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Boxgrove: Palaeolithic hunters by the seashore

Mark B. Roberts

Excavations at Boxgrove in Southeast England have yielded a detailed picture of how humans lived there, and of the environments they occupied, 500,000 years ago. The director of the project – which is funded by English Heritage – discusses Boxgrove's place in the early colonization of Europe and argues that the site's occupants were highly capable hunters.

Around half a million years ago, hominids first walked into the landmass now known as the British Isles. At that time, England was physically connected to the rest of Europe by a substantial landbridge, primarily composed of chalk, and the ancestral English Channel was only open to the Atlantic Ocean, in the west.[1] The area now covered by the southernmost North Sea was a massive river delta, of which the River Thames was merely a left-bank tributary.[2] The valley of the Thames ran to the north of the river's current course and flowed eastwards into the delta through what is now northern Essex.[3]

The earliest record of hominid occupation in Middle Pleistocene Britain (Fig. 1, Table 1), comes from the southern (dip-) slope of the South Downs and the upper coastal plain of West Sussex. The palaeogeography of this area too was substantially different 500,000 years ago. The Isle of Wight was still connected to the mainland. A major fluvial system – the Solent River – entered the sea between the northeast of the Isle of Wight and the west of a coastal embayment, backed by chalk cliffs, that extended over 30 km from present-day Ports Down in Hampshire to Arundel in West Sussex (Fig. 2). Within the embayment, the sites of Boxgrove, and to a lesser extent Slindon, preserve evidence of the activities of the early hominid colonizers and the changing environments within which they operated.

Early human colonization of Europe

The area of origin of the early colonizers is largely unresolved, although Africa and the Levant are thought the most likely sources. Archaeological evidence suggests that the occupation of northern and western Europe took place very quickly during the interglacial/temperate period that began 524,000 years ago (Imbrie et al. 1984).[4] Sites appear in Spain at Atapuerca, France at Abbeville, and Germany at Kärlich and Miesenheim.[5] There may have been earlier, sporadic, occupation of the Mediterranean coast, especially in southern Spain,[6] although this remains to be conclusively proved. Support for the hypothesis of an out-of-Africa colonization comes from the presence of stone tools known as handaxes at many of the early western European sites (Fig. 3). The handaxe is a tool form that appears outside Africa only around 500,000 years ago. However, it is possible that hominid colonizers may also have been coming into Europe from the east and southeast, especially in the light of recent estimates for the age of Dmanisi in the Caucasus and Korolevo in the Ukraine, which place these sites in the Early Pleistocene, over 780,000 years ago.[7] A demographic expansion from this direction may have been fed from eastern Asia as there is now evidence of occupation in these areas back to two million years ago.[8] Early archaeological assemblages in eastern and central Europe do not contain handaxes, although this phenomenon may be attributable to a non-availability of suitable raw materials.[9]

The circumstances that led to the colonization of Europe at this time are unknown. Various hypotheses have been postulated, such as changes in the taxonomic composition of European carnivore fauna,[10] but it is most likely that the pressure for hominid expansion out of Africa resulted from climatic or demographic factors or a combination of both, within the continent.

Upon arrival in Britain, hominids dis-

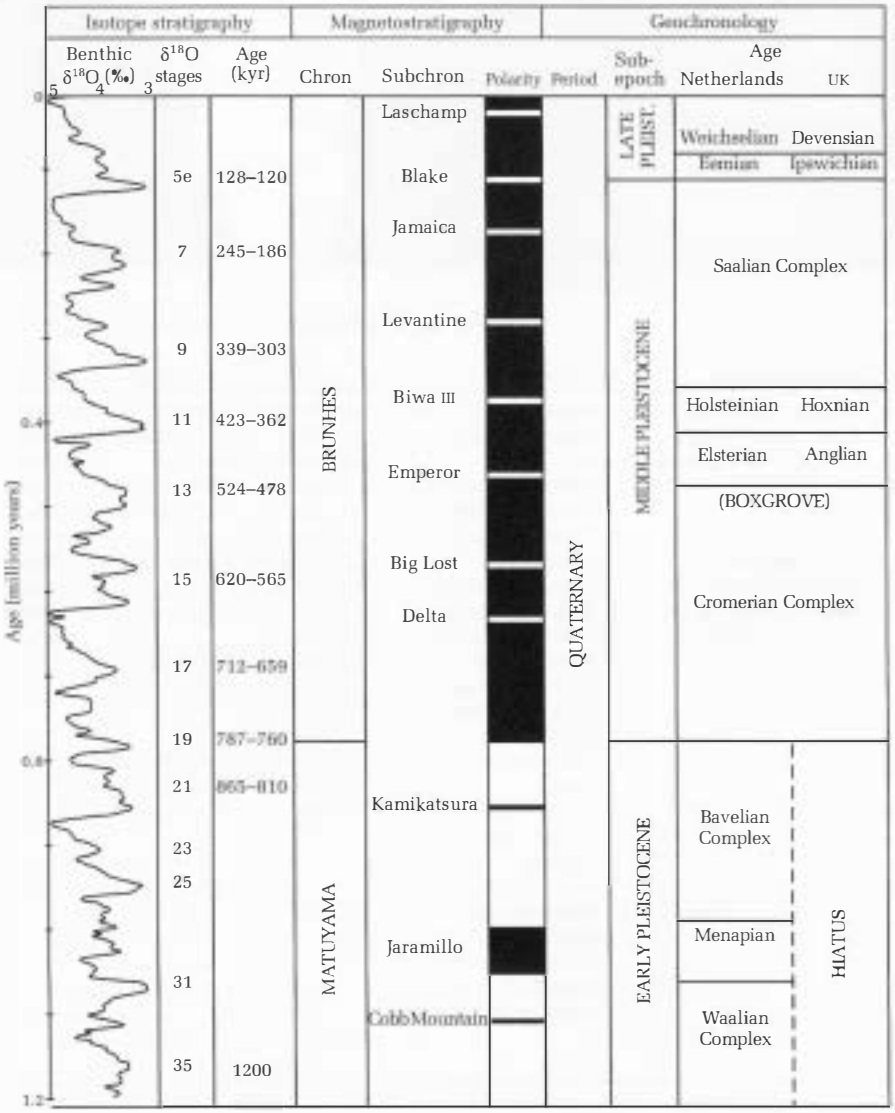

Figure 1 *Chart of the last 1.2 million years of the Quaternary Period, based on isotope stratigraphy from deep ocean cores, magnetostratigraphy showing normal (black) and reversed (white) polarity, and geochronology. The position (age) of the Boxgrove temperate sediments is shown in the right-hand column.*

Table 1 *Lithostratigraphy and chronostratigraphy in years before present (bp) of the Middle Pleistocene and Upper Cretaceous deposits of the West Sussex coastal plain in the Boxgrove area (not to scale).*

Stage	Group	Formation
Saalian complex	Lower Coastal Plain group	Norton
POSSIBLE UNCONFORMITY		
362,000 years bp		
Hoxnian/ Holsteinian?		Aldingbourne
POSSIBLE UNCONFORMITY		
424,000 years bp		
Anglian/Elsterian		Eartham
478,000 years bp	Upper Coastal Plain group	
Cromerian IV		Slindon
524,000 years bp		
MAJOR UNCONFORMITY		
c. 65 million years bp Campanian	Chalk group	Upper Chalk

persed widely. Sites that pre-date the last (Anglian) glaciation exist at Westbury-sub-Mendip (Somerset) and Kent's Cavern (Devon). In Southeast England the only sites definitely associated with this period are Boxgrove and Slindon, although Red Barns at Ports Down is another possibility.[11] The most northerly site is at Waverley Wood (Leicestershire), with other sites located in East Anglia at High Lodge (Suffolk), Warren Hill (Suffolk) and, farther south, at Wivenhoe (Essex).[12] It is possible that other sites exist or existed outside these areas, but glacial activity has removed many early Middle Pleistocene deposits to the north and west of them.

The location, geology and environmental history of Boxgrove

The oldest Middle Pleistocene sediments and preserved landsurfaces of the West Sussex coastal plain have been exposed by quarrying along the southern margin of the dipslope of the South Downs, between the Lavant Valley and the River Arun (Fig. 2). The most extensive exposures, and the only place where the complete continuous (conformable) geological sequences may be seen, are in the ARC Eartham Quarry (near Boxgrove). These workings, which cover an area of some 250ha, are located 12km from the present coastline of the English Channel and 7km east of Chichester. The quarry complex straddles the parish boundaries of Boxgrove to the west and Eartham to the east, but the conformable geological sequences, within which the Palaeolithic archaeology is preserved, are found only in the parish of Boxgrove, after which the site is named (Figs 4 and 5).

The Pleistocene marine and terrestrial sediments at the site are cut into, and unconformably overlie, Upper Cretaceous chalk. The marine deposits have been formally named the Slindon Formation, and they comprise the Slindon Gravel, Slindon Sands and Slindon Silts. The terrestrial deposits (the Eartham Formation), comprise lower and upper gravels. A transition between interglacial and cold-stage sediments is located at the interface between them (Fig. 6).

The Pleistocene sediments sit upon, and are contained within, a marine platform and chalk cliff. These features were formed during a Middle Pleistocene period of high sea level when the sea transgressed northwards over the lower coastal plain, cut into the chalk of the south-facing dipslope of the Downs and deposited a (now raised) beach (Fig. 7). The marine Slindon Sands were deposited during the period of high sea level and have now been mapped east–west over a distance of 10km in the Boxgrove area. They grade upwards into the Slindon Silts, which were formed when the direct path of the sea, retreating into a large embayment formed by the Downs, was blocked. Although the exact mechanism by which this happened is not yet known, a large saltwater tidally fed lagoon was created. At the end of the lagoon phase, following further fall of sea level, a (now buried) soil developed on the surface of the silts. It represents the most extensive Pleistocene land surface at the site, and it has produced most of the archaeological material (Fig. 8). The Pleistocene land surface was subsequently flooded with fresh water to create an alder fen or carr. This deposit was overlain by brickearths and gravels derived from soils that covered the old chalk cliff and downland north of the site, and which were eroded as vegetation cover became more sparse under an increasingly severe climatic regime. Finally, under periglacial conditions large amounts of gravel from the chalk cliff and the Tertiary rego-

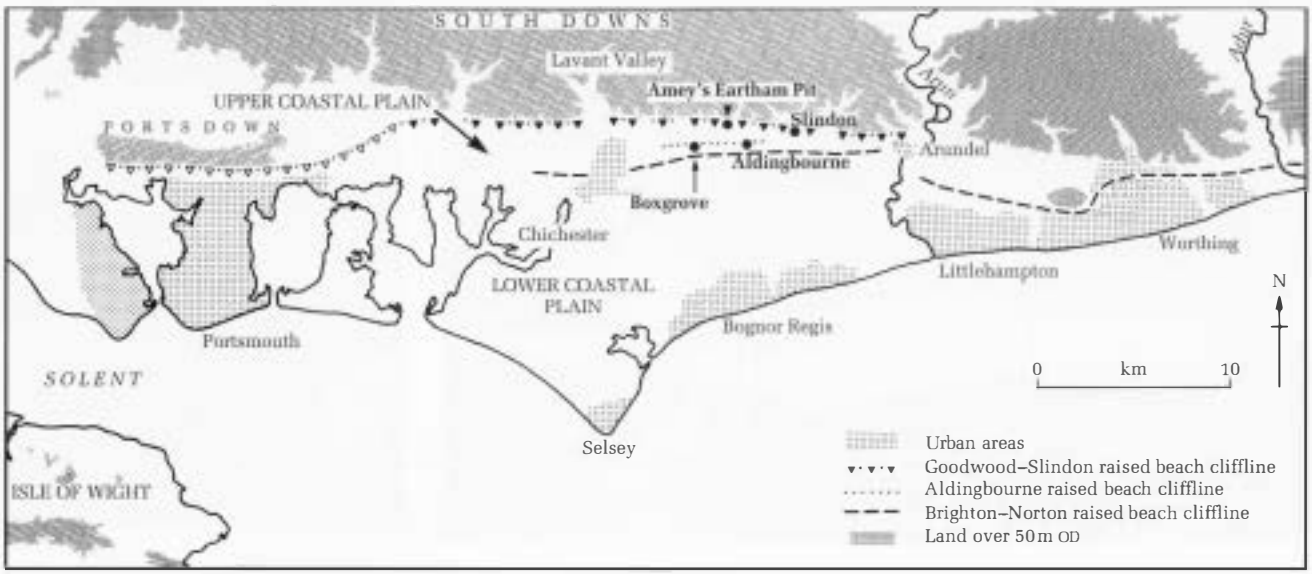

Figure 2 *Location of sites and raised beaches from Brighton to Portsmouth.*

Figure 3 *A typical Boxgrove handaxe.*

Figure 4 *An aerial view of the Boxgrove Quarries looking east.*

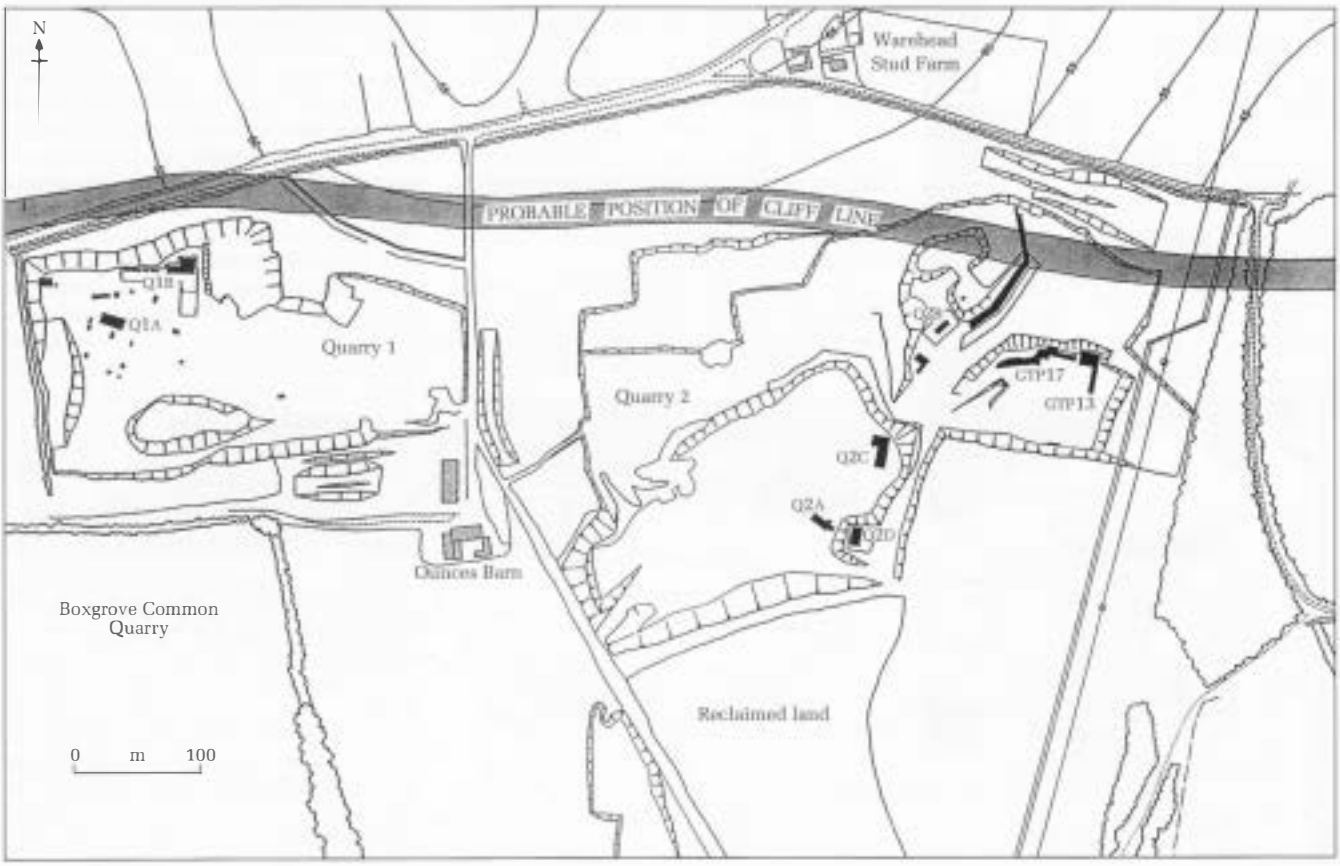

Figure 5 *Plan of the Boxgrove Quarries, showing (in solid black) the location of the main excavation areas and geological test pits.*

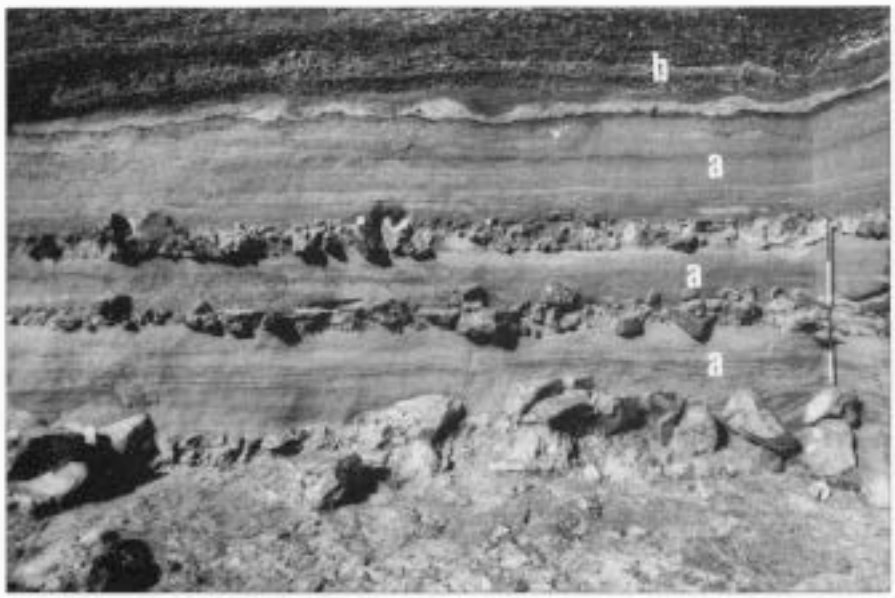

Figure 6 *The Boxgrove type section at GTP 13, showing the sediments of the largely marine Slindon Formation (a) and the terrestrial Eartham Formation (b); scale in 0.5m divisions.*

lith covering the Downs moved down slope in the form of mass-movement deposits.

Archaeological evidence

All the sedimentary units at Boxgrove contain archaeological material, in the form of flintwork, and, in some units, the remains of butchered animals, but it is most abundant and least disturbed in the Slindon Silts and the soil horizon that developed on their surface. Linking the archaeology to the geological and palaeoenvironmental evidence demonstrates that the area was occupied by hominids for tens of thousands of years.

The stone tools, all of which are made from local flint, are dominated by handaxes. There are also a few flake tools, including categories such as end scrapers, side scrapers, transverse and notch scrapers. Other stone artefacts are large blocks of nodular flint which were used as anvils and hammerstones. The most abundant component of the stone (lithic) assemblages is the flint waste from the production of the handaxes (Fig. 9). In addition to the stone tools, bone and antler hammers have been preserved, which were used for fine flaking in the terminal stages of handaxe manufacture (Fig. 10). The bone hammers appear to have been abandoned after limited immediate use, in contrast to percussors made from the antlers of deer, which exhibit significant use over a prolonged time period and were clearly curated.[13]

How did the hominids at Boxgrove procure their food?

The activities of the hominids at Boxgrove, on the mudflats and grasslands in front of the cliff, indicate that this area was used for procuring and processing animal carcasses. Evidence for the collection of plant foods, if such took place at Boxgrove, has not survived. However, it is clear from the distribution and condition of fish bones and marine molluscs recovered during excavation, that these potential food sources were not utilized. It is therefore important to consider how the carcasses were procured, what species of animals were butchered, and how this process was undertaken. Answering these questions will have significant implications for our understanding of the technological capabilities and behavioural repertoire of Middle Pleistocene hominids

Analyses of the butchered animal remains from Boxgrove indicate that hominids had access to complete carcasses in very fresh condition. The carcasses are predominantly from large mammals such as rhinoceroses, horses and giant deer; other butchered remains include bear, red deer and bison. The following points attest to the condition of carcasses prior to butchery:

- Body-part representation: evidence from Q1B and GTP17 (Fig. 5) indicates that at the time of butchery all anatomical elements were present.

Figure 7 *The relict chalk cliff (a), gravels of the raised beach (b) and chalk cliff collapse (c).*

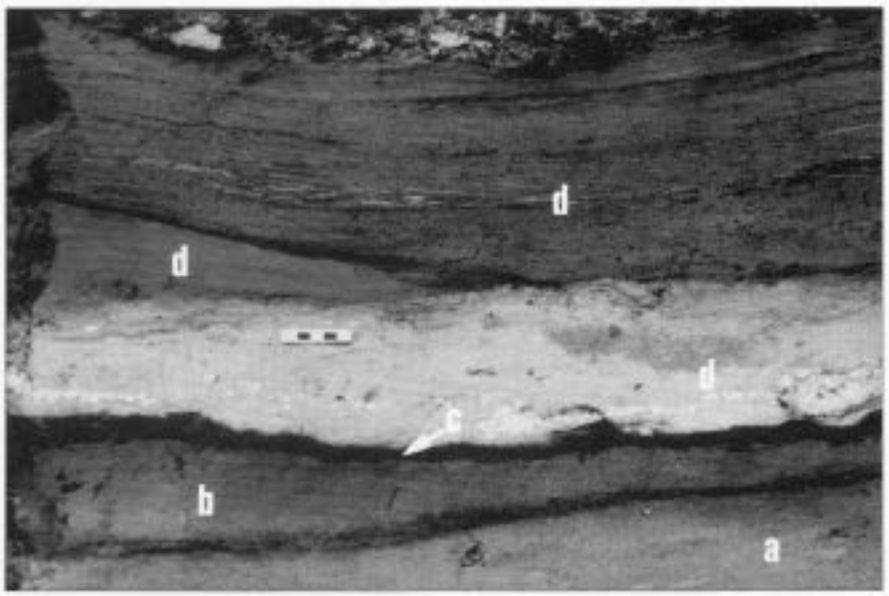

Figure 8 *Detail of (a) the upper part of the lagoonal Slindon Silts, (b) the buried soil, (c) the overlying Organic and (d) Brickearth Beds; scale in 10mm divisions.*

Figure 9 *A scatter of refitting flint waste at GTP 17, where a horse was butchered; scale in 10mm divisions.*

Figure 10 *The end of a bone hammer, used in the final stage of handaxe manufacture.*

- The nature of the butchery activities, which follow a logical progression from skinning, through disarticulation to filleting and bone smashing (Fig. 11).
- There is no evidence from the many butchered bones that predators, such as lions, or carcass processors such as hyænas and wolves, killed or had first access to the carcasses. Where gnawing or puncturing marks of carnivore teeth are found on butchered bone, they always overlie cut marks made by hominids.

Furthermore, where butchered body parts have been found in isolation, for example in geological test pits or at the edges of main excavation areas, they too exhibit features that point to the carcass having been fresh. These features include butchery marks to remove tongues, cut marks in the eye sockets, and skinning of the head. The butchered animals are either juveniles or prime-of-life adults, and they show no signs of disease in their hard tissues.

Was hunting or scavenging the main method of procuring food?

There are only two viable methods of meat procurement that would result in the combination of features outlined above: confrontational scavenging and hunting. Confrontational scavenging relies upon other carnivores to kill the prey; the predator is then driven off and the carcass secured. This practice has been observed among present-day hunter–gatherers such as the Hadza of East Africa.[14] The American archaeologist Lewis Binford has argued that skinning marks on skulls and lower limbs are indicative of scavenging, as these elements represent the non-consumables from primary predator kills.[15] However, at Boxgrove, these elements are found in association with other parts of the skeleton of the same animal, all of which exhibit hominid butchery marks. Additionally, the uppermost (atlas) vertebra and upper (proximal) ends of lower limb bones show disarticulation marks, consistent with separation of these elements while the carcass still had flesh on it. Confrontational scavenging can be inferred to occur at two main time intervals: immediately after the initial kill or at the juncture between the completion of feeding by the primary predator and the arrival of secondary carcass processors, such as hyænas and wolves. The evidence from the animal remains at Boxgrove suggests that only the first situation is feasible.

It is almost certain that, during this period of the Middle Pleistocene, animal carcasses were sometimes scavenged, but it is important to emphasize that no evidence exists for marginal scavenging and that the evidence for confrontational scavenging is very weak. It is highly improbable that, if confrontational scavenging was a widely used technique, no evidence for it would have been found. This is especially the case at Boxgrove, considering the large spatial area and time depths covered during the excavations, and the large number of bones recovered. In the excavation area Q1B there is evidence of four rhinoceroses having been butchered. They were mid-life

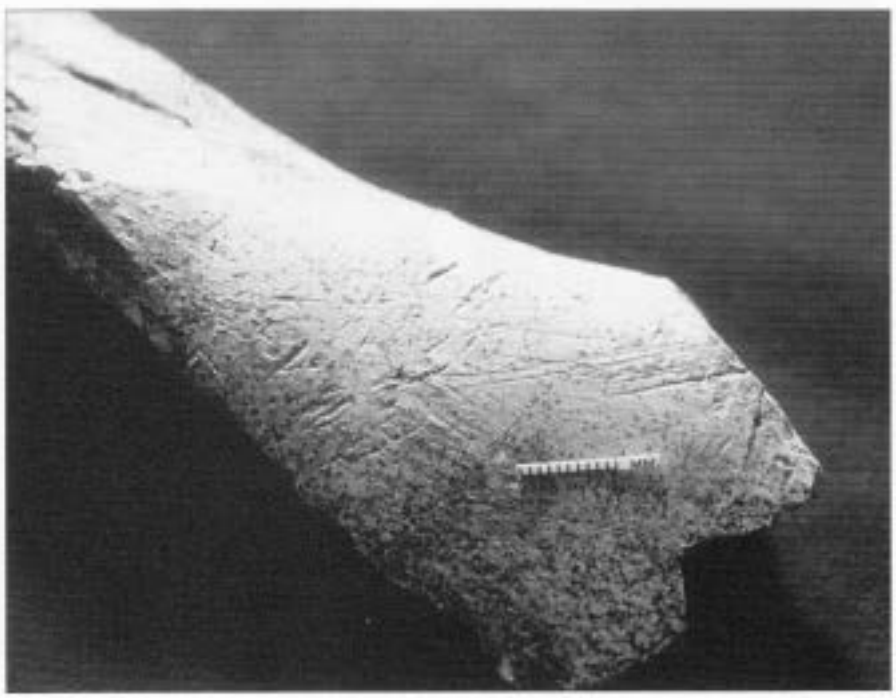

Figure 11 *Cut marks made by flint tools on a horse bone; scale in 1 mm divisions.*

adults that were unlikely to have had natural predators, which again points to a procurement strategy other than confrontational scavenging, i.e. hunting.

In addition to the strong but still circumstantial evidence for hunting, more direct evidence comes from a horse shoulder blade (scapula) discovered in the Slindon Silts in the area of GTP17 (Fig. 5). The bone exhibited a curious fracture: a semicircular break approximately 50mm in diameter (Fig. 12). Preliminary analysis by Sir Bernard Knight, of University College of Wales at Cardiff, indicated that the puncture was consistent with penetration by a projectile such as a spear. The wound resembled those caused by bullet penetration, albeit at a lower velocity. The projectile entered from the outside (lateral) face of the scapula and upon exiting from the inside (medial) face caused a bevelling of the inner surface of the bone, characteristic of a projectile wound. Additionally, looking into the edge of the wound, it was possible to pick out lines running perpendicular to the horizontal axis of the scapula, which were indicative of rifling. Rifling marks on bone occur when the projectile (such as a rifle bullet) is spinning in flight and at the moment of entry into a body. Thus, the evidence from the scapula strongly suggests that the horse was speared (Fig. 12).

Further evidence for the use of spears in the Middle Pleistocene comes from the site of Schöningen in Lower Saxony, Germany.[16] The site is dated to 400,000 years ago in the Holsteinian Interglacial period. The spears were made from slow-growing spruce wood (*Picea* sp.) and they show extensive workmanship in the shaping of the spears and especially the working of the tips. The tips were always made from the base of the tree, where the wood is denser and harder, and the other (distal) ends were tapered in the same way as a modern javelin to provide stability in flight.

Boxgrove has provided strong evidence that hunting was a vital part of hominid behaviour at this period of the Pleistocene. The ability to hunt game removes dependence on other predators and therefore a large element of risk from a subsistence strategy. Also, the nutritional quality and variety of body parts would be far greater than from scavenging. Access to intestinal fat, lights, offal and stomach contents increases the overall nutritional yield, especially of essential vitamins. Hunting would therefore be the passport to colonization and exploitation of other ecological niches. Europe, far from being a daunting prospect to hominids from Africa, would have been quickly opened up,[17] as their presence at Boxgrove half a million years ago indicates.

Figure 12 *A horse scapula showing (top left) the semicircular shape left by an impact fracture, probably made by a spear.*

Notes

1. For up-to-date accounts of the archaeology and palaeoecology of the Boxgrove area, see M. B. Roberts, S. A. Parfitt, M. I. Pope, F. F. Wenban Smith, "Boxgrove, West Sussex: rescue excavations of a Lower Palaeolithic landsurface (Boxgrove Project B 1989–1991)", *Proceedings of the Prehistoric Society*, **63**, 303–358, 1997; M. R. Bates, S. A. Parfitt, M. B. Roberts, "The chronology, palaeoecology and archaeological significance of the marine Quaternary record of the West Sussex coastal plain, Southern England, UK", *Quaternary Science Reviews* **10**(10), 1252–77, 1997; M. B. Roberts & S. A. Parfitt, *The Middle Pleistocene hominid site at ARC Eartham Quarry, Boxgrove, West Sussex, UK* (London: English Heritage, in press [English Heritage Archaeological Report 17]).
2. See P. L. Gibbard, "The history of the great northwest European rivers during the past three million years", *Philosophical Transactions of the Royal Society of London B* **318**, 559–602, 1988; P. L. Gibbard, "The formation of the Strait of Dover" in *Island Britain: a Quaternary perspective*, R. C. Preece (ed.), 15–26 (London: Geological Society of London, 1995).
3. D. R. Bridgland, *Quaternary of the Thames* (London: Chapman & Hall, 1994).
4. See W. Roebroeks & T. van Kolfschoten (eds), *The earliest occupation of Europe*, (Leiden: University of Leiden, 1995); J. Imbrie, J. D. Hayes, D. G. Martinson, A. MacIntyre, A. C. Micks, J. J. Morley, N. G. Pisias, W. L. Prell, N. J. Shackleton, "The orbital theory of Pleistocene climate: support from a revised chronology of the marine O^{18} record. In *Milankovitch and climate* (part 1), A. Berger, J. Imbrie, J. D. Haynes, G. Kukla, B. Saltzman (eds), 269–306 (Dordrecht: Reidel, 1984).
5. See E. Carbonell, J. M. Bermúdez de Castro, J. I. Arsuaga, J. C. Díez, A. Rosas, G. Cuenca-Bescós, R. Sala, M. Mosquera, X. P. Rodríguez, "Lower Pleistocene hominids and artefacts from Atapuerca-TD6 (Spain)", *Science* **269**, 826–30, 1995; A. Tuffreau & P. Antoine, "The earliest occupation of Europe: continental and northwestern", in *The earliest occupation of Europe*, W. Roebroeks & T. van Kolfschoten (eds), 147–63 (Leiden: Leiden University Press, 1995); T. van. Kolfschoten & E. Turner, "Early Middle Pleistocene mammalian faunas from Kärlich and Miesenheim I and their biostratigraphical implications", in *The early Middle Pleistocene in Europe*, C. Turner (ed.), 227–54 (Rotterdam: Balkema, 1996).
6. L. Gibert, Ll. Gibert, A. Iglesias, E. Maestro, "Two 'Oldowan' assemblages in the Plio–Pleistocene deposits of the Orce region, southeast Spain", *Antiquity* **72**, 17–25, 1998.
7. See L. Gabunia & A. Vekua, "A Plio–Pleistocene hominid from Dmanisi, East Georgia, Caucasus", *Nature* **373**, 509–512, 1995; V. Gladiline & V. Sitlivy, "Les premières industries en sub-Carpathie", in *Les premiers Européens*, E. Bonifay & B. Vandermeersch (eds), 217–31 (Paris: Editions du CTHS, 1991).
8. C. C. Swisher III, G. H. Curtis, T. Jacob, A. G. Getty, A. Suprijo, Widiasmoro, "Age of the earliest known hominids in Java, Indonesia", *Science* **263**, 1118–21, 1994; B. Wood & A. Turner, "Out of Africa and into Asia", *Nature* **378**, 239–40, 1995.
9. See D. Mania & K. Valoch in *The earliest occupation of Europe*, W. Roebroeks & T. van Kolfschoten (eds) (Leiden: University of Leiden); and also M. J. White, "Raw materials and biface variability in Southern Britain: a preliminary examination", *Lithics* **15**, 1–20, 1995.
10. A. Turner, "Large carnivores and earliest European hominids: changing determinants of resource availability during the Lower and Middle Pleistocene", *Journal of Human Evolution* **22**, 109–126, 1992.
11. C. S. Gamble & A. M. ApSimon, "Red Barns, Portchester", in *The Palaeolithic of Britain and its nearest neighbours: recent trends*, S. N. Collcutt (ed.) (Sheffield: University of Sheffield, Department of Archaeology and Prehistory, 1986).
12. See figure 1 in M. B. Roberts, C. S. Gamble, D. R. Bridgland, "The earliest occupation of Europe: the British Isles", in *The earliest occupation of Europe*, W. Roebroeks & T. van Kolfschoten (eds), 165–92 (Leiden: University of Leiden, 1995).
13. See pp. 215–22 in *Fairweather Eden: life in Britain half a million years ago as revealed by the excavations at Boxgrove*, M. Pitts & M. B. Roberts (London: Century, 1997).
14. J. F. O'Connell, K. Hawkes, N. Blurton-Jones, "Hadza scavenging: implications for Plio/Pleistocene hominid subsistence", *Current Anthropology* **29**, 356–63, 1988.
15. See chapter 6 in *Bones: ancient men and modern myths*, L. R. Binford (New York: Academic Press, 1981).
16. H. Thieme, "Lower Palaeolithic hunting spears from Germany", *Nature* **385**, 807–810, 1997.
17. See pp. 134–41 in *Timewalkers: the prehistory of global colonisation*, C. S. Gamble (Stroud: Alan Sutton, 1993).