Chapter 9 The Quaternary history of the Somerset lowland, Mendip Hills and adjacent areas

Introduction

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The sites described in this chapter were selected to document the extra-glacial development of the Somerset lowland, Mendip Hills and adjacent areas (Figure 9.1). This region has considerable potential significance, because it contains important and unique evidence for extra-glacial Quaternary environments. Especially important are the interglacial marine deposits of the Burtle Formation, the interstadial marginal marine Low Ham Member and the massive cold-stage gravel aggradations, possibly interstadial deposits and archaeological material of the Broom Gravel Pits in the Axe Valley. The northern and western parts of the region also contain extremely important examples of cold-stage periglacial, colluvial, aeolian and fan-gravel sedimentation and warm-stage palaeosol development.

The Pleistocene record of Somerset has great potential importance, but has been relatively neglected in comparison with regions such as East Anglia. Some of the leading nineteenth century earth scientists worked on aspects of the Pleistocene of the region. For instance, Buckland (1823) recorded mammal remains from a number of cave sites in his *Reliquiae Diluvianae* and Buckland and Conybeare (1824) identified the marine origin of the interglacial Burtle Beds of King's Sedgemoor. Later in the nineteenth century, raised beaches near Weston-super-Mare were described by Sanders (1841) and Ravis (1869). The first detailed synthetic work on the Quaternary deposits of the region was the Geological Survey Memoir of Woodward (1876). Prestwich included a number of sites in Somerset and Avon in his monumental reviews, providing faunal lists and proposing an interglacial age for the raised beaches and Burtle Beds (Prestwich, 1892).

Head, alluvial fan gravels and 'cold-stage' terrace gravels are an extremely important component of the Pleistocene deposits in this region, but until modern geochronometric methods are applied to them they will remain virtually impossible to date with any confidence. Occasional records of gravel and head deposits were made during the nineteenth century, and many of these are summarized in the early Geological Survey Memoirs. Thus, Woodward (1876) described a number of terrace-gravel and fan-gravel sites around Mendip. Ussher (1906) mapped and described 'old washes and talus fans' and 'terrace gravels' in the Isle Valley and Chard Gap and later mapped 'loamy gravel and head' in the Quantocks and Tone Valley (Ussher, 1908). At several localities, these deposits were associated with reindeer remains and, at Doniford, with mammoth (Ussher, 1908). The great hand-axe sites of the Axe Valley were first noted by D'Urban (1878) and these terrace sites were briefly described by J.F.N. Green (1943). Similar deposits were later mapped as 'spreads of head and gravel' in the upper Parrett, Yeo, and Cam valleys by Wilson *et al.* (1958). Palmer (1934) conducted studies of a number of cold-climate breccia and blown-sand sites, including Holly Lane (Chapter 10) and the important section at Brean Down, and demonstrated a southerly origin for the sands on mineralogical grounds. The first detailed account of the periglacial deposits of Brean Down was not made, however, until the work of ApSimon *et al.* (1961).

After the work of Woodward (1876), Prestwich (1892) and Ussher (1908), interest in the marine interglacial deposits of the Somerset lowlands waned. Research resumed with Bulleid and Jackson's (1937, 1941) detailed accounts of the Burtle Beds of King's Sedgemoor. This was followed by the work of ApSimon and Donovan (1956), who described marine Pleistocene deposits in the Vale of Gordano. The marine interglacial deposits became a source of major controversy, as morphometric work and then the first radiocarbon dates on the raised beach at Middle Hope suggested correlation with the Upton Warren Interstadial (Donovan, 1962; Wood *in* Callow and Hassall, 1969), though this was later rejected by Kidson (1970).

The influential reviews by Mitchell (1960, 1972) provoked much debate concerning the limits and timing of glaciation, the possible existence and age of proglacial lakes and the occurrence, nature and stratigraphic position of the interglacial marine deposits. Thus Kellaway (1971), Hawkins and Kellaway (1971, 1973), and Kellaway *et al.* (1975) suggested that

most of South-West England had been overrun by ice sheets during an early glaciation. Convincing evidence of glaciation in the Bristol area was provided by Hawkins and Kellaway (1971) and these authors contended that the Burtle Beds of lowland Somerset were glacial outwash deposits. Stephens (1970a, 1970b, 1973) suggested an alternative, with limited glaciation in the coastlands of Somerset damming an enormous proglacial lake in lowland Somerset, which eventually discharged into the Axe Valley through the Chard Gap. These suggestions were vigorously disputed by Kidson (1971), Kidson and Haynes (1972), Kidson *et al.* (1974) and Kidson (1977) who produced compelling evidence to show that the Burtle Beds were of interglacial marine origin, and C.P. Green (1974b) who showed that the gravels of the Axe Valley were locally derived. More recently, Hunt *et al.* (1984) showed that no unequivocally erratic material could be found in southern Somerset.

Eventually, the emergence of robust stratigraphical and palaeoenvironmental evidence led to a broad consensus: that the Burtle Beds of King's Sedgemoor are estuarine interglacial deposits with freshwater intercalations (Kidson *et al.,* 1978; Gilbertson, 1979; Hunt and Clarke, 1983), with the balance of evidence pointing toward an Ipswichian age. The raised beach at Swallow Cliff, Middle Hope (Gilbertson, 1974; Gilbertson and Hawkins, 1977; Briggs *et al.,* 1991), periglacial deposits at Holly Lane and elsewhere in Avon and north Somerset (Gilbertson, 1974; Gilbertson and Hawkins, 1974, 1983), the valley-fill deposits at Doniford (Gilbertson and Mottershead, 1975) and fan sediments in Mendip (Findlay, 1977; Pounder and Macklin, 1985; Macklin and Hunt, 1988) were also re-described.

Recently, the development and application of aminostratigraphy have led to the recognition of the extreme complexity of the Pleistocene sequence in Avon and Somerset and have prompted the re-examination of a number of key sites. The first application of the method in the region was by Andrews *et al.* (1979) who determined ratios from the Burtle Beds at Greylake and the Middle Hope raised beach, together with other sites in South-West England and South Wales. The Greylake No. 2 Quarry deposits were shown to be only marginally older than the Middle Hope raised beach deposits, although *Patella* shells from both produced ratios in the region of 0.11. The work of Davies (1983) suggested that the Middle Hope raised beach deposits were substantially older, and she attributed them to Group 3 of her classification (mean ratios of 0.2). This problem has not yet been fully resolved, though the latest views (Bowen, pers. comm., 1996) lean towards a last interglacial (Oxygen Isotope Stage 5e) age. Hunt *et al.* (1984) provided ratios on *Corbicula* of 0.18 from the Chadbrick Gravels and 0.18 and 0.26 from *in situ* assemblages from the Burtle Beds at Greylake No. 1 Quarry (Gilbertson, 1979). These ratios were interpreted as suggesting an Ipswichian age for the Chadbrick Gravels and some components of the Burtle Beds.

The important reassessment of the aminostratigraphy of British non-marine deposits by Bowen *et al.* (1989) renders many of the early aminostratigraphic interpretations in Somerset and Avon obsolete (Hunt, 1990a). Given that very few assays have been made and that correlations based on small numbers of ratios may not be trustworthy, it would nevertheless appear that an extremely complex picture of sea-level change is preserved in the sequences in Avon and Somerset. These changes can be related, albeit tentatively, to the global oxygen isotope stratigraphy (Campbell *et al.,* in prep.; (Figure 9.2)).

Important themes in the Pleistocene of the Somerset lowland, Mendip Hills and adjoining areas

Several important themes emerge from the scientific background outlined above. These have guided site selection, which was carried out in consultation with other relevant specialists. In several cases, there is only one site where a certain facet or feature of Quaternary history can be demonstrated clearly; where several closely comparable sites were available, secondary factors, such as other features of earth-science interest, vulnerability to development and ease of access were considered. The themes are:

1. Evidence for high Pleistocene sea levels

Somerset and Avon offer an exceptional sequence of marine interglacial and interstadial deposits. GCR sites were chosen to provide the best evidence for these high sea-level events, wherever possible. The sites are Swallow Cliff (Oxygen Isotope Stage 5e or 7), Portfield (Stage 7), Greylake No. 2 Quarry (Stages 7 and 5e) and Low Ham (Stage 5a). Low Ham is particularly important as the only site in the UK where high relative sea levels during a Devensian (i.e. post-Stage 5e) interstadial can be demonstrated. Complementary sites in the Bristol area (Chapter 10) include Kennpier

(? Stage 15), Kenn Church (Stage 7) and Weston-in-Gordano (undated but with three marine interglacial sequences interbedded with ?till).

2. Terrace stratigraphy

Excluding the glacial and marine sequences, the fundamental framework for establishing a Pleistocene stratigraphy in Somerset and Avon is provided by river terrace gravels. Key terrace sites were selected for the GCR to demonstrate the main elements and regional variations in terrace stratigraphy. In southern Somerset, key sites in the Parrett–Cary catchment are the interglacial (Stages 9 and 7) sites at Hurcott Farm and Portfield, the cold-stage (Stage 8) site at Langport Railway Cutting and the interstadial site (Stage 5a) at Low Ham.

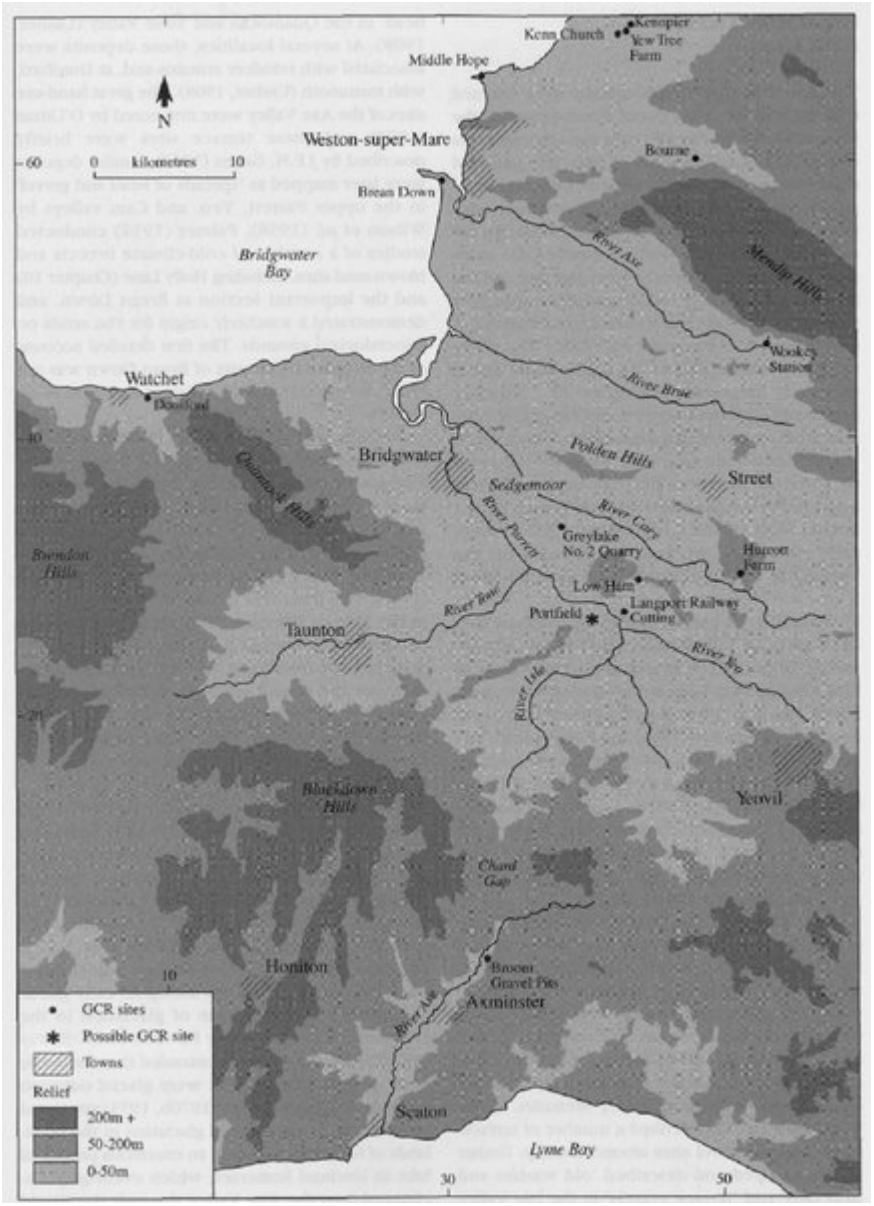
3. Temperate-stage palaeobiology

Somerset and Avon have one of the most complete and richly fossiliferous sequences of marine interglacial and interstadial deposits in the British Isles. There are also some important non-marine palaeobiological sites. One site is of particular significance. The Stage 5a marginal marine interstadial site at Low Ham, with its mollusc and ostracod faunas, plant macrofossils and pollen is unique in northwestern Europe. Important regional marine mollusc sites include Greylake No. 1 Quarry (Stage 9 and late Stage 7), Swallow Cliff (Stage 5e or 7) and Greylake No. 2 Quarry (Stage 5e). The Greylake sites have yielded regionally important mammal faunas and freshwater mollusc assemblages. The Stage 9 site at Hurcott Farm and the Stage 7 site at Portfield contain regionally important freshwater mollusc fossils and some pollen.

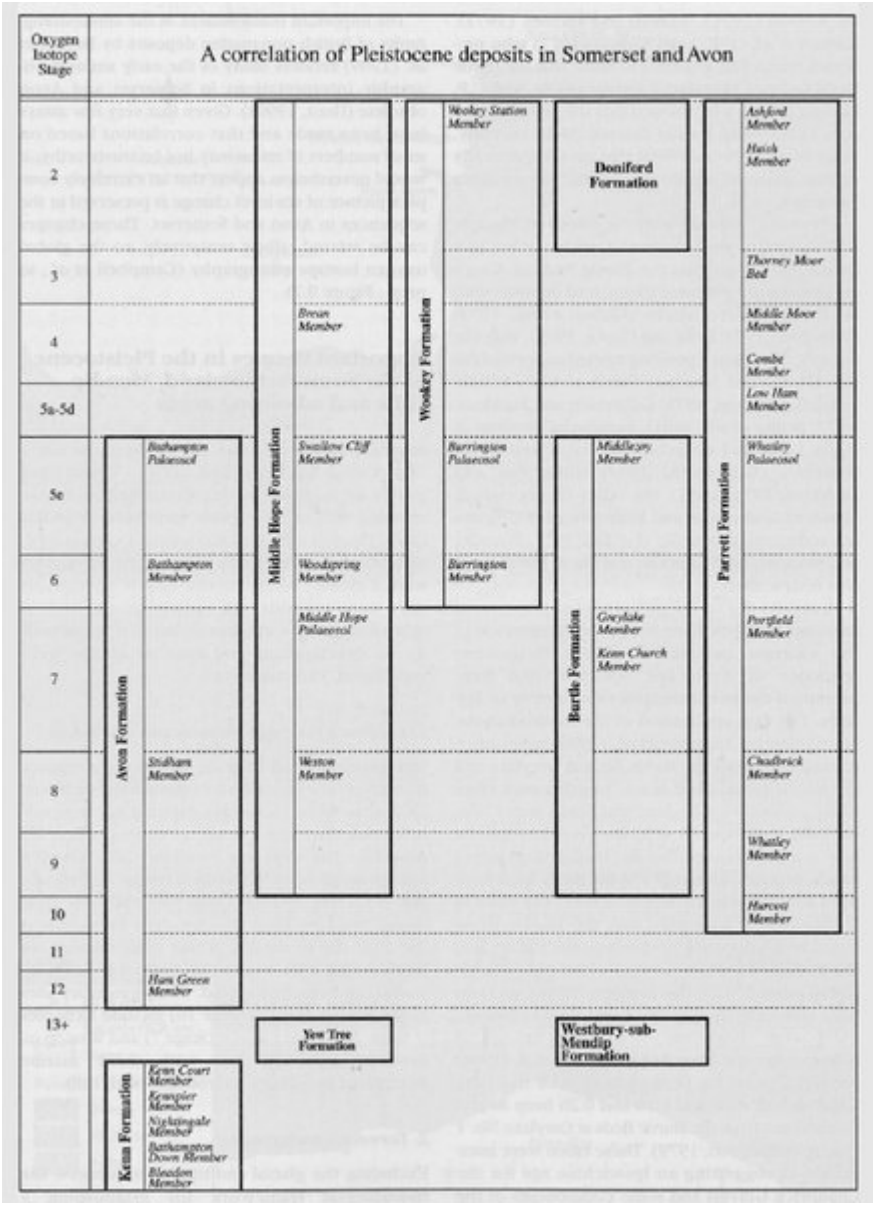
4. Cold-stage sedimentation and palaeobiology

Subsequent to the Kenn glaciation, Avon and Somerset lay beyond the glacial limits. Cold-stage sedimentation was ubiquitous, but good examples, particularly pre-Devensian ones, are very rare. Subgroups of sites were chosen to demonstrate this aspect of Pleistocene history. Two sites represent fan sedimentation around Mendip. Wookey Station provides an excellent example of fan sedimentation, a rare mollusc fauna and pollen dating from the coldest part of the Late Devensian. The Bourne sequence demonstrates at least two earlier periods of fan aggradation, separated by an interglacial palaeosol which is virtually unique in the region. Brean Down is important for periglacial aeolian and slope sediments and Early to Mid-Devensian vertebrates and land molluscs. At Swallow Cliff, Middle Hope, the raised beach deposits overlie rare Stage 6 or 8 slope deposits which contain land molluscs. Cold-stage river terrace gravels make up a further important group of sites. Outstanding among these is the cliff section at Doniford (Chapter 7), which exposes a considerable proportion, in cross-section, of a cold-stage valley-fill. Langport Railway Cutting provides an excellent sequence, of proposed Stage 8 age, with land mollusc faunas.

References



(Figure 9.1) The Mendips and Somerset lowland, showing GCR sites described in this chapter, and selected GCR sites described in Chapters 7 and 10.



(Figure 9.2) A correlation of Pleistocene deposits in the Somerset lowland, Mendips, Bristol district and Avon Valley. (Adapted from Campbell et al., in prep.)