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A butchered bone from Norfolk: evidence for very early human presence in Britain

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Before the Anglian glaciation some 450,000 years ago, much of England was drained by large rivers that deposited sediments – known as the Cromer Forest-bed Formation – now exposed along the coast of East Anglia. The Forest-bed has yielded a great variety of fossils but until now no definite evidence of human activity. The recent discovery of cut marks on a bison bone collected from it in the nineteenth century demonstrates conclusively that humans were present in this part of East Anglia over half a million years ago.

Research on the bison bone from Norfolk is part of an interdisciplinary programme – the Ancient Human Occupation of Britain (AHOB) project[1] – that is investigating glacial and pre-glacial deposits along the East Anglian coast, focusing particularly on the stratigraphy, palaeoenvironments and age of the Cromer Forest-bed Formation and associated deposits. Today the Forest-bed (so named because tree stumps are preserved in the sediments) is exposed discontinuously on the foreshore and in cliffs for over 80 km from Sheringham in north Norfolk, south to Kessingland near Lowestoft in Suffolk.[2] Excavating and recording these deposits is often challenging and sometimes dangerous work, as they outcrop at the foot of precipitous and unstable cliffs (Fig. 1). What makes the Forest-bed very interesting archaeologically is that it was deposited at a time when humans first moved out of Africa and dispersed into Asia and Europe. Throughout this period the floodplains of the rivers that deposited the Forest-bed sediments would have provided an attractive environment for hunter–gatherers, with a wide range of animals and plants to exploit.

As early as the 1860s, the eminent Victorian geologist Sir Charles Lyell predicted that human artefacts would one day be found in the Forest-bed,[3] but after nearly 200 years of intensive searching, including the discovery of so-called eoliths, which are now thought to have been flaked by natural processes,[4] no convincing artefacts have been found in its sediments. Why this should be so has become increasingly perplexing, because Lower Palaeolithic sites, such as Boxgrove in Sussex,[5] show that humans were present in other parts of southern England at this time. Spurred on by abundant finds of stone tools and bones at Boxgrove, archaeologists and geologists are again actively examining the Forest-bed for evidence of human presence.

One of the many objectives of the AHOB project is to document and research existing museum collections of finds from the Forest-bed, including animal bones, and to undertake small-scale field investigations with the aim of establishing their age, geological context and environmental setting. One unexpected result of this work has been the discovery of sites where bones show that large animal carcasses were butchered with stone tools, but at which no such tools have been recovered.[6] The most remarkable outcome so far is the discovery, in a nineteenth-century collection of animal bones from the Forest-bed, of a butchered bone with cut marks on it. This is the first unequivocal evidence for human presence contemporary with the Forest-bed. It is an exciting discovery, but it is even more intriguing that such evidence has been so difficult to find. Possible reasons for the lack of evidence of humans in the Forest-bed sediments are discussed later in this article.

Figure 1 View of the cliff at Pakefield south of Lowestoft on the Suffolk coast, showing dark Forest-bed sediments at the foot of the cliff, overlain by glacial deposits, April 2000.

The cut-marked bison bone

The cut-marked bison bone is part of a large collection of specimens of Forest-bed vertebrates sold to the Natural History Museum in 1897 by A. C. Savin. He was a local fossil collector who amassed the single largest collection of Forest-bed vertebrate fossils. When I recently examined this collection, I identified multiple cut marks on a complete foot bone from one of the hind limbs of a bison,[7] and thus provided the first unambiguous evidence of human activity from the Forest-bed so far described. Savin's catalogue indicates that the specimen was collected from Forest-bed sediments at Happisburgh on the Norfolk coast (Fig. 2). Its surface morphology is exquisitely preserved,[8] and shows classic signs of butchering, consisting of two distinct sets of parallel incisions on the lateral (Fig. 3) and medial faces. The incisions on the medial face are deeply incised, are V-shape in cross section and are sharply angled, showing that the marks were inflicted by a stone tool such as a sharp flake used with slicing strokes. Foot bones are commonly discarded at primary butchery sites and the anatomical placement of the cuts suggests dismemberment rather than defleshing or skinning.

When studying old collections, one first has to establish the provenance of the finds. Savin's catalogue indicates that the cut-marked bone was collected from a foreshore exposure of the Forest-bed north of Cart Gap at Happisburgh. Unfortunately, he did not record a detailed description of the geological context of the find, and because the cliff at Happisburgh has eroded greatly since the late nineteenth century, it is now impossible to locate the spot where he found the bone. However, contemporary geological accounts show that the cliff right along the Happisburgh coast consisted of glacial deposits resting on top of fossil-rich Forest-bed sediments. More recently, Richard West (a palaeobotanist at the University of Cambridge), studied the geological succession at Happisburgh.[9] He demonstrated that below the

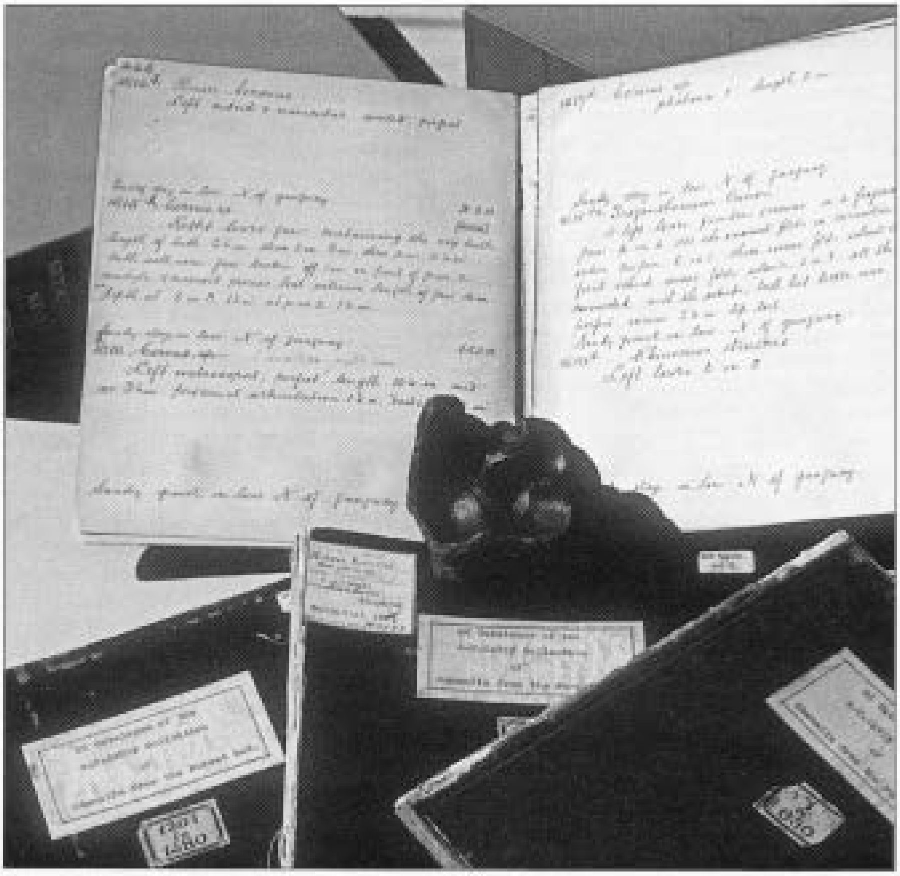

Figure 2 *The bison foot bone from Happisburgh, with A. C. Savin's catalogue of his collection of vertebrate fossils from the Forest-bed.*

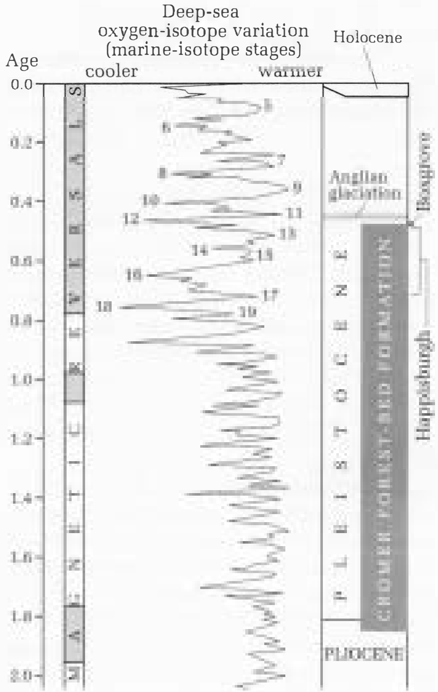

Figure 4 *Chronology of the past two million years, showing the positions of the Cromer Forest-bed Formation and the Anglian glaciation in relation to those of the pre-Anglian Lower Palaeolithic sites of Happisburgh and Boxgrove, and changes in global climate inferred from variations in oxygen isotopes in the shells of marine micro-organisms (foraminifera) preserved in deep-sea sediments. The deep-sea oxygen-isotope stages are numbered sequentially back in time from the present interglacial period (= Marine Isotope Stage 1). Changes in Earth's magnetic field (magnetic reversals) provide a means of correlating the marine oxygen-isotope curve with terrestrial deposits; grey areas in the column indicate normal polarity (when the Earth's magnetic polarity was north-facing, as today) and unshaded areas show periods of reversed polarity.*

glacial sediments there is a deep sequence of mainly estuarine and marine deposits (resting on chalk bedrock), which he correlated with the early part of the Forest-bed *c.* 1.8–1.6 million years ago (Fig. 4). Subsequently, mammalian specimens from Happisburgh (many found loose on the beach) were studied by Adrian Lister of the UCL Department of Biology.[10] He found that they consisted of a mixture of Late Pliocene to Early Pleistocene and early Middle Pleistocene species and thus demonstrated that there were younger Forest-bed sediments at Happisburgh than those sampled by West. A comparison of measurements of the Happisburgh bison bone with the same type of bone from other bovid specimens from Late Pliocene and Pleistocene sites in Europe confirms that it is most likely to belong to the more recent group of fossils and hence to come from what is termed the Cromerian Complex, sometime between approximately 800,000 and 500,000 years ago. These more recent bones from Happisburgh probably derive from a channel incised into the earlier deposits, and this is the probable context of Savin's cut-marked bone.

Figure 3 *Detail of the left hind foot bone (navicular-cuboid) of a bison from the Forest-bed at Happisburgh, collected by A. C. Savin and now in the Natural History Museum, London (accession number M6583). It shows parallel cut marks on the lateral face just below the articular surface, the position and orientation of which suggest that the foot was disarticulated from the hind limb. Before the specimen was photographed, it was dusted with ammonium chloride to overcome the effects of both the dark colour of the bone, caused by humic staining while it lay in the sediment, and of shine, caused by later use of a consolidant to conserve it.*

Pre-glacial geography and the earliest occupation of Britain

Until recently, it was thought that the earliest occupation of Britain had followed the most extensive (Anglian) glaciation that affected the British Isles some 485,000 years ago, but excavations at Boxgrove in the mid-1980s firmly established the presence of humans in Britain approximately 500,000 years ago, before the Anglian glaciation.[11] Boxgrove has gained international renown because of the discovery there of hominid fossils and spectacular assemblages of flint artefacts and butchered animal bones,[12] but there are several other less well known British Lower Palaeolithic sites that have also been shown to pre-date the Anglian glaciation.[13]

Immediately prior to the Anglian glaciation, the palaeogeography of Britain differed greatly from that of the present day (Fig. 5). Britain was then a northwestern peninsula of Europe, and across what is now the English Channel a chalk ridge formed a land bridge that connected southeastern England to the mainland. The land bridge was the point of entry into Britain for migrating animals, including humans. To its south and west, raised-beach deposits along the foot of the South Downs in Sussex and estuarine deposits south of the Solent on the Isle of Wight record the position of the pre-glacial coast, which formed a large embayment fed by the proto-Somme and -Seine and the former Solent river. To the east and north of the land bridge a vast marine embayment formed the southern part of the North Sea basin, which was mostly infilled by deltaic sediments deposited by rivers flowing across the north European plain (the proto-Rhine and -Meuse), and east across Britain (the proto-Thames and the former Bytham river) (Fig. 5).

Palaeolithic stone tools have been found in abundance in the terraces of the proto-Thames, Solent and Bytham rivers and their tributaries. This reflects occupation along their banks and suggests that their floodplains presented easy routes of access for humans migrating into Britain. Some of the most important pre-glacial archaeological sites have been found in floodplain deposits of the Bytham river. Victorian antiquarians discovered several of them (e.g. High Lodge and Warren Hill), but others have come to light within the past few years as a result of the extraction of gravel for construction. These sites were originally believed to be relatively recent (perhaps no older than 200,000 years), but detailed geological mapping in the late 1980s by geomorphologist Jim Rose and colleagues showed that the sites in the west Midlands and East Anglia were associated with quartz and quartzite-rich river deposits beneath Anglian till (rocky debris left by the ice sheet), which could be traced to the East Anglian coast. This geological detective work demonstrated conclusively that the sites were pre-glacial in age.[14]

Raw-material availability and mapping humans on the landscape

The distribution of British pre-glacial sites demonstrates that the availability of raw material strongly controls the visibility of past human activity in the palaeo-landscape. During the period of the Forest-bed, the sites with the most artefacts are those associated with the most abundant and high-quality flint, exposed for example in chalk seacliffs, as at Boxgrove, or where rivers have eroded or cut through chalk bedrock, as at Warren Hill. These examples reflect a broader pattern, whereby, when the Lower and Middle Palaeolithic sites are plotted on a map of the distribution of the chalk, it can be seen that the sites with the largest assemblages of artefacts are invariably located near chalk escarpments or cliffs or in river deposits immediately down stream of them, as in the middle Thames Valley, where high-quality flint for tool manufacture could be procured easily. Conversely, in parts of southeast England where flint of good quality is rare, such as the Weald, much of the Thames basin and the coastal hinterland of East Anglia, artefacts are scarce. This suggests that, in areas where there was a ready supply of this raw material, evidence for human activity is abundant, because tools were made and discarded there. In contrast, in areas where flint was scarce, people conserved the stone tools that they had transported, and discarded them only rarely.

What implications does this have for our reconstruction of how humans exploited the landscapes of the Forest-bed river systems? It seems likely that the availability of raw materials may explain why it has taken so long to find evidence of human occupation in these deposits. In the lower reaches and estuaries of the Forest-bed rivers, sediments are generally of fine grain. Gravel deposits are scarce in these stretches of the rivers, and most of the flints in the deposits have been reworked from beach gravels by water action, or transported down stream from the chalk region of central East Anglia. These river gravels constitute a scarce secondary source of flint, but the flint nodules are generally small, of poor quality and often frost-shattered or battered and rolled by water. The cut-marked bone from Happisburgh, together with the apparent absence of any discarded stone tools in the Forest-bed sediments, suggests that people brought flint implements with them to butcher large mammal carcasses, and that these tools were carefully curated and seldom discarded.

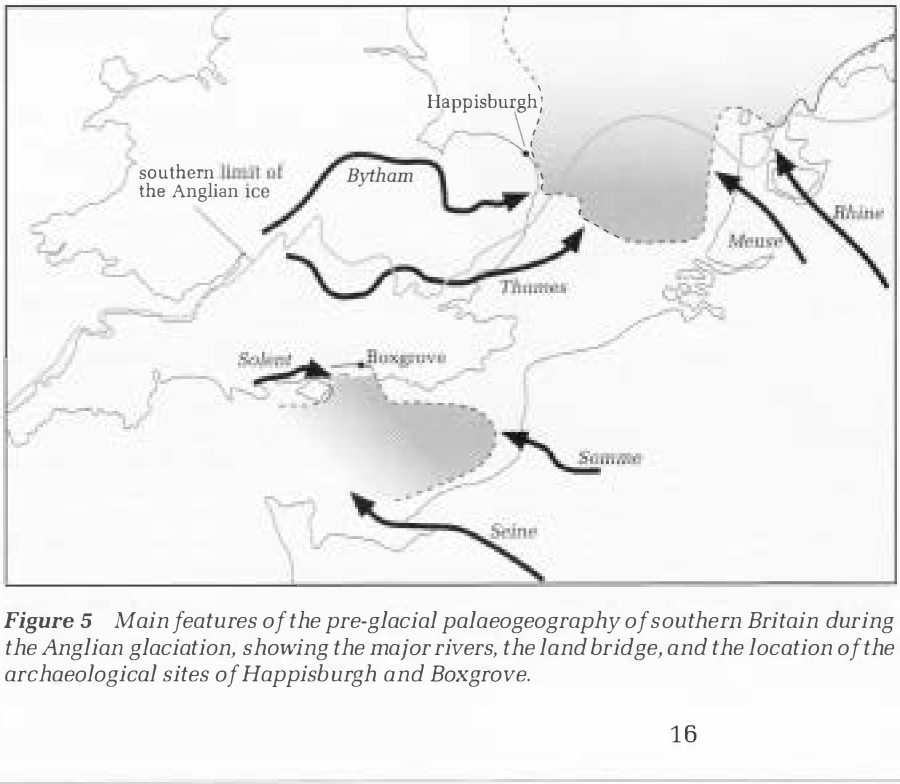

Figure 5 *Main features of the pre-glacial palaeogeography of southern Britain during the Anglian glaciation, showing the major rivers, the land bridge, and the location of the archaeological sites of Happisburgh and Boxgrove.*

Conclusion

After nearly two centuries of investigation of the Forest-bed, the cut marks on the bone from Happisburgh, and its stratigraphical position, constitute the first conclusive evidence that humans were present in this part of East Anglia before the first major glaciation of lowland England. This find fills a significant gap in the geographical distribution of pre-glacial archaeological sites in Britain and reinforces the view that humans at this time were living, under varied climatic regimes, in a wide range of environments that extended from the coastal fringe along river valleys and into upland areas. Many of the sites have yielded prolific quantities of stone tools. We may therefore ask why has it been so difficult to find evidence for human occupation along the lower reaches and estuaries of the former Forest-bed rivers? There may be several reasons for this, but the main one is likely to be the paucity of flint of good quality as a raw material, and a consequent lack of knapping debris from stone-tool manufacture, which has frequently provided evidence elsewhere of Palaeolithic occupation.

The East Anglian coast is now a key area in the search for evidence of the earliest human occupation of Britain. Extensive stretches of it are currently undergoing accelerated erosion by the sea, which is exposing geological sections that were previously hidden by sea defences and sand dunes. These exposures offer a unique window into the Pliocene–Pleistocene history of northwest Europe and they have the potential to contribute significantly to our knowledge of the timing and nature of the first human colonization of northern Eurasia.[15]

Notes

1. The AHOB project is a five-year interdisciplinary research programme, funded by the Leverhulme Trust, which began in October 2001. It is led by Chris Stringer (Natural History Museum) and brings together a range of specialists from several British universities and museums to investigate when people first arrived in Britain and what factors led to their survival or local extinction. The project spans the period from the first signs of human occupation during the early Middle Pleistocene, more than 500,000 years ago, to the beginning of the Holocene about 10,000 (*c.* 11,500 calibrated radiocarbon) years ago. Much of this work is being undertaken by AHOB members and associates, including Jim Rose and colleagues (Royal Holloway, University of London) in collaboration with the British Geological Survey (Jonathan Lee, Richard Hamblin, Brian Moorlock). Previously known sites in the East Anglian Brecklands are being re-investigated by Nick Ashton (British Museum), Simon Lewis (Queen Mary, University of London), Jim Rose and myself (Institute of Archaeology, UCL). Further details, including a list of members and associates, can be found at http://www.nhm.ac.uk/hosted_sites/ahob and see N. Ashton, "Hunting for the first humans in Britain", *British Archaeology* **70**, 8–13, 2003.
2. The Forest-bed has a long history of investigation, and its dating and stratigraphy continue to be revised. There is a voluminous literature on it; for a recent summary see R. C, Preece & S. A. Parfitt, "The Cromer Forest-bed Formation: new thoughts on an old problem", in *The Quaternary of Norfolk and Suffolk. Field Guide*, S. G. Lewis, C. A. Whiteman, R. C. Preece (eds), 1–27 (London: Quaternary Research Association, 2000). For accounts of the spectacular vertebrate fossils of the Forest-bed see A. J. Stuart, "Vertebrate faunas from the early Middle Pleistocene of East Anglia", in *The early Middle Pleistocene in Europe*, C. Turner (ed.), 9–24 (Rotterdam: A. A. Balkema, 1996), and A. J. Stuart, "The West Runton elephant", *Current Archaeology* **149**, 164–8, 1996.
3. See p. 228 in C. Lyell, *The geological evidence of the antiquity of man, with remarks on theories of the origin of species by variation* (London: John Murray, 1863).
4. An enthralling discussion of the eolith controversy can be found in F. Spencer, *Piltdown: a scientific forgery* (London, Oxford and New York: Natural History Museum Publications and Oxford University Press, 1990); see also A. O'Connor, "Geology, archaeology, and the 'raging vortex of the eolith controversy' ", *Proceedings of the Geologists' Association* **114**, 255–62, 2003.
5. For a popular account of the discoveries at Boxgrove see M. Pitts & M. Roberts, *Fairweather Eden: life in Britain half a million years ago as revealed by the excavations at Boxgrove* (Century: London, 1997). The work at Boxgrove undertaken over many years by staff and students from the Institute of Archaeology has also been described in two articles in *Archaeology International*, the first by Mark Roberts in the 1997/1998 issue and the second by Matthew Pope in the 2003/2004 issue.
6. For a report on one such site, see S. A. Parfitt, "A Middle Pleistocene butchery site at Great Yeldham, Essex", *Quaternary Newsletter*, in press.
7. The specimen is a navicular-cuboid, a foot bone of the hind limb that articulates with two other bones of the foot, the astragalus and calcaneus.
8. Small patches of grey silt overlie the cut marks, demonstrating that the marks are ancient. A sample of this sediment was processed to see if it contained ancient pollen grains that might provide information about the depositional context of the bone, but no pollen was recovered (Phil Gibbard, pers. comm.).
9. R. G. West, *The pre-glacial Pleistocene of the Norfolk and Suffolk coasts* (Cambridge: Cambridge University Press, 1980).
10. A. M. Lister, "The stratigraphical significance of deer species in the Cromer Forest-bed Formation", *Journal of Quaternary Science* **8**, 95–108, 1993, and "The stratigraphical interpretation of large mammal remains from the Cromer Forest-bed Formation", in *The early Middle Pleistocene in Europe*, C. Turner (ed.), 25–44 (Rotterdam: Balkema, 1996).
11. The cold period of the Anglian glaciation is believed to equate in the deep-sea record with Marine Isotope Stage 12 (MIS 12) *c.* 485,000–425,000 years ago (see Fig. 4). The sequence of marine isotope stages represents a succession of climatic changes inferred from variations in oxygen isotopes in the shells of foraminifera (marine microfossils) in cores of deep-sea sediments, which demonstrates a consistent pattern of oscillating cooler and warmer periods of sea temperature. Similar techniques applied more recently to ice cores from Antarctica and Greenland have yielded comparable results. The oxygen-isotope variations from both the ice- and the deep-sea cores are considered to reflect the complex sequence of glacial advances and recessions that is especially evident in the northern hemisphere during the past 700,000 years.
12. See M. B. Roberts, C. B. Stringer, S. A. Parfitt, "A hominid tibia from Middle Pleistocene sediments at Boxgrove, UK", *Nature* **369**, 311–13, 1994; C. B. Stringer, E. Trinkaus, M. B. Roberts, S. A. Parfitt, R. Macphail, "The Middle Pleistocene human tibia from Boxgrove", *Journal of Human Evolution* **34**, 509–547, 1998; and M. B. Roberts & S. A. Parfitt, "*Boxgrove. A Middle Pleistocene hominid site at Eartham Quarry, Boxgrove, West Sussex*, (London: English Heritage, Archaeological Report 17, 1999).
13. See J. Wymer, *The Lower Palaeolithic occupation of Britain* (Salisbury: Wessex Archaeology and English Heritage, 1999).
14. J. Rose, "Major river systems of central and southern Britain during the Early and early Middle Pleistocene", *Terra Nova* **6**, 435–43, 1994.
15. The research described here was undertaken as part of the AHOB project. I have benefited from discussion with AHOB colleagues and associates, especially Andy Currant, Adrian Lister, Richard Preece, Chris Stringer and Jim Rose. In particular I would like to thank John Stewart, who helped me see the wood for the trees. I also thank Rob Symmons and the Photographic Unit, Natural History Museum, who helped prepare figures. I am indebted to Nigel Larkin, who provided a list of Happisburgh material in the Norwich Castle Museum, and to Tony Stuart for access to the collection.