Black Ridge Brook

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Highlights

Black Ridge Brook GCR site provides an important record of Devensian late-glacial and early Holocene environmental conditions on northern Dartmoor. It shows that human modification of the natural mid-Holocene forest cover occurred as early as Mesolithic times. The site has also yielded important information regarding the extent of woodland on Dartmoor during the 'forest maximum'.

Introduction

Black Ridge Brook has yielded one of the most extensive records of Holocene environmental change in South-West England. The human role in modifying the natural vegetation cover can be shown, on the basis of radiocarbon-dated pollen evidence from this site, to have begun as early as the Mesolithic. The pollen record has also been seen as central to establishing the extent of tree cover ('tree-lines') on Dartmoor during the forest climax in the mid-Holocene. Referred to by Caseldine and Maguire (1981), the site has since been studied in detail by Maguire (1983), Maguire and Caseldine (1985) and Caseldine and Maguire (1986). Pollen studies at this and adjacent sites have allowed a comprehensive picture of vegetational and environmental changes to be reconstructed for the area (Simmons, 1964a; Simmons *et al.*, 1983; Hatton, 1991; Caseldine and Hatton, 1993, 1996).

Description

Black Ridge Brook rises in the northern part of Dartmoor on the south-west-facing slopes of Black Ridge (573 m OD), an interfluve between the northerly draining West Okement river and the south-west-flowing Amicombe Brook. The Black Ridge Brook pollen site [SX 579 842] is located approximately at the confluence of the Black Ridge and Amicombe brooks (Figure 4.19). The surrounding interfluve areas, including nearby Little Kneeset (507 m OD), are characterized by gently undulating topography, largely blanketed with peat and occasionally punctuated by tors. Several pollen profiles have been described from different locations along this reach of Black Ridge Brook: the main site, however, is that referred to by Maguire and Caseldine (1985) as Black Ridge Brook (lower).

The most detailed description of the site was provided by Caseldine and Maguire (1986) who recorded a 2.12 m-thick sequence from a river section. The following detailed stratigraphy was provided for the lower part of this section:

14. Black pseudo-fibrous peat (140–176 cm)

13. Wood (176–179 cm)

12. Wood / well-humified brown peat (179–181 cm)

11. Grey/dark brown well-humified peat (181–188 cm)

10. Wood (188–189 cm)

9. Black well-humified peat (189–195 cm)

8. Wood (195–196 cm)

7. Black well-humified peat (196–199 cm)

6. Wood (199–200 cm)

5. Black well-humified peat (200–202 cm)

4. Wood (202–203 cm)

3. Charcoal (203–204 cm)

2. Well-humified grey/brown peat (204–212 cm)

1. Head (mineral matter) (> 212 cm)

The pollen and radiocarbon evidence derived from this sequence is shown in simplified form in (Figure 4.20): five radiocarbon dates are available, and the pollen spectra have been divided into five local pollen assemblage biozones (BRB1 to BRB4).

Interpretation

The basal sediments (beds 1 and 2) contain a Salix–Gramineae–Cyperaceae pollen assemblage (BRB1), indicating open-ground conditions with very few trees. High *Salix* values are taken as denoting the presence of *Salix herbacea* rather than local stands of more shrubby forms of *Salix* (Caseldine and Maguire, 1986). The dominantly minerogenic nature of bed 1 and the pollen evidence are strongly suggestive of conditions at the Devensian late-glacial/Holocene transition, similar to those described throughout the British Isles and north-west Europe (Caseldine and Maguire, 1986).

The radiocarbon date of 7730 ± 95 BP (GU–1606), from sediments covered by the lowest part of the biozone, is thought to be too 'young', perhaps due to groundwater seepage along the peat/mineral boundary between beds 1 and 2 or from rootlet contamination (Caseldine and Maguire, 1986).

Local pollen assemblage zone BRB2 spans beds 2–4 (well-humified peats with charcoal and wood layers). This *Juniperus–Empetrum–Pinus–Betula–Gramineae* zone signals the establishment of an early Holocene birch woodland. The fall in *Salix* pollen, the continued presence of Gramineae and Cyperaceae pollen and successive peaks in the pollen of *Empetrum, Juniperus* and *Betula,* which characterize the biozone, reflect a pattern of plant succession with an initial gradual development of dwarf birch scrub and the eventual immigration and establishment of tree birches. A radiocarbon date of 8785 ± 85 BP (GU-1700) from the base of bed 5 suggests that the disappearance of dwarf scrub elements of the vegetation and the establishment of birch woodland, at best only scrubby and open in form, was a slow process. Certainly, in comparison with other areas of the British Isles, where birch spread rapidly after the climatic amelioration following the Younger Dryas (Smith and Pilcher, 1973; Huntley and Birks, 1983), the late spread of birch to Dartmoor and other upland areas of South-West England seems anomalous. Caseldine and Maguire (1986) suggested that the delay in the development of birch woodland could have been due to the soil properties of the area. After the close of the Devensian, Dartmoor would have been dominated by large areas of bouldery cutter and very coarse periglacial detritus rather than the thick glacial sediments present over much of Scotland, northern England and Wales. Where fine fractions were largely absent from the soil, it is thought that the reduction in water retention capacity may have limited birch establishment. Other factors such as exposure and winter temperature regimes may also have played a part in the observed delay in woodland development. The prominent charcoal layer (bed 3) suggests that fire (naturally rather than human-induced) may have been instrumental in retarding woodland succession at this early stage of the Holocene (Caseldine and Maguire, 1986).

The succeeding pollen biozone (BRB3a) covers beds 5–8 and the lower part of bed 9, a series of alternating well-humified peat and wood layers. This *Corylus/Myrica–Quercus–Betula–Filicales* assemblage denotes the establishment of birch-hazel woodland on Dartmoor after *c.* 8785 BP. *Corylus* becomes co-dominant in the pollen record by *c.* 8500 BP, a relatively late date. Caseldine and Maguire (1986) have argued, on the basis of arboreal and shrub pollen frequencies, that for a time birch-hazel woodland reached close to, if not over, the summit areas, largely clothing Dartmoor, with perhaps only pockets of more open ericaceous heath on the very highest areas. The pollen frequencies at Black Ridge Brook certainly demonstrate the existence of woodland around the site, some 120 m below the nearby summits. During this period of woodland expansion (roughly 8700–8500 BP), *Quercus* would have become the dominant tree in more sheltered valleys. Changes in local conditions are also denoted by pollen zone BRB3a: at *c.* 8785 BP shallow *Sphagnum* bog was replaced by *Salix* carr which lasted until *c.* 7490 BP — well into the succeeding pollen assemblage zone BRB3b (Caseldine and Maguire, 1986).

Local pollen assemblage BRB3b spans the upper part of bed 9, beds 10–13 and the lower part of bed 14, and provides evidence of vegetational changes between *c.* 8000 and 7500 BP. It shows that woodland communities still remained at high altitudes after *c.* 8000 BP, but that locally, oak and hazel developed at the expense of birch; the evidence from this and other Dartmoor sites shows that hazel was dominant in the woodland above *c.* 400 m (Caseldine, 1983; Maguire, 1983; Simmons *et al.,* 1983; Caseldine and Maguire, 1986). In common with other areas of the South-West at this time, *Pinus* was sparse, and elm appears never to have become a significant element of the upland woodland community, having been restricted to more sheltered lowland locations (Caseldine and Maguire, 1986). The pollen evidence shows that woodland retreat from the highest areas of Dartmoor may have begun at *c.* 7700–7600 BP.

The succeeding local pollen assemblage zone (BRB4) occurs in the upper part of bed 14 and in the sediments above it (not analysed in detail; (Figure 4.20)). This zone opens at *c*. 7490 ± 80 BP, and demonstrates colonization of the area by *Alnus* (alder), which displaced birch especially in local valley floors and areas marginal to the bog (Caseldine and Maguire, 1986). A general reduction in woodland cover is indicated by increases in the percentages of Gramineae and *Calluna* pollen at the expense of *Corylus/Myrica* and *Betula.* Although these changes may partly reflect variations in local conditions — from *Salix* carr to blanket peat — higher percentages of charcoal in the profile after *c.* 7000 BP suggest that vegetational development was being governed by widespread external influences.

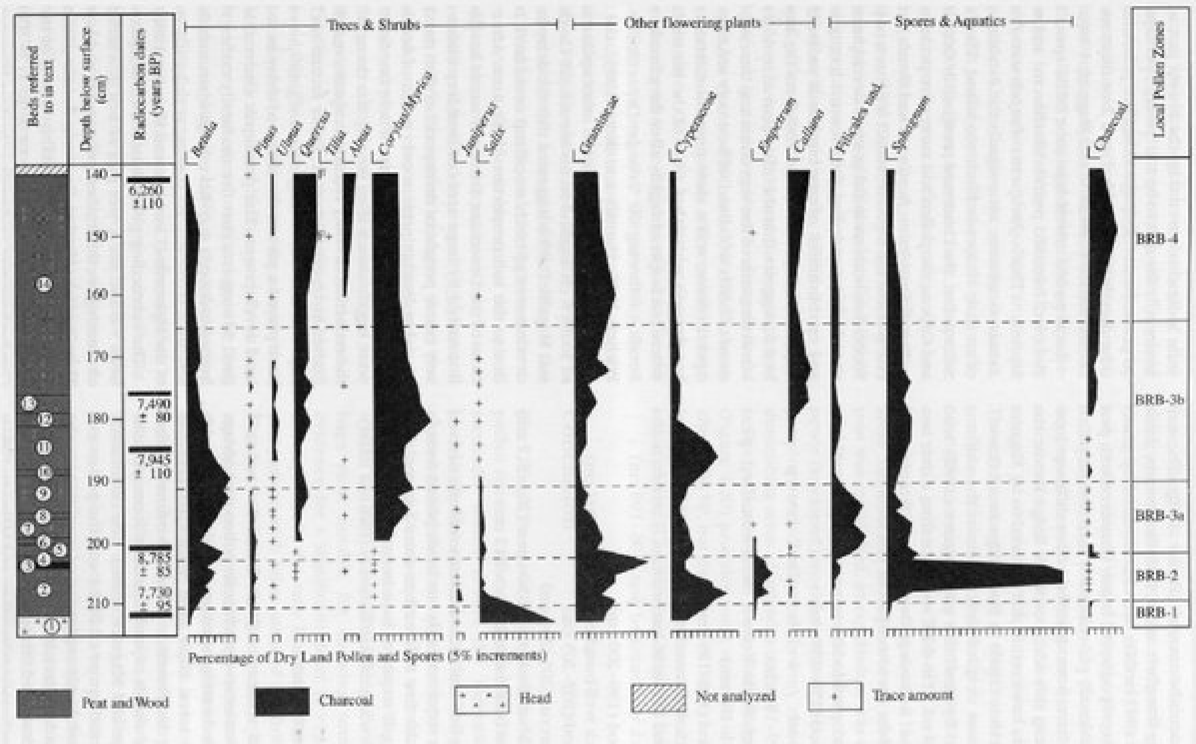
Caseldine and Maguire (1986) have argued that these changes (a fall in arboreal and shrub pollen, rising amounts of charcoal in the profile and the extension of blanket peat on relatively level ground and gentle slopes) were brought about by the recurrent burning of woodland by Mesolithic hunting populations. This burning may have led to soil deterioration and the onset of blanket peat formation (cf. Jacobi *et al.,* 1976; Simmons *et al.,* 1983). The continuous presence of charcoal in the peat profile at Black Ridge Brook up to and after *c.* 6260 BP is not matched by a further decline in tree and shrub pollen after *c.* 7000 BP. Caseldine and Maguire (1986) suggested that once the higher areas had lost their woodland cover, and blanket peat was established, an equilibrium was achieved with fire maintaining the open character of the newly developed moorland communities, and suppressing woodland there, but not further diminishing areas of upland woodland.

The pollen diagram from Black Ridge Brook (Figure 4.20) provides some measure of changes after 6260 BP, but the nature of the record and the lack of radiocarbon dates makes detailed interpretation unwise (Caseldine and Maguire, 1986).

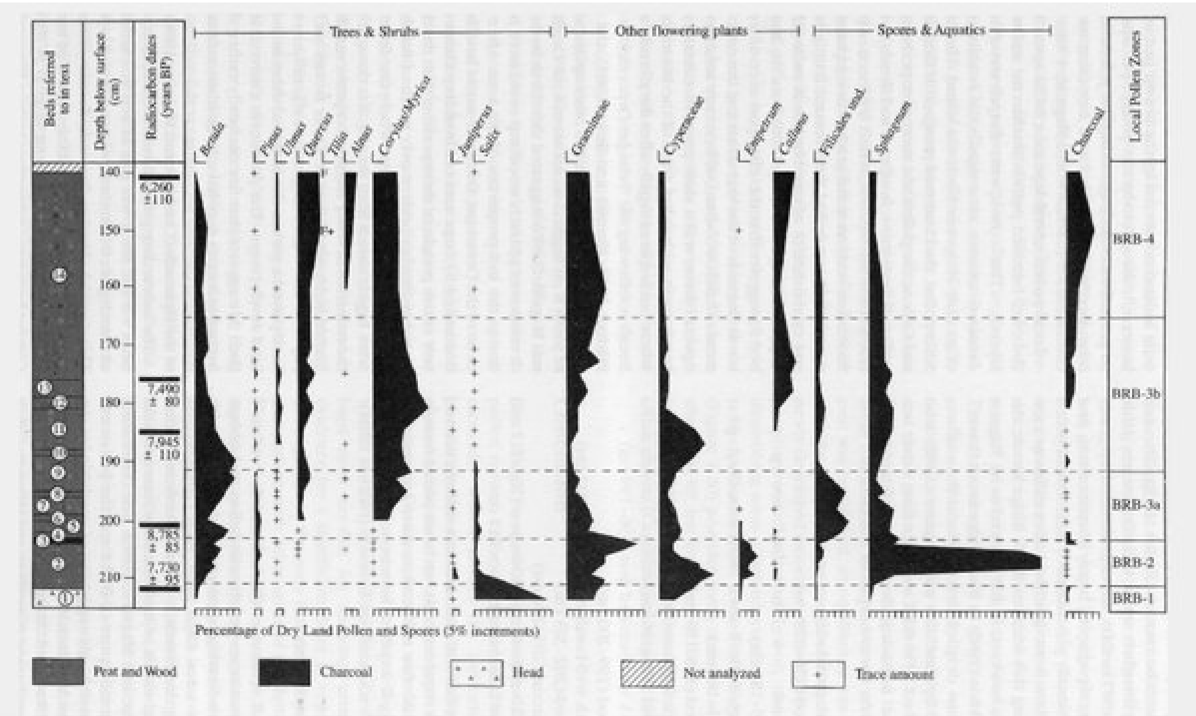
Conclusion

Black Ridge Brook GCR site provides a detailed pollen record, calibrated by radiocarbon dating methods, which covers the Devensian late-glacial/early Holocene time interval. Sites providing environmental data from this time interval are not only rare on Dartmoor, but there are relatively few in South-West and central southern England as a whole. The record from Black Ridge Brook is perhaps most notable for showing unequivocal evidence for a significant delay in vegetational development in the early Holocene, especially in comparison with other areas of the British Isles. This has been attributed to a variety of environmental factors including the coarse nature of local parent materials and extreme climatic exposure. The site also provides some of the best evidence in Britain for the influence of Mesolithic people in reducing woodland cover by fire, and for providing a link with these activities and the widespread initiation of blanket peat. The site's pollen record is one of the most comprehensive in South-West England and is central to reconstructions of regional vegetation history. It is intimately linked to human influence on the natural landscape.

References



(Figure 4.19) Shallow peat sections exposed along Black Ridge Brook, northern Dartmoor. (Photo: C.J. Caseldine.)



(Figure 4.20) Simplified pollen diagram for Black Ridge Brook, adapted from Caseldine and Maguire (1986).