D. Groß / H. Lübke / J. Meadows / D. Jantzen (eds.): From Bone and Antler to Early Mesolithic Life in Northern Europe. Untersuchungen und Materialien zur Steinzeit in Schleswig-Holstein und im Ostseeraum 10 (Kiel / Hamburg 2019). ISBN 978-3-529-01861-9.
Early View: Quotable online version with preliminary pagination. After the printed volume has been published you can find this article with its final pagination as open access publication here: https://www.wachholtz-verlag.de/Wissenschaft/Open-Access/.
The printed volume will be available here: https://www.wachholtz-verlag.de/Wissenschaft/Archaeologie/

Understanding the bone and antler assemblages from Star Carr

Ben Elliott, Barry Taylor, Becky Knight, Nicky Milner, Harry K. Robson, Diederik Pomstra, Aimée Little and Chantal Conneller

Abstract
This paper comments on the bone and antler assemblages excavated from the Early Preboreal site of Star Carr (North Yorkshire, United Kingdom) between 2004 and 2015. It examines the spatial distribution of osseous material across the site, and discusses the various depositional processes which have led to their accumulation. As a previously excavated site, the published literature surrounding Star Carr has presented challenges for the traditional categories of animal bones, artefacts and osseous manufacturing waste. This paper uses some of the most high-profile finds from Star Carr, the red deer antler frontlets, as a case study for the examination of these tensions, and details the ways in which the most recent excavations required a reappraisal of the categorisation of these artefacts in light of new finds, technological analysis, and experimental replication.

1 Introduction

Since its discovery in the late 1940s, the assemblage of animal bone and antler recorded at Star Carr has provided a wealth of information on a range of aspects of life in the British Mesolithic. The assemblage dates to the Early Mesolithic and consists of large quantities of animal bone and antler, as well as a range of osseous material culture including barbed antler points, bone scrapers and bodkins, and the famous red deer antler frontlets. These had been deposited, along with a large assemblage of worked flint, into an area of reed swamp at the edge of the palaeo-Lake Flixton, and were thought to represent a small, lakeside camp (Clark 1954).

Analysis of the assemblage allowed Clark, one of the original excavators, to determine the character and economic basis of Star Carr, and provided new information on aspects of Early Mesolithic material culture (Clark 1954; 1972). In the years that followed, subsequent generations of archaeologists have used the assemblage to reinterpret the site (e.g. Legge/Rowley-Conwy 1988), investigate aspects of Mesolithic technology (Elliott/Milner 2010), explore depositional practices (Chatterton 2003; Conneller 2003), and debate the relationship between humans and animals (Conneller 2004). However, some aspects of the Star Carr assemblage remained poorly understood. In particular, the lack of detailed spatial and contextual information from Clark's excavations has made it difficult to determine the forms of activity through which the material had been deposited or the environment into which deposition had occurred. Moreover, since the mid-1980s it has become increasingly obvious that the material Clark recorded is far from typical of local Early Mesolithic faunal assemblages.

Excavations at other Early Mesolithic sites in the area have failed to record anything like the same quantity of animal bone, antler, or osseous artefacts (Conneller/Schadla-Hall 2003), whilst work at Star Carr itself showed that the assemblage was very different to the faunal material deposited at other parts of the site (Mellars/Dark 1998).

Between 2004 and 2015 new excavations were carried out at Star Carr. These included large-scale, open area excavations that incorporated the area investigated by Clark as well as the adjacent lake edge deposits and dryland parts of the site. During this work a large assemblage of bone, antler, and osseous material culture was recorded from a range of contexts, including previously undisturbed deposits between two of Clark's trenches that contained a continuation of the large assemblage of bone and antler recorded in the 1940s. Analysis of the assemblages from the site has allowed us to develop a more nuanced understanding of the economic and technological practices through which they were generated, and the processes through which this material was deposited.

2 The Star Carr faunal assemblage

Clark recorded over 1000 fragments of animal bone and over 200 pieces of antler during his excavations at Star Carr. This material was analysed by Fraser and King, in what was one of the first comprehensive zooarchaeological studies in Britain. Their work showed that the assemblage was made up of a range of species, including large and medium ungulates, smaller fur bearing mammals, and birds. Of these, estimates of the number of individual animals represented by the assemblage showed that red deer and roe deer were the most abundant, with smaller numbers of elk, aurochs, beaver, and wild boar. Based on the presence of unshed red deer antler, Fraser/King (1954) argued that these animals must have been hunted and killed during the late winter, whilst the presence of shed antler indicated that people must have remained in the area to collect this during the spring.

During the late 1970s a series of publications demonstrated that the original analysis of the faunal assemblage, and the conclusions drawn from it, were flawed. In their initial analysis Fraser/King (1954) had used both shed and unshed red deer antler to calculate the MNI of the species and the time of year the animals were killed. However, in a reassessment of the published data, both Caulfield (1978) and Jacobi (1978) showed that antler was overly abundant in relation to post-cranial elements of these species, and had probably been brought to the site as raw material. As such, the numbers of animals killed at Star Carr, and the season that the site was occupied were potentially incorrect.

In the 1980s Legge and Rowley-Conwy undertook a comprehensive re-analysis of the faunal assemblage (Legge/ Rowley-Conwy 1988). They identified some of the aurochs remains as elk, and calculated new MNIs for the main mammalian species which disregarded shed and unshed antler. Using tooth eruption data to establish the age at death of the younger individuals, they argued that most of the animals had been hunted and killed in the summer, with only one individual (a juvenile elk) killed at a later time in the year. This re-analysis also showed that the assemblage was incomplete, and that parts of the bodies of the principal prey animals were either poorly represented, or absent. Drawing comparisons with body-part representations recorded from ethno-archaeological studies, they suggested that Star Carr may have acted as a hunting camp, and that some of the missing material had been taken away to residential camps at other locations in the landscape.

2.1 The 2004–2015 faunal assemblage

Over 2400 fragments of animal bone and antler were recorded during the recent excavations, of which almost 500 were recovered from the flotation and wet sieving of the fills of archaeological features.

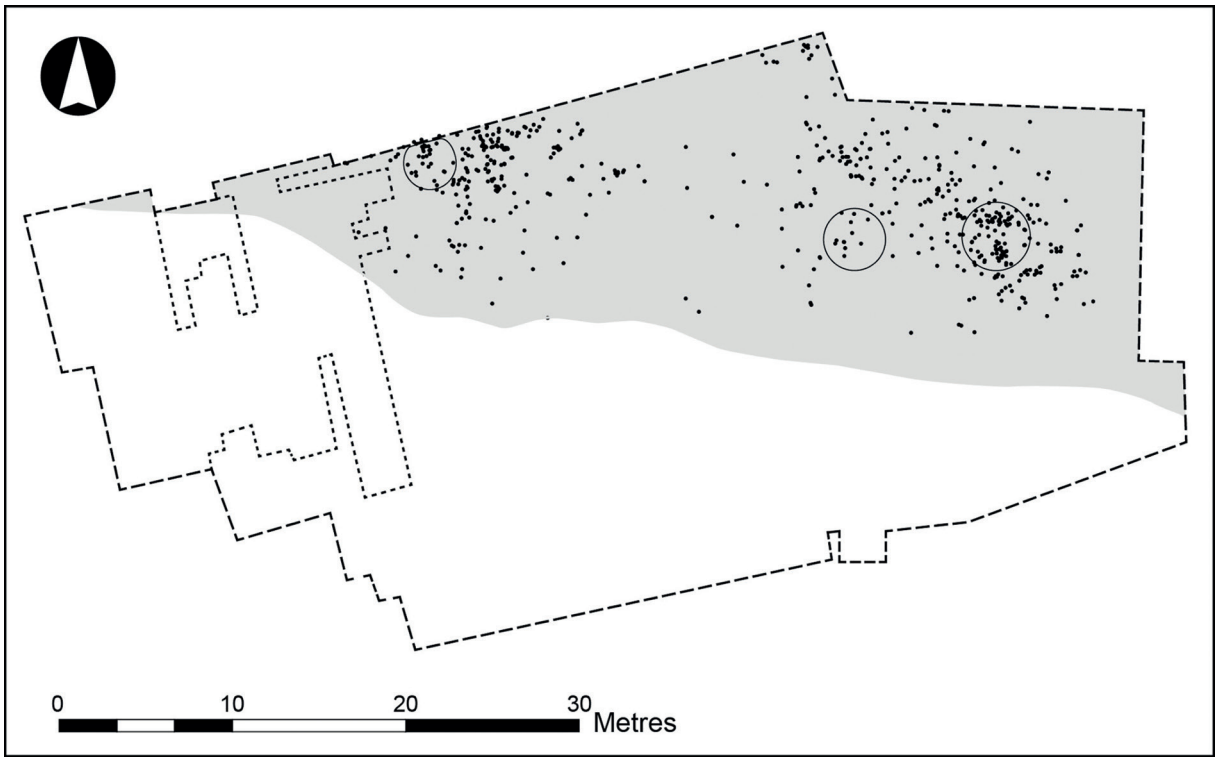

Fig. 1. Distribution of animal bone and antler from the dryland area of the site (shaded grey). The area investigated by Clark is outlined on the left of the plan, and the three structures are shown as circles.

Sixteen species are represented in the assemblage, of which four (wild cat, field vole, northern pike, and European perch) were not recorded by Clark and represent additions to the site resource spectrum. The relative proportions of the different species are similar to those recovered during the original excavations, both in terms of the numbers of fragments and the calculated MNIs (minimum number of individuals). In particular, there is a predominance of red deer followed by roe deer, elk, aurochs, beaver, and wild boar, whilst the remaining smaller mammals and birds are all represented by small quantities of material representing a single individual.

In terms of the new species that are represented, perhaps the most important are those of fish. Their absence from the assemblage recovered in the initial excavation led Clark to argue that the site must have been abandoned in the summer, the time of year when fish such as pike were being caught at other European Mesolithic sites (Clark 1954). Subsequently Wheeler argued that fish populations may have been absent from the lake entirely due to the difficulties of colonising the area in the Early Mesolithic (Wheeler 1978). In fact, their absence appears to have been the result of recovery practices, and in particular the lack of sieving during Clark's excavations. 21 fish remains have now been identified of which 19 were recovered from sieving. These specimens mostly consist of teeth and fragments of vertebrae or ribs. Of the total assemblage two could be identified to species (northern pike and European perch), whilst a further three were identified as *Esox lucius*/Salmonidae (which includes salmons, trouts, chars, and whitefishes) and eight as Cyprinidae (which includes the largest taxamonic group of freshwater fish from the British Isles, including carps and minnows). These remains are complemented by the discovery of fish processing polish on two pieces of struck flint, providing the first clear evidence of fishing as part of the economy of the site (Robson et al. 2016).

The faunal material was recovered from two principal contexts, the dryland area of the site and the adjacent lake edge wetlands (including the area investigated by Clark). The material from the dryland made up just over a quarter of the entire assemblage, and was focused around two areas where post-built

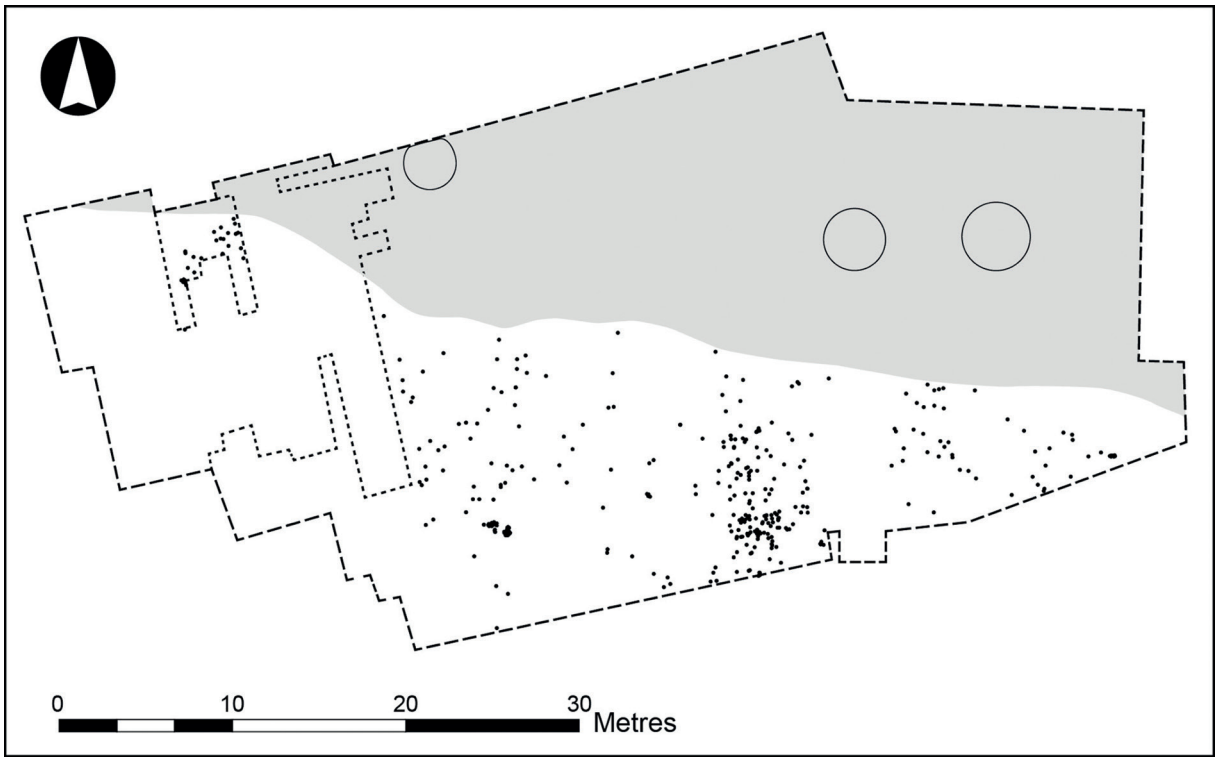

Fig. 2. Distribution of animal bone and antler from the wetland area of the site (shaded white). The area investigated by Clark is outlined on the left of the plan.

structures were recorded (Fig. 1). Unfortunately preservation in this area was very poor, and only half of the specimens could be identified to species or element. However, the nature of the identifiable material was consistent with the butchering and processing of whole (or substantial parts of) animal carcasses, mostly cervids and aurochs, as well as the working of bone and antler into artefacts.

Over two thirds of identifiable specimens were fragments of limb and podial elements, generally found in a disarticulated state, along with smaller quantities of vertebrae, pelves, crania, and mandibles. Almost a fifth exhibited evidence for deliberate breaks, though given the poor preservation the overall figure was probably substantially higher. Most of these were spiral fractures and percussion breaks, which probably resulted from the extraction of marrow or fat, though some limb elements showed evidence for longitudinal splitting, possibly resulting from craft activities. In several places, discrete scatters of material were recorded, including collections of vertebrae and limb bones, and limb and podial elements, which probably represent individual episodes of butchery and processing. Overall, however, there was little evidence for any spatial patterning that could represent areas of butchery or craft specialisation.

The faunal material from the wetland deposits can be divided into three assemblages, each representing different forms of activity and deposition. The first consisted of a relatively diffuse scatter of bone and antler that lay across much of the lake edge area (excluding the area investigated by Clark), and which had accumulated throughout the duration of the site's occupation (Fig. 2). This consisted largely of limb and podial elements, with smaller quantities of material from torsi and crania, and had been generated through the butchery and processing of larger mammals, notably red deer, and the working of red deer antler. Some of the limb and podial elements occurred as small, semi-articulated assemblages. These had been generated through the dismemberment and processing of the lower limb, the discard (whilst still articulated) of the bones of the ankle and the phalanges, and in some cases the removal of the metatarsal or metacarpal. Similar processes were probably responsible for the formation of the remainder of the assemblage, which consisted of disarticulated limb and podial elements. Over 40 % of these elements

(over 60 % of the long bones) exhibited deliberate fractures and breaks such as spiral fractures, percussion breaks, and longitudinal splitting, probably deriving from butchery and dietary processing.

The second assemblage occurred as a more discrete scatter of material within the wetlands, and represented the deposition of either whole animals or complete parts of animal bodies into the lake during a very early stage of the site's occupation. The assemblage consisted of four near-complete, semi-articulated limbs (the left and right forelimbs and shoulders, and two left rear limbs), vertebrae (including partially articulated thoracic vertebrae), a complete and partial pelvis, and fragments of the mandible, as well as two frontlets, and a skull. This material was found in close association with a second skull (of a juvenile male elk), and several barbed antler points. Three of the red deer limbs and the thoracic vertebrae lay in their correct anatomical positions in relation to each other, and could represent the deposition of a complete carcass (the remainder of the body having been moved through post-depositional processes), after which parts of other bodies (limbs and heads) were placed in the same area (for a full discussion of these practices, see Milner et al. 2018). Alternatively, whole limbs and parts of the torso of several animals were placed into this part of the lake, along with skulls (of both red deer and elk) and frontlets.

Fig. 3. Part of the faunal assemblage discovered in the baulk between Clark's trenches.

The final assemblage represents the material from an area of preserved deposit in one of Clark's baulks. Overall, this assemblage consisted of a very dense concentration of heavily processed animal bone that had been deposited into a discrete area at the edge of the lake (Fig. 3). The radiocarbon dating indicates that this occurred over a relatively short period of time, no more than 145 years, probably significantly less. Much of the assemblage represents the waste from the butchery and dietary processing of large mammals (red and roe deer, aurochs, elk, and to a lesser extent wild boar) and the working of red deer antler. Long bones (including metapodials), phalanges, mandibles and, to a slightly lesser extent, pelves of these species show particularly high incidences of deliberate fractures and breaks, and were probably being processed for marrow or fat. There is also evidence for the deliberate fracturing of the mandibles of beaver to extract the incisors, and for the breakage of the limb elements of birds, possibly for the manufacture of beads. For the larger mammals there is little indication that particular parts of the body are under-represented, and the overall character of the assemblage is consistent with the butchery of complete animals. The situation may be different for the smaller animals (such as wild boar and beaver), which have a less even representation of elements. However, given the highly processed nature of the assemblage, it is very possible that the missing elements are represented by unidentified fragmentary material.

2.2 Worked antler and bone

Clark's excavations at Star Carr recovered an extensive assemblage of worked antler, and a lesser quantity of worked bone. These included 191 uniserial barbed points made of red deer antler, 102 red deer antlers (94 of which showed signs of working), 115 removed red deer tines, five red deer antler 'blank' splinters, a socketed red deer beam, six elk antler mattocks, an elk antler hammer, an elk scoop, and 21 red deer antler frontlets. Worked bone was less common, consisting of eight elk lateral metacarpal bodkins, two elk metapodia which had been longitudinally split, eleven aurochs metapodial scraping tools, 13 pieces of aurochs metapodial working waste, a possible bird bone bead and two perforated animal teeth.

Of this material, the most renowned by far are the worked red deer antler frontlets, or headdresses as Clark interpreted them. 21 of these were identified by Clark (1954), consisting of the frontal and occasionally the parietal bones of the skull, as well as the pedicles and antlers to varying extents. Eleven of the artefacts had been artificially perforated through the parietal bone. In the cases where the antler remained intact, the majority of the circumference of the antlers and tines had been removed via the groove-and-splinter technique, and the spongy core tissue removed to leave a thin strip of antler. Clark (1954, 168) also noted the removal of the burr on the inner aspect, and the retention of the burr on the outer aspect.

As Clark's definitions suggest, the artefacts classed as frontlets are actually highly variable. In regard to antlers, some have considerable lengths of beams and tines still intact, whilst others have just stumps remaining. The portion of skull still attached varies significantly with some featuring frontal and parietal bones, with others represented by a single frontal bone and pedicle. Details of this variation are given in a schedule of artefacts, but are not reflected in the original publication of the Star Carr finds, which illustrates only the more intact artefacts (Clark 1954).

Clark's interpretation and discussion of the frontlets helped to propel them to international prominence (e.g. Conneller 2004; Clark 1972; Scarre 2013). The reduction of the antlers would have served to lighten the objects, whilst he noted smoothing of the internal surfaces of the braincase in a small number of instances which suggested they were prepared for wearing. The perforations were seen by Clark as evidence for the attachment of webbing or strapping. These factors led him to conclude with confidence that these were pieces of headgear (Clark 1954, 172).

Having argued for their role as headgear, Clark (1954, 174) went on to present two alternative hypotheses regarding their function. The first of these is to suggest that the frontlets might have been worn as a hunting disguise, to allow hunters to approach deer. This suggestion is supported by ethnographic accounts from North America (Boas 1964) of hunters using sets of antlers to lure deer. The second is that they formed part of a costume for a ritual dance. Clark cites the occurrence of red deer antlers in Late Mesolithic burial contexts at the French sites of Téviec and Hoëdic, and Upper Palaeolithic depictions of dancers in animal costumes, as well as ethnographic examples of shamanistic groups from Eurasia who wear similar costumes.

2.3 New finds from the 2004–2015 excavations

The 2004–2015 excavations have recovered further evidence for the working of animal bone and antler at Star Carr. Of this, worked antler is the most common, with twelve modified red deer frontlets, 33 red deer antler barbed points, 108 pieces of worked red deer antler, 47 removed red deer antlers tines, four red deer antler 'blank' splinters, an elk antler mattock, and a possible elk antler mattock preform. Worked bone was less represented, consisting of an elk lateral metacarpal bodkin, an aurochs metapodial scraping tool, 13 longitudinally split red deer metapodia, two longitudinally split roe deer metapodia, five longitudinally split red deer long bones which were unidentifiable to element, and a cervid bone barbed point. Detailled analysis of this material has been carried out in collaboration between traceologists, zooarchaeologists, and microwear specialists, to present a holistic interpretation of the complex and overlapping processes which have produced butchery waste, osseous techological debitage, and artefacts at Star Carr (Elliott et al. 2018).

Discovery of further examples of anthropogenically modified red deer crania have posed a number of new questions concerning their relationship to Clark's 'frontlets'. A clear pattern in the working of these crania began to emerge during excavation. This pattern was confirmed during post-excavation analysis, with the full assemblage, once brought together for study, being noted for its striking similarities, with the consistent absence of maxilla, dentition, or nasal bones (Fig. 4). It might be argued that the absence of the

Fig. 4. Modified red deer crania from the 2013–2015 excavation at Star Carr.

fragile nasal bones could be attributed to taphonomic factors, and as such the recurrent form of the crania is a product of post-depositional processes rather than human action. However, the recovery of deer crania missing the nasal bones, dentition and jaws from areas of the site which exhibit exceptional levels of organic preservation, which do not appear to be trampled or subject to other taphonomic damage, and from which other small, fragile bones such as fish and bird bone fragments were found, confirms that these crania were deposited in this specific form.

These modified deer crania vary in form beyond the extent of the artefacts discussed by Clark, and thus present some challenges in drawing typological affinities. One has been produced on the skull of a female deer, and so lacks the pedicles, burrs, and antlers. This is crucial, as Clark's definition of the frontlet artefacts relies on the modification of the burrs and the working of the antlers. As such, under his scheme, female deer skulls cannot be used to produce frontlets. And yet a female deer skull recovered (Fig. 4, bottom row, central) from Star Carr in the recent excavations showed similar patterns of modification with the removal of the nasal bones, maxilla and dentition. Further to this, other male skulls appear to have been modified after being killed in the spring, having shed their antlers. Again, under Clark's classification these could not be considered as frontlets due to their lack of antlers.

A closer revision of Clark's published discussion of the frontlets indicates that he struggled with a typological definition for the modified red deer crania himself. Within the interim excavation reports, Clark (1949) initially notes the occurrence of modified red deer skulls, stating that eight of the nine recovered in the 1949 season had been worked. These included a parietal which had no frontal bones attached, but which had been perforated. The frontlet 'artefacts' are discussed again within the initial interim faunal report, which lists: 'Cranial portions of two stags and one hind, three occipital fragments, five frontlets with antlers severed obliquely close to the burr and with artificially perforated parietals, and one parietal portion with a similar perforation' (Clark 1949) as the sum of red deer crania from the first season of excavation.

Clark (1950) lists a further six recovered during the 1950 excavations, two of which were represented by perforated parietal bones, frontal bones, and worked antlers. The remaining four consisted of frontal bones with worked antlers but no parietals. Clark also notes variation in the preservation of these pieces, with some having their brow tines retained in antiquity, but which had not survived to the present day.

However, this picture is clouded somewhat by the reference to red deer skulls within the second interim faunal report. This lists eight worked frontlets as being excavated in 1950, and a further two 'half' frontlets (presumably representing a single frontal bone, pedicle and antler). These were recovered alongside two female skulls, four males with shed antlers, one with unshed antlers, and the frontal bones and attached antlers of a young red deer in its first year, with unworked antlers. This last specimen is illustrated and captioned 'frontlet'.

Clark also uses this interim report to lay out his initial interpretations, with the reduction in antlers lightening the skulls and the perforations allowing for the objects to be strung or suspended. Clark dismisses the idea of suspension for display based on the attention that seems to have been paid to reducing the weight of the artefacts.

Clark's full site monograph lists 21 artefacts within the frontlet group, with a further five artefacts (one of which was a half frontlet) being presumably recovered during the 1951 excavations. Yet, again, discrepancies exist between the descriptions of this material within the faunal report. Fraser/King (1954) list two female crania, three male crania with shed antlers, one male cranium with one shed and one unshed antler, six occiputs, sixteen worked frontlets, three halves of worked frontlets, and one incomplete parietal, probably from a worked frontlet. It is therefore unclear from the final publication what is being classed as a frontlet, and if pieces are not included within this group, it is unclear as to how they are being interpreted. This key discrepancy in the interpretation of artefacts cited as the earliest evidence for religious practices in the European Holocene (Scarre 2013) has never been questioned before, and as such is worth highlighting specifically within this context. This confusion is also apparent in the post-excavation archiving and curation of the frontlets, with the majority being given to the Natural History Museum, alongside the other faunal remains, but the majority of the other artefacts from Clark's excavations given to the Cambridge Museum of Archaeology and Ethnography (Milner et al. 2013).

Bearing in mind this lack of clarity, the decision was taken to approach the newly excavated red deer crania from a technological rather than typological perspective. Whilst their form varies considerably, there may be ways in which the crania have been treated and worked which aid their definition. A technological approach might also help to distinguish unfinished or partially worked examples within the assemblage, which a more typological approach would otherwise dismiss. Within the wider context of the site and its archaeology, bone and antler working debitage is well-represented at Star Carr, indicating the deposition of working waste products in the wetland areas; and as such the presence of partially finished frontlets or waste products might not be unexpected.

To pursue this further, a traceological analysis of a large and relatively well-preserved frontlet (which would have been classified as such under Clark's definition) was undertaken in 2013, and from the results of this a series of experiments designed to establish the methods used to produce the artefact and the specific working marks identified during the analysis. The details of these experiments are described elsewhere (Little et al. 2016), but in sum it is important to note that, following the trialling of several methods of skull reduction, only one method created similar controlled, level edges and scalar flaking removal scars around the retained edges of the crania. This method involved skinning the deer head, covering the desired areas in damp clay, heating the fleshed head in a hearth for several hours and then removing the exposed, charred bones of the face and lower crania using light percussion with a hammerstone. Reduction of the skull was carried out in several phases, with the clay being replaced and the partially reduced head being placed back into the hearth several times throughout the process.

Although the preservation of the modified deer crania varies, and thus makes the identification of well-defined working marks and surface detail difficult across the assemblage, the insights gained from these experiments can be used to further our understanding of the frontlets from Star Carr. If this particular method of skull reduction is taken as the defining feature of these artefacts, it is possible to consider a wider range of objects which includes male and female red deer skulls, male skulls with antlers

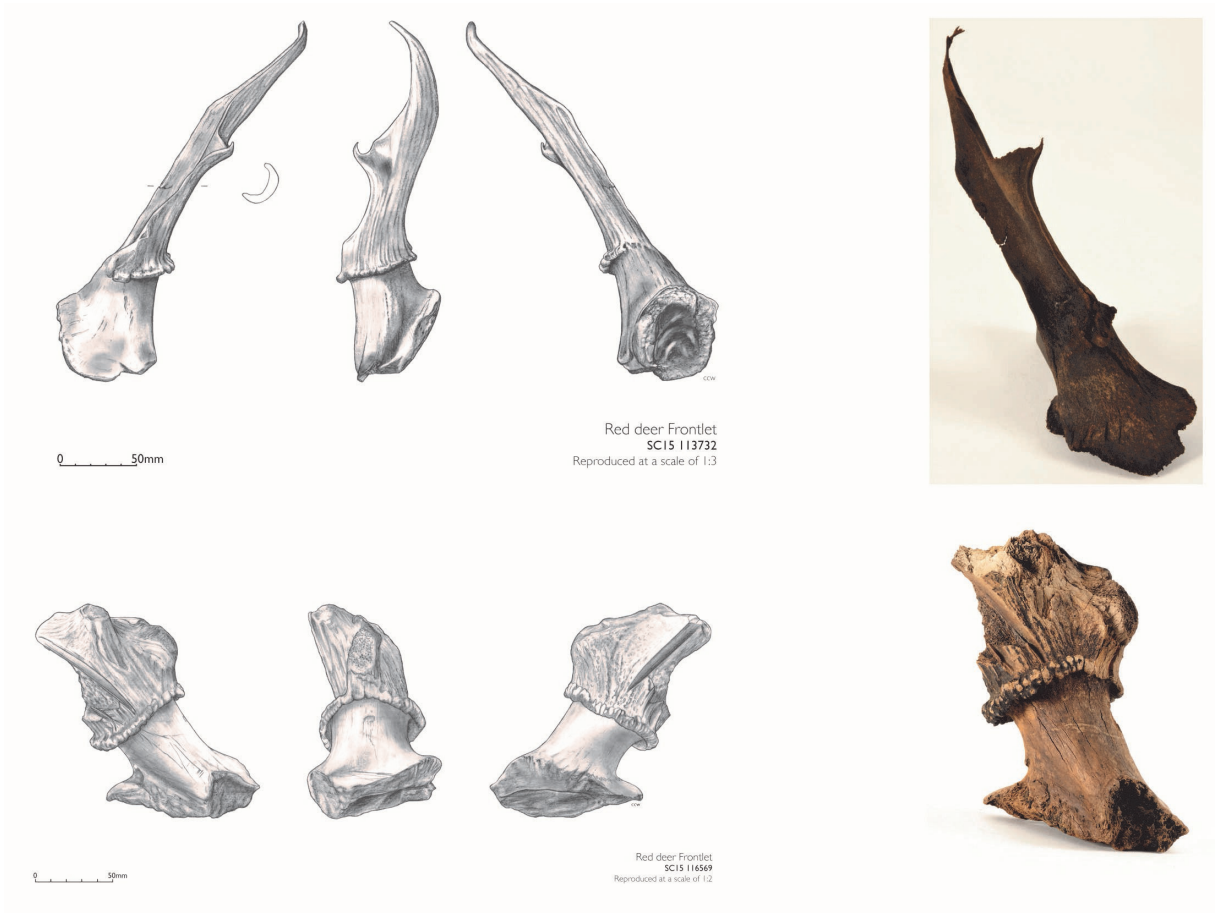

Fig. 5. Unshed red deer antler debitage 116569 and half frontlet 113732 (illustrations C. Watson).

that have been reduced to stumps, and male skulls with shed antlers. The occurrence of male and female skulls which had the facial bones removed, but with the bones of the braincase either intact or partially removed, can also be interpreted differently in light of these experiments. These cases could represent deer heads which had started to be worked, but not fully finished before being deposited into the lake-edge wetlands.

If this method of skull working is considered a defining feature, it is worth considering the other patterns of formal variation evident across the assemblage. Although Clark states that in the cases where the parietal bone is retained, frontlets are always perforated, this does not seem to be the case with the newly excavated material. In the instances where the braincase has been reduced, eight items have at least part of the parietal retained. Yet only one of these has been artificially perforated, and in a position not noted on any of Clark's frontlets (posterior to the orbital arches).

In the instances in which antlers were present, the extent to which they were reduced varies considerably. Some antlers have over 24 cm of the beam left intact (Clark's AF18), or the complete length of the brow and bez tines retained. Others are completely reduced to scooped-out stumps of antler barely extending above the pedicle. However, despite this variation, the manner of working is remarkably consistent. The groove-and-splinter process has been applied to both the tines and beam to reduce the majority of the circumference of the outer antler. The remaining spongy core tissue has then been removed, to leave a hollowed out, thin strip of outer antler remaining. The consistency to which this is applied in the antler working of the frontlets is notable, and contrasts with the large quantity of shed and unshed red deer antler beams which have been worked via the groove-and-splinter process, solely to provide 'blanks'

Fig. 6. Intact red deer skull and replica frontlet suspended in various arrangements.

for the production of other forms of material culture (namely uniserial barbed points). Further to this, the patterns of burr working which Clark notes are also consistent in the recently excavated material, with the inner aspect of the burr being removed and the exterior aspect retained.

These factors help to distinguish 'half frontlets' from unshed groove-and-splinter debitage, which despite having similar anatomical elements present (the burr, pedicle and fragments of attached frontal bone) lack the scooping of the spongy tissue or any modification of the burr (Fig. 5). So the presence of antlers on a deer head appeared not to determine whether or not it would be worked further into an artefact, yet when they were present they were worked in a particular way which was distinct to the more regularly practised groove-and-splinter working.

Having focussed on the methods used to manufacture these artefacts as a means to define them, obvious questions remain regarding their function. The experiments conducted in recreating a frontlet demonstrated conclusively that the levels of work and skill invested in the creation of these artefacts went way beyond those required to efficiently extract the usable materials of hide, sinew, grease, brain, muscle, and antler from a red deer head. As such, it seems rather far-fetched to suggest that this method of skull reduction is indicative of butchery waste. Furthermore, the occasional actions of perforation and the hollowing out of antler core tissue are actions totally unrelated to the extraction of raw materials.

Another suggested use for the Star Carr frontlets is for the suspension from trees or on posts. A simple set of experiments was carried out to investigate these hypotheses at the York Experimental Archaeology Research (YEAR) Centre. Using simple linden bast fibre cordage, attempts were made to suspend an unmodified male red deer skull and the replica frontlet produced in earlier experiments on a birch tree trunk, on top of a wooden pole, and between two birch trees. These experiments confirmed that both the unmodified and modified deer crania could be successfully suspended in all three scenarios (Fig. 6). This form of argument does not 'disprove' that these artefacts were ever suspended or displayed in the manner suggested previously. However, it was concluded that for this purpose the working of the frontlets was unnecessary: unworked deer skulls with no perforations, reduction of braincase and facial bones or working of antlers were just as easy to suspend as the 'finished' frontlets.

Alongside these experiments, attempts were also made to secure the replica frontlet to a human head using cordage and a folded piece of tanned, soft leather. The frontlet was placed on top of the packing, on top of the wearer's head. Cordage was passed through the perforations and the nutrient foramen of the supraorbital fossa, and below the wearer's chin. A further piece of cordage ran from the perforations around the back of the wearer's head. This made the frontlet secure enough to allow free movement on both a male and female wearer (Fig. 7).

These experiments are preliminary in their nature, and again their results should be interpreted cautiously. Further work is required to investigate the effect that variation in the position of the perforations has on the ability to be secured, and how a more sophisticated form of packing and support might help to better secure the object to the wearer's head. Attempts also need to be made to secure a frontlet which lacks perforations. In addressing these questions, more specialist forms of knowledge also need to be accessed. Archaeologists lack much of the detailed understanding of textile properties, balance, and costume mechanics to create sophisticated composite headgear of the kind represented within the ethnographic record, and as such further experimental work would benefit greatly from interdisciplinary collaboration in this regard.

Fig. 7. Replica frontlet secured to the head using packing and cordage.

Further consideration for this new definition of frontlet artefacts at Star Carr relates to the formal similarities between both red and roe deer cranial elements from the site. Of the six roe deer crania recovered 2004–2015, five show similar patterns of fragmentation, with the maxilla, mandibular and nasal bones removed and the frontal and parietal bones retained. In addition to this, several of the roe deer crania were recovered in close association with red deer frontlets, such as the two found underlying 115876 (Fig. 8).

However, in comparison to the red deer crania the preservation of the roe deer crania is markedly poor, preventing the direct identification of working marks. As such, the evidence for human modification of these pieces is scarce, and there is also more variation within the portion of the braincase retained. There are also differences in size between the red deer frontlets and roe deer crania, which suggest that they could not have functioned in precisely the same ways, with the roe deer skull and braincase being considerably smaller and more curved than that of a red deer. So as these similarities cannot be positively demonstrated on typological or technological grounds, it remains a tentative link based on anatomical similarities. Yet their concentration around Clark's area of excavation and proximity to the locus of frontlet deposition, as well as the elements retained in their deposited form, suggest that there may be some links between these materials. Additionally, it should be borne in mind that the finished frontlet 'artefacts' may have been composite in their form (possibly featuring more complex arrangements of packing and cordage than shown in Fig. 7). Differences in size and shape of roe deer frontlets in comparison to red deer frontlets may be mitigated for within the superstructure of the finished artefact. As such, the reduced roe deer crania may be associated with the same patterns of deposition as the red deer frontlets, and share some formal similarities which may suggest some overlap in meanings and function.

3 Conclusions

Analysis of the faunal and worked osseous assemblages from the 2004–2015 excavations at Star Carr has significantly furthered our collective understanding of human activity at the site in the Early Preboreal. A key theme within this more developed understanding is deposition: the social, economic, and taphonomic processes which brought such a varied collection of animal remains together and into the archaeological deposits at the site, and through which economically and spiritually entangled relationships

Fig. 8. Antler frontlet 115876 (highlighted in red), and two roe deer skulls (green) with antlers attached.

were expressed. This theme runs through the archaeology of Northwestern Europe more generally during the Preboreal (Overton/Elliott 2018; Sørensen et al. 2018), and is an emerging topic for further research.

The recent excavations have improved our understanding of spatial deposition, and through stratigraphic, large-scale excavation and 3D finds recording, have enabled the identification of the spatial extents of several distinct processes within both wetland and dryland areas of the site. Inextricably linked to this, the extensive programme of AMS radiocarbon dating and Bayesian modelling has begun to pick apart the chronological relationships between these processes. As a consequence, this has furthered our understanding of how various factors driving the deposition of animal remains changed throughout the site's occupational history.

Finally, the in-depth discussion of one particular artefact type, the red deer frontlets, serves as a case-in-point for the consideration of technology within our understanding of depositional processes. Here we highlight some of the discrepancies in the ways red deer frontlets have previously been defined, and the challenges these pose for the interpretation of more recent finds. The complexities in interpreting partially made, finished, used, and damaged artefacts at the site more generally have been discussed elsewhere (Elliott/Milner 2010; Taylor et al. 2017). A more detailed appreciation of the ways in which these artefacts were being made has allowed formally diverse material to be considered as a collective. This in turn generates new insights concerning the deposition of these particular types of artefact, with both 'finished' (although possibly disassembled, if once part of a composite object) and unfinished artefacts being deposited within the wetland areas of the site.

References

Boas 1964: F. Boas, The Central Eskimo (Lincoln 1964).

Caulfield 1978: S. Caulfield, Star Carr: an alternative view. Irish Archaeological Research Forum 5, 1978, 15–22.

Chatterton 2003: R. Chatterton, Star Carr reanalysed. In: L. Bevan/J. Moore (eds.), Peopling the Mesolithic in a Northern Environment. British Archaeological Reports, International Series 1157 (Oxford 2003) 69–80.

Clark 1949: J. G. D. Clark, A preliminary report on excavations at Star Carr, Seamer, Scarborough, Yorkshire, 1949. Proceedings of the Prehistoric Society 15, 1949, 52–69.

Clark 1950: J. G. D. Clark, A preliminary report on excavations at Star Carr, Seamer, Scarborough, Yorkshire (second season, 1950). Proceedings of the Prehistoric Society 16, 1950, 109–129.

Clark 1954: J. G. D. Clark, Excavations at Star Carr: an early Mesolithic site at Seamer near Scarborough, Yorkshire (Cambridge 1954).

Clark 1972: J. G. D. Clark, Star Carr: a Case Study in Bioarchaeology. Addison-Wesley Module in Anthropology 10 (Reading [Massachusetts] 1972).

Conneller 2003: C. J. Conneller. Star Carr recontextualised. In: L. Bevan/J. Moore (eds.), Peopling the Mesolithic in a Northern Environment. British Archaeological Reports, International Series 1157 (Oxford 2003) 81–86.

Conneller 2004: C. J. Conneller, Becoming deer. Corporeal transformations at Star Carr. Archaeological Dialogues 11 (1), 2004, 37–56.

Conneller/Schadla-Hall 2003: C. J. Conneller/T. Schadla-Hall, Beyond Star Carr: the Vale of Pickering in the 10th millennium BP. Proceedings of the Prehistoric Society 69, 2003, 1–23.

Elliott/Milner 2010: B. J. Elliott/N. Milner, Making a point: a critical review of the barbed point manufacturing process practiced at Star Carr. Proceedings of the Prehistoric Society 76, 2010, 75–94.

Elliott et al. 2018: B. J. Elliott/R. Knight/A. Little, Osseous technology. In N. Milner/C. Conneller/B. Taylor (eds.), Star Carr, volume 2: Studies in Technology, Subsistence and Environment (York 2018) 255–272.

Fraser/King 1954: F. C. Fraser/J. E. King, Faunal remains. In: J. G. D. Clark (ed.), Excavations at Star Carr: an early Mesolithic site at Seamer near Scarborough, Yorkshire (Cambridge 1954) 70–95.

Jacobi 1978: R. M. Jacobi, Northern England in the eighth millennium BC: an essay. In: P. Mellars (ed.), The early Post-glacial Settlement of Northern Europe (London 1978) 295–332.

Legge/Rowley-Conwy 1988: A. J. Legge/P. A. Rowley-Conwy, Star Carr Revisited (London 1988).

Little et al. 2016: A. Little/B. Elliott/C. Conneller/D. Pomstra/A. A. Evans/L. C Fitton/A. Holland/R. Davis/ R. Kershaw/S. O'Connor/T. O'Connor/T. Sparrow/A. S. Wilson/P. Jordan/M. J. Collins/A. C. Colonese/ O. E. Craig/R. Knight/A. J. A. Lucquin/B. Taylor/N. Milner, Technological analysis of the world's earliest shamanic costume: a multi-scalar, experimental study of a red deer headdress from the Early Holocene site of Star Carr, North Yorkshire, UK. PloS One 11 (4), e0152136. doi: http://dx.doi.org/10.1371/journal.pone.0152136.

Mellars/Dark 1998: P. Mellars/P. Dark, Star Carr in Context: New Archaeological and Palaeoecological Investigations at the Early Mesolithic site of Star Carr, North Yorkshire (Oxford 1998).

Milner et al. 2013: N. Milner/H. Saul/B. Elliott, Star Carr Archives Project. Archaeology Data Service Collection 11335. doi: http://dx.doi.org/10.5284/1019856.

Milner et al. 2018: N. Milner/C. Conneller/B. Taylor, Star Carr, volume 1: A Persistent Place in a Changing World; volume 2: Studies in Technology, Subsistence and Environment (York 2018).

Overton/Elliott 2018: N. J. Overton/B. Elliott, Animals in a wider context. In: N. Milner/C. Conneller/ B. Taylor (eds.), Star Carr, volume 2: Studies in Technology, Subsistence and Environment (York 2018) 335–343.

Robson et al. 2016: H. K. Robson/A. Little/A. K. G. Jones/S. Blockley/I. Candy/I. Matthews/ A. Palmer/D. Schreve/ E. Tong/D. Pomstra/L. Fletcher/N. Hausmann/B. Taylor/C. Conneller/ N. Milner, Scales of analysis: evidence of fish and fish processing at Star Carr. Journal of Archaeological Science: Reports. doi: http://dx.doi.org/10.1016/j.jasrep.2016.02.009.

Scarre 2013: C. Scarre, The Human Past: World Prehistory and the Development of Human Societies (London 2013).

Sørensen et al. 2018: M. Sørensen/H. Lübke/D. Gross, The early Mesolithic in southern Scandinavia and northern Germany. In: N. Milner/C. Conneller/B. Taylor (eds.), Star Carr, volume 1: A Persistent Place in a Changing World (York 2018) 305–329.

Taylor et al. 2017: B. Taylor/B. Elliott/C. Conneller/N. Milner/A. Bayliss/B. Knight/M. Bamforth, Resolving the Issue of Artefact Deposition at Star Carr. Proceedings of the Prehistoric Society 83, 2017, 23–42. doi:10.1017/ppr.2017.8.

Wheeler 1978: A. Wheeler, Why were there no fish remains at Star Carr? Journal of Archaeological Science 5 (1), 1978, 85–89.

Ben Elliott
Department of Archaeology
University of York
King's Manor
York
YO1 7EP
UK
ben.elliott@york.ac.uk

Barry Taylor
History and Archaeology
University of Chester
Parkgate Road
Chester
CH1 4Bj
UK
b.taylor@chester.ac.uk

Becky Knight
Department of Archaeology
University of York
The Kings Manor
York
YO1 7EP
UK
becky.knight@york.ac.uk

Nicky Milner
Department of Archaeology
University of York
The Kings Manor
York
YO1 7EP
UK
nicky.milner@york.ac.uk

Harry K. Robson
BioArCh Laboratory
University of York
Wentworth Way
York
YO10 5DD
UK
harry.robson@york.ac.uk

Diederik Pomstra
Faculty of Archaeology
Leiden University
Einsteinweg 2
Leiden
2333 CC
The Netherlands
diederikpomstra@planet.nl

Aimée Little
Department of Archaeology
University of York
The Kings Manor
York
YO1 7EP
UK
aimee.litte@york.ac.uk

Chantal Conneller
School of History, Classics and Archaeology
Faculty of Humanities and Social Sciences
Newcastle University
NE1 7RU
UK
chantal.conneller@newcastle.ac.uk