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Making a Point: a Critical Review of the Barbed Point Manufacturing Process Practised at Star Carr

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Star Carr, North Yorkshire, has the largest deposition of Mesolithic antler barbed points in the country; in fact it accounts for roughly 97% of all Early Mesolithic barbed points known in Britain. There has been much debate about whether barbed point manufacture occurred at the site or elsewhere within the landscape but the process of manufacturing has never been examined in great detail. This paper presents a new evaluation based on analysis of museum collections, recent excavations and experimental work and concludes that there is evidence to suggest that the full manufacturing process took place at Star Carr.

The remarkable collection of antler barbed points found at Star Carr in North Yorkshire was one of the contributing factors to the site becoming so well known in the archaeological world. Similar Upper Palaeolithic and Mesolithic artefacts are found widely distributed across Europe and have long attracted the interest of archaeologists. In recent years, several authors have attempted to further our understanding of the function of barbed points by examining the archaeological contexts they occur in; the application of statistical analysis to the variations in point length (Verhart 2000); the development of more detailed typologies; and analogy with technologies in ethnographically documented societies (Pétillon 2008). A total of 193 have been found at Star Carr which accounts for roughly 97% of all Early Mesolithic barbed points known from Britain.Yet this extraordinary concentration remains to be adequately explained. One of the key, much debated, questions is whether barbed points were actually manufactured at Star Carr or elsewhere in the landscape; however, what seems rather surprising is that the manufacturing process itself has never been examined in great detail.

The question appears to be unresolved due to the nature of the data. Evidence for the first stage of barbed point manufacture is present: there are 94 red deer antlers with signs of splinter removal – that is, the removal of 'blank' portions of antler which can then be worked into a variety of different tools. However, evidence for the second stage of manufacture, of turning these splinters into finished points, has been lacking. This paper presents a new evaluation of antler working at Star Carr, using old collections, material from more recent excavations, and experimental antler working. The first section will provide a background to barbed point manufacture at the site, setting out details of the excavations, the antler working data that has been published to date, and the arguments for and against barbed point manufacture at the site. The second section will present new evidence that sheds light on this activity in order to reinterpret antler-working practices at Star Carr and within the wider landscape.

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BACKGROUND TO BARBED POINT MANUFACTURE AT STAR CARR

Excavations and fieldwork at Star Carr

Star Carr is an Early Mesolithic site in North Yorkshire, five miles south of modern day Scarborough. Star Carr was situated on the shore of Lake Flixton in the Mesolithic period. Originally discovered and excavated briefly by John Moore in 1948, the site soon attracted the attention of the Cambridge Professor J.G.D. Clark, who was interested in excavating a Mesolithic site with good preservation of organic material. Clark carried out three seasons of excavations at Star Carr between 1949 and 1951 and published his monograph on the site in 1954. His excavations consisted of five cuttings around the lake edge (Fig. 1). The extraordinary archaeological material included a brushwood platform, large quantities of animal bone, 102 red deer antlers, 191 barbed points, 21 sets of worked stag frontlets, 33 shale beads, deposits of ochre, 3 pieces of amber, and an intensive flint industry, notable for having the only burin-heavy lithic assemblage in Britain.

There is another source of less-documented antler material from Star Carr: immediately after Clark's 1950 season of excavation, before the trenches were filled in, Tot Lord was given permission by Clark to retrieve archaeological material for his own personal collection from the areas behind the section edge. This was achieved by reaching into the soft sediments at the end of cuttings II and III and feeling for material blindly (Dark *et al.* 2006, 191–2). A number of finds were collected, including antler and another barbed point.

Further excavations carried out in 1985 and 1989 (Mellars & Dark 1998) revealed that the areas studied by Clark represented a smaller proportion of the overall site than previously believed (Fig. 2). These excavations featured a series of test pits and a long trench excavated to produce environmental data. Radiocarbon dates taken from charcoal recovered during these investigations show that Star Carr was occupied for a period of several hundred years (Dark *et al.* 2006).

The current investigations at Star Carr carried out by Chantal Conneller, Nicky Milner, and Barry Taylor (Conneller 2007; Milner 2007; Taylor 2007) have focused on outstanding questions regarding the depositional contexts of material recovered previously, the limits of the site itself, and the marked deterioration in preservation conditions. These investigations have involved fieldwalking, test pitting along the peninsula to the south-east of the previous excavations, and excavations on the lake edge and dry land areas. The fieldwalking and test pits have produced a wide distribution of knapped flint suggesting that the areas excavated by Clark may constitute less than 5% of the total occupation site (Milner 2007).

A better understanding of Star Carr's wider context has also been gained through a series of excavations carried out at other Early Mesolithic sites around Lake Flixton (Schadla-Hall 1987; 1988; 1989; Conneller & Schadla-Hall 2003), which have helped to build up a picture of a complex system of sites occupied at different times and associated with different activities (Fig. 3). Despite this work around the lake, no other sites have produced the same range of artefacts, and barbed points have only been discovered at two of the sites: a small fragment at Flixton (Clark 1954, 152) and a piece of broken point at No Name Hill (Chatterton 2003, 72).

Before discussing the key arguments concerning barbed point manufacture at Star Carr, it is perhaps worth outlining the methodology for manufacturing a barbed point. First, two parallel lines are scored into the antler beam using a sharp piece of flint; grooves are then made by a constant sawing motion up and down the beam until they pierce through the outer shell; the end is cut; the splinter is then levered out; this needs to be ground down on the inner surface; and then once a clean blank has been created, the barbs can be cut or ground out (Fig. 4). The groove and splinter technique has been discussed extensively by David (2003) in her wider study of bone and antler tool manufacturing techniques across the European Mesolithic (David 2004; 2007). These have built on the traditions of studying osseous artefacts in France by using archaeological experiments and tracelogical analysis of bone and antler debitage to characterise several different manufacturing traditions across the continent. However, although this general technique is present across Europe, there are some subtle variations at Star Carr, particularly concerning the methods used to remove splinters.

In the Star Carr monograph, Clark breaks down the manufacture of barbed antler points into two stages (1954, 123): the initial removal of splinters from the antler and then the finishing of the 'blanks' into barbed points. In terms of grooving for the

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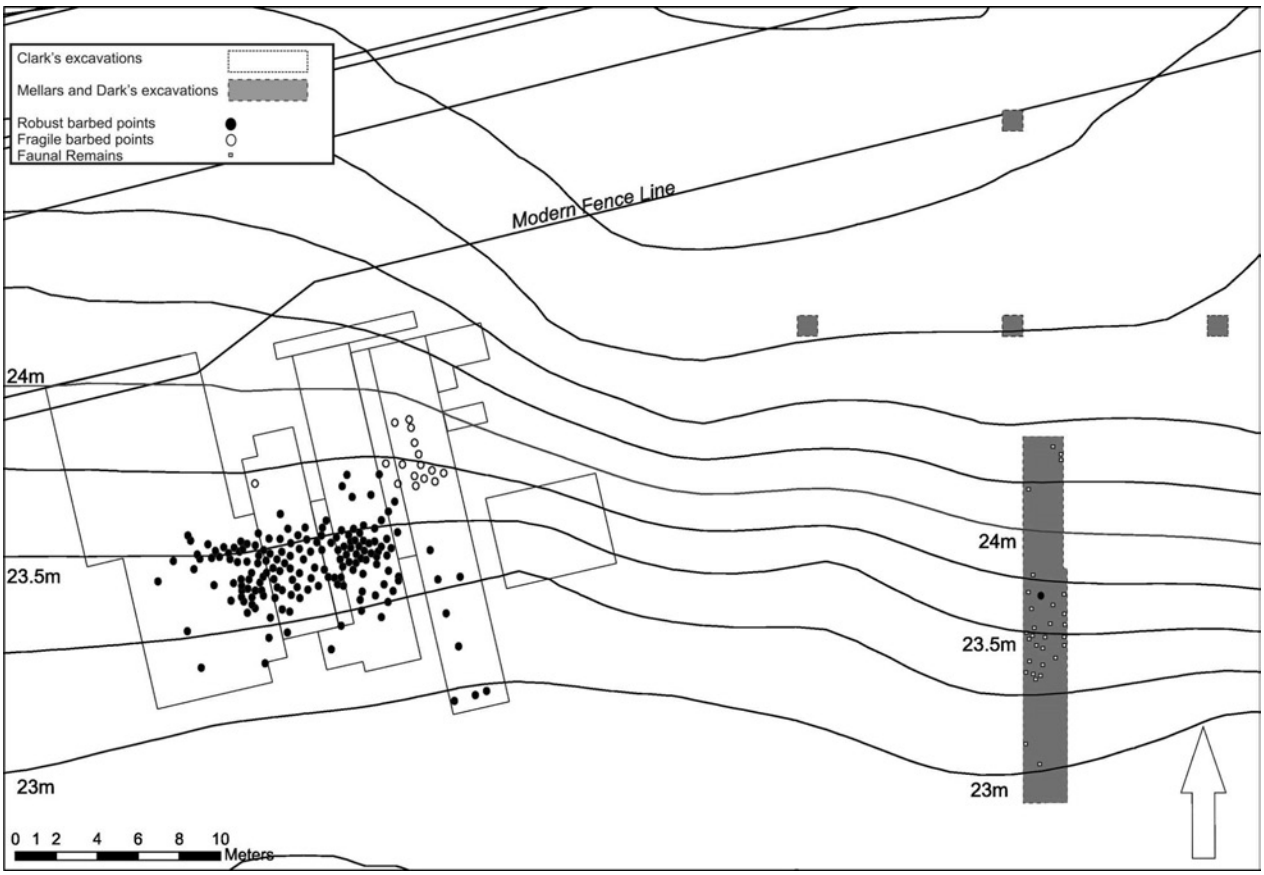

Fig. 1.
Plan of the trenches from Clark's investigations and those in the 1980s, with the barbed points located in Clark's excavations. A further one was found by Tot Lord, location unknown, and another was found in the 1985/89 trench

removal of splinters, Clark observes that the grooves run parallel to the beams' axis, corresponding to the natural grooving of the antler itself. Instances where antlers had been abandoned before the removal of a splinter show that grooves were first marked out lightly, then a small segment was deepened – breaking through the hard compactor tissue. This small deepening was then extended along the length of the groove. Clark notes that this kind of working was most probably carried out using flint burins, based on the toughness of the antler and the depth of the grooves. He uses unpublished experimental work carried out by McBurney and Thompson to support this (*ibid.*, 115).

On the removal of grooved splinters Clark comments that tapering grooves were infrequent and that they very rarely converged completely because transverse grooving across the natural grooving of the antler would have been much more difficult to achieve and was able to produce just one example of this occurring at Star Carr (Clark 1954, 117). For the majority of cases, however, Clark concluded that the splinter must have been removed by force. He points to the steepness of breaks at one end of the splinters as being signs of bending backwards and forwards and the removal of small flakes of beam surface along with the splinter in a number of instances.

Clark appears to have been influenced by his

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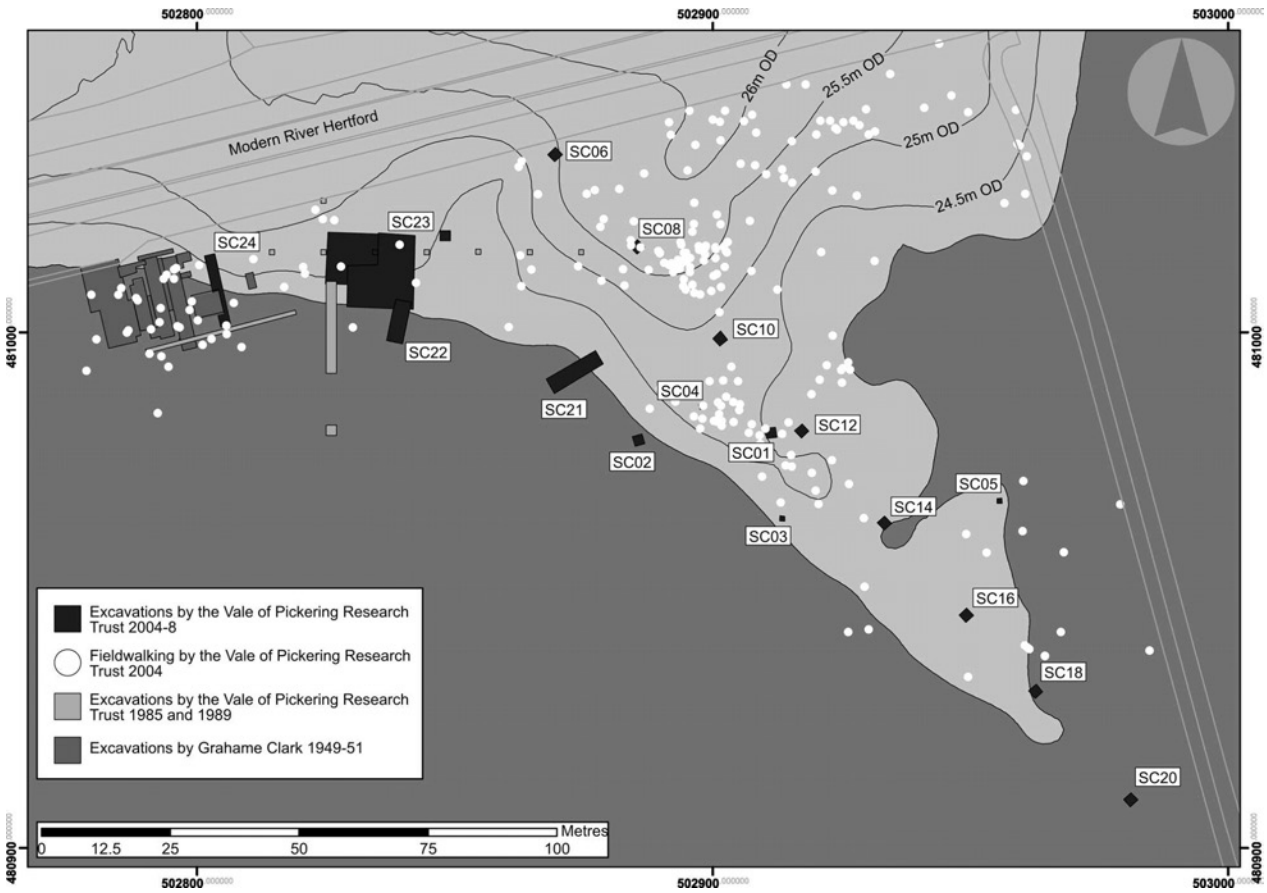

Fig. 2.
Map of Star Carr, with the 1985/89 excavations and current excavations marked in relation to Clark's original work (drawn by Barry Taylor)

previous study with Thompson (Clark & Thompson 1953, 148) where they used ethnographic examples of Eskimo antler-working as an analogy. In this case splinters are forcibly broken out by flexing the beam. However, it is important to note that this case study is based on working reindeer rather than red deer antlers, and splinters are usually taken from the outer aspect of the upper beam where it may be easier to bend the beam outwards (Fig. 5). The Mesolithic red deer antler beams at Star Carr would have been far more robust with much thicker compactor tissue, so bending them in the lower portion would have been much more difficult, and may have only been facilitated by something more than a thinning of the compactor using flint scrapers. These differences in material properties and elasticity between red deer and reindeer antler have also been noted by Currey (2002, 130). This point will be returned to later.

Published data on antler working at Star Carr

During Clark's excavations 102 beams, 9 detached tines, and 4 removed splinters were recorded, alongside the 191 barbed points themselves. Of the beams found, 83 had splinters removed, 5 were lightly grooved but no splinters were removed, 6 had the crown and tines detached, and 8 were un-worked (Clark 1954, 115–17). The points also display

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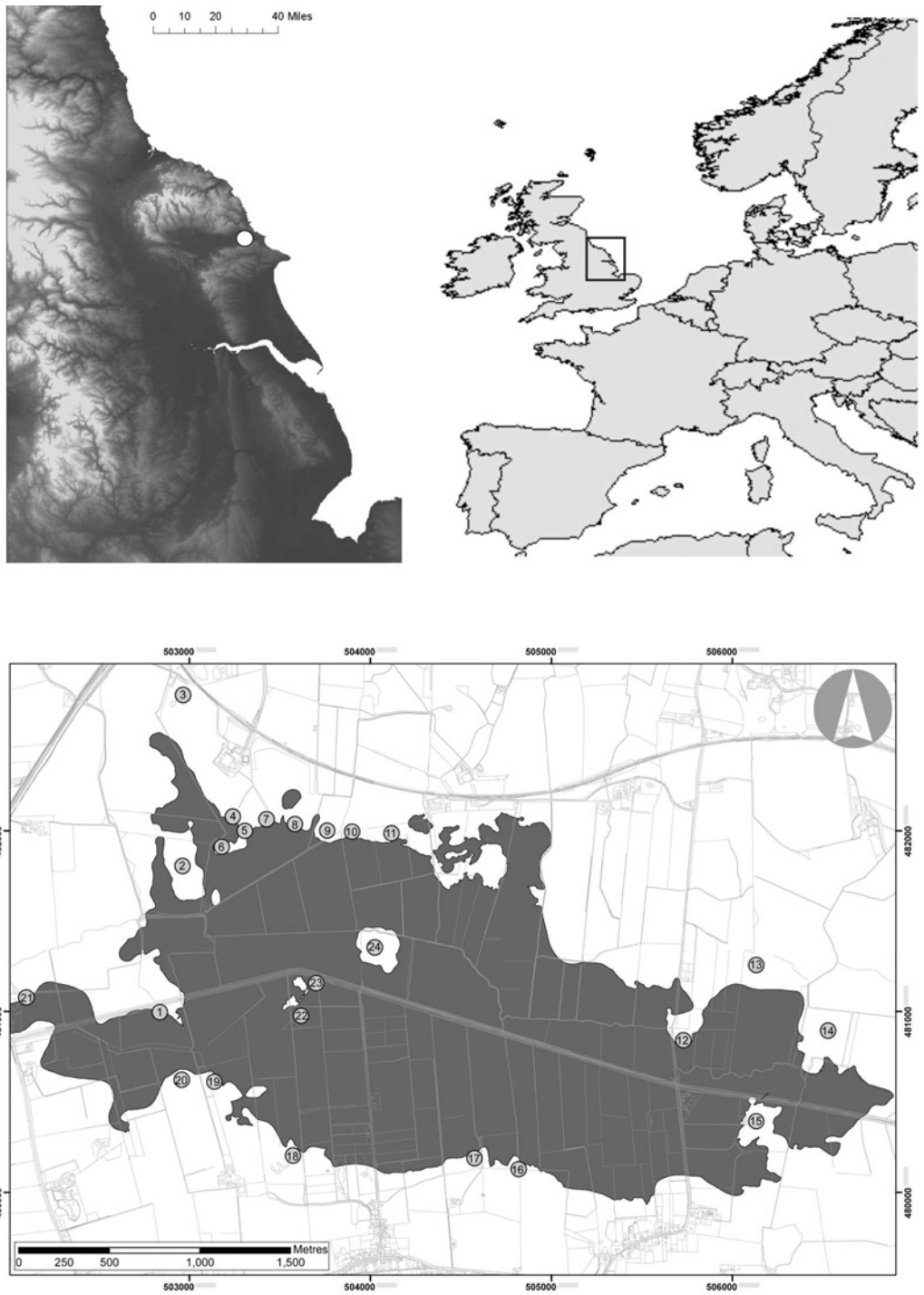

Fig. 3.
Reconstructed map of Lake Flixton showing the location of Star Carr and other Early Mesolithic sites along the lake edge. 1. Star Carr; 2. Flixton 9; 3. VP-D; 4. VP-E; 5. Flixton School; 6. Barry's Island; 7. Lingholme Farm; 8. Cayton Carr; 9. Seamer Carr C; 10. Seamer Carr K; 11. Seamer Carr D; 12. No Name Hill; 13. Flixton Island (drawn by Barry Taylor)

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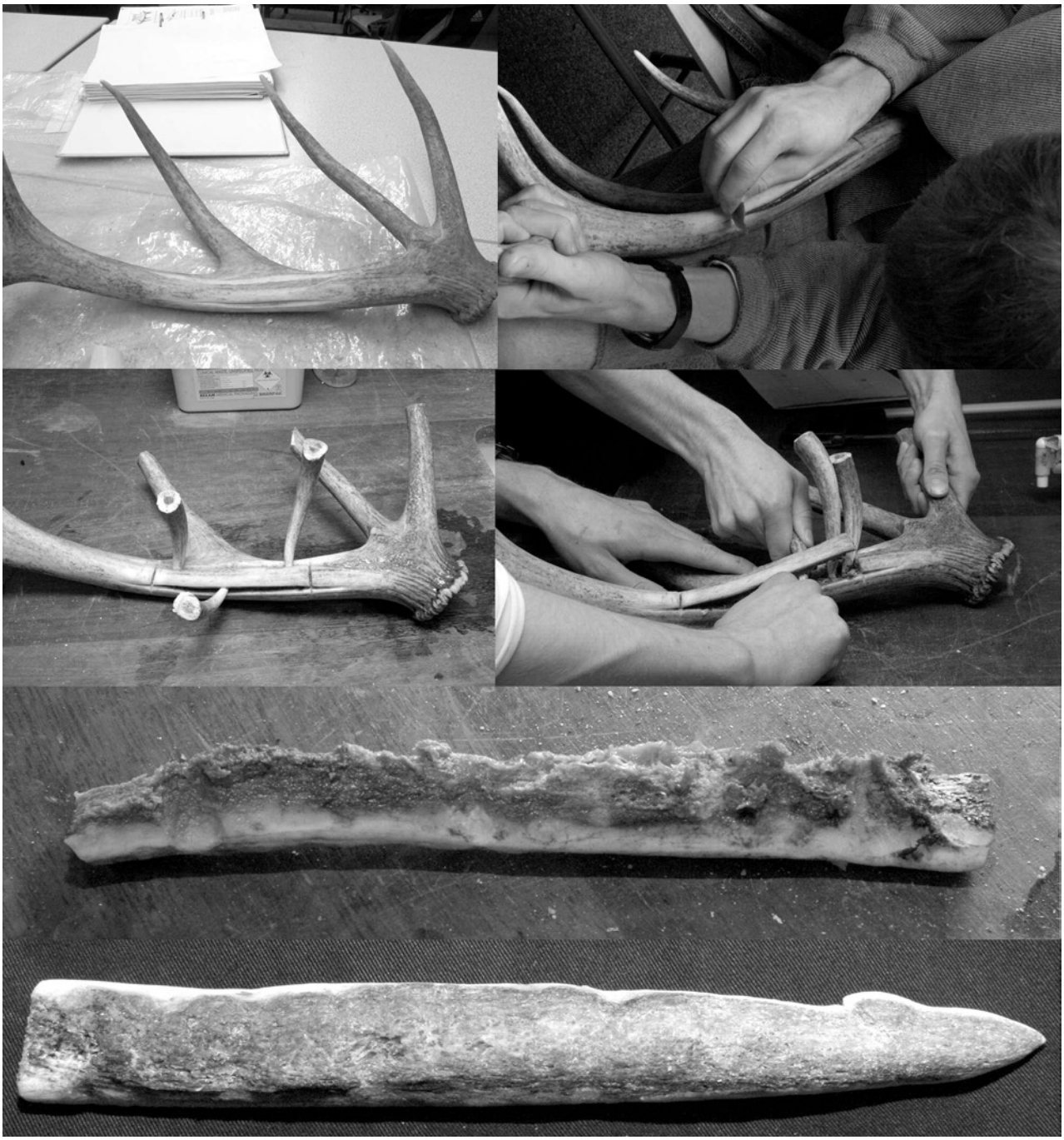

Fig. 4.
Red deer antler with two lightly scored parallel grooves; transverse cut being made across the natural grooving of the antler to define the end of a splinter; tines inserted as wedges to prise out splinter; tine run beneath the loosened splinter to detach the splinter form the core; excess core material attached to removed splinter; point defined and sharpened using flint tools

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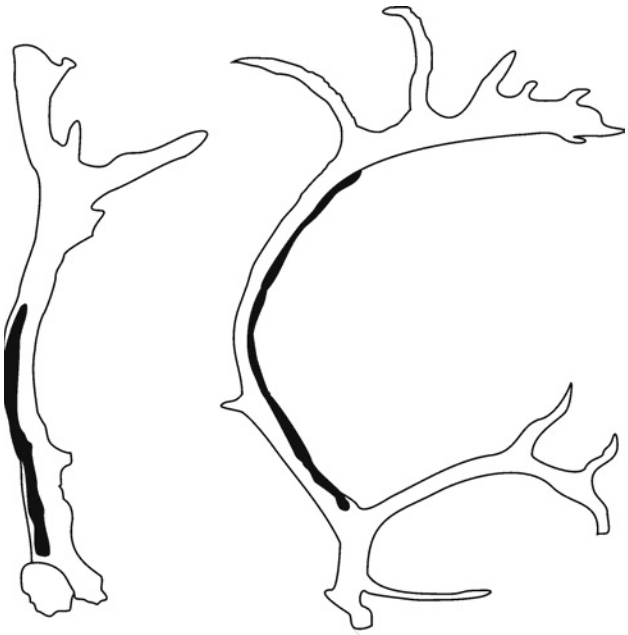

Fig. 5.
Red deer antler (left) and reindeer antler (right) morphology, with typical area for the removal of splinters shaded (from Clark & Thompson 1953, 151)

variation in their state at deposition, with 137 being broken and 54 in a fully intact state when deposited at the lakeside. The barbed point recovered from the site by Tot Lord is also fully complete (Dark *et al.* 2006). This variation in state has caused considerable problems with interpretation of the depositional context of the points, as it lends itself to neither discard of broken items, nor caching of finished points for later retrieval (Chatterton 2003, 72).

Ten major fragments of antler were also recovered during the excavations in 1985 and 1989 (Mellars & Dark 1998). This included 4 beams, 1 removed splinter, 2 basal segments and pedicel, and 3 detached tines (Rowley-Conwy 1998, 99). In addition a further barbed point was found, bringing the total to 193.

Arguments for manufacture at Star Carr

Antler working was described by Clark as one of the most archaeologically visible activities at Star Carr and, consequently, it was given some serious consideration (Clark 1954). Through experiments on reindeer antler and analogies with Eskimos, the first phase of barbed point manufacture, the groove and splinter technique, was argued to be the method of splinter removal practised at the site (Clark & Thompson 1953). Clark suggested that antler-working made up a significant proportion of life and that handicrafts were not the result of specialised individuals, based on the spatial distribution of the burins, the antler artefacts, and his belief that the working debris represented the actions of three or four adults (Clark 1954, 21–5). Pitts (1979) took the discussion of antler-working further, suggesting the lakeside location was critical for antler- and hide-working, particularly because antler can be softened by soaking it in water prior to working, leading to the interpretation that the site was an industrial complex and not a settlement site.

Legge and Rowley-Conwy (1988, 95) suggest that antler was being cached at Star Carr and that broken barbs may have been softened in preparation for repair work. They use the example of Stellmoor, an Ahrensburgian site, where similar caching and softening of reindeer antler splinters appears to have been employed (*ibid.*). However, it is important to note here that at Stellmoor it is the blank splinters that have been soaked for finishing into barbed points. At Star Carr it is the full antler beams that are more commonly being soaked (106 beams in total from both excavation), not the blanks themselves (5 splinters in total).

Dumont (1988), through the examination of a sample of lithics, suggested that a variety of tools were used for antler-working by methods including scraping, planing, sawing, and whittling, some of which could be used in the finishing processes of antler-working which he therefore uses as evidence that there was full manufacture at Star Carr. However, Dumont does not distinguish between different types of antler-working at the site in his interpretation. The use episodes could also be connected with the manufacturing of any of the other antler artefacts that have been recovered here, such as the thinning and lightening of the antler frontlets, the working of red and roe deer tines, or the shaping and perforation of elk antler mattocks.

Rowley-Conwy (1998) conducted further analysis on the antler recovered from the 1985/89 excavations and, like Andresen *et al.* (1981), builds on Binford's (1978) concept of boredom reducers – tasks which are often interrupted with the appearance of game – and it is suggested that this is what the unworked splinter

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finds represent (*ibid.*). Whilst this interpretation acknowledges that Star Car may represent something more complicated than a single 'type' of site, potentially it has two problems. First, it cannot account for the rarity of the splinters in comparison to splintered beams and finished points: if interruption of craftwork was occurring regularly, then splinters would be more frequent. Secondly, this craft-working activity would represent the entire manufacture process, including finishing of splinters into barbed points and thus fails to address the lack of finishing evidence highlighted by Jacobi (1978, 318).

Arguments for manufacture elsewhere

Jacobi (1978) was the first to observe that there was a distinct lack of evidence for barbed point finishing work. Clark (1954) identified four unworked splinters, however, in Jacobi's own re-examination of the material he identified a further two; but even a total of six blanks did not seem to be a very large number in comparison to the large quantities of barbed points and antler beams. In addition, he remarked on the lack of splinters in the initial stages of grinding down, the dearth of half-made points, and the total absence of any trace of the tiny pieces of antler or lozenges which would be expected as a by-product of the notching out of the barbs (Jacobi 1978, 318). Consequently, Jacobi questioned whether point finishing occurred here at all. In suggesting that it occurred elsewhere, he puts forward a two-phase manufacturing process, with splinters being removed from beams at Star Carr but being finished at another location in the landscape. This is later reinforced in a paper by Andresen *et al.* (1981), who support Jacobi's interpretation of a lack of evidence for finishing at the site.

Recently, the discussion has focused more on the deposition of the completed barbed points. This is a key point because for those who consider the second phase of the barbed points manufacture took place elsewhere, it means that they are returned to this site for deposition (eg, Warren 2006, 28). Equally, if the barbed points are fully manufactured at the site they still may have been used elsewhere in the landscape before finally being deposited here (Chatterton 2003, 72).

Another view is presented by Pollard (2000) who explores Star Carr as an ancestral place in the Mesolithic landscape, created by structured depositional practices. He points out that the people of Star Carr may have only deemed it culturally appropriate to deposit barbed points *here*. He cites ethnographies where strict taboos are associated with hunting and where weapons can be regarded as symbolic pollutants (*ibid.*, 127). He also states that the barbed points most probably had strong gender connotations and that their deposition could be linked to the maintenance of specific sexual roles within society.

It is also important to note that performance forms a major part of technology (Finlay 2000) and, if finishing was not being carried out at Star Carr, then the site was not the 'stage' for much of this performance. The negotiation of the people/deer relationship then floats over the Mesolithic Vale of Pickering, but cannot be attributed directly to any specific archaeological site or assemblage.

Chatterton (2003) proposes that the deposition of antler-working products at Star Carr was a ritual act, embodying the circular nature of hunting deer. Analogies are drawn with ethnographic examples of similar circular relationships shown in hunter-gatherer societies (*ibid.*, 76–8). He notes that the death of the deer is followed by the birth of the barbed point, through the working of antler, which is used as a weapon to bring about the death of another deer. The death of the barbed point is then marked by its deposition into the water (*ibid.*, 78). Consequently Chatterton views the deposition of both broken and unbroken barbed points at Star Carr as contradictory to Pitt's (1979) interpretation of it as an industrial area, questioning why points seem to have been brought back to the site after use and breakage (Chatterton 2003, 72).

NEW INVESTIGATIONS INTO BARBED POINT MANUFACTURING

Methods

As has been noted, if barbed point manufacture was being carried out on the site, it is important to consider the processes and the kinds of debris that might be visible in the archaeological record. These would include non-ground splinters, blanks, and fine debitage from the production of the barbs. There are however two main problems with the data that have been used to date:

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1. Clark's collection has never been considered a total collection by scholars who have re-examined it (R. Jacobi, pers. comm.; P. Rowley-Conwy, pers. comm.) and this has been confirmed by one of the original excavators who has informed us that not all the bone and antler was kept and that much was discarded on the sides of the trenches (R. Erskine pers. comm.).

2. Although in the 1985/89 excavations all bone and antler was kept, no sieving or flotation was carried out and, therefore, small pieces of antler-working debris, if there was any, will have been missed.

In recent excavations at the site, it has been possible to conduct further analyses in order to investigate this question. We have also been given access to the Tot Lord collection which, although small, has provided some further important insights. In order to test the research question the following methodologies have been applied:

1. new material has been studied, and some of Clark's collections which are housed in the Cambridge Museum of Ethnography and Archaeology have been re-examined;

2. experiments in barbed point manufacture have been carried out in order to identify diagnostic debitage; and

3. flotation has been conducted on sediments from the archaeological horizons excavated in 2007 and the residues examined.

Analysis of antler

The recent excavations have recovered more pieces of antler but, as a result of the severe deterioration in preservation conditions at the site (Milner 2007), these more recent finds are severely limited in their utility in revealing barbed point manufacturing techniques. There are, however, a few possible instances of working that could give new insights into the methods used by those at Star Carr.

Piece 82834 represents 70–80% of a full antler beam and demonstrates better preservation in comparison to the other finds. There is a long splinter scar (411 mm long) running along the inner aspect, from which it appears that two splinters have been removed (Fig. 6). The edges of the splinter scar are smoothly defined, whereas other splits in the compactor surface elsewhere on the piece are frayed due to flattening and the general deterioration in condition caused by changing conditions in the ground. The basal end of the splinter shows what appears to be a 'V-shaped' end to the splinter, created through the incision of two short tapering grooves. The tapering of grooves to define the end of a splinter at the lower end of the beam is noted by Clark to be extremely rare, only occurring in one instance (Clark 1954, 117). What is also significant about this piece is that it was found in trench SC22 which is even further to the east than the 85/89 trench, demonstrating that the process of antler-working is spread across a large area and appears to continue for a longer period than previously posited by Dark *et al.* (2006; Conneller *et al.* 2009).

There are a few other possible instances of working in the 2006 finds, but the interpretation of these is severely complicated by shrinkage and warping. Piece 82526 displays what appear to be two unnaturally straight edged cuts, converging at 90°. Both cuts seem to extend into the remaining compactor tissue but do not penetrate it. Again, this goes against Clark's theory that transverse cuts were difficult to achieve using flint tools.

The Tot Lord collection is in excellent condition when compared to that recovered during more recent excavations. There is no evidence of the flattening described by Rowley-Conwy (1998) or the shrinkage noted in the more recent excavations, and the core is intact and robust. The collection features six pieces of red deer antler: 1 beam with the crown attached, 2 detached tines, and 3 removed splinters.

The two removed tines (pieces 462 and 465) were unworked other than their obvious removal from the antler beam itself. The other material, however, showed evidence of some interesting methods of splinter removal, which again contradict Clark's (1954) theory of bending and breaking by force.

Piece number 464 represents a removed splinter of red deer antler 125 mm long and 21mm wide (Fig. 7). The curved nature of the splinter suggests that it was removed from a tine rather than a beam and represents close to 50% of the complete tine circumference. It appears that other, smaller, splinters were first removed from the tine and the remaining segment was then broken off from the beam as a

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Fig. 6.
Longitudinal splinter scar on 82834

splinter itself. The removal of adjacent splinters seems to have been marked by a transverse cut which intrudes onto piece 464 at the basal end (Fig. 7). This cut is made into the compactor tissue and would have penetrated it across the end of the adjacent splinter to facilitate its removal.

Evidence for transverse cuts can also be seen on piece 461, a red deer upper beam with the crown still attached. The beam has had several splinters removed, with clearly defined grooves stretching 200 mm along its length (Fig. 8). The lower end of the splintering scar shows evidence of two transverse cuts made against the natural grooving of the beams, which have intruded onto the remaining antler in a similar manner to those on piece 464 (Fig. 7).

The evidence for transverse cutting to define splinters is further strengthened following a reanalysis of antler recovered by Clark held in the Cambridge Museum of Archaeology and Ethnography. Casts of antler beams numbered A86 and A104 displayed transverse cuts (Fig. 9), which defined the ends of splinters. These marks were uncommented on by Clark, who cites A51 as the only instance where transverse grooving occurred.

The Tot Lord collection also offers insight into the use of wedges to loosen and remove splinters from the beam, once grooves had been cut. Clark notes that this is a possibility with the groove and splinter technique, but was unable to find evidence for it from the Star Carr antler assemblage (Clark 1953, 150). Piece 460 is a splinter 145 mm long and 18 mm wide (Fig. 10) which displays a distinct impression along its cut edge of a wedge being forcefully inserted. The impression is made into the cut hard compactor tissue, which would have required considerable force. This would have enabled the splinter to be prised away from the beam longitudinally.

Clark (1954, 136) notes one example of an unfinished barbed point (P187) which he describes as having the middle part being unfinished and the notches are unevenly spaced and incompletely cut. However, the experience of making barbed points has enabled the identification of other partially worked examples in the collection. Defining the barbs takes time: one method involves marking out the barbs before defining each one more clearly in turn. If this method is adopted but the point is unfinished it will result in a point with some clearly defined barbs and

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Fig. 7.
Piece 464. Splinter taken from red deer tine. Right: transverse cut across the basal end of piece 464 for the removal of an adjacent splinter

some comparatively cruder notches. It has not been possible to go through the entire collection of barbed points (because this has been divided across many museums and some are presently unaccounted for); however, some in the Cambridge Museum and some illustrated in the monograph do appear to be only partially finished (eg P10, P25, P28, P63, P112, P128, P136, P166, P169, P181, P187; see also Fig. 11).

In sum, analysis suggests that splinters were often being removed using transverse cuts; wedges were probably used to remove them but, most importantly, there is evidence that suggests partially finished barbed points do exist on this site.

Experimental barbed point manufacturing

A series of experiments were carried out in order to understand the manufacturing process and to identify the kind of antler debitage that might be expected in barbed point manufacturing. Although indirectly linked to barbed point manufacture, Griffitts and Bonsall's (2001, 208–10) experimental work on bevel ended tools provides significant insight into the production of antler 'blanks' through the groove and splinter technique. They were able to produce splinters 100–150 mm long and 15 mm across in around two and a half hours when the antler was dry and an hour and a half when the antler was soaked. Grooves were made using flint tools and the intervening splinter removed by inserting wedges of bone and willow wood. Soaked antler is notably softer and easier to work than dry antler (MacGregor 1985, 63–5) and this was picked up by Legge and Rowley-Conwy (1988, 95), who used it to suggest that antler was being cached in Lake Flixton for softening.

John Lord (1998) carried out a similar experiment to the one being attempted here, recreating a hafted antler harpoon point. The point itself was an

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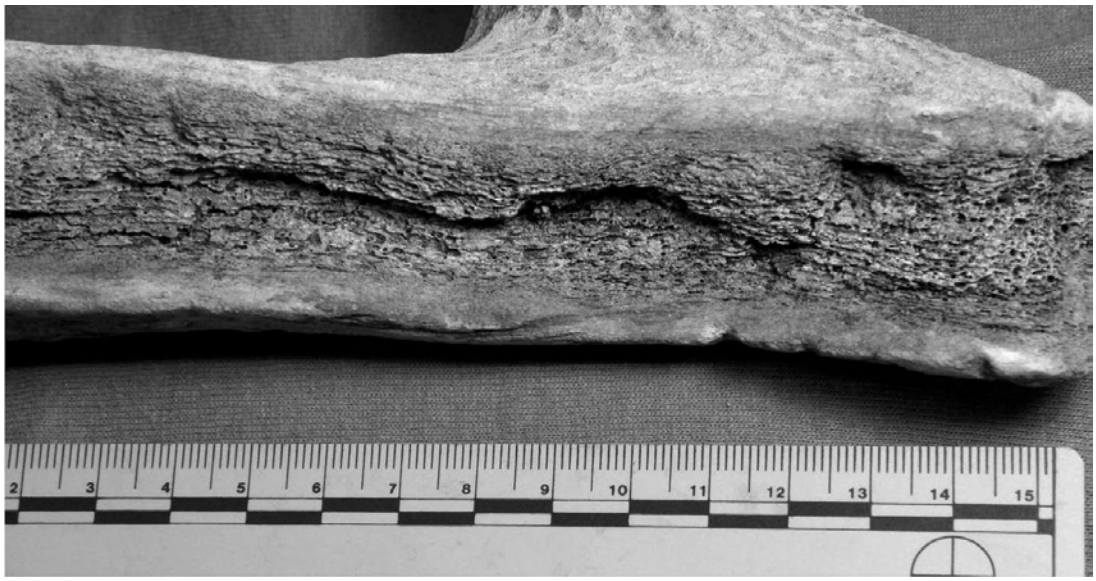

Fig. 8.
Piece 461. Red deer crown and upper beam, with splinters removed. Right: evidence of transverse cuts used to define the splinters removed from piece 461

'Obanian' style point, which involved a markedly different method of finishing to those found at Star Carr. Obanian points are barbed on both sides with long, sweeping barbs. Lord created these by drilling points into the blank splinter, and then smoothing them out to create a Christmas tree-like shape (Lord 1998, 193–4).

This is obviously inappropriate for the single sided, shorter barbs of the Star Carr points, but the method of splinter removal, via the groove and splinter technique, was useful for this study. Lord notes how initial grooves were marked out using 70° burins, which were later deepened using 30° burins (*ibid.*, 193). This concurs with Clark's two-stage grooving process (1954, 116–17), and Star Carr's unusual burin-heavy lithic assemblage (Clark *ibid.*, 96).

Lord's method differs from that described by Clark, however, in that he employs transverse cuts to define the ends of the splinter. These are made using a flint saw blade and are noted as being harder to work than longitudinal grooving as they go against the natural formation of the antler, but they are possible (*ibid.*, 194). Lord then recommends the use of tines as splinters (*ibid.*), which are driven into the core tissue and result in the removal of the splinter. Taylor (1998, 61) has noted that many of the worked tines recovered from Star Carr would be ideally suited for use as wedges and display abrasion patterns consistent with being hammered into another material. Before the splinter was worked further, Lord states that the excess core material must be removed by scraping against either a coarse stone or a sharp edged flint core (*ibid.*). Clark does note that the core surface is visible to some extent on all of the barbed points (Clark 1954, 124). Presumably then, some core was attached initially and it was not totally removed by the antler-worker when creating a barbed point. Dumont's (1988) study of use-wear patterns in the Star Carr flint assemblage identified nine instances of working on the cores included in his sample. Although he was not able to positively identify the material responsible (*ibid.*, 318), it remains possible that these cores had been used to removed material from splinters.

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The methodology which was employed in the experiments was as follows:

1. Red deer beams were soaked for 48 hours in fresh water before working.

2. Two parallel grooves were marked out, roughly 200 mm long and 40 mm apart, by light scoring using a flint burin, and the antler was re-wet every 20 minutes to maximise ease of working.

3. The grooves were deepened using flint tools until the core material was exposed, however, burins were not always used and flint was selected from a varied toolkit. Again, the antler was re-wet every 20 minutes. During this process, all the antler debitage was collected on plastic sheets over which the working took place.

4. Following the results from the examination of Star Carr material, the ends of the splinters were defined by transverse cuts across the grooving of the beam, using sharp pieces of flint. These were deepened until they penetrated the compactor tissue and revealed the core. Again, the antler was re-wet every 20 minutes.

5. Tines were used as wedges to lever out the splinter by lodging them into the grooves and hammering them in using a stone.

6. Once the end of the splinter had been loosened, a tine was run between the core and the compactor to prise the splinter out.

7. The removed splinter had the excess core material removed by scraping across using a coarse stone.

8. The rough shape of the point was created by abrasion on a coarse stone.

9. Using appropriate pieces of flint, particularly flakes and unretouched blades, the point was defined further and then the barbs.

Clark (1954, 126) distinguished three styles of barb, which he terms 'fine, closely set barbs, those with medium spaced barbs and those with relatively coarse, widely spaced and often prominent ones'. Three examples were selected from the Cambridge collection to best reflect the variation described by Clark and, therefore, the majority of those recovered (Fig. 12). The different types of barbs were made experimentally.

The splinter removal stage of the manufacturing process yielded fine shavings of antler compactor tissue, similar in form to sawdust (Fig. 13). These shavings, whilst distinctive in form, would be unlikely to be visible during excavation, and would only survive in an archaeological context in exceptional circumstances. There was no variation in this debitage for any of the splinters made.

The finishing stage of manufacture yielded two distinct types of debitage. All of the points created produced very fine antler shavings, alongside fractures of flint where blades had snapped during working (Fig. 14). In replicating the barbs of P175 and P160, it was possible to achieve comparable results by cutting and scraping alone, as the barbs were either too closely set, or too poorly pronounced from the stem to require the cutting of the triangular 'lozenges' described by Jacobi (1978, 318). The finishing stages for replicas of P175 and P160 thus produced more of the fine antler shavings noted above. However, because of the greater spacing and high prominence of the barbs the replica of P177 produced a different type of debitage, in the form of more robust fragments roughly 5mm across. These were the product of converging cuts used to define the more prominent barbs: Jacobi's 'lozenges'(1978, 318). It is important to note that these would only be present in the manufacture of points with this style of barb, as none of the other experiments yielded this type of debitage.

These tiny fragments might be difficult to see during excavation, although flint debitage of this size, particularly on the dry land excavations at Star Carr, is routinely collected so it is not impossible that such pieces may be observed, particularly if in a concentration. Another method for recovering such debitage is flotation, which will be explored below.

In addition, during the experiments, some interesting observations were made which could lead to a better understanding of the barbed point manufacturing process. For instance, the flint blades used during the work often snapped in a manner which left a burin-like tool. These were not necessarily discarded instantly, as they were sometimes used later for further grooving. Although it is impossible to distinguish 'accidental' burins from intentionally knapped tools in the site's lithic material, it is easy to

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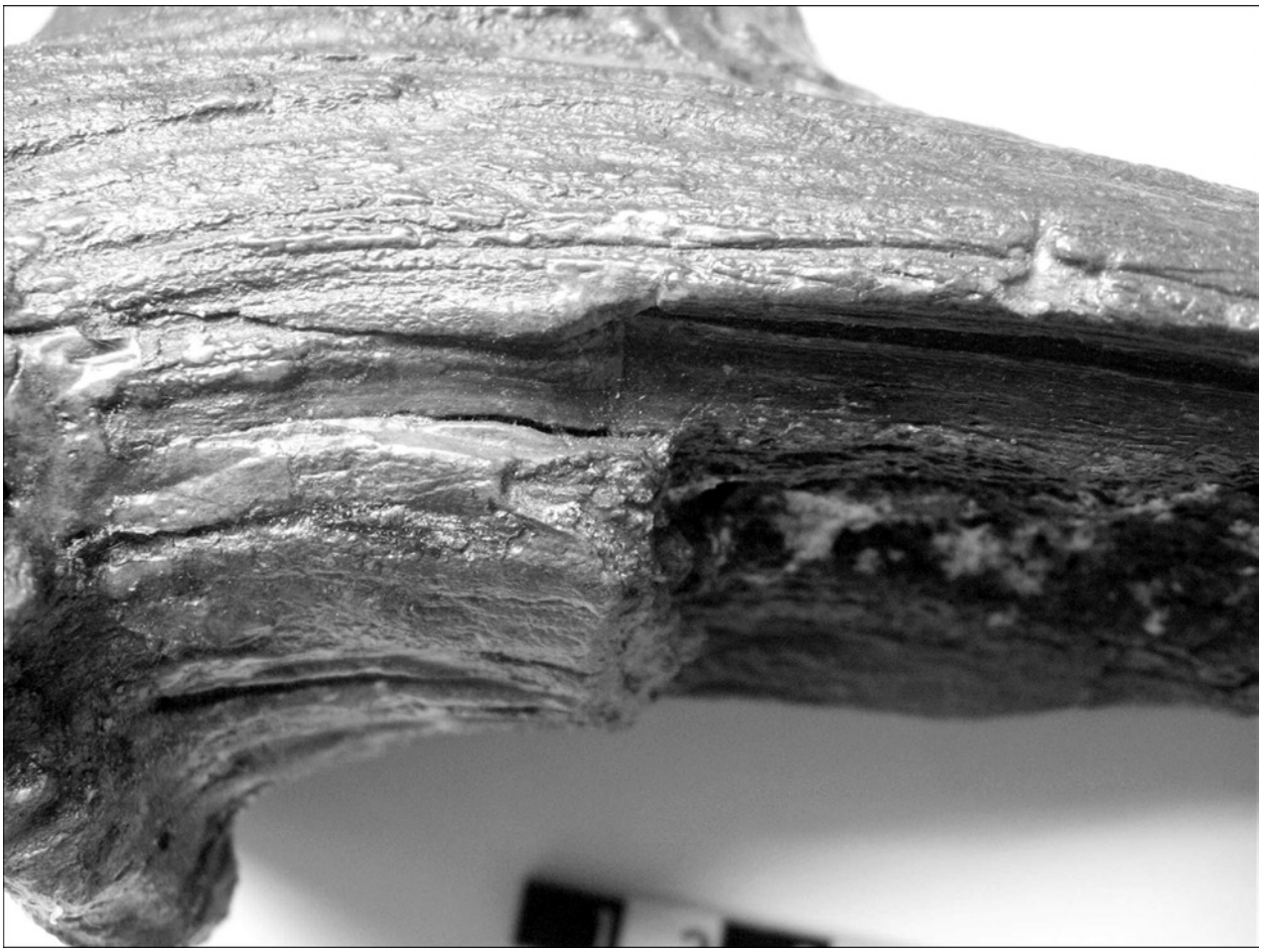

Fig. 9.
Transverse cut defining the end of a splinter on A104. The upper splinter is clearly defined by a straight line whilst the lower one appears more roughly cut (photograph taken at the Cambridge Museum of Archaeology & Ethnography)

see how the groove and splinter technique could produce a burin-heavy assemblage, similar to that found at Star Carr.

It was also found that sometimes the splinter-removal stage of the process required the experimenter to work around the antler (which was normally held stationary), which sometimes required an extra pair of hands to brace the beam whilst grooving or hammering in the tines. Once the splinter was removed it was instantly more portable, allowing the experimenter to complete the working alone without assistance.

A rather surprising find was the antler bled when being worked. Although the antler which was used had been air dried for three years, the core material still contained dried blood. When the core had been penetrated by grooving, water was able to run through the core when the beam was being left to soak. The water that then ran out of the antler was blood red (Fig. 13). This phenomenon was also visible if the antler was stood upright in still water and the blood floated out into the clear water, giving the impression that the antler was pumping blood.

Finally, attempts to re-wet the splinter following its

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Fig. 10.
Impression of wedge made on the inner aspect of the cut edge on piece 460

Fig. 11.
Barbed points showing signs of partial finishing
(photograph taken at the Cambridge Museum of Archaeology & Ethnography)

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Fig. 12.
Barbed points P160; P175; P177 (scale in cm)
(photograph taken at the Cambridge Museum of Archaeology & Ethnography)

removal from the beam actually proved troublesome in the 'finishing' stage of the barbed point manufacture, as wet antler could not be abraded as easily on stone and proved slippery for the fine detail work needed on the barbs themselves. The remaining core material also became difficult to work, as it proved too soft and stringy. This suggests that, in fact, 'blanks' would not be soaked and are more easily worked dry, which may be why blanks and the final stages of working, including half finished forms are very rare finds at the site.

Flotation and sorting of 2007 soil samples

In order to ascertain whether or not antler-working was being carried out on site at Star Carr, the diagnostic antler fragments identified during the experimental work were looked for in soil samples taken from the 2007 season of excavations. Wet sieving was carried out on site but this failed to produce any small pieces of antler. In addition, a bulk sampling strategy was drawn up in order to carry out flotation, the drying of fractions, and then high-resolution sorting of some 20 soil samples to divide the heavy fractions up into their various components and identify what, if any, small antler fragments were present.

Samples were taken from selected areas of interest in the dry land trench (SC23), such as contexts associated with possible features and areas of burning. In the wetland trench (SC24), where the waterlogged nature of the deposits makes the survival of antler much more likely, each context was sampled in a 1 m grid, with a litre of soil being taken from each square.

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Fig. 13.
Sample of antler debitage equivalent in size to that of Fig. 14, and blood from splinter removal for replica of P175. The darker patches are bloody water

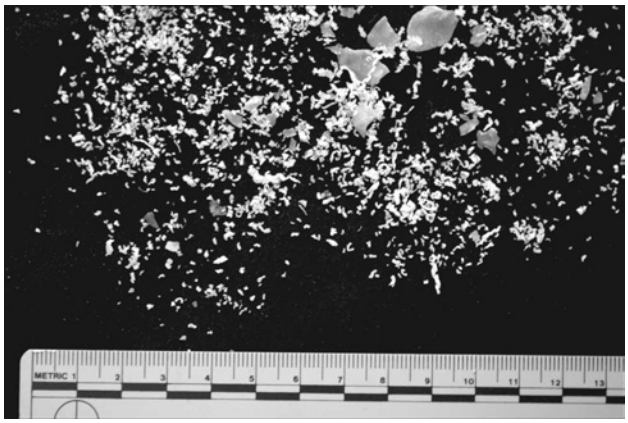

Fig. 14.
Sample of finishing antler and flint debitage from replica of P177

Soil was placed on a gauze mesh and then submerged in a flotation tank filled with water. The soil was then washed by hand within the tank. The light fraction floated to the surface, where it was run off and trapped using another piece of gauze. The heavy fraction was then lifted out of the tank when fully washed by removing the bottom gauze. Both of the fractions were then left to dry in a drying cupboard before being bagged, weighed and labelled.

At least 100 g of material from each sample was finely sorted using tweezers to pick out wood, antler, bone, stone, seeds, and insect remains. Unfortunately this process produced no evidence of antler-working. In addition, it should be noted that a 500 mm square block of peat which had been lifted intact from the site in 2007 was carefully excavated in the laboratory during 2007–8 under controlled conditions and this too also failed to produce evidence of antler-working. (Hadley *et al*. 2010)

DISCUSSION

The results from these examinations and experiments arguably have provided more data to suggest that all the stages of the barbed point manufacturing process were carried out at Star Carr. The key evidence is that a number of the barbed points appear to be half finished. However, the fact that the experiments suggest that wetting blanks is not useful for the final stages of production lends weight to the idea that this stage was not carried out on the lake edge and may, in fact, have been an occupation carried out on the dry land. Although, to date, no barb manufacturing has been identified in the excavations of the dry land, the residues and the barbs themselves are less likely to survive in this context, but equally there are still large areas of the dry land to be investigated.

One of the other main arguments for the manufacture of the barbs elsewhere has been the lack of blanks on the site. Clark only noted four, though Jacobi increased this number to six when he re-examined the collections. In addition, Tot Lord found another three in a short visit to the site, taking the total to nine: a third of all blank splinters from the site! The fact that Lord found so many in the section suggests that perhaps some are yet to be found further into the lake, or possibly that some which were uncovered during the excavation were not kept because at the time they were not considered to be diagnostic or important. In addition, it should be remembered from the experiments conducted, that, in actual fact, soaking blanks makes the next stage harder, and dry blanks are easier to make into barbs than wet ones. Therefore the lower percentage of blanks in the assemblage is perhaps to be expected.

The lack of waste from the making of barbs is perhaps also to be expected. If they were being manufactured on the dry land then the small lozenges

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will not be found in the lake edge deposits. At site Seamer K (Conneller 2003, 93) distinct lithic scatters were found, with different activities being carried out at different parts of the site. Scatter 30, for instance, represents the initial testing and reduction of a number of flint nodules to cores, whilst scatter 2 is the product of microlith manufacture and retooling activities. With this type of intrasite spatial organisation present, it is entirely possible that barbed points were finished at another location within the Star Carr 'site'.

Although some flotation has been carried out on dry land deposits, further examination of deposits would be worthwhile, though it must also be considered that they may not have survived in this environment: the bone and antler found to date on the dry land is in a fragile state. If any working of barbs was, however, carried out on the lake edge, it is also highly unlikely that the residues would survive. It has been demonstrated that the deposits have severely deteriorated over the last 60 years and even the large pieces of antler are in a very bad condition (Milner 2007) due to extremely acidic conditions (Needham 2007): the chances of debitage surviving are very slim.

So, what does this tell us about the craft of barbed point manufacture at Star Carr? It seems highly likely that this was an activity that was carried out in this location, perhaps both at the edge of the lake and on the dry land. It may also be possible that some blanks were removed to other places for finishing, though evidence from other sites around the lake is distinctly lacking. Does this mean that barbed point manufacture was a boredom reducer as proposed by Rowley-Conwy (1998)? Certainly there is more data now to argue that these activities started and stopped in this location, but how this related to other activities is impossible to say. What we do know from recent fieldwork is that the area which was excavated by Clark is a very small proportion of the overall 'site' and that there is a large area of what would have been dry land which is little understood. It is only when we begin to link these areas together and understand more about the site through further fieldwork that we can build up a clearer picture of the activities carried out here, and also the important question of why barbed points were being deposited at this point in the landscape.

What this work has also demonstrated is that barbed point manufacture is complex, multi-stage process which may have required co-operation between people, particularly in the removal of the splinters. The fact that wet antlers appear to pump blood cannot have gone unnoticed by those working them and this adds weight to the interesting ideas put forward by Bevan (2003), Chatterton (2003), and Conneller (2003; 2004) on the links between humans and animals and connections between the barbed points and the death and regeneration of the deer.

CONCLUSION

In conclusion, the current preservation conditions at Star Carr mean that the chances of survival for small, diagnostic fragments of antler are now very low and so it may be impossible to prove definitively that barbed point manufacture occurred here. The low numbers of unworked splinters and half finished barbed points however, suggest that the activity may have taken place here. It is also important to note that blank splinters have not been recovered from any other Mesolithic site in the Vale of Pickering. This fact cannot be attributed solely to preservation conditions as other Mesolithic sites in the Vale have produced faunal remains, and even two antler barbed points. This is only one of many unresolved questions that can be posed for Star Carr, and it is only through more fieldwork on both the lake edge and dry land deposits that we can hope to build up a better understanding of the activities that were carried out here, both spatially and temporally.

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