Humans in the Environment: Plants, Animals and Landscapes in Mesolithic Britain and Ireland

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Abstract

Environmental archaeology has historically been central to Mesolithic studies in Britain and Ireland. Whilst processual archaeology was concerned with the economic significance of the environment, post-processual archaeology later rejected economically driven narratives, resulting in a turn away from plant and animal remains. Post-processual narratives focused instead on enigmatic 'ritual' items that economic accounts struggled to suitably explain. Processual accounts of landscapes, grounded in economic determinism, were also rejected in favour of explorations of their sociocultural aspects. However, in moving away from plant and animal remains, such accounts lacked the ability to rigorously explore the specificities of particular landscapes and humans actions within them. This paper will bridge this gap by considering how palaeoecological and zooarchaeological analyses can be used to explore human interactions with plants and animals, which were key in developing understandings and relationships that ultimately structured

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landscapes, influenced past human actions and shaped archaeological assemblages.

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Introduction: Early Approaches to Plants and Animals

Plant and animal remains are conspicuously absent from early 20th century accounts of the British and Irish Mesolithic. Although faunal remains had been discovered in 1920 (Peake and Crawford 1922), the first British synthesis was almost entirely focused on lithics (Clark 1932), whilst interest in organic remains was directed toward artefacts, namely a handful of barbed points recovered from Skipsea and Hornsea, the Rivers Thames and Royston, and the Leman and Ower sandbanks (Clark 1932). Following European models, plant materials began to be used to establish the sequence of vegetational changes in Britain and Ireland from the later stages of the last Ice Age, which provided a means to date sites and finds, including the Leaman and Ower barbed antler point, and relate them to the European record (Godwin and Godwin 1933; Jessen 1949).

By the 1940s, there was a growing desire to discover sites with organic preservation, in part to date material, but also to investigate the lifeways of ‘Maglemosian Man’ (Clark 1954). This was encapsulated in *Prehistoric Europe: The economic basis,* which aimed to reconstruct economic life from material traces of human lives, using animal bones to demonstrate species’ economic importance, and animal behaviour to discuss methods of hunting, seasonality and cycles of occupation (Clark 1952).

The growing interest in organic remains led to the excavation of Star Carr, which yielded the first associated lithic, faunal and osseous artefact assemblages (Clark 1954). Analysis of the faunal remains identified red deer as the most important hunted species, converted the assemblage into calorific totals in order to estimate an aggregated occupation length, and used shed and unshed antler to identify the season of occupation, (Clark 1954). In contrast, whilst the potential of plants as a source of food was discussed, they were considered to be of secondary importance, and the botanical material was used primarily to determine the character of the local environment and to relate Star Carr chronologically to other Mesolithic sites in Northern Europe (Clark 1954). In early accounts of the Mesolithic, animal remains were established as nutritional and material resources, used to explore how humans lived; however, plant remains played a more passive role, simply providing the environmental context within which these actions occurred.

Economic Archaeology

From the 1950s, archaeological interest in faunal and botanical materials continued to increase, leading to the development of both zooarchaeology and palaeoecology, and the emergence of a more scientific approach to archaeological analysis. This manifested itself in a focus on the measurable and testable aspects of past human life, and in particular the assertion that economic institutions played leading roles in culture (Trigger 1971). Within early economic accounts of the Mesolithic, it was the abundance and distribution of food resources that was deemed to be of critical importance, structuring human movements within the landscape (e.g. Mellars 1975).

Fauna

Within accounts of the British Mesolithic, the changing populations of animals were cited as the most immediate concern of Mesolithic humans (Mellars 1974, 1975). From the Star Carr assemblage, Clark again noted that red deer were the prime food source, but also suggested Mesolithic groups would have followed migrating herds between lowland areas in winter, and upland areas in summer (Clark 1972). More detailed studies, again focusing on red deer, described herds seasonally shifting from dispersed upland summer populations to more concentrated lowland winter groups (Mellars 1975). Echoing Clark, this seasonal variance was cited as the key in shaping human settlement patterns, social organisation and mobility strategies, leading to upland–lowland seasonal transhumance, larger winter settlement sites and smaller summer social groupings (Mellars 1976). In turn, this model was employed to interpret the functional patterning in lithic assemblages, identifying small, microlith-dominated assemblages in upland areas as summer hunting camps, whilst assemblages with a balanced of microliths and scrapers in lowland areas were interpreted as winter sites (Mellars 1976).

The Irish material offered a distinct contrast. Based on the distribution of sites within valleys, in particular the Bann Valley, early accounts suggested the ‘oft quoted, but never substantiated’ theory that Mesolithic life in Ireland relied on fishing (Woodman 1973). However, by the 1970s, organic remains were recovered from a number of sites, permitting the first direct examination of Irish Mesolithic economies. Remains of salmonid and eel from Newferry provided evidence that fishing was of prime importance (Woodman 1977), which was supported by the recovery of large quantities of the same species from excavations at Mount Sandel and Lough Boora (Woodman 1978). The mammalian assemblages were dominated by wild boar, a pattern reflecting the restricted Irish fauna, which lacked aurochs, elk, red deer and

roe deer (cf. Woodman et al 1997). The absence of remains of these animals, or any substantial upland occupation, in these assemblages suggested a radically different economy to the British red deer transhumance model. In contrast, Irish Mesolithic groups were described as remaining in river valleys, occupying sites in summer to target migrating salmon and eel, hunting wild boar in winter, and moving to exploit coastal resources in spring (Woodman 1978). In turn, these fish-oriented economic models were used to interpret lithic assemblages, presenting Bann flakes as part of a maintenance kit for fish weirs and traps (Woodman 1977).

Later processual accounts (from the 1980s onwards) continued to base Mesolithic mobility on the exploitation of key resources; re-analysis of Star Carr compared the faunal material with modern hunter-gatherer assemblages, to interpret the site as a hunting camp (Legge and Rowley-Conwy 1988), continuing the tradition of interpreting site use in terms of animal resource exploitation. In Ireland, narratives of seasonal mobility and settlement patterns continued to revolve around the exploitation of fish, and, to a lesser, extent wild boar. Full analyses of the Mount Sandel and Lough Boora material confirmed high frequencies of salmonids and eel, which were characterised as highly predictable summer resources (Van Wijngaarden-Bakker 1990; Woodman 1985) and a storable food that buffered winter shortages (Woodman 1985), implicitly suggesting that wild boar hunting was somewhat of a winter stop-gap. As British narratives were grounded in models of red deer movements, in Ireland, it was fish and fishing that played the key role. Indeed, fish were so central to accounts of the Irish Mesolithic that sites in close proximity to rivers, but containing no fish remains, were interpreted as fishing sites (cf. Little 2009). Furthermore, the recovery of a larger assemblage of marine fish and mollusc remains from Ferriter's Cove led to the consideration of marine resources, and the

suggestion that Later Mesolithic communities on the Dingle peninsular may have remained in coastal areas for substantial parts of the year (Woodman et al 1999). This focus on marine resources, tied into wider debates regarding 'complex' hunter gatherers and the intensification of marine resource exploitation (Price 1985), was echoed in Britain by the Oronsay Middens (Mellars 1987). Thus, whilst the British and Irish assemblages contained distinctively different materials, and subsequently very different accounts of Mesolithic life, these narratives both presented hunter-gatherers as understanding landscapes based on resource availability, and occupying sites within seasonal rounds to efficiently extract these resources.

Flora

Early economic accounts continued to use plants to characterise the Mesolithic environment, identifying large-scale vegetational changes during the early Holocene (Mellars 1974), and establishing Ireland's limited flora (cf. Edwards 1985). However, from the 1960s, pollen diagrams from British Mesolithic sites indicated phases of forest recession and clearance associated with high frequencies of micro-charcoal, suggesting anthropogenic clearance intervention using fire (Smith 1970; Simmons 1979). This was interpreted within ungulate hunting models, where clearance stimulated vegetation re-growth, increasing the area's 'carrying capacity' and attracting herbivores, resulting in increases in deer numbers, health, and weight (Mellars 1975). These clearances were also identified as allowing Mesolithic groups to control animal resources, reducing hunting time and energy expenditure, and allowing the formation of larger groups and more permanent settlements (Mellars 1976). This became a key element in accounts of British Mesolithic economies, and although the potential increase of plant food resources was acknowledged (Mellars 1976), clearance was presented primarily as a strategy to obtain animals. Fire was

the principal tool in deer cycle maintenance (Simmons 1979), and vegetation clearance was presented as a form of proto-pastoralist herd management (Mellars 1976). Furthermore, high frequencies of ivy pollen at British Mesolithic sites were interpreted as gathered fodder for red deer (Simmons and Dimbleby 1974), adding further weight to narratives of human control over animal resources. Whilst episodes of woodland manipulation were identified in Ireland (Smith 1981; Preece et al 1986), there were fewer than in Britain, possibly reflecting less engagement in clearance practices in Ireland, because of the absence of large ungulate species (Woodman 2000) and the economic focus on fish.

These early economic accounts present an important contrast between archaeology's approaches to plant remains and animal remains. In Britain and Ireland, animals were presented as key resources whose differential distribution was the foundation of human understanding of the landscape; humans were believed to seasonally 'map on to' this distribution, shaping mobility strategies, site use and lithic assemblages. In contrast, plant remains were used in these accounts to characterise the environment within which humans and animals existed, or as a medium for considering human–animal interactions. Although plant food resources were acknowledged, their dietary importance was not fully explored. This can be considered the result of the preservation bias between botanical and osseous remains, though this 'meat fixation' can also be understood as an imposition of modern dietary values on to the past (Clarke 1978).

This plant–animal imbalance began to be addressed as the dietary role of plant foods, and the use of clearance to specifically manage and increase plant resources, were considered in more detail (Zvelebil 1994). These later studies highlighted the wealth of plant foods available to Mesolithic people, even suggesting that wild boar

and fish remains from Irish sites may have supplemented a plant-dominated diet (MacLean 1993). Furthermore, the recovery of plant remains from archaeological features identified intensive exploitation of hazelnuts and other plant species on the Scottish island of Colonsay (Mithen et al 2001). Such studies did much to emphasize the significant role plant resources may have played in the Mesolithic: from this point in research history, the Mesolithic environment was understood as made up of animal *and* plant resources extracted by occupying specific sites, which formed a network across the landscape, orientated around optimised exploitation.

Post-Processual Mesolithic Studies

From the 1980s, new archaeological themes emerged. Unhappy with processual narratives of human action driven by *measurable* economic factors, post-processual studies moved to consider the social, and *unmeasurable*, aspects of human lives. However, after decades of research focused on environmental and economic issues, the Mesolithic research community was largely populated by scientific environmental archaeologists, far less interested in 'unmeasurable' social accounts. This led to the later emergence of a post-processual Mesolithic and, with new practitioners, a move away from subsistence models and environmental reconstruction.

For the first time, humans' relationships with animals were examined beyond the well-established assumption that humans considered animals in exclusively economic terms. Instead, animal remains were considered within the context of symbolic and/or religious Mesolithic world views, relating to themes such as human and animal fertility (Bevan 2003). Furthermore, studies began to break down the long-standing divisions between humans and animals, to explore relationships

between humans and animals in which nonhumans were considered as active social agents, as opposed to objects. Whilst earlier, processual studies had discussed animal behaviour (e.g. Legge and Rowley-Conwy 1988), these had tended to focus on biological factors (such as breeding cycles or seasonal migration) and their implications for Mesolithic economies. In contrast, an explicit recognition of animal agency acknowledged the potential for nonhumans to affect humans through their actions and interactions. This in turn was seen to guide processes of hunting, gathering, use, consumption and deposition in the past, practices which ultimately shaped the archaeological record. For example, in Britain, both Conneller (2003) and Chatterton (2003), argued that the large assemblage of bone and antler artefacts and faunal material at Star Carr was generated through intentional forms of deposition relating to the culturally appropriate ways of disposing of the remains of animals. Furthermore, the enigmatic red deer 'frontlets' from Star Carr were regarded as objects retaining the agency of the living animals from which they originated; and, when worn, they combined elements of human and red deer, extending human bodies and blurring the boundaries between human and animal (Conneller 2004). In Ireland, Kelly suggested that humans may have developed an understanding of wild boar as dangerous through hunting encounters, and subsequently dealt with this reality by including these animals in their wider cultural beliefs (2005).

Similarly, consideration of plants and woodlands extended beyond their economic role, by exploring how humans may have come to terms with the world around them. Influenced by a growing body of hunter-gatherer ethnographies, Mesolithic woodlands in Ireland, and woodlands more generally, began to be considered as

things with which Mesolithic humans may have engaged in personal relationships, as ancestors or benevolent parents, wrapped up in complex symbolic understandings of the world (see Warren 2003). Similarly, oft-cited clearance events were considered as having social, as opposed to economic, motivations, to maintain clear areas and paths, as part of longer-term relationships between humans and woodlands (Davies et al 2005).

Post-processual studies produced new accounts of Mesolithic Britain and Ireland that were not reliant on problematic economic models of optimised exploitation. However, by moving the focus away from subsistence and the environment, they also moved away from plant and animal remains. Having served as crucial lynchpins in studies of subsistence, seasonality and mobility, faunal and palaeoecological remains appear to have been burdened with a seemingly unshakable and irreversible economic stigma. New accounts of Mesolithic landscapes lacked paleoecological evidence (e.g. McFadyen 2006), and it was suggested that to further the study of human–animal relations, there was a need to 'move beyond bones' (Bevan 2003). In the case of animal remains, whilst 'typical' zooarchaeological material was absent, post-processual studies focused on material that was understood as having other-than-economic significance, such as the barbed points and frontlets from Star Carr, and whole animal depositions, which previously sat awkwardly in traditional economic interpretations (Conneller 2004; Chatterton 2006). At the same time, processual studies of plant and animal remains continued to focus on subsistence, seasonality and clearance events on either side of the Irish Sea (e.g. Innes and Blackford 2003; Carter 2001). Therefore, zooarchaeological and palaeoecological data continued to be used within economic frameworks, whilst

enigmatic or artefactual items made of animal remains were being explored within social accounts of the British and Irish Mesolithic. At the publication of *Mesolithic Britain and Ireland: New Approaches* (Conneller and Warren 2006), this division in the use of faunal and palaeoecological remains, between 'economic' and 'social' approaches, presented a major challenge in thinking about humans, plants, animals and landscapes; could we ever get the full picture by only considering a portion of the evidence?

Mesolithic Britain and Ireland: Ten years on

Over the last ten years, research into plants, animals and landscapes has undergone significant developments. The analysis of faunal and palaeoecological evidence continues to use inherently processual methodologies, generated over decades of research and development. However, more recent theoretical frameworks have demonstrated a shift from abstract to more data-focused accounts. A renewed interest in the material world, the so called 'material turn', has challenged anthropocentric frameworks, which assumed humans to be separate from and superior to all the other elements of the world, and replaced them with a conceptualisation within which all entities, be they humans, plants, things or animals are on an equal footing (Thomas 2015). In such frameworks, all elements of the world are considered to have the capacity to act and act back, affecting other things, including humans. This places the materials of Mesolithic lives, and examination of human interactions and relationships with them, at the centre of producing new understandings of the period.

New approaches within zooarchaeology have begun thinking about animals not as nutritional or material resources, but as active living beings, with the ability to affect

human understanding through meaningful interactions and encounters. As faunal assemblages are made up of the very animals with which humans interacted, standard zooarchaeological data regarding species, age and sex can be used, in conjunction with animal behaviour studies, to characterise the encounters between humans and particular individuals in specific places, environments and at different times of the year. The human understandings of animals developed through these encounters may have been important in shaping how species or individuals were later killed, processed, and finally deposited, and are, therefore, key considerations in the interpretation of archaeological assemblages (Overton and Hamilakis 2013). Such studies have already begun to produce more detailed accounts of the relationship between humans and animals in the British Mesolithic (Overton 2014), and most recently, identified the transportation and curation of isolated wild cat, badger, fox, wolf and otter bones as significant objects, as opposed to simply waste from fur extraction (Overton 2016). The potential consumption of bear and birds of prey at Moynagh Lough and Mount Sandel in Ireland have been explored as a potential means for humans to take on behavioural or symbolic attributes of these species (Warren 2015). Similarly, animal remains used for the production of artefacts have been characterised as 'dragging' effects of past encounters with them, influencing the ways materials and artefacts were used, understood and treated (Conneller 2011; Elliott 2012). This extends to the way such items were disposed of, as seen with the evidence for the deliberate decommissioning of equipment made from osseous materials at Star Carr (Taylor et al 2017).

In contrast, studies of plant remains have continued to focus on the evidence for human structuring of woodland and the gathering of food, raw material and fuel (in Ireland; Warren et al 2014; in Scotland: Bishop et al 2013, 2015), continuing to

redress the plant–animal imbalance of earlier accounts. However, consideration is also given to the social and cultural circumstances that may have encouraged the gathering of plants (Warren et al 2014), and the role such practices, and the resultant remains, have in making socially significant places and landscapes (Cobb 2016). This marks an area of great potential for future study; recent discussions of the dynamic relationships between humans and plants have highlighted the potential agency of plants, and their ability to affect humans through entangled relationships and mutual transformations. Van der Veen (2104), for example, has discussed how human and plant behaviour is intricately linked in relationship of mutual benefit through the processes of domestication. Though Mesolithic groups did not practice agriculture, Taylor (2018) has shown that wild plants possessed a similar agency in the way they effected patterns of human behaviour within Mesolithic landscapes. Equally , the suggestion that plants may have been used for their medicinal or narcotic properties (for example, the *Galium aparine* remains recovered from Belderrig in IrelandWarren 2015), provides an obvious avenue for research into the social significance of plant species. In the rejection of anthropocentric schemes, and in light of recent literature that argues for the recognition of plant agency (e.g. Brown and Emery 2008; van der Veen 2014), we must not open the door to animal agency, only to shut it again on plants.

Case Study: Humans in the Environment

To illustrate how a social account of a Mesolithic environment can be constructed, we conclude with a case study focusing on an episode of aurochs hunting in the early Mesolithic landscape of the palaeo-lake Flixton (N. Yorks, UK) (Figure 1). Drawing upon recent palaeoenvironmental studies (Mellars and Dark 1998; Taylor 2012) and excavations (Gray Jones and Taylor 2015), we will discuss how the lives

of the aurochs and its hunters were entwined through their complex relationships with other aspects of the environment; and how, through mutual encounters, the animal came to be seen as an agent, acting with purpose and intention within the landscape.

Figure 1

Aurochs Hunting around the Palaeo-Lake Flixton

In 1999, test-pitting surveys carried out by the Vale of Pickering Research Trust recovered a faunal assemblage from a small, peat-filled hollow at Flixton School House Farm, on the southern shore of the palaeo-lake Flixton (Gray Jones and Taylor 2015) (Figure 2). Subsequent excavations recorded a discrete area of activity adjacent to the hollow, consisting of pits, arrangements of post-holes, and deliberately constructed hollows. The main phase of activity has been dated to the first half of the ninth millennium cal BC, though there is evidence for occupation both earlier and later in the Mesolithic (Gray Jones and Taylor 2015). Further excavation in the hollow failed to recover any more archaeological material, and the faunal assemblage appears to reflect a discrete episode of deposition.

Figure 2

The faunal assemblage formed a discrete scatter, less than 0.3 m across, with many elements in close association. Macro-botanical analysis suggests that it was deposited into a shallow pool of water amongst beds of *Phragmites* reeds and sedges (Taylor 2012). Attempts to date the bones failed. However, a pollen profile

recorded from the same trench (Cummins and Simmons 2013) places the deposition of the assemblage well before the expansion of hazel, dated locally to 8295–7789 cal BC (8940±90BP) (Mellars and Dark 1998).

Analysis of the assemblage, carried out by Overton, has identified 13 ribs (6 left sided and 7 right sided), 3 thoracic vertebrae and a fragment of the right pelvis (Figure 3). Both left and right first ribs were present, but due to high levels of fragmentation and poor surface preservation it was not possible to identify the remaining ribs to specific position in the rib cage. However, the morphology of the rib head and costal facets suggests that whilst the majority originated from the anterior half of the rib cage, at least two ribs were from the posterior half. One rib exhibited transverse cut marks on the internal surface of the rib body, confirming human association with the remains. It was not possible to identify the thoracic vertebrae to specific positions within the vertebral column. The fragment of pelvis represents a portion of the supra-acetabular margin on the dorsal side of the innominate, exhibiting an ancient break, including the loss of a small splinter along the edge of the element, which may be associated with direct percussion.

The assemblage was originally thought to represent an articulated portion of the animal; however, the skeletal frequencies do not support this. Firstly, the pelvis and the thoracic vertebrae do not articulate directly; they are connected via the sacrum and lumbar vertebrae, both of which are absent. Secondly, a fully articulated portion containing 13 ribs would also contain 7 vertebrae, each supporting a pair of ribs. The under-representation of vertebrae cannot be explained as a result of differential preservation, as this would require identical vertebrae to either be well preserved, or

entirely destroyed within the same context, suggesting the patterning is the result of human action.

Figure 3

The aurochs, and the humans who hunted and killed it, inhabited a diverse environment. Much of the immediate landscape was covered by birch woodland with an understory of ground flora (Mellars and Dark 1998; Cummins 2003), interspersed with hazel and shrub species (Taylor 2012). Within the woodland were small ponds, fringed with reeds and willow (Taylor 2012), and a shifting pattern of clearings created through ongoing processes such as windfall and animal action (Cummins 2003). At the lake shore, birch grew amongst aspen and willow, creating dense thickets in some places, whilst a suite of shrubs and fen plants thrived in areas with reduced tree cover (Taylor 2011, 2012). Within the lake, extensive beds of swamp vegetation were growing in the areas of shallower water, filling many of the small embayments around the edges of the basin, whilst aquatic plants grew in the deeper water beyond (Taylor 2011, 2012). A range of animal species also inhabited this landscape, including large mammals such as elk, red and roe deer, and wild boar; predators such as wolf and fox; and smaller mammals such as beaver, pine marten, and squirrel (Clark 1954).

These elements of the environment interacted with one another in subtly different ways. The aurochs, which is thought to have grazed on grasses (including reeds) but also browsed in the winter (van Vuure 2002), probably moved between the woodland and the extensive beds of reeds that formed in parts of the lake. Its habitats crossed

over with those of elk, which would have come to the lake to feed on aquatic vegetation and browse on the thickets of willow and aspen along the shore, and roe deer, who would have fed on browse in the terrestrial woodland (Legge and Rowley 1988). However, its behaviour was also informed by interactions with predatory species such as wolves, and like other browsers and grazers, it would have avoided areas of reduced mobility and visibility, focusing instead on places with clear lines of sight and unimpeded escape routes (Ripple and Beschta 2004).

The interactions between plants and animals would have structured the character and composition of the local vegetation. Around the edges of the lake, selective foraging by beaver would have resulted in patches of younger shrub species, and created openings within the denser cover of willow and aspen (Rosell et al. 2005). The growth of willow and aspen would also have been more limited in areas where browsers such as elk were most active, and more pronounced in areas that they avoided (Ripple and Beschta 2004), whilst grazing of the reed beds by aurochs is likely to have locally inhibited the expansion of woody vegetation into the wetlands. As animal populations fluctuated and vegetation changed, these interactions would have created a shifting mosaic of plant and animal communities within and around the lake.

The humans who inhabited this landscape had an equally complex relationship with this environment. Excavations at sites around the lake have shown that people were interacting with a variety of different plants and animals through a range of tasks (Taylor 2012). The nature and scale of these tasks would have varied across the landscape in response to the spatial variation of particular plant and animal

communities, and the way they changed throughout the year. As with the aurochs, these patterns of activity would have crossed over with those of the animals, as people engaged with the same species of plants in comparable environmental contexts. This included visiting the lake edge to collect wetland plants, or cutting down aspen from thickets growing at the shore. And as with animals, these activities also structured the environment, creating clearings in the reed beds and woodland.

In can be argued that, as they undertook these activities, people would have encountered the different plant and animal communities and observed the way they interacted with one another. Through this, they would have developed a keen, empirical knowledge of their environment; the distribution of different animal and plant species, the relationships between them, and the way they behaved in different circumstances. However, this understanding may well have gone further. Many of the animals would have formed small social groups that occupied limited territories within this landscape. People's understanding would have been situated in encounters with particular groups of animals or specific individuals, some of which may have been recognised from previous meetings. What is more, in observing these animals, people would have seen behaviour that was recognisable to them, and which in some cases involved engaging with and modifying the same plant communities in similar landscape settings. In this way, the division between humans and animals would have broken down, with animals seen as agents, acting with purpose and intent in the landscape (cf. Overton and Hamilakis 2013; Overton 2014; 2016).

To the hunters, the Flixton aurochs was a familiar animal, whose behaviour they understood; it may even have been an individual they recognised. They would have known where to find the animal, and the signs that it was near. The Kutchin of the Alaskan interior identify the presence of moose from the damage it causes to willow when feeding, and then use tracks to tell how recently the animal was at the site (Nelson 1986). If Mesolithic hunters adopted a similar strategy they may have looked for grazed reeds in the lake margins and then followed fresh tracks, either along the shore or into the woodland. From there, the hunters could employ a number of different strategies, all based upon an understanding of the animal's behaviour. One would be to drive the aurochs from cover towards waiting hunters, a strategy sometimes employed by the Kutchin when hunting moose (Nelson 1986), and possibly driving the animal into the lake edge, where the boggy ground would have limited is mobility (Andersen et al 1981). Alternatively, if the animal was moving along a trail they could have intercepted it, using knowledge of the animal's behaviour and the local environment to select suitable locations for an ambush (Nelson 1986)

Whatever strategy was employed, the hunt ended with a final, physical encounter with the aurochs. It is likely that the hunters used projectiles, such as arrows, to attack the animal, striking it from multiple directions in an attempt to kill or incapacitate it. Impact injuries on the bones of aurochs and other large mammals from Mesolithic sites in Northern Europe indicate the use of projectile weapons fired from the rear, sides and front (Noe-Noygaard 1974; Fischer 1989; Leduc 2014). It is possible that the Flixton aurochs was killed by a fatal shot during this initial encounter. However, evidence from the Danish Mesolithic show that some animals

were dispatched by blows from large spears aiming for the heart (Noe-Nygaard 1974). In such cases, the animal may have been pursued till exhausted and then finished off, or may have been driven, injured, into an area where its mobility was reduced, allowing the hunters to get close enough to strike.

Once killed, at least part of the animal was brought to the site at Flixton School House Farm, where elements of its butchered carcass were deposited in shallow standing water. Based on its context, the material is unlikely to reflect an episode of *in situ* butchering, whilst the discrete nature of the assemblage argues against ad hoc disposal from an adjacent activity area. Instead, it represents materials gathered together from a larger assemblage and then deposited. This would explain the imbalance in rib and vertebra frequencies, and the presence of non-articulating thoracic vertebrae and pelvis in such close association. This is not to rule out the possibility that the three vertebrae were deposited articulated, potentially with ribs attached; however, if this was the case, further isolated ribs and the pelvic fragment were also deposited alongside them. Furthermore, given that the elements were found in such close association, the bones may originally have been wrapped up or deposited in a bag.

Similar forms of deposition have been documented in ethnographic accounts of traditional hunter-gatherer societies and often form part of a wider set of beliefs in which animals and other aspects of the environment are considered to be sentient in similar way to humans (e.g. Nelson 1983; Jordan 2003). Whether or not such ideas lay behind the material from Flixton, the assemblage represents far more than simply the disposal of waste. Rather, this was a deliberate act of curating and then

depositing the remains of an animal, which was known, understood and perceived as an individual.

Conclusions

The continuation of non-anthropocentric explorations of zooarchaeological and palaeoecological data from the British and Irish Mesolithic has the potential to provide increasingly detailed accounts of meaningful interactions between humans, plants and animals, which may in turn greatly enhance our interpretations of human practices and actions. It is an exciting prospect to consider how more data from other forms of analysis, such as isotopic analysis, zooarchaeology by mass spectrometry (ZooMS), tool microwear and residue analysis, and even DNA analysis might develop these accounts further. If we consider animals not as resources but as agents, the relationships and understandings humans developed through encounters and interactions have significant implications for future analysis of animal remains. We know from ethnographic accounts that animal remains are deposited in very structured, prescribed ways amongst groups who perceive those animals to be agents. To ignore the possibility that Mesolithic faunal assemblages may have been generated through comparable sets of rules is archaeologically naive. As highlighted in the case study, deposited material should not be conceived of as simply rubbish; these remains retain aspects of specific human–animal relationship with them: they guided and shaped the ways they were butchered, consumed, distributed and deposited. One interesting direction for future research is to examine how much excavated material exhibits patterning in densities and distributions that are the result of intentional acts of deposition, and how these can be interpreted in the wider framework of human–animal relationships. Furthermore, if the majority of, or all,

faunal remains were subject to specific treatments as a result of human–animal relationships, they can all be used to examine these relationships, collapsing any previous divisions between ‘economic’ and ‘social’ assemblages. This requires us to move beyond characterising the treatment of animal remains in specific ways as rare or other-than-normal by using the term ‘ritual’. Instead, we should acknowledge that meaningful interactions with animals, and the negotiation of significant relationships with them through practices of hunting, consumption and deposition, were probably part of everyday life. On a larger scale, greater focus on species demographics and hunting strategies is needed to focus on the spatial and temporal variations in the species hunted, to provide new accounts of hunting that move beyond outdated red deer transhumance models, and also to consider how processes of hunting particular species at specific sites structured local landscapes. In doing so, it is also important to explore how particular human–animal relationships may have affected hunting strategies, and the extent to which regional patterning could be understood as socially mediated.

Admittedly, both the case study, and the concluding remarks to this point, have focused more on the consideration of humans and animals, than of plants, echoing the bias outlined in previous sections. However, if we accept the agency of plants (van Der Veen 2014), or indeed their potential animacy we can begin to examine how human interactions and encounters with plants developed particular understandings of specific species, and how this may have affected the ways humans treated them, used them or avoided them. Examining plants as agents or as animate beings may be both methodologically and conceptually challenging, but it is equally relevant. The ethnographic record contains numerous examples of plants that are aware of the actions of humans, and possess the capacity to be offended or

angered; as the ethnographer Richard Nelson wrote, ‘My Koyukon teachers told me, almost reluctantly, about one plant that is truly evil’ (Nelson 1983). And in many cases interactions with plants and the disposal of plant materials are subject to similar rules to those governing the treatment of animal, with comparable consequences for those who fail to adhere to them (e.g. Boaz 1921; Nelson 1983; Brown and Emery 2008). Returning to the European Mesolithic, the agency of plants has recently been demonstrated by Taylor (2018) who has shown how the habitat preferences and growth patterns of particular plant species acts to structure the spatial and temporal patterning of human activity. Whilst plant animacy may be harder to see archaeologically that does not mean that the evidence is not there. Recent reviews of the evidence for plant use show a considerable degree of consistency in the choice of species that were utilised (e.g. Bishop et al 2013, 2015). Should these only be explained in terms of availability or functionality, or might they also be the result of specific ways humans understood certain species? To us, the idea of an animate, sentient plant sounds absurd, but to the inhabitants of the British Isles during the Mesolithic such concepts may have underpinned the routine habitual practices of daily life.

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