Mammoths and Neanderthals in the Thames Valley

Excavations at Stanton Harcourt, Oxfordshire

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Keeping such a large and valuable collection of Pleistocene material safe from thieves and the elements was never easy. Friends with farms in Oxfordshire kindly offered their barns for storage. We thank Stuart and Gillian Hamilton, Guy Pharaon, and Malcolm Hastings for providing short-term shelter in the early days. We are especially grateful to Nina and Nick Ritchie who put up with our comings and goings on their farm for more than 20 years. A permanent home with display potential was always the goal, to which end several people in the village of Stanton Harcourt, led by Charles Mathew, endeavoured to locate suitable premises for a museum with storage facilities. We are pleased to report that everything is now in the care of the Oxford University Museum of Natural History due mainly to the enthusiasm and perseverance of the Collections Manager, Dr Hilary Ketchum. We are also grateful to the Director, Prof. Paul Smith, and the Head of Earth Collections, Eliza Howlett, for facilitating this event and to the Curry Fund of the Geologists' Association for covering the costs of packing and re-boxing the material. Conservation and curation of the fossils has continued thanks to the expertise of Neil Owen and Neil Adams and the generosity of the Street Foundation.

The entire excavation project hinged on the co-operation of the quarry owners who were unfailingly supportive of our efforts to extract material in very tough conditions. In this respect, Hanson Aggregates (formerly ARC) and the landfill operators Greenways Landfill together with their on-site staff were instrumental in our ultimate success. In particular, we were fortunate to have the interest and co-operation of Hanson's technical and external affairs director, John Mortimer, as the result of which Hanson generously contributed to excavation funds. Invaluable financial and other support was also received by the British Academy, Earthwatch (UK), the Hanson Environment Fund, the Leakey Foundation, the Society of Antiquaries (London) and the Quaternary Research Association (QRA).

The final compilation of this volume was frustrated by the Covid pandemic as one of us (KS) had to remain in South Africa for the year of 2020. Apart from the inherent difficulty of remote collaboration, essential documents in Oxford were inaccessible. KS is particularly grateful to Edward Cropper and Tahli Betteridge for their persistence in locating and scanning many documents and photographs from UK files. Thanks are also due to Polly Courtice and Valda Führ for their editorial assistance, and to Robin Orlić for page-setting the text and illustrations.

Abundant illustrations are essential to describe a site so rich in finds as Stanton Harcourt. The maps and plans in Chapters 1 and 2 describing the geological context were drawn by CMB. As regards the rest of the illustrations, it is hard to do justice to the contribution made by Greg Scott to this volume. Not only did he finalise all KS's line drawings of animal remains, but he produced the finished photographs of over 100 fossils and 74 artefacts, created the vegetation reconstructions in Chapter 6, and designed the cover for the book.

Last but not least, we express deep gratitude to our husbands, Richard Cropper and Keith Buckingham, for their forbearance, support and encouragement over so many years.

Preface

This book describes an unusual situation near the village of Stanton Harcourt, Oxfordshire. In 1989, fossils came to light in a quarry that had been the focus of gravel extraction a decade previously. The discovery, in a disused pit, presented an opportunity to carry out extensive fieldwork for 10 years rather than the more usual 'rescue' excavation and resulted in one of the most remarkable Pleistocene assemblages in Britain.

At the base of the pit, below the extracted gravel, was a metre or so of 'uneconomic' gravel, so-called because it contained a variety of large stones and organic material. This gravel was left in place, the pit was abandoned awaiting its use for waste disposal, and vegetation took root across the quarry floor. In 1989, in the course of drainage maintenance, the tusk of a mammoth was discovered. By coincidence, the authors visited the quarry shortly thereafter and agreed to return to salvage the tusk. Within a short time, it was clear that there were abundant *in-situ* animal and plant remains. In 1992, there was great excitement when the first of many stone artefacts was found. For the rest of the decade, it was possible to excavate, record and analyse the context of a very large assemblage of Pleistocene bones, artefacts, shells and wood in the sediments of a meandering river.

Such a situation is extremely rare in Britain. The majority of bones and stone tools donated to museums by fossil collectors over more than a century have come from gravel pits. In most cases, there is little or no accompanying contextual information as there is rarely an opportunity to carry out detailed fieldwork at working quarries. Hence fossils and artefacts are generally found in the wake of quarrying at the base of excavated pits or on piles of extracted gravel. Gravel is the accumulation of millennia of ancient river beds and so, even in cases where it has been possible to record the context of fossils, it is a common perception that such material is of limited value in reconstructing the past because, by its very nature, a river is a dynamic environment with the potential to transport and redistribute such material.

Stanton Harcourt proved to be an exception. The excavated deposits revealed a buried channel, a former course of the River Thames. Material that found its way into this channel had evidently been rapidly buried, preventing oxidization and erosion, with the result that organic material was extraordinarily well preserved. In such a situation, it had a better chance of surviving into the fossil record than equivalent material on the ground surface. Apart from more than 1500 animal bones, teeth and tusks, there were molluscs, insects, and vegetation including seeds, nuts, branches and trunks of trees. A date of c.200,000 years makes this assemblage unique for this period in Britain.

Over the course of the decade, it was possible to document the course of the river over a wide area and, through the detailed analysis of the sedimentary environment, to identify a variety of depositional histories within this fluvial setting. The particular significance of this site is that it is possible to describe in unprecedented detail a temperate environment approximately 200,000 years ago (marine isotope stage 7). Analyses of the vegetational remains reveal this region of the Upper Thames to have been an area of open woodland and grassland bordering a river where large mammals grazed. Of particular interest is the most common species at the site – the mammoth. Initially thought to be the woolly mammoth *Mammuthus primigenius*, it was soon recognised as an earlier species – a small form of the steppe mammoth

M. trogontherii. This mammoth was living alongside the much larger straight-tusked elephant and other animals – bison, horse, bear, wolf and lion.

The discovery of stone tools in the same context as the large vertebrates was highly significant because, at the time of excavation, it had long been believed that people were not present in Britain during interglacials. The lack of archaeological evidence was taken as an indication of the reluctance or inability of Pleistocene hominins to occupy forested habitats. It has become increasingly clear that the more open environment of MIS 7 was not a limiting factor to human movement in Britain.

As will be seen in the Acknowledgments, a substantial number of people and institutions contributed to the success of the excavation both on- and off-site. Access to several acres over a period of ten years generated a vast amount of data: crates of fossils, buckets of sediment samples, and thousands of photographs, plans and section drawings. Apart from the enormous task of analysing and collating these after the excavation, the vertebrate fossils required conservation. Although generally well-preserved when unearthed, they were not fully fossilized which meant that most larger items required to be encased in fibreglass or Plaster of Paris before they could be lifted. Reversing this process was time-consuming and often difficult especially in the case of the mammoth skulls and tusks two metres in length and curved. Apart from the technical difficulties encountered in such a conservation task, suitable workspace was always a problem. Derek Roe generously allocated us an office at the Donald Baden-Powell Quaternary Research Centre in Oxford but the University lacked the extensive space required for the excavated material. The Oxford University Museum of Natural History had long expressed interest in acquiring the Stanton Harcourt material (as well as that from several other Upper Thames sites at which we had worked) but had not sufficient space to house it. Friends on farms provided temporary accommodation in their barns for the first few years and then Hanson (the quarry owners) gave us access to a large disused glasshouse. This offered everything we needed and had always lacked – ample space, light, and water. However, the publicity that resulted from media interest in the discovery of mammoths near Oxford and the excavation having featured on television in the *Time Team* series made the collection extremely vulnerable. Sporadic thefts of fossils from the excavation were a continual problem but, when thieves broke into the glasshouse and stole some of our best, fully prepared specimens, it was a major blow. The theft triggered an immediate and onerous move to another farm where conservation went on in secret until 2018. At this point, the University Museum took possession of buildings at a former airbase and acquired funds to employ a curator. It was a great relief to spend the summer of that year cataloguing and crating up the entire collection to be donated to the OUM, knowing that it would be curated, eventually made available to future researchers, and displayed.

With the future of such a large and valuable collection assured, it remained to us to complete our analysis of the large vertebrates, put the finds within their geological context, and collate all other contributions in preparation for this volume. It is a matter of great regret to us that four of the contributors are no longer with us. Derek Roe, Russell Coope, David Keen and Terry Hardaker were all very generous with their support and expertise during the excavation years, we benefitted greatly from their enthusiasm and presence on site, and from innumerable discussions with them. The reports they prepared make a significant contribution to this volume and we trust that the way we have incorporated their research gives these authors the recognition they deserve.

Chapter 1

Introduction

As the title denotes, this book concerns the excavation of 200,000-year-old fossiliferous deposits at a site known as Stanton Harcourt in Oxfordshire (SP413051). More accurately, the excavation site was Dix Pit, a former gravel quarry near the village of Stanton Harcourt (Figure 1.1). Oxfordshire is rich in mineral resources. Those which are used for primary aggregate production comprise extensive alluvial sand and gravel resources along the River Thames and its tributaries. River terraces occur at several levels above the modern floodplains within the Thames, Evenlode, Windrush and Thame valleys and their minor tributaries. The sands and gravels within these terraces comprise mainly unconsolidated materials laid down by rivers and streams and are an important resource in the county. Once the gravel is removed, the pits are flooded and used for recreational purposes.

In the immediate vicinity of Stanton Harcourt, the sand and gravel deposits are attributed to the meltwater of the penultimate cold stage. Dix Pit, quarried in the 1970s by Hanson Aggregates (formerly ARC), was unusual for two reasons. Firstly, below the 5-6m of quarried sands and gravels was a less well sorted deposit approximately 1m thick. This was considered uneconomic and not quarried. Secondly, as Dix Pit had been ear-marked as a waste disposal site, the abandoned quarry was not flooded, and vegetation grew on the quarry floor. Over the next decade, sporadic visits by Quaternary scientists led to the conclusion that this lower gravel represented a former river channel cut into the Oxford Clay and it became known as the Stanton Harcourt Channel (Briggs *et al.* 1985). Within these channel deposits were warm adapted molluscs, insects and plant remains that were not typical of the bulk of overlying quarried gravel which represented cold conditions.

In 1989, during drainage operations, the tusk of a mammoth was unearthed at the base of the pit. The authors' initial interest was in trying to retrieve this tusk but it was soon apparent that it was in sediment containing fresh water shells of a species normally found in much warmer climates than in Britain today and that this area of the pit might be another exposure of the Stanton Harcourt Channel reported by Briggs *et al.* (*op. cit.*). Mammoths are generally associated with a cold climate but the associated molluscs indicated temperate conditions. However, the gravel deposits were predominantly of fluvial origin so the question that arose was: had the tusk and shells originated in different climatic episodes and become mixed together by river action or was the mammoth a survivor from a previous cold episode that had become adapted to a warm climate? This apparent anomaly of creatures of cold and warm habitats in the same deposit led the authors to explore the site further.

As the pit had been designated for waste disposal in the foreseeable future, field work at the site was initially in the nature of a rescue operation. As time passed and as the finds and their importance increased, funding was applied for and field work was undertaken between 1990 and 1999 on a more systematic basis (Figure 1.2). For several years, funds facilitated three two-week excavations with volunteers and field assistants. At other times, the authors and various local helpers made regular visits to the site. The excavations became known as the 'Mammoth Project' and later as the 'Oxford Mammoths'.

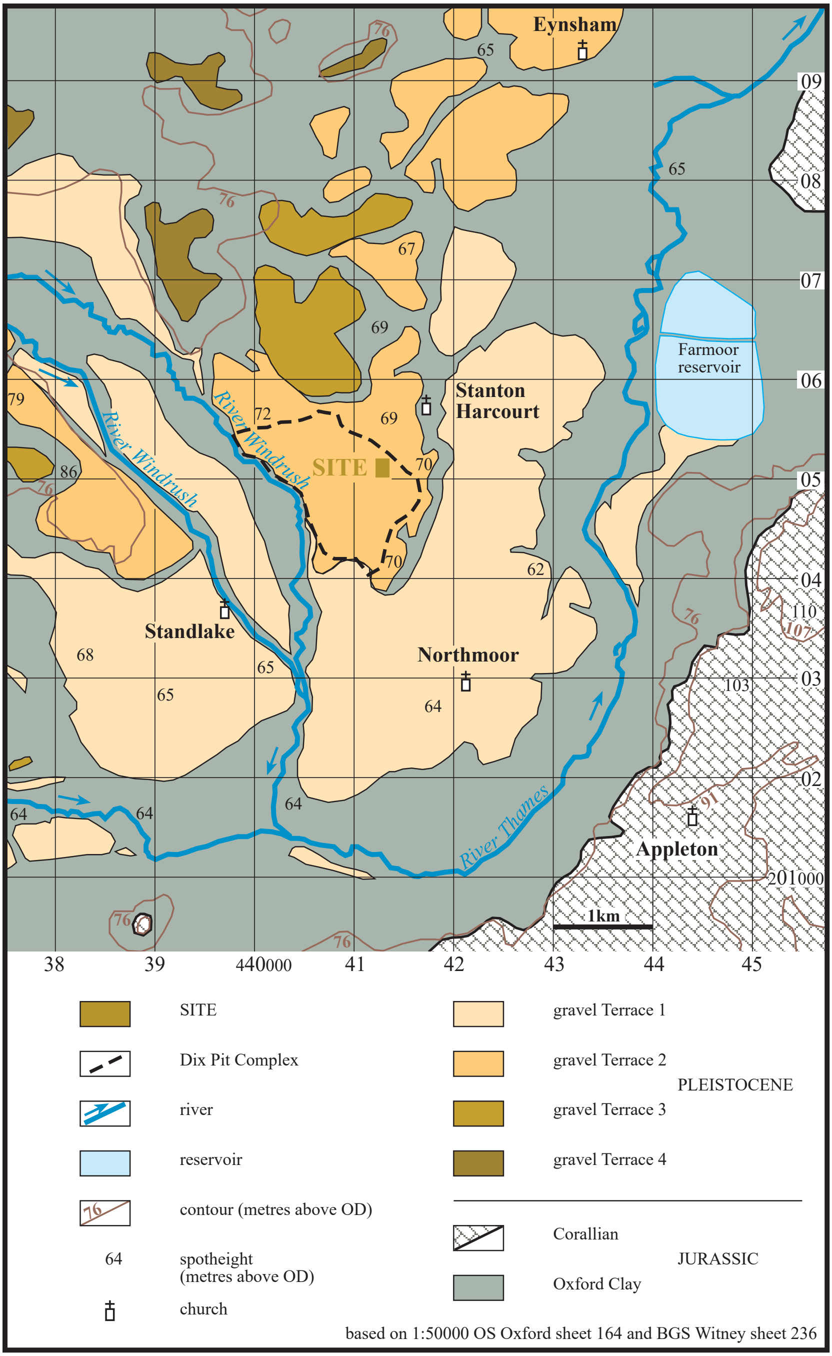

Figure 1.1 Site location map with simplified geology

Figure 1.2 Looking SE at part of the excavation site showing the Pleistocene fluvial sediments that had been left at the base of the pit after gravel extraction and, below these, the Oxford Clay.

Preliminary reports on the early years were given by Buckingham *et al.* (1996) and Scott and Buckingham (1997). Further descriptions of the excavations and the importance of the finds were published by Scott and Buckingham (2001), Scott (2001), Jones *et al.* (2001), Buckingham (2007) and Scott (2007).

It was a very interesting time to undertake this excavation as new research on the application of oxygen isotope stratigraphy to oceanic sediments was indicating a far greater number of warm and cold periods within the last 2 million years than had previously been thought. In the absence of suitable material for absolute dating, previous attempts to distinguish between British interglacial deposits had depended solely on the terrestrial record. A means of distinguishing between interglacial deposits based on botanical remains had been proposed by West (1963, 1968). Mitchell *et al.* (1973) applied West's palaeobotanical interpretations of the temperate deposits, together with geological evidence for the deposition of other sediments under extremely cold or even glacial conditions, to create a chronostratigraphic framework that would enable Quaternary specialists to identify glacial and interglacial deposits. However, it soon became apparent that the 1973 scheme as a chronostratigraphic tool was problematic in the case of deposits that were widely separated and had little or no pollen. Furthermore, the fossil mammals from the Lower Thames seemed not to fit into the scheme and Sutcliffe (1975, 1976) argued for a hitherto undocumented temperate phase between the Hoxnian/Holsteinian Interglacial and the Last Interglacial to account for anomalies within the large vertebrate assemblages from these localities.

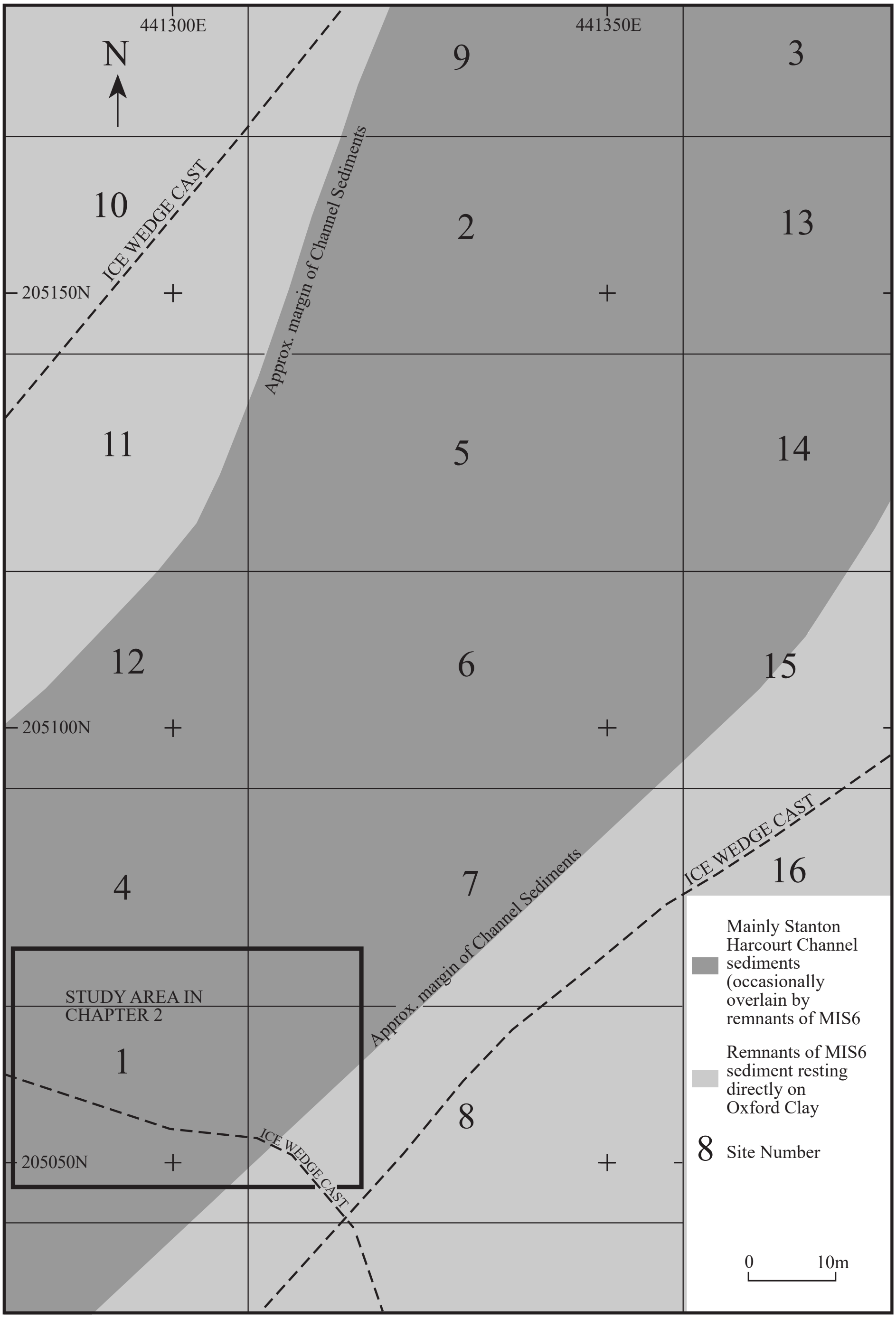

Figure 1.3 Plan of the excavation grid at Dix Pit, Stanton Harcourt

The emergence of the oxygen isotope record to become a stratigraphic standard with which terrestrial sequences may be correlated was thus widely welcomed. Of particular relevance to this site was the proposal that the temperate deposits of the Stanton Harcourt Channel should be equated with the so-called 'new' interglacial (MIS 7) between the established Last Interglacial (Ipswichian) and the Hoxnian (Briggs *et al.* 1985). Amino acid racemisation of molluscs from the site supported this view and indicated a date of c.190,000-200,000 years BP (Bowen *et al.* 1989).

The excavations

The area covered by fieldwork between 1990 and 1999 was approximately 150m x 100m and was divided into a number of separate excavations (Figure 1.3). From the outset, bones, teeth and tusks were numerous and frequently associated with Pleistocene molluscs and vegetation (including oak) clearly indicative of a warm climate. Although many larger bones and tusks appeared to be in poorly sorted coarse gravels, there were also other bones in silt and sand layers. Sedimentary structures such as ripple laminae within these sand or silt layers indicated relatively undisturbed sedimentary deposits within the river channel. There was no evidence of major floods or mixing of material of different Pleistocene environments and this suggested that the basal sediments at Stanton Harcourt were all deposited during the same interglacial by the same river, gradually, over a period of time (See Chapters 2 and 3).

Of the numerous large vertebrate remains at the site, mammoth was overwhelmingly the best represented (Table 1.1; Figures 1.4 and 1.5). Initially, this was identified as the cold-adapted woolly mammoth *Mammuthus primigenius*, yet the associated environmental evidence indicated that these mammoths were living in a warm climate in the vicinity of deciduous woodland. This was further supported by the discovery in 1993 of the molar of a straight-tusked elephant *Palaeoloxodon antiquus*, a true temperate forest species. There was much discussion as to whether the mammoths represented populations from the previous cold stage that had been isolated in Britain by the MIS 7 sea-level rise and adapted to a temperate habitat. However, during the course of preparing the fossil material for publication, new research into the evolution of mammoths indicated that, on the basis of certain distinctive dental characteristics, some assemblages of mammoths previously described as woolly mammoths were more correctly a late form of *M. trogontherii* - the steppe mammoth (Lister and Sher 2001). Based on their criteria, the Stanton Harcourt mammoths were also identified as *M. trogontherii* (Scott 2007). The significance of this

Number of specimens	
Carnivores	
Canis lupus, wolf	1
Ursus arctos, brown bear	10
Felis spelaea, lion	3
Herbivores	
Palaeoloxodon antiquus, straight-tusked elephant	57
Mammuthus trogontherii, steppe mammoth	922
Proboscidean unidentifiable post-cranial	274
Equus ferus, horse	34
Cervus elaphus, red deer	4
Bison priscus, bison	125
Bovid/equid unidentifiable post-cranial	21
Other post-cranial unidentifiable to species	126
TOTAL	**1577**

Table 1.1 Summary of identifiable large vertebrate remains from Stanton Harcourt

Figure 1.4 Excavating a mammoth tusk

Figure 1.5 A mammoth mandible with dentition being uncovered

finding was that the steppe mammoth is a common element in interglacial faunal assemblages and thus the apparent anomaly of mammoths in a temperate environment was resolved. A particularly diagnostic feature of the Stanton Harcourt mammoths is their small size relative to steppe mammoths from earlier interglacials (Figure 1.6). As described in Chapter 4, this is now recognised as an important marker for MIS 7 (Lister and Scott in press).

Unexpectedly, soon after the excavations began, the first of more than 30 stone artefacts was discovered, many of them in good (unrolled) condition. Until the emerging realisation of the 'new' interglacial c.200,000 years ago, it had been generally accepted that the north European interglacials were characterised by heavy forestation. The apparent absence of archaeological evidence from known sites of interglacial age supported the conclusion that forested habitats were unsuitable for hunter-gatherers. Although this remains true for the Last Interglacial, the evidence at Dix Pit indicates that the terrain during MIS 7 (at least as represented by the excavated deposits) was predominantly open with some woodland in the vicinity and was evidently favourable to hominins (See Chapter 8).

Continued excavations at Stanton Harcourt throughout the decade enabled detailed documentation of this MIS 7 environment, a habitat where hominins co-existed with lion, bear and various large herbivores, including the steppe mammoth. This was a unique opportunity to excavate an ancient riverbed in 3-dimensions and to establish the nature of the fossil accumulation in its sedimentary deposits.

Geological context of the Stanton Harcourt Channel

Understanding the sediment that is deposited by a river requires an appreciation of a large number of variables. The amount and particle size of the sediment carried by a river is mainly a feature of its discharge. This in turn depends mainly on the rainfall, the river gradient and the size of the catchment. The type and structure of the rock over which the river flows are

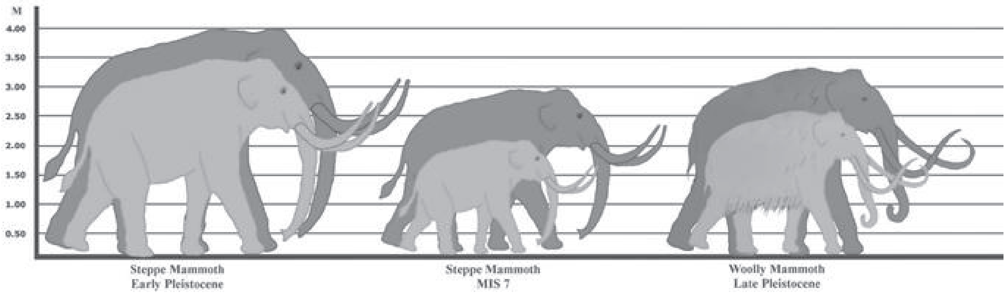

Figure 1.6 Shoulder height in British Pleistocene mammoths estimated from fossil post-cranial remains. Minimum and maximum shoulder heights for the Early Pleistocene steppe mammoths and the Late Pleistocene woolly mammoths are calculated from the skeletal remains of males (data from Lister and Stuart 2010). Females are likely to have been smaller. The remains of the MIS 7 steppe mammoths were not sufficiently complete to determine the sex of individuals. Thus the figure simply represents the shortest to tallest individuals represented (Scott and Lister in press).

also significant factors in determining how easily material can be entrained and transported by the water and how the size and nature of that river evolves. Disarticulated bones and pieces of wood can also be regarded as potential sediment to be transported if the discharge is high enough and deposited when the energy wanes.

The regional setting of the Stanton Harcourt Channel

At the time of the existence of the Stanton Harcourt Channel the catchment area of the Upper Thames and its tributaries was probably of a similar size to that of today. The palaeo-Thames had a meandering route on low lying relatively flat land along a wide valley between Cheltenham and Oxford, north of its current route. This area is mainly defined by the NE/SW strike of the Jurassic Oxford Clay, north of the Corallian limestone escarpment. Throughout the Middle and Late Pleistocene, the River Thames has shifted laterally down-dip to the SE, in response to both channel migration and regional uplift (Maddy 1997).

The main tributaries drained NW to SE down the limestone dip slope of the Cotswolds, joining the palaeo-Thames on its left bank, when looking downstream to the NE (Figure 1.1). The gradient of the tributaries would have been higher and the potential for both incision and deposition would consequently have been greater than that of the main river, especially during Glacial Stages of the Pleistocene. As a result, previously deposited fluvial sediments remain as discontinuous river terraces on the NW side of the main valley, mainly at the confluences with, and in, the lower reaches of the tributaries. The fluvial deposits form a series of terraces which become progressively younger and at a lower elevation towards the current R. Thames. Bridgland *et al.* (2004) have stressed the importance of terrace sequences for providing a semi-continuous record of Pleistocene fluvial deposition, with periodic incision isolating individual deposits with unique faunal and floral characteristics.

The tributary of particular interest to the Site is the River Windrush. In the area near Stanton Harcourt, sediment mainly from the R. Windrush has encouraged the R. Thames to migrate south eastwards and to undercut the Jurassic Escarpment. The Pleistocene sediments discussed here underlie the Second Terrace surface (approx. 70m above OD) and at the time of deposition were located near the confluence of the River Thames and its tributary the R. Windrush (Fig 1.1). These sediments are separated from the First Terrace by an outcrop of Oxford Clay which underlies the church at Stanton Harcourt village.

At Dix Pit, Stanton Harcourt, the Second Terrace is comprised of two distinct gravel deposits representing two climatic events within the Pleistocene. The upper deposit, mainly composed of limestone dominated sand and gravel, was the deposit of commercial interest and reached a depth of 5-6 metres. Underlying this, the bone-bearing sediments formed about 1m of sediment that remained at the bottom of the gravel pit after quarrying ceased, mostly below 64m above OD. These basal deposits described as the Stanton Harcourt Channel are formally known as the Stanton Harcourt Bed of the Summertown-Radley Member of the Upper Thames Formation and are correlated with the interglacial at Marine Isotope Stage 7 (MIS 7) (Bowen, 1999).

The presence of the earlier gravel terraces and fossils within the Oxford Clay provided the raw material for potential incorporation into the sediment of the Stanton Harcourt Channel. The gradient of the channel would have been low where it flowed over the clay. At the excavation site the bone-bearing channel deposits were found to lie between clear geological boundaries.

Lower Stratigraphic Boundary

Mapping of the Stanton Harcourt Channel showed that the MIS 7 bone-bearing sediments of interest had a lower stratigraphic boundary with the Upper Jurassic Oxford Clay (Buckingham *et al.* 1996; Buckingham 2004 and Figure 1.). The excavation area was in the Stewartby Member (Middle Oxford Clay), near the transition from the *Kosmoceras spinosum* sub-zone of the *Peltoceras athleta* zone to the *Quenstedtoceras lamberti* zone (Cox *et al.* 1992). The Stewartby Member is a stiff, light blue grey, plastic clay, which is occasionally silty (Hollingworth and Wignall 1992). Ammonite zone fossils in this clay indicate that the base of the Stanton Harcourt Channel was near the boundary with the Lamberti limestone, a distinctive fossiliferous, calcareous mudstone bed within the Oxford Clay. 'Turtle stones' (large pillow-shaped concretions from the Oxford Clay) were also commonly *in situ* near the top of the clay, at the base of the Pleistocene sediments. Scours and grooves below the sediments of interest, together with local fossils and lumps of clay within them, suggest that this boundary was erosive (Buckingham 2004).

Fieldwork suggested that the harder mudstone layers and turtle stones within the Oxford Clay were instrumental in inhibiting the lateral migration of the Stanton Harcourt Channel. An environment was created where there was net sedimentation rather than erosion which resulted in the location of this exceptional fossiliferous site (See Chapter 2).

Upper Stratigraphic Boundary

At the excavation site it was observed that the upper stratigraphic boundary of the MIS 7 bone-bearing beds was also predominantly erosive with scours and cobbles at the base of overlying limestone dominated sand and gravel. Evidence indicated that the overlying sediment belonged to periglacial conditions of the succeeding glacial at MIS 6. Patterned ground with ice wedge casts was mapped. One cast bisected two mammoth tusks and a bison jaw within the MIS 7 sediments (Figures 1.7 and 1.8). A reindeer shed antler was also excavated from the MIS 6 basal sediment. In areas of Dix Pit beyond the margins of the MIS 7 channel, the MIS 6 sediments directly overlie Oxford Clay.

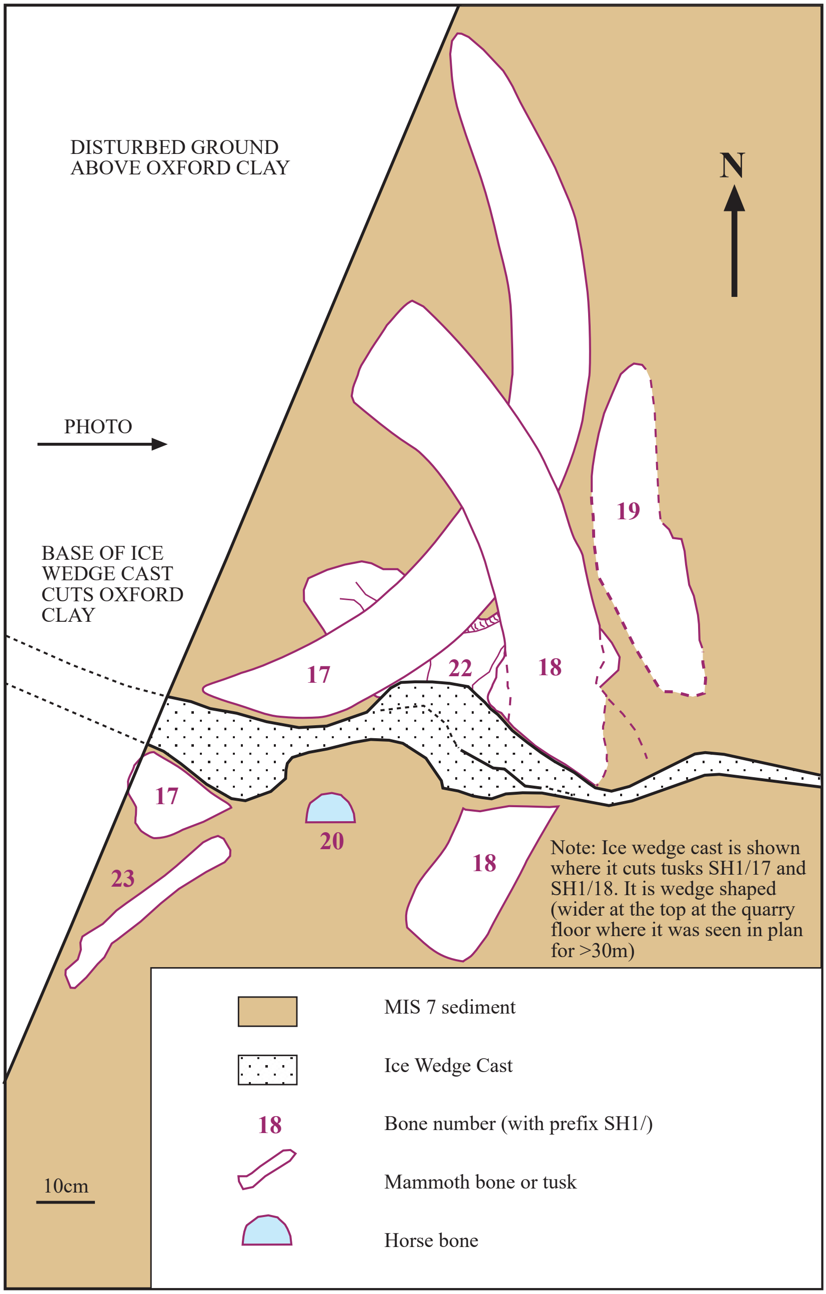

Figure 1.7 (a) Plan of ice wedge cast at Site 1 bisecting mammoth tusks SH1/17 and SH1/18

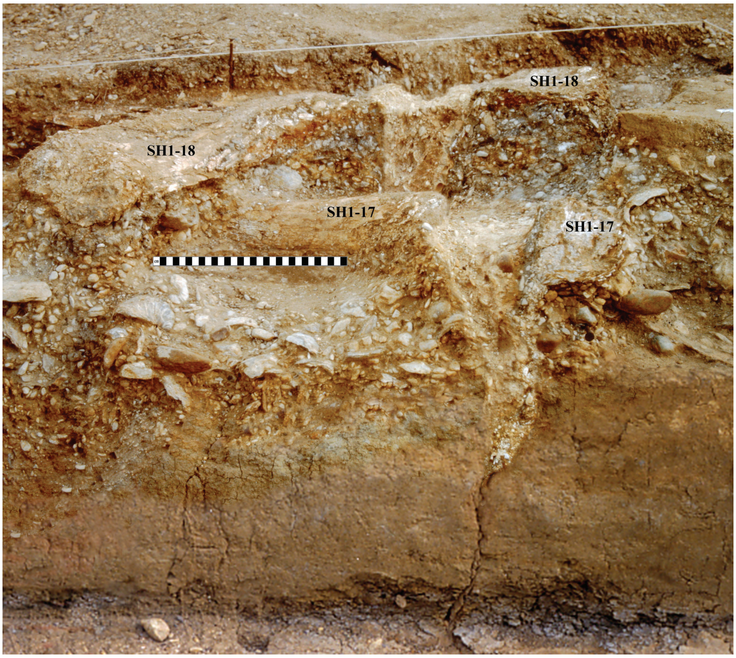

Figure 1.7 (b) Photograph of the ice wedge and tusks taken from west

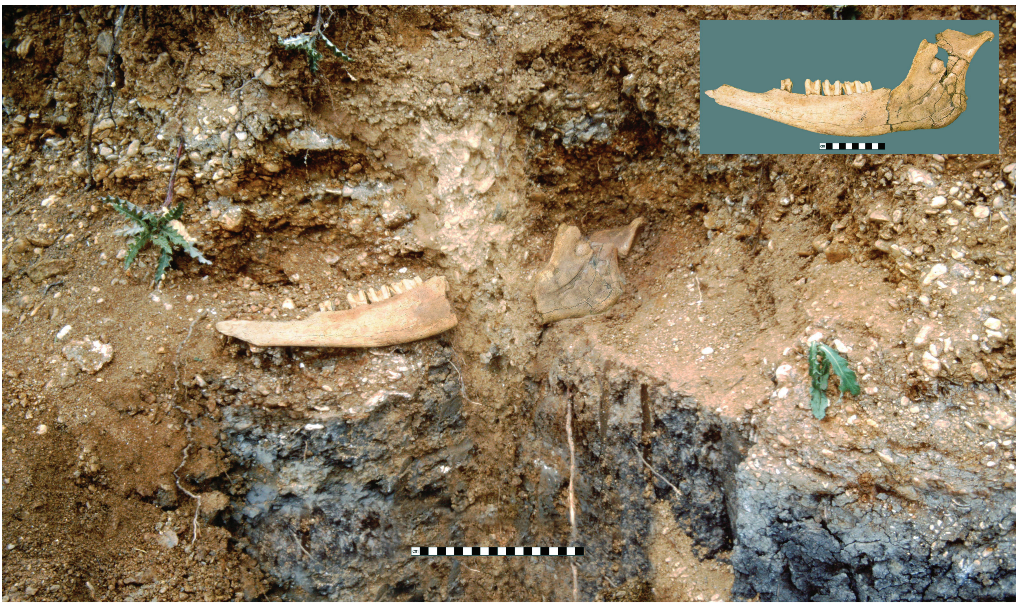

Figure 1.8 Ice wedge bisecting bison mandible SH1/340). Inset: the mandible once restored