THE HUMAN OCCUPATION OF THE BRITISH ISLES DURING THE UPPER PALAEOLITHIC

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The British Isles offer archaeologists an opportunity to examine the capacity of anatomically modern humans in late Pleistocene north-west Europe to cope under varying and severe climatic conditions from possibly more than 40,000 b.p. to the onset of the Holocene. In this brief summary of the British Upper Palaeolithic we will review the evidence for human settlement in this region and how it relates to changing climatic conditions.

Much of our increased knowledge of the British Upper Palaeolithic results from new dating programmes organised by the Oxford Radiocarbon Accelerator Unit at the Research Laboratory for Archaeology and the History of Art, Oxford University (HOUSLEY 1991, HOUSLEY *et al.* 1997). These dating programmes have fundamentally advanced our understanding of the British Upper Palaeolithic because accelerator dating offers good precision on a small quantity of archaeological material. This has enabled the direct dating of rare bone and antler artefacts.

The uncalibrated radiocarbon dates for the British Isles display a bimodal frequency distribution with the modes lying on either side of the Last Glacial Maximum (LGM; ALDHOUSE-GREEN and PETTITT 1998). We will structure our presentation accordingly with the archaeological evidence for the settlement of *Homo sapiens sapiens* in Britain during the Middle Last Glacial (Middle/Late Devensian) subdivided into the early Upper Palaeolithic (over 40,000 to 24,000 b.p.), the Dimlington Stadial (24,000 to 14,000 b.p.), and the Late Last Glacial (Late Devensian) covering the British late Upper Palaeolithic (14,000-10,000 b.p.; 17,000 to 11,500 cal BP). This is preceded by a discussion of issues relating to radiocarbon dating.

ISSUES IN BRITISH UPPER PALAEOLITHIC CHRONOLOGY

The ^{14}C technique provides the basis for the British Upper Palaeolithic chronology. For some now time the use of accelerator dating has allowed the dating of much smaller amounts of material, allowing greater levels of pretreatment and the dating of rare artefacts. The most recent advance has been the publication of the 1998 radiocarbon calibration curve Intercal 98 (STUIVER & VAN DER PLICHT 1998) which provides calibration for ^{14}C estimates to around 20,000 ^{14}C years b.p. (24,000 cal BP). Calibration curves for much of the Upper Palaeolithic have been available since 1993, but the new (1998) curve has improved resolution and is recommended by the journal *Radiocarbon*, the

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international journal of the radiocarbon community. Calibration of the ^{14}C time-scale is required because the production of ^{14}C in the atmosphere is not constant over time meaning that radiocarbon dates are incorrect in relation to calendar dates. Furthermore, the radiocarbon time-scale is not uniformly incorrect and therefore cannot be used as a linear relative chronology as the true chronological relationship between uncalibrated dates is not known. Beyond 24,000 cal BP several calibration curves have been proposed for ^{14}C estimates, but discrepancies exist between them (VAN DER PLICHT 1999).

THE RADIOCARBON TIME-SCALE BEFORE 20,000 B.P.

The period before 20,000 b.p. (24,000 cal BP) when the Intercal 98 curve ends does have several proposed calibration curves. Most notable are the long varve chronology from Lake Suigetsu in Japan (KITAGAWA and VAN DER PLICHT 1998) and curves based on geomagnetic intensity (e.g., VAN ANDEL 1998). Van der Plicht (1999) has argued that there are significant discrepancies between the various calibrations, particularly beyond 30,000 b.p. He warns prehistorians that there is no detailed calibration for the Middle and early Upper Palaeolithic (VAN DER PLICHT 1999 : 122). It is also known that there are two pronounced peaks in radiocarbon production at 23,000 and 31,000 cal BP as calibrated by van der Plicht (1999 : 121) using the Lake Suigetsu varves. This may be responsible for a clustering of dates at these times such as observed by Aldhouse-Green and Pettitt (1999). We can say with some confidence that there is now an accepted calibration for the period up to 20,000 b.p. which is reasonably reliable and should be used. The period from 20,000 to 30,000 b.p. requires more caution as there is currently no accepted calibration curve. Beyond 30,000 b.p., and particularly when close to 40,000 b.p., even greater caution is required as we near the limits of the ^{14}C technique.

EARLY UPPER PALAEOLITHIC

Palaeoenvironmental reconstructions for the early Upper Palaeolithic indicate that there existed throughout much of the British Isles a cold tundra environment dominated by grasses and sedges with a limited distribution of *Betula* and *Salix* (JONES and KEEN 1993). The continental climate consisted of cool summers with temperatures rising to a July mean of 10° C as indicated at numerous palaeontological sites, and very cold winters with mean January temperatures no more than -10° C and perhaps as low as -25° C (e.g., BRIGGS *et al.* 1985). Potentially important economic species, including *Rangifer tarandus* (reindeer), *Bison priscus* (bison), *Equus przewalskii* (horse), *Mammuthus primigenius* (woolly mammoth) and *Coelodonta antiquitatis* (woolly rhinoceros) are found throughout England and in Wales. Reindeer and mammoth are found in Ireland, and reindeer and woolly rhinoceros are found in Scotland (JONES and KEEN 1993).

The early Upper Palaeolithic in Britain appears to consist of three cultural units distinguished typologically and possibly chronologically (BARTON 1997, CAMPBELL 1986, JACOBI 1980). The earliest of these displays affinities to the Jerzmanovice industry of Poland. The industry contains bifacially and unifacially flat (surface) retouched leaf-shape points probably used as spear points (BARTON 1997, JACOBI 1980). The Jerzmanovice Leaf Point industry may itself simply be a northern variant of the Szeletian industry found principally in Hungary (ALLSWORTH-JONES 1986, BHATTACHARYA 1977).

Over 20 sites and find spots of Jerzmanovice Leaf Points in England and Wales have been identified (BARTON 1997, JACOBI 1980). The dating of this industry is uncertain, but for Britain it is proposed to date from over 40,000 to 27,000 b.p. (ALDHOUSE and PETTITT 1998). This range must be viewed cautiously as it falls near the limits of ^{14}C dating. Moreover, this broad range is consistent with sites in central Europe, and in Belgium at the site of Trou Magrite, where Leaf Points were found associated with Early Aurignacian assemblages dating to about 38,000 b.p. and with Late Aurignacian assemblages dating between 34,000 and 30,000 b.p. (OTTE and STRAUS 1995:229-30). The association of Jerzmanovice Leaf Points with the Aurignacian in Britain remains unclear (ALDHOUSE-GREEN 1998, see ALLSWORTH-JONES 1990), and we believe that there is good reason to be cautious. The Szeletian and related industries appear either to belong technologically to the late Middle Palaeolithic or to have evolved from late Middle Palaeolithic industries of central Europe (BARTON 1997 : 109; BHATTACHARYA 1977 : 119; WYMER 1982 : 181, 203). Given the recent history of early Upper Palaeolithic industries such as the Chatelperronian, we leave open the possibility that these Leaf Point associated assemblages are the last vestiges of the Neanderthals in Britain.

The British Aurignacian is represented at a number of sites in England and Wales, and appears to date after 30,000 b.p. although this is very difficult to assess because many of the dated early Upper Palaeolithic assemblages have been referred to as Aurignacian. Where recent formal analyses have occurred, such as at Paviland Cave and Kent's Cavern, it does appear that the British Aurignacian is best characterised as equivalent to the French Aurignacian II (BARTON 1997, CAMPBELL 1986, JACOBI 1981).

The Aurignacian in Britain, as elsewhere in Europe, appears to be replaced by the Gravettian. Again, associating dates with industries is difficult, but the transition seems to be post-28,000 b.p. The British Gravettian assemblages contain large tanged points with surface retouch. Although larger, these points are similar in form and technology to the Font Robert points found in French Gravettian assemblages.

Early Upper Palaeolithic sites are found in England and Wales south of the furthest extent of ice associated with the LGM, with the exception of the sites of Ffynnon Bueno and Cae Gwyn located in northern Wales (ALDHOUSE-GREEN 1998, JACOBI 1980, WYMER 1982). The palaeontological record would suggest that climatic conditions during this time varied little latitudinally across the British Isles, therefore we view the current site distribution as most likely reflecting the impact of later glaciation. The early Upper Palaeolithic deposit at Ffynnon Bueno, although overlain with three metres of boulder clay, provides hope for the discovery of further early sites in Wales and northern England, perhaps in Scotland, and possibly even as far west as Ireland (WOODMAN 1986, 1998).

DIMLINGTON STADIAL

Although the glacial history of the LGM is complex, it appears that the cycle of climatic decline extends from *circa* 26,000 to 13,000 b.p. (JONES and KEENE 1993). Securely radiocarbon dated sites in Britain during the Dimlington Stadial are rare. Some recent publications (ALDHOUSE-GREEN and PETTITT 1998, BARTON 1997, HOUSLEY *et al.* 1997, TOLAN-SMITH 1998) argue for regional abandonment. We take a more cautionary perspective. We suggest that human population densities in the tundra environment of north-west Europe were probably extremely low, and as such they are virtually invisible archaeologically. Settlements may have consisted of only ephemeral campsites, reflecting the need for mobility to exploit the migratory herds of reindeer which are known to occur in the region during this time (see ALDHOUSE and PETTITT 1998). Geography is also important. Whilst much of Britain was covered by ice, extensive lowlands circumscribing Britain and Ireland would have existed as a result of lowered sea levels. We have argued elsewhere (BLOCKLEY *et al.*, in press) that humans may have continued to exploit resources found on these lowlands throughout the Stadial. Support for this is indicated by a bone pin recovered by Pengelly from Kent's Cavern in 1867 and dated to (OxA-2845) 14,140 ± 110 b.p. (17490-16440 cal BP; 95% confidence interval). This date is questioned by Jacobi (HEDGES *et al.* 1994 : 342) because the recorded context is indicated as Aurignacian, however, there appears to be no indication by the lab that there may be contamination. Recently, further support for human existence in Britain at this time has been indicated by the recovery of worked ivory from Paviland Cave dated at 21,100 ± 550 b.p. (OxA-7112; see ALDHOUSE-GREEN and PETTITT 1998).

LATE UPPER PALAEOLITHIC

Most British Palaeolithic sites date to this period. Both Housley *et al.* (1997) and Tolan-Smith (1998) suggest that Britain and north-west Europe underwent a phased recolonisation from various refugia at the onset of the Late Glacial Interstadial. Calibration of the radiocarbon time-scale and new dating results allows us to question the basis for these proposals. Once dates are calibrated there is little or no evidence for a phased recolonisation of Britain (BLOCKLEY *et al.* in press). Instead, our analysis indicates a sudden change from virtually no occupational evidence to numerous sites which centre around the remarkably rapid climatic amelioration at *circa* 14,700 ice core years BP indicated by the GISP2 ice core record (ALLEY *et al.* 1993). This suggests to us that the implicit rapid increase in human population is driven by improved climatic and environmental conditions.

Using dates calibrated with the 1993 curve Barton and Roberts (1996) have argued that that there is a tight chronology for a series of typological groups within the Late Upper Palaeolithic of Britain. They argue that the British Creswellian and penknife point assemblages are chronologically separate, or display some slight overlap (see BARTON 1997 : 124). If all the reliable dates for these industries are used and calibrated with the Intercal 98 curve the result is a complete overlap between the Creswellian and the penknife point dates (Figure 1). It may be more appropriate to view penknife points as a late tool form within the Creswellian tradition (and see TOLAN-SMITH 1998 : 24).

The need for calibration is clearly exemplified when we examine the archaeological evidence for occupation of the British Isles during the Loch Lomond (Younger Dryas) Stadial. On the basis of uncalibrated radiocarbon dates some archaeologists have argued, quite contrary to research by Smith (1992), that Britain was abandoned during the Loch Lomond Stadial at *circa* 10,500 b.p (BARTON 1997, MELLARS and DARK 1998). This proposal arises from the apparent gap between the uncalibrated ^{14}C dates of 10,600 ± 110 b.p. (OxA-811) and 10,270 ± b.p. (OxA-1778), which are both dates on human modified material. After calibration these dates become 12,960-12,110 and 12,770-11,440 cal BP (95% confidence interval), indicating that there is no evidence whatsoever for a gap in the occupation of Britain during the Loch Lomond Stadial.

There is, however, a chronological separation between the Creswellian and the long blade technology at the end of the Upper Palaeolithic. The long blade technology (BARTON 1997, 1998, 1999) is found principally in south-east England. Barton (1997 : 131) has argued that this technology dates "after the cold peak", which is when he saw a possible abandonment of Britain. The calibrated time range for the long blade site at Three Ways Wharf, Uxbridge is 12,780-11,440 cal BP (OxA-1788; 95% confidence interval). When compared to the GISP2 record this date range indicates that this technology falls mainly within the Loch Lomond Stadial where there are stable cold conditions for *circa* 1000 ice core years. If we add the dates for the barbed points associated with the long blade assemblage at Sproughton, then the time range is *circa* 13,200-11,440 cal BP (95% confidence interval) placing it squarely within the Loch Lomond Stadial. This technology, linked to the Ahrensburgian (TOLAN-SMITH 1998), is possibly an adaptive response to the environmental effects of the climatic downturn.

CONCLUSION

We have attempted to show that while major advances are being made in the chronology of Upper Palaeolithic settlement in Britain, we still have many unresolved problems. Within the early Upper Palaeolithic, better chronological definition of the industries, improved cultural affiliation of the assemblages, closer examination of geologically intact localities within glaciated Britain, and identification of the manufacturers of the leaf point industries are all needed.

We have examined the case for abandonment of the region during the Dimlington Stadial, and have presented data and theoretical issues in support of human presence within north west Europe during this time.

Within the later Upper Palaeolithic we attempted to show that there is no chronological basis for distinguishing penknife point assemblages from the Creswellian, but that the long blade technology is chronologically distinct. Finally, we showed that there is no support from radiocarbon dates, when calibrated, for those presenting a case for abandonment of Britain during the Loch Lomond Stadial.

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Captions

Figure 1. Chronology for human occupation and climatic episodes for the British Upper Palaeolithic.

Biozone (^{14}C b.p.)	^{14}C b.p.	Cultural Groups	Cal ^{14}C BP	Biozone (GISP2 YBP)
				Pre-Boreal
Pre-Boreal 10200 b.p.	10000 b.p.			
			11500BP	11500 BP
		"Long Blade"		
Loch Lomond Stadial	10900 b.p.		12500BP	Loch Lomond Stadial
11000 b.p.				12800 BP
		"penknife" variant		
Windermere Interstadial	12000 b.p.	Creswellian		Windermere Interstadial
13000 b.p.				14700 BP
			15900BP	
		Human Presence		
Dimlington Stadial	14000 b.p.?		17000BP	Dimlington Stadial
	21000 b.p.			
		Gravettian		
26000 b.p.				
	28000 b.p.			
		Aurignacian		
Upton Warren Interstadial	30000 b.p.			Upton Warren Interstadial
		Leaf Point		
	>40000 b.p.			