Deserted Britain: declining populations in the British Late Middle Pleistocene

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This paper defines the potential reasons for low population levels in Oxygen Isotope Stages 6–4: climate, habitat preferences and sea level.

Key-words: Britain; Middle Pleistocene; Oxygen Isotope Stages 6–4; demography

Introduction

Until the 1970s there was thought to be a semi-continuous population in Britain from the earliest human occupation (e.g. Smith 1894; 7; Evans 1897; 697–8; Paterson 1941: 408; Wymer 1968: 308–12). Since then, adoption of the oxygen isotope sequence, and refinements in biostratigraphy and dating, have suggested that humans were present in Britain from at least Oxygen Isotope Stage (OIS) 13 (Roberts *et al.* 1995), but that there was a possible absence during the last interglacial (OIS 5e) (Stuart 1976; Currant 1986; Wymer 1988). This has been based on the apparent lack of artefacts associated with faunal assemblages that include hippopotamus, a marker species for the last interglacial (Sutcliffe 1975; Stuart 1976). More recently it has been suggested that this absence may have extended throughout OIS 5 and into 4 (Currant & Jacobi 2001) and possibly from OIS 6 (Jacobi *et al.* 1998; Ashton in press). Here we look at the problem afresh, with particular reference to evidence from the Middle Thames Valley.

Problems and methods

Assessments of Palaeolithic population levels are problematic, particularly due to the variable preservation of artefact-bearing deposits. Further problems arise from the variable intensity of fieldwork. Equally, the interpretation of individual sites in terms of population is rarely straightforward; a thousand artefacts might represent occasional discard over several thousand years, or simply an afternoon's knapping.

Some of these problems may be circumvented by examining fluvial terrace aggradations, where any artefacts *within* the terrace unit represent a variety of activities from a broad area over a defined length of time (*cf* Hosfield 1999). Each terrace unit can be compared to younger or older units, providing a mechanism for assessing change in artefact numbers through time. The problem of variable preservation of sedimentary units is overcome through mapping of the terraces, and collector bias is reduced through selection of part of a single river system. Finally, use of this method removes the problems of interpreting the length of time represented by individual assemblages.

The Middle Thames Valley is a good area to test the method; it has a rich history of collecting and fieldwork, with numerous sites and findspots, while the terraces are well mapped and their chronology is well constrained (Bridgland 1994; TABLE 1; FIGURE 1). The artefacts from these terrace aggradations are, in the majority of cases, derived, and must be interpreted with care. States of condition vary from little or no edge abrasion to rolled. It is assumed, though, that in most cases artefacts originate from sedimentary units that are only slightly older than the gravels into which they have been incorporated. In theory, much older artefacts could be reworked into younger terrace aggradations, increasing artefact numbers in the lower terraces. The suggestion being tested is that population decreases through time, making any decrease in artefact numbers more significant if artefacts have been reworked from higher terraces.

Many factors affect the rate and type of recovery. The majority of artefacts from the Mid-

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terrace	OIS	duration estimate (yrs)*	no. of artefacts (bifaces and Levallois pieces)	terrace area (sq. km)	artefact density/ sq. km	artefact density/ 100,000 years	urban growth 1861–1927 (sq. km)	artefact density over area of urban growth/ 100,000 years	quarrying until 1932/35 (sq. km)	artefact density over area of quarrying/ 100,000 years
Black Park	late 12	15,000	373	17·9	20·8	139	0	–	0·15	16,580
Boyn Hill	11–10	75,000	808	11·9	67·9	90	2·42	445	0·04	26,933
Lynch Hill	9–8	100,000	3038	59·2	51·3	51	15·78	192	0·23	13,208
Taplow	7–6	110,000	143	36·4	3·9	3	4·04	32	0·57	227
Kempton Park	5–2?	112,000	9	60·4	0·1	0·1	24·67	0·4	0·36	22

* Figures taken from Maddy & Bridgland 2000.

TABLE 1. *Artefact numbers and densities for different terrace areas taking into account time estimates for terrace aggradation, urban growth 1861–1927 and quarrying until 1932/35.*

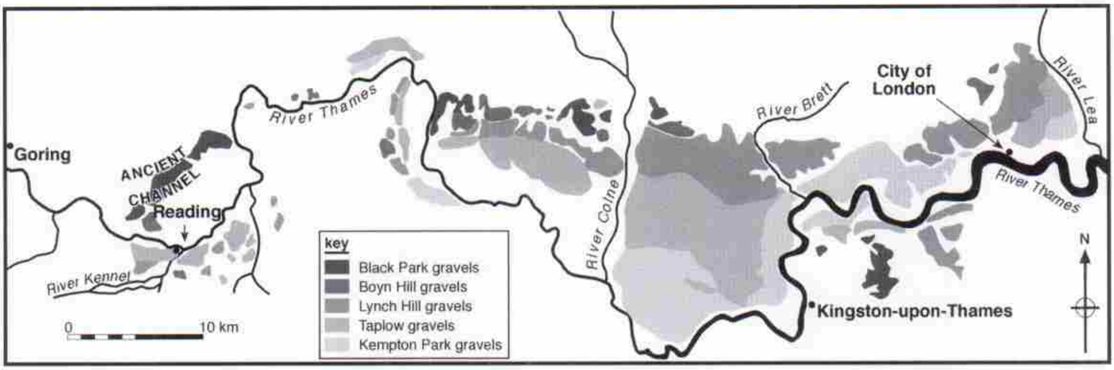

FIGURE 1. *Distribution map of the Black Park, Boyn Hill, Lynch Hill, Taplow and Kempton Park terrace aggradations in the Middle Thames valley.*

dle Thames were collected (not excavated) by individuals who in many cases either recovered the artefacts from active gravel pits (e.g. Brown 1887) or otherwise from trenches for house foundations (Smith 1894). This type of collecting was important from the 1890s until the start of mechanised digging in the 1930s. The timing of gravel-pit development and of urbanization have therefore had an important impact on artefact recovery.

Unfortunately different artefact types have been selectively recovered, with flakes and cores kept by some collectors, but not by others. Bifaces, however, were more easily recognized and universally collected, providing therefore a better reflection of artefact densities within the study area. The lower prevalence of bifaces in Middle Palaeolithic assemblages can be compensated for in part by the inclusion of Levallois flakes and cores. Therefore, the occurrence of bifaces and Levallois artefacts (although they are not necessarily equivalent) are used as the proxy for artefact discard rates. How far population is reflected in artefact discard also needs consideration. Changes in raw material availability, artefact function or increasing reliance on other materials, are all factors that might influence discard rates through time, but unfortunately are difficult to assess, other than recognizing them as possible sources of bias.

Results

The results (TABLE 1) are based on the data in the English Rivers Palaeolithic Survey (1991–97). The density of artefacts (i.e. number of handaxes and Levallois flakes and cores/sq. km) in each of the terrace aggradations can be adjusted to account for the time period encompassed by each aggradation, and is estimated by correlation with the oxygen isotope record (TABLE 1). Most aggradations represent approximately 100,000 years, corresponding to an inter-

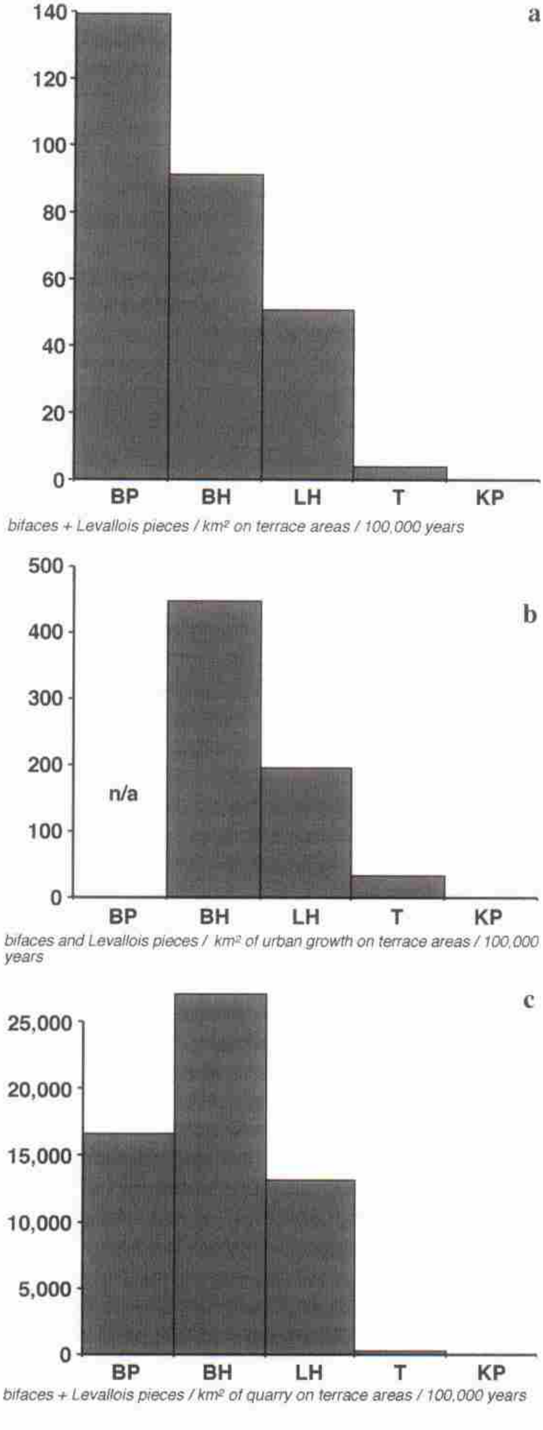

FIGURE 2. a *Artefact densities on terrace aggradations per 100,000 years;* b *artefact densities on terrace aggradations subject to urbanization between 1861 and 1927 per 100,000 years;* c *artefact densities on terrace aggradations subject to quarrying until the 1930s per 100,000 years.*

glacial-glacial cycle, though for the Black Park terrace only 15,000 years are estimated as it formed towards the end of the Anglian glaciation (OIS 12) (Maddy & Bridgland 2000). Gravel accumulation would not have been continuous throughout these periods, being punctuated by phases of erosion. However, this provides a time-averaged indication of fluvial deposition and artefact accumulation. Adjustment for this (TABLE 1; FIGURE 2a) indicates a steady decline in artefact densities through time from the Black Park to Lynch Hill terraces, and then very small densities for the Taplow and Kempton Park terraces.

TABLE 1 shows the amount of urban growth over each terrace area, based on 1-inch Ordnance Survey maps of 1861 and 1927. These indicate a potential source of bias, with urbanization primarily taking place over the Kempton Park and Lynch Hill terraces. Here the same trend emerges (FIGURE 2b), although the Black Park terrace cannot be used as there is no recorded urban growth over that terrace area.

The extent of gravel extraction (TABLE 1), taken from the 1930s *Land Utilisation Survey of Britain*, underestimates likely quarrying activity, but provides a rough indication of relative activity in each terrace area. Again, taking this into consideration (FIGURE 2c) the same broad pattern holds, other than the Black Park terrace where artefact densities are lower than shown by other measures.

Discussion

Although the analysis has attempted to minimize the biases in the data, some problems remain. The meaning of the contradictory figures for the Black Park terrace remains unclear, but may reflect population during OIS 13, rather than late OIS 12. The most notable feature of the results is the marked decline in artefact densities from the Boyn Hill terrace through to the Kempton Park terrace, with a particularly noticeable drop from the Taplow terrace on. This suggests that populations were at a peak from the end of OIS 13 through to 10 and then declined into OIS 8, dropping sharply from OIS 7.

This pattern of declining populations has been noted elsewhere (Ashton in press; White & Jacobi in press). The number of sites throughout Britain attributable to OIS 7 is very low (TABLE 2), and they often have very small numbers of artefacts. The exceptions are Crayford (Bridgland 1994) and Pontnewydd (Green 1984).

site	context	dating (OIS)	archaeological environment	*in situ*/ primary/ secondary context	industry	artefacts	main reference
Purfleet (Botany Pit)	upper gravel	early 8	cool ??, river-edge	secondary	bifaces, 'proto-Levallois'	3800	Bridgland *et al.* 1995
Ebbsfleet Channel (Baker's Hole)	coombe rock/ basal gravel	late 8	cool, river-edge	primary	bifaces, Levallois	1400	Wenban-Smith 1995
West Thurrock, Lion Pit tramway	basal gravel	late 8	cool, river-edge	primary	Levallois	170	Bridgland 1994: 237–51
Crayford	base of brickearth	late 8/ early 7	cool-warm ?, river-edge	*in situ*	blade Levallois	500	Bridgland 1994: 249–50
Pontnewydd	Lower Breccia	mid 7	cool-temperate, open steppe, cave, river-edge	primary–secondary	bifaces, Levallois	1500	Green 1984
Aveley	interglacial sands	early 7	warm	primary	flakes	5	M. White pers. comm.
Maidenhall/Stoke Tunnel	'Bone Bed'	7	warm, open deciduous woodland, river-edge	primary	Levallois	20	Wymer 1985: 234
Brundon	base stratum 3	7	warm, open, river- edge	primary + secondary	Levallois	< 280	Wymer 1985: 200
Stanton Harcourt	Channel	7	warm, open woodland, river-edge	secondary	bifaces, cores and flakes	20+	Buckingham *et al.* 1996
Selsey	Channel	7	warm, river-edge	primary	Levallois	4	Sutcliffe 1995
Aveley	interglacial silty clays	late 7	warm	primary	Levallois core, flakes	3	M. White pers. comm.

TABLE 2. *All major, datable sites for the Early British Middle Palaeolithic.*

Levallois sites that might be attributed to this stage are those around Yiewsley and Ealing, in particular Creffield Road. But these artefacts occur in brickearth overlying Lynch Hill gravel (Brown 1887) the age of which remains unclear (Gibbard 1995a: 95–100).

Currently no archaeological sites can definitely be attributed to OIS 6 and 5. Twenty-six artefacts from terrace 4 of the Warwickshire Avon (Whitehead 1988), attributed by Maddy *et al.* (1991) to OIS 7/6, are very rolled and undoubtedly derived. Equally, at Cassington almost 100 artefacts have been recovered from the base of deposits that have been attributed to OIS 5a (Maddy *et al.* 1998; Terry Hardaker pers. comm.), but their condition also suggests derivation. The absence of humans may continue into OIS 4; Currant & Jacobi (2001) suggest that sites with 'Banwell' type faunas, which they attribute to this stage, are not associated with artefacts, in contrast to 'Pin Hole' type faunas (probably OIS 3) that have an undoubted human association.

The reasons for human absence from OIS 6 to OIS 4

Two contributory factors may be suggested to explain the apparent absence of humans from Britain for some 130,000 years, from OIS 6 to possibly the end of OIS 4.

Factor 1. The harsh climate during OIS 6 and the rapid severing of Britain from mainland

Europe during OIS 5e are critical. The history of Britain's isolation from the continental mainland is important to understanding the occupation of Britain by humans (Preece 1995; White & Schreve 2000). It has been suggested (e.g. Gibbard 1995b) that overflow from a proglacial lake in the southern North Sea breached the Chalk of the Dover Strait during the Anglian (OIS 12). However, dating of this event is problematic because of the paucity of sediments in the area of the Strait, other than at Wissant and Wimereux (France). They are poorly dated and variously interpreted as overspill from the proglacial lake (Gibbard 1995b), or as fluvial sediments (Bridgland & D'Olier 1995). The only other evidence lies at Herzeele (France), where deposits, interpreted as either OIS 13 or 11 (Meijer & Preece 1995), are argued to rest on a flat which continues into the northern end of the strait at Wissant, and therefore post-date the breach. By contrast, van Vliet-Lanoë *et al.* (2000) suggest that the history of the connection of Britain to mainland Europe is far more complex and was governed by the combination of neotectonics and sea-level change. They suggest 'a possible closed status of the Strait until OIS 7' (van Vliet-Lanoë *et al.* 2000: 34).

The molluscan evidence also suggests a late date for the breach. The presence of warm, marine molluscan faunas in the North Sea has been taken as evidence of a marine link with the Channel, with the first substantial evidence from sites on the Dutch coast dated to OIS 5e (Meijer & Preece 1995). Comparison of faunas between Britain and the continent have also been used, so that the occurrence at Swanscombe and possibly Clacton of 'Rhenish' molluscs suggests that the Thames and Rhine systems were connected during OIS 11. The first good evidence for a difference in British and continental faunas is from OIS 5e, where the mollusc *Theodoxus fluviatilis* (Meijer & Preece 1995) seems to be absent from Britain. Although there are some differences in mammal assemblages from earlier phases, these may be climatic. The first notable depletion of the British fauna occurs in OIS 5e, where horse *Equus ferus*, extinct rhinoceros *Stephanorhinus kirchbergensis*, and the pine vole *Microtus (Terricola)* sp.(= *Pitymys*) (Sutcliffe 1995; Stuart 1995) are missing.

Continued separation from mainland Europe during later OIS 5 has been tentatively suggested by Keen (1995), with an estimate that sea levels may have only dropped to –25 m during OIS 5d and 5b, whereas the Channel at this time might have been as deep as –40 m. Any landbridge would be dependant on the height of the southern North Sea basin, which is also currently at –40 m (Bridgland & D'Olier 1995).

The combination, therefore, of sea-level and climate provides one factor of why human populations were absent apparently from OIS 6 to perhaps OIS 4. The major phase of more amenable climate during OIS 5 coincided perhaps with the first major isolation of Britain from mainland Europe.

Factor 2. The second factor is based on suggested changes in the climatic and habitat preferences of humans in the Middle Palaeolithic (Ashton in press; see also Roebroeks *et al.* 1992). It is argued that the earliest colonizers of northern Europe favoured the warmer climates of the oceanic west (papers in Roebroeks & van Kolfschoten 1995), but by the Middle Palaeolithic there was increasing adaptation to more open, often cooler environments. This change in habitat preference can be noted in Britain from OIS 8–7, where the only sites associated with warm conditions contain small quantities of artefacts (TABLE 2). In northwest Europe there also appears to be a paucity of sites that can be attributed with certainty to OIS 5e. Of nine sites that do survive in eastern Germany (Roebroeks & Tuffreau 1999), only four have assemblages of more than a handful of artefacts. Part of this apparent pattern of low human density may be preservational (Speelers 2000); in northwest France many of the lower fluvial terraces are buried beneath the modern floodplain, while erosion during OIS 5d has created artefactual palimpsests at the top of last interglacial raised beaches that are difficult to date.

Given the paucity of evidence for OIS 5e sites in northwest Europe, it is not surprising that the large number of sites from OIS 6–3 are, where it can be discerned, usually associated with cooler, often open, steppic conditions. As Bosinski noted, Middle Palaeolithic German sites are dominated by mammoth, reindeer and horse (1967: 69: TABLE 12). Despite the potential problems of preservation, it seems clear that humans were adapting better to more open and at times cooler conditions, in particular the rich environments of the mammoth-steppe (Guthrie 1990). This might suggest that during warm periods human populations tended to survive better on the steppes of the east, only colonizing northwest Europe as climate cooled, following the westward expansion of these steppe biomes, and perhaps retreating to southern refugia during glacial extremes. However, the distribution and movement of herds in the more open landscapes would have required greater mobility by human populations and new strategies for exploiting their resources, through the development of more sustained hunting and reflected in more complex social organisations (Gamble 1995).

Advances in technology are likely to have played a major role, from improvements in hunting equipment to the development of measures for coping with the cold. Gaudzinski (1999) noted a change in butchery and hunting patterns from OIS 7, signifying more organised predation. Evidence of increased hunting specialisation is recorded from sites such as La Borde, France (probably OIS 7 — Jaubert *et al.* 1990), La Cotte de St Brelade on Jersey (OIS 6 — Scott 1986) and Wallertheim (probably OIS 5d — Gaudzinski 1995).

Levallois technology can also been linked to changes in hunting. Geneste (1989) demonstrated that in southwest France, Levallois technology occurs on the more exotic raw materials and is carried longer distances. White & Pettitt (1995) argued that Levallois was specifically a technology geared towards greater mobility. This is reflected in the longer transport distances in the Middle Palaeolithic of lithics in general (Roebroeks *et al.* 1988), with distances in eastern Europe of up to 300 km (Féblot-Augustins 1999).

Thus factor 2 proposes progressive advances in technology, in hunting strategies and successful adaptation to open, often cool environments, with the consequent changes on social structure, that led to increasing reliance on the biota of the mammoth-steppe. The effect for northwest Europe was low or absent populations in warm periods with an increasing human presence as climate cooled, but retreat to southern refugia during glacial maxima.

Synthesis. In combination these factors of changing habitat preference, climate and fluctuating sea-level determine the pattern of Britain's occupation, and may account for a decline or absence of humans in Britain from OIS 6 to 3.

White & Schreve (2000) have emphasized the significance of changes in Britain's connection to mainland Europe for Lower and Middle Palaeolithic archaeological signatures. Assuming the breach of the Kent-Artois plateau dates to OIS 12, they have proposed three geographic situations during subsequent climatic cycles:

1. times of maximum glaciation, with the landbridge established, but Britain uninhabitable;
2. cooler episodes, where the landbridge is still maintained, but more favourable conditions pertain for occupation;
3. fully interglacial conditions when Britain becomes isolated and colonization is difficult from mainland Europe.

However, if the breach occurred later (as suggested in factor 1) a fourth, post-Anglian geographic scenario needs to be considered: an interglacial, pre-breach situation, where Britain is both habitable and accessible. The importance of this to the stability of human occupation is immense. Prior to the breach the cycle of occupation could have been semi-continuous with constant access to and from mainland Europe, with phases of non-occupation during glacial maxima. After the breach, occupation or potential for colonization would have been much more punctuated, being dependant on the competing factors of a significant drop in sea-level (below *c.* 40 m), and a climate moderate enough for human occupation.

It is possible to explore the interaction of these factors using oxygen isotope records as indicators of climate and glacio-eustatic sea level trends over the last 500,000 years (Shackleton & Opdyke 1973). Global sea-level estimates derived from isotope signals and those from raised coral terraces such as the Huon Peninsula, New Guinea, show good agreement and are well calibrated, particularly for the last 140,000 years (Chappell 1974; Chappell & Shackleton 1986; Chappell *et al.* 1996; Pillans *et al.* 1998). Adjacent to the continental ice sheets, sea-level movements are also affected by glacio-isostatic mechanisms. The interaction of eustatic and isostatic components can lead to complex patterns of sea-level change (Gray 1995). However, in southern England sea-level change since the last glacial maximum is dominantly a function of glacio-eustatic sea-level rise (Devoy 1979), though glacio-isostatic factors are

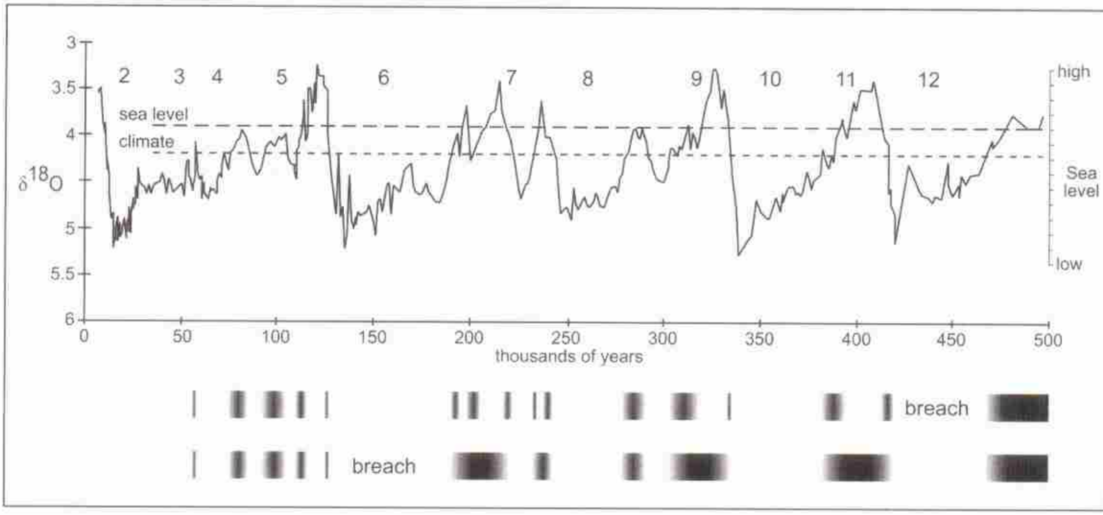

FIGURE 3. *Oxygen isotope record from V19-30 (0–330,000 years) (Shackleton 1987) and ODP 677 (330,000–500,000 years) (Shackleton* et al. *1990), scaled to oxygen isotope fluctuations (left-hand side) and sea level (right-hand side). A sea level of –40 m, shown by the horizontal dashed line, is used to delimit periods of island status. Shaded bars indicate periods when occupation is possible, based on eustatic sea level and climatic factors.*

still important (Lambeck 1991). This may have been the case during the Middle Pleistocene.

If the isotope curve is accepted as an approximation of glacio-eustatic sea level, it is possible to scale the isotope curve to sea level using a last interglacial high sea-level stand of +6 m and a low sea-level stand during the last glacial maximum of –120 m (Chappell 1974; Chappell & Shackleton 1986; Gvirtzman 1994). This provides an estimate of sea-level patterns over the last 500,000 years (FIGURE 3). The isotope signal also provides a general indication of glacial-interglacial climatic fluctuations and these trends may be used to estimate those periods when conditions were probably too harsh to permit occupation of Britain.

Occupation of Britain from Europe was therefore possible when sea level was low enough to create a landbridge and climate was sufficiently benign to allow human presence (FIGURE 3). Two scenarios for the timing of the breach are depicted, OIS 12 and OIS 6. In both cases the post-breach situation is one of very limited 'windows of opportunity' to reach Britain. This is particularly the case at the end of each cold phase due to rapid deglaciation and therefore sea-level rise. If the breach occurred during OIS 12 the population influx at the OIS 12/11 boundary must have been large enough to create a sustainable population during the following island phase. The high population levels during OIS 11 and 9 relative to 7 and 5e may be better explained by a later breach, perhaps during OIS 8 or 6, allowing more continuous access to Britain from the rest of Europe during OIS 11 and 9.

If the breach occurred during OIS 8, low and/or isolated populations might be expected during OIS 7 with possible extinction in the harsh climate of OIS 6. Rapid warming at the OIS 6/5 boundary would have given humans very limited time to recolonize from southern refugia, with an estimated sea-level rise of 50 m in 3000 years (Shackleton 1987). As the mammoth steppe retreated east during OIS 5e, so too did humans, leaving only small or isolated populations in the forests of northwest Europe. Isolation of Britain may have continued throughout OIS 5 (Keen 1995; but see FIGURE 3), which together with the colder climate of OIS 4, may have made Britain difficult or unattractive for human colonization until OIS 3.

Conclusions

This model suggests that formation of the English Channel changed the cycle and stability of human occupation, through the sensitive interplay of sea level and climate change. At the same time, with the progressive change in human habitat preferences, Britain and northwest Europe became less attractive for colonization, except in cool, open conditions. The strength of the model lies in the robust evidence for population decline from the data in the Middle Thames valley, although this needs to be substantiated by evidence from other valley systems. The mechanisms by which this population decline came about need much further investigation, in particular research into the timing of the breach, investigation of the effect of isostatic factors on sea-level change, together with a better understanding of human habitat tolerances and preferences in northwest Europe during the Middle Palaeolithic.

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