
Chapter 10 The Quaternary history of the Avon Valley and Bristol district

Introduction

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The sites described in this chapter were selected to document the glaciation and subsequent landscape development of the Bristol district and Avon Valley (Figure 10.1). This region contains important and unique evidence for a very early glaciation. Especially important are the glacial deposits of the Kenn Formation and associated landforms, distributed widely throughout the area, and the ?Stage 15 interglacial deposits of the Yew Tree Formation, which overlies the Kenn Formation of the Kenn lowlands. The Avon Valley contains a potentially important terrace sequence post-dating the glacial deposits, and important cold-stage aeolian and colluvial sediments are preserved at Holly Lane, Clevedon.

The Pleistocene record of the Bristol district and Avon Valley has considerable importance, but, with a few notable exceptions, has been relatively neglected in recent years. There is a rich history of research, spanning nearly two centuries. In the early years of the nineteenth century, many of the major elements of the Pleistocene geology of the region were described and interpreted by a variety of notable geologists. Much of this work still holds good today. Thus, Smith (1815) identified the alluvial origin of the Avon Levels and the presence of buried valleys under the alluvium, Conybeare and Phillips (1822) recorded erratic material on the hilltops around Bath, and Buckland (1823) recorded mammal remains from a number of cave sites in his *Reliquiae Diluvianae*.

Later, Weston (1850) described fossiliferous terrace gravels and erratic-rich plateau deposits near Bath, and Trimmer (1853) identified glacial erratics at Court Hill. Both argued that the erratics had been introduced during the 'deluge'. Considerable early attention was focussed on vertebrate localities in the Bath and Bristol districts (Dawkins, 1865; Moore, 1870). The first detailed synthetic work on the Quaternary deposits of the region was the Geological Survey Memoir of Woodward (1876). Prestwich (1890) later re-described the high-level gravels in the Bath area.

In the early years of the twentieth century, Harmer (1907) proposed that the river network of the Bristol district had resulted from glacial diversions of drainage. Although his suggestion was contested or ignored by authors such as Varney (1921), Davies and Fry (1929), Palmer (1931) and Trueman (1938), who favoured a solely fluvial origin for the network unhindered by glacial activity, recent work has tended to support his views. The terrace stratigraphy of the Bristol Avon was revised by Davies and Fry (1929) and Palmer (1931), who both proposed a tripartite terrace sequence with low, 50 foot and 100 foot terraces.

The investigation of periglacial deposits in Avon started with the discovery of the Clevedon bone cave in the Holly Lane 'gravel' quarry (Davies, 1907; Hinton, 1907a; Reynolds, 1907). Greenly (1922) recognized the cold-climate aeolian origin of the loamy sand units at Holly Lane, a conclusion supported by Palmer and Hinton (1929), Palmer (1934) and Vink (1949). Palmer (1934) conducted studies of a number of cold-climate breccia and blown-sand sites, including Holly Lane and the important section at Brean Down (Chapter 9), and demonstrated a southerly origin for the sands on mineralogical grounds.

Modern interest in the glacial geology of the region was stimulated by Mitchell's (1960) influential review, which 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 local interglacial marine deposits (e.g. Stephens, 1970a, 1970b, 1973; Hawkins and Kellaway, 1971, 1973; Kellaway, 1971; Kidson, 1971, 1977; Kidson and Haynes, 1972; Mitchell, 1972; Kidson *et al.*, 1974; Kellaway *et al.*, 1975).

Eventually, a growing body of stratigraphical and palaeoenvironmental research was to lead to a broad consensus on two major issues. First, that much of Avon had been glaciated during the Wolstonian (Gilbertson, 1974; Kidson, 1977; Gilbertson and Hawkins, 1978a, 1978b) and second that Somerset had not been glaciated (Kidson, 1977; Hunt *et al.*, 1984; Hunt, 1987). The Burtle Beds were shown to be estuarine interglacial deposits with freshwater intercalations

(Kidson *et al.*, 1978; Gilbertson, 1979; Hunt and Clark, 1983), with the balance of evidence pointing toward an Ipswichian age. Similar sediments, post-dating the glacial deposits, were described from Kenn and were also thought to be Ipswichian in age (Gilbertson, 1974; Gilbertson and Hawkins, 1978a; Hunt, 1981). Post-Ipswichian periglacial deposits were described at Holly Lane and elsewhere in Avon and north Somerset (Gilbertson, 1974; Gilbertson and Hawkins, 1974, 1983). Some deposits, for instance the gravels on Bleadon Hill (Findlay *et al.*, 1972), remained more enigmatic, however.

The application of amino-acid geochronological techniques has since led to the reassessment of the Pleistocene sequence in the Bristol area and to the recognition that the glaciation of the region was of considerable antiquity. It has also become clear that marine interglacial deposits overlying the glacial deposits are of considerable complexity. Andrews *et al.* (1984) presented amino-acid ratios of c. 0.2 from estuarine interglacial deposits at Kenn Church and New Blind Yeo Drain, which they interpreted as Ipswichian; ratios of c. 0.38 for the upper estuarine deposits at Yew Tree Farm and Kennpier which overlay supposedly Wolstonian glacial deposits, were interpreted as equivalent in age to deposits at Purfleet in the Thames Estuary. Bowen *et al.* (1989) correlate these sites with later 'Cromer-complex' sites such as Waverley Wood and Oxygen Isotope Stage 15. The Kenn Church deposits have most recently been referred to Stage 7 (Campbell *et al.*, in prep.).

A number of important conclusions have emerged from the most recent work. First, many of the earlier ascriptions of sites to the Ipswichian Interglacial seem unfounded. Second, the great antiquity of the glaciation of Avon, pre-dating the Kennpier and Yew Tree Farm interglacial deposits and thus ?Stage 15, is also apparent. This glacial episode would appear to be substantially older than the Anglian glaciation of eastern England, which post-dates Stage 13.

Important themes in the Pleistocene of the Avon Valley and Bristol district

Several important themes emerge from the scientific framework outlined above, and were central to the process of site selection outlined in the introduction to Chapter 9. The themes are as follows.

1. Evidence for the age and limits of early glaciation

Sites in Somerset and Avon are of critical national importance since it is here that possible pre-Anglian glacial deposits and landforms are preserved in stratigraphic relationship with fossiliferous, and therefore datable, interglacial sediments. One group of sites was selected to demonstrate glacial deposits and landforms — the col-gully and glacial outwash at Court Hill, the till and glaciofluvial deposits at Nightingale Valley, and the tills and glaciofluvial gravels at Kennpier. A second group of sites provides additional evidence for glacial morphology and limits: glacial erratics contained in karstic fissures on the plateau of Bathampton Down at Bath University; recycled glacial erratics in fluvial gravels at Hampton Rocks Cutting in the Avon Valley, at Newton St Loe, Stidham Farm and Ham Green; ?glaciofluvial gravels at Bleadon Hill on Mendip; possible glacial deposits below the Burtle Beds at Greylake No. 2 Quarry in King's Sedgemoor (Chapter 9); and the erratic-free deposits at Langport Railway Cutting, 6 km farther south, which probably lay just beyond the glacial limit (Chapter 9). A further important group of sites provides dating evidence or the potential for dating Pleistocene events. At Kennpier, a channel incised into the Kennpier till contains interglacial deposits which have yielded amino-acid ratios indicative of an Oxygen Isotope ?Stage 15 age. At Weston-in-Gordano, till-like material lies stratified within interglacial marine deposits which may have formed during three separate high sea-level stands, thus providing further geochronological potential. The terrace stratigraphy of the Bristol Avon offers another potential dating tool since, in the nineteenth century, the Avon gravels were described as richly fossiliferous. Representatives of each of the main stratigraphic units were therefore selected — the plateau glacial deposits at Bath University, the 100' terrace at Ham Green, the 50' terrace at Stidham Farm, Saltford, and the low terraces at Newton St Loe and Hampton Rocks Cutting.

2. Evidence for high Pleistocene sea levels

Avon and Somerset offer an unparalleled sequence of marine interglacial and interstadial deposits and, wherever possible, GCR sites have been chosen to provide evidence for the high sea-level events. The sites are Kennpier (Stage 15), Kenn Church (Stage 7), and Weston-in-Gordano (undated but with three marine interglacial sequences interbedded with till-like material). Complementary sites are Swallow Cliff (Stage 5e or 7), Greylake No. 2 Quarry (Stages 7 and 5e)

and Low Ham (Stage 5a) (Chapter 9).

3. Post glaciation landscape development and river terrace stratigraphy

With the exception of the glacial and marine sequences, the fundamental evidence for establishing the Pleistocene stratigraphy of Somerset and Avon is provided by river terrace gravels. GCR sites were therefore selected to demonstrate the critical elements of this regional terrace stratigraphy. In the Bristol Avon Valley, Hampton Rocks Cutting, Newton St Loe, Stidham Farm and Ham Green were selected to represent the principal stratigraphic units. Complex deposits at Weston-in-Gordano show a long history of sea-level change and landscape development following the glaciation of the area. In the same area, more recent landscape development under a periglacial regime is documented at Holly Lane.

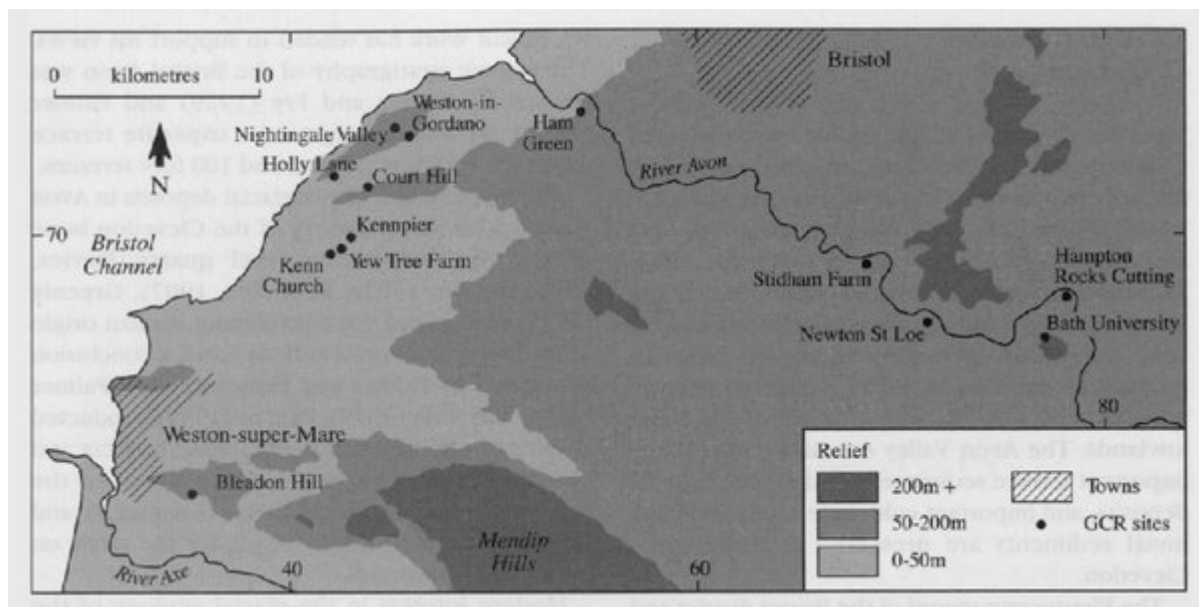
4. Temperate-stage palaeobiology

Somerset and Avon have one of the most complete and richly fossiliferous sequences of marine interglacial and interstadial deposits in Britain. Two sites are of particular significance. The ?Stage 15 interglacial deposits at Kennpier and Yew Tree Farm are unique, with their rich fossil mollusc faunas, pollen and dinoflagellate cysts. Also important are the marine mollusc sites at Kenn Church (Stage 7) and Weston-in-Gordano (?Stage 7 and/or earlier stages).

5. Cold-stage sedimentation and palaeobiology

Subsequent to the Kenn glaciation, Avon and Somerset lay beyond the Pleistocene ice sheets. Although cold-stage sedimentation was widespread, good examples of pre-Devensian sediments are very rare. Fine examples of cold-stage river terrace gravels are seen in the Avon Valley at Hampton Rocks Cutting, Newton St the, Stidham Farm, Saltford, and Ham Green. Also important are the 'coversands' of the Avon coastlands, which pass laterally into thick colluvial and aeolian sequences found below steep slopes, for instance at Holly Lane, Clevedon.

References



(Figure 10.1) The Avon Valley and Bristol district, showing GCR sites described in this chapter.