sense such broadly defined topics may provide a useful framework for advancing Mesolithic research. I have no doubt that these broad topics provide sufficient scope to ensure the inclusion of virtually any Mesolithic research proposal. However, in defining suggestions for an East Midlands research agenda there is an opportunity to identify more specific research objectives that can be purposefully addressed. What follows has been based upon the previous discussion.

- Characterising the regional and local scale distributions of earlier and later Mesolithic activity
- Identifying assemblage-types through the quantitative analysis of inter-assemblage variability amongst 1) earlier and 2) later Mesolithic assemblages
- Identifying site-types through combining the study of assemblage types with that of the size, shape and locational characteristics of lithic scatters
- Defining the spatial extent of typologically distinctive sub-types: i.e. 'Star Carr-type', 'Deepcar-type', 'basally trimmed microliths'
- Refining chronology for Mesolithic industries – particularly for the earlier Mesolithic variants, the potential intermediate industries containing basally trimmed microliths, and for the early to mid-fourth millennium
- Greater resolution in defining raw material sources and raw material procurement and use in assemblages across (and beyond) the region

- Defining earlier and later Mesolithic site reduction sequences to understand how technology was organised
- Targeting deposits offering potential for the preservation of Mesolithic environmental data
- Targeting deposits offering potential for the preservation of Mesolithic faunal or floral subsistence data
- Establishing the extent, chronology and character of evidence for environmental manipulation across the region

As has already been discussed, for the generality of Mesolithic archaeology in the East Midlands region to address any or all of the 3 transitional/ chronological issues identified above will require more chronological and typological detail from the analysis of lithic assemblages. This applies equally to surface survey and excavations. It is not sufficient for scatters to be simply regarded as locations for identifying the presence or absence of features through mechanical trenching. Detailed analysis of excavated assemblages is necessary for typological, morphological and inter-assemblage research to proceed. Of course, the ever present demands for more reliable radiocarbon dating of Mesolithic assemblages and the holy grail of finding well preserved Mesolithic structural evidence confirms that opportunities to investigate suitable features and contexts should not be ignored. It would be desirable to see some research excavation of scatters defined by surface collection.

- Increased chronological and typological detail from analyses of Mesolithic survey and excavation assemblages
- Extend initial fieldwalking to areas that have not previously been surveyed or that have received little attention
- Increased detail on assemblage scatter sizes and shapes through appropriate plotting of finds from known or suspected concentrations
- Scatters defined by surface collection to be selected for research excavation in accordance with the research framework priorities
- Publication and archive consolidation of excavated sites, including previously unpublished excavations
- Summarise this detail on SMR entries

To achieve such objectives may require changes in the drafting of project briefs and will also require changes in fieldwork methodology. Surface collection survey methodologies should be designed ultimately to enable various site and assemblage details to be derived from recovered lithics beyond that of simple dots on maps. A traverse and stint methodology may be efficient for the initial recognition of activity concentrations. Once identified however such concentrations should be plotted to a greater level of detail, with the objective of defining their extent, shape and size. Finds may or may not need to be recorded individually. The level of plotting should be appropriate for enabling the fieldwork to contribute positively in addressing the issues raised by

the agenda. Methodologies should also take into account the impact upon rates of site recognition of having too widely spaced traverses given that many Mesolithic activity concentrations may be very small in diameter. Such surveys will prove to be most useful where the fieldwork is conducted across varied geologies, geomorphologies and topographic locations to a broadly standardised level of coverage. Finally, if SMRs are to play a more constructive role in Mesolithic research then their records need to incorporate an increased level of detail on the typology and chronology of assemblages and more detail regarding the size and density of lithic scatters and sites.

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