The Bog, Roos

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Introduction

The Bog, Roos is a small, deep basin in southern Holderness, East Riding of Yorkshire, that contains a full succession of minerogenic and organic Late-glacial and Holocene lacustrine and peat deposits. Detailed litho- and biostratigraphical studies at the site have been completed by Beckett (1975, 1977b, 1981), who also reported radiocarbon dates on the Late-glacial sequence. These data have been reproduced or discussed by several other authors in reviews of regional palaeoenvironmental history (Gilbertson, 1984a; Flenley, 1984, 1987, 1990; Rose, 1989a; Can, 1991b; Van de Noort and Davies, 1993; Dinnin, 1995; Dinnin and Lillie, 1995b; Taylor, 1995; Greig, 1996; Lillie and Gearey, 1999). Colluvium studies (Lillie, 1995) and archaeological survey (Head *et al.,* 1995b) have been undertaken in the environs of the basin. Dinnin and Lillie (1995b) and Taylor (1995) have completed palaeoenvironmental research in adjacent valley sediments, from which nationally important archaeological wooden figures have been recovered (Coles, 1990, 1993).

Description

The site lies about 2 km south-west of Roos village and about 6 km inland from the coast. The basin is steep-sided and is considered by most authors to have originated as a kettlehole during ice decay (Flenley, 1987; Catt 1991b), although it is possibly a collapsed pingo (Berridge and Pattison, 1994), as it is enclosed almost entirely by a till rim of higher ground that may represent the pingo rampart. The bog surface lies at about 5 m OD, and the rim altitude is between 8 and 15 m OD. The oval basin, about 220 m by 120 m in size, lies on a ridge of Withernsea Till (Catt and Penny, 1966; Madgett and Can, 1978; Catt, 1991b), now reclassified as the Withernsea Member of the Holderness Formation (Lewis, 1999). This till unit is restricted to south-east Holderness, extending no more than 10 km from the coast, so the site is near to its westerly limit. The till ridge upon which The Bog, Roos sits forms the interfluve between incised east–west draining valleys that formerly supported mere, swamp and fen-carr environments at about 3 m OD, but which are now drained. These valleys, the Keyingham, Halsham and Roos Drains, are filled to depths of over 9 m by mid- and late Holocene alluvial and carr deposits (Dinnin and Lillie, 1995b). There is no natural drainage from The Bog, Roos basin to the surrounding areas of valley wetland, but the bog has been drained artificially to the north by ditches and pipes. This may have been a relatively recent occurrence, as the site contains unoxidized peats to the surface without a capping mineral layer. The relatively small, steep-sided basin would not have been easy to drain before modern times and seems not to have been subject to long-term, concerted drainage that would have damaged the more recent sediments. Before 1968 the bog surface was not very wet and supported a tree cover of *Betula, Quercus* and *Larix* (Beckett, 1975, 1981). Then the trees were killed by deliberate flooding, since when the surface has been waterlogged, with surface water across most of the bog and *Salix, Phragmites, Typha latifolia* and other wetland plants increasing.

Beckett (1975, 1977b, 1981) completed a transect of borings (Figure 8.31) across the long axis of the site, which revealed that beneath the sediment the basin sides continue to be steep, down to a relatively flat bottom. The following 11.5 m of sediments were recorded in a core from the centre of the basin and these were representative of the site's overall, rather uniform, lithostratigraphy.

	Depth (m)
Humified woody peat with *Betula* twigs	0.00–0.4
Less humified peat with plentiful *Sphagnum, Menyanthes trifoljata* seeds and Ericaceae stems. *Polytrichum* sp. at 1.80m	0.40–2.00
Humified coarse detritus mud, with *Sphagnum* leaves	2.00–3.90

Fine, dark brown detritus mud with occasional leaves *of Quercus robur, Betula pubescens* and *Salix* sp.	3.90–9.30
Pinkish grey clay with occasional moss fragments of *Fontinalis antipyretica*	9.30–10.90
Fine, dark detritus mud	10.90–11.16
Slightly organic grey clay	11.16–11.33
Fine, dark detritus mud with a little clay	11.33–11.36
Grey clay, gravelly at the base, with moss fragments of *Leptodictyum* sp.	11.36–11.50

Pollen analyses were conducted on this central core (Beckett, 1981), and these are shown in (Figure 8.32) in the form recalculated and redrawn by Flenley (1984, 1987, 1990), with frequencies as percentages of total dry-land pollen. Eleven pollen assemblage zones are recognized, from the base of the diagram, as follows.

RB1a *Betula* and *B. nana* are the important taxa, with lesser Gramineae and Cyperaceae.

RB1b *Betula* values are greatly reduced. Gramineae and Cyperaceae characterize the pollen assemblage, with high *Helianthemum* and *Hippopheie* and significant *Artemisia* and *Thalictrum.*

RB2 *Betula* dominates the zone, with *Pinus* also increased. *Fllipendula* rises in frequency but all other shrub and herb types are greatly reduced.

RB3 Cyperaceae characterizes the assemblage. *Betula* frequencies fall sharply, but *B. nana,* Gramineae, *Juniperus* and *Artemisia* all increase. *Thalictrum* rises late in the zone. *Pinus is* important.

RB4 *Betula* rises sharply to 80% of land pollen and dominates the assemblage, although *Pinus* remains significant. *Filipendula* frequencies show a peak and aquatic herb taxa values rise.

RB5 *Corylus/Myrica* percentages rise sharply to dominate the zone at almost 80%. No other taxa are significant except *Ulinus* and, later in the zone, *Quercus.*

RB6 A rise in *Alnus* pollen to almost 30% characterizes the zone, with *Corylus/ Myrica* pollen still at high frequencies. *Ulmus* and *Quercus* are in low but significant values, and *Tilia* rises later in the zone. All other pollen types are very low.

RB7 *Ulmus* frequencies decline to very low values, and *Tilia* also is much reduced before recovering. *Alnus* and *Corylus/Myrica* continue to dominate the assemblage and *Quercus* and *Betula* are both increased. *Plantago lanceolata* is recorded for the first time, and other dry-land herb types increase. *Sphagnum* spores are common.

RB8 Characterized by a major fall in all tree and shrub taxa. *Callum* and *Empetrum* show very high peaks in mid-zone. Gramineae and *Plantago lanceolata* frequencies are high. Several ruderal dry-land herb taxa are consistently present. Peaks in *Sphagnum* occur.

RB9 Gramineae dominates the assemblage and *Plantago lanceolata* remains high. A peak of cereal-type pollen occurs, with many ruderal herbs. *Betula* increases slightly and *Sphagnum* spores are important.

RB10 *Betula, Alnus* and *Pinus* values rise and all herb pollen frequencies fall, although Gramineae remains in moderate percentages.

Five radiocarbon dates were obtained (Beckett, 1981), all in the Late-glacial sediments, and these are shown on (Figure 8.32). The upper 9 m of the core remain undated, other than relative to the major pollen stratigraphy changes. The radiocarbon dating control for the Late-glacial succession allowed Beckett (1981) to calculate sediment-accumulation and pollen-influx rates. The latter are shown on (Figure 8.33) for selected, major taxa, calculated as pollen grains per square centimetre per radiocarbon year. In zones RB1a and RB1b influx rates are very low, although higher in zone RB1a. *Betula* and *B. nana* provide most of the pollen influx, in accordance with the pollen percentage data. Rates in zone RB1b are very low indeed.

In zone RB2 tree pollen influx rises to over 300, contributed mainly by *Betula,* and total rates also rise sharply. Fluctuations for other taxa match the percentage changes. In zone RB3 total influx values fall markedly, although they still exceed those for zone RB1b. Values are lowest in the first half of RB3, recovering towards the top of the zone. *Betula* is much reduced. Only *Juniperus* is marginally increased relative to the earlier zones. Sediment accumulation rates are much higher in the clastic sediment of zone RB3 than in the rest of the Late-glacial sequence. In zone RB4 total influx rates increase greatly, contributed mainly by *Betula,* which reaches well over 1000. *Pinus, Salix,* Gramineae, Cyperaceae and *Filipendula* all rise sharply also, although none exceed 100. The data on influx rate support the pollen percentage evidence for the whole of the Late-glacial succession.

Interpretation

The major importance of The Bog, Roos lies in the great thickness of the sediments preserved in the basin and the apparently unbroken Late-glacial and Holocene record that they preserve. Resting upon the Withernsea Member near to its arcuate western margin, the basal sediments at the site can provide a limiting age for ice retreat (Catt, 1991b). With the radiocarbon evidence from Dimlington (Penny *et al.,* 1969), the lowermost date from The Bog, Roos therefore can constrain estimates of the age of the latest Devensian Stadial ice-surge advance in the Holderness area (Eyles *et al.,* 1994). The lowest date at the site, 13 045 ± 270 years BP, is closely comparable to the few other dates available from east Yorkshire for earliest organic deposition after ice retreat, for example that of 13 042 ± 140 years BP from Seamer Carrs in the Cleveland lowlands (Jones, 1976a). The interval between deglaciation and revegetation and organic deposition is conjectural, however, as ice removal may well have occurred considerably before *c.* 13 000 years BR These dates at The Bog, Roos and elsewhere are more a measure of climatic improvement than deglaciation and remain of coarse limiting value. The very large standard deviation on these early Late-glacial dates further increases their uncertainty.

Nevertheless, the Late-glacial date series from The Bog, Roos has been one of the most valuable, at least prior to the major allocation of dates to the Late-glacial sequence at Gransmoor in the Hull valley (Walker *et al.,* 1993; Lowe *et al.,* 1995a, b). The date at The Bog, Roos of 13 045 ± 270 years BP is on a 3 cm thick layer of organic, detritus mud 3 cm thick, which overlies the basal, gravelly grey clay. This thin mud layer lies below the thicker Late-glacial interstadial organic layer, separated from it by an inorganic silt, and so is evidence of a climatic amelioration prior to that of the main (cf. Allerød) interstadial. This early Late-glacial organic mud unit has been observed at other sites in the region, such as Skipsea Bail Mere (Flenley, 1984, 1987). This early warmer climatic phase is also manifest in the pollen record as higher frequencies of tree *Betula* pollen at some sites, so producing the phenomenon of a dual Late-glacial *Betula* peak. This has been noted at Tadcaster (Bartley, 1962) and Thorpe Bulmer (Bartley *et al.,* 1976), as well as at Skipsea Bail Mere. It occurs also at The Bog, Roos, with zone RB1a as the early *Betula* peak and zone RB2 as the much more substantial main interstadial *Betula* expansion. The pollen record at 13 045 ± 270 years BP suggests considerable shrub and tree birch cover within a still mostly open landscape, whereas the main interstadial peak indicates that *Betula* woodland expanded across most of the area. The radiocarbon dates on this higher organic layer confirm it as the main interstadial warm phase between about 12 000BP and 11 000 years BP Zone RB1b at The Bog, Roos therefore is evidence of a climatic reversion during which tree and shrub growth became much more restricted and cold-tolerant taxa, such as grasses, sedges, *Helianthemum* and *Hippophae* occupied a much more open landscape. The early Late-glacial phase has the highest resolution pollen sampling interval of the whole of Beckett's (1981) pollen diagram and so the data from The Bog, Roos are a reliable record of early Late-glacial climatic fluctuation. The clastic unit corresponding with zone RB3 is dominated by cold-tolerant pioneer herb pollen taxa and represents a major phase of severe cold climate, probably arid, tundra-type conditions. Its radiocarbon parameters of 11 220 ± 220 and 10 120 ± 180 years BP confirm it as the Younger Dryas (Loch Lomond) Stadial, with poor vegetation cover, soil instability and erosion. Increased *Juniperus* values may represent some growth of that shrub within the rim of the basin on the more sheltered slopes. The return of warm climate conditions at the start of the Holocene Epoch is marked in the lithology by a switch to highly organic detritus lake mud above the Loch Lomond Stadial clay. This limnic sequence persists until the late Holocene and the site was an open water lake for most of its history.

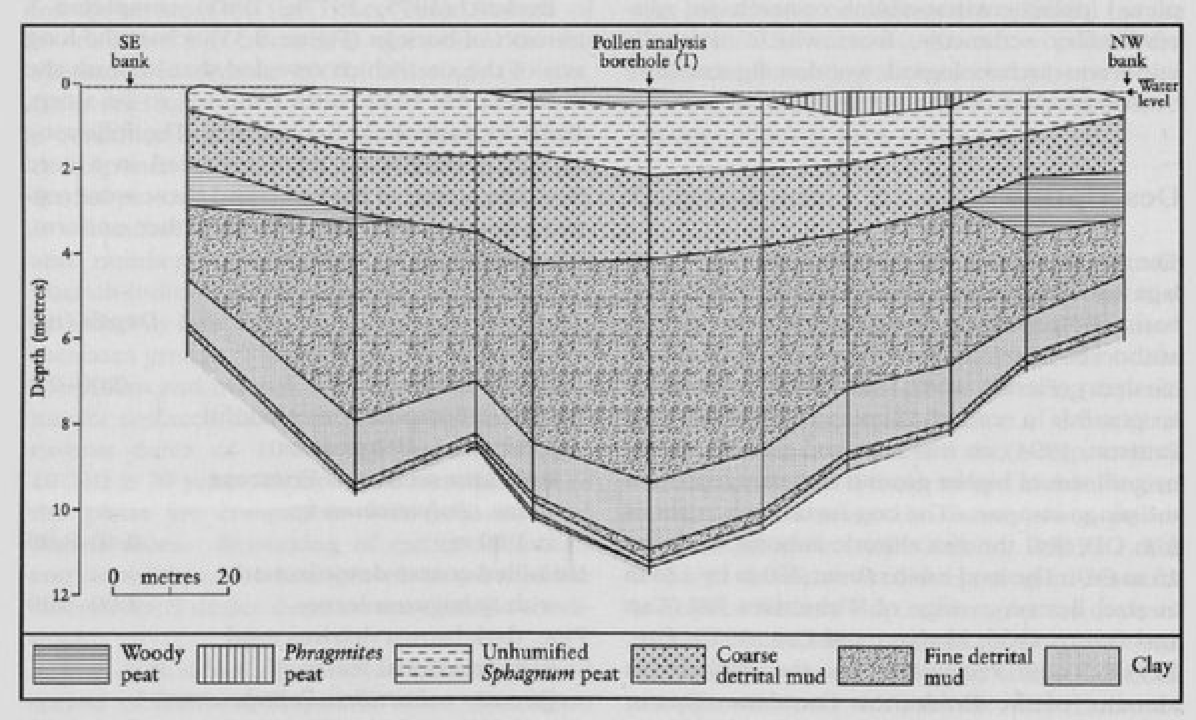
The early Holocene vegetation succession is similar to that of most other sites in the region. A very rapid expansion of *Betula* woodland occurred, supressing shrub taxa such as *Jumperus* before they could become abundant as a transitional community. The classic earliest Holocene *Filipendula* peak does occur at the site, however. Tree *Betula* may well have had local refugia in which it survived the Late-glacial stadial and from which it could spread quickly to establish a dense cover. Sporadic pollen records of *Alnus, Quercus, Ulmus* and *Corylus,* thermophilous trees associated with mid-Holocene forests, do occur at this early stage as they do at other sites in the area, such as Skipsea Bail Mere (Flenley, 1984, 1987). These may support the idea of local Late-glacial sheltered refugia, but little emphasis can be placed on such isolated records. The Bog, Roos exhibits a remarkably rapid switch from *Betula* to *Corylus* dominance, with the latter extremely abundant. *Ulmus* and then *Quercus* did increase during this *Corylus* phase, but the sustained *Corylus* dominance suggests local abundant growth, perhaps on the slopes around the basin, for a long period. The Holocene section of the pollen record unfortunately is not dated, but by analogy with other dated profiles *Corylus* may have completely dominated the area around the site for well over 2500 years. A much more mixed dense deciduous forest developed after the *Alnus* rise, although alder became locally abundant on the drier soils of the till ridge around the site. Higher *Alnus* frequencies occur in the low-lying valleys around the ridge, which had begun to fill with alluvial and carr wetland sediments from the mid-Holocene onwards, although some centres of early Holocene deposition did occur (Dinnin and Lillie, 1995–6; Taylor, 1995).

After a clear *Ulmus* Decline, for which the comparable regional date is 5099 ± 50 years BP at Gransmoor Quarry (Beckett 1975), deposition in the basin changed from limnic to peat-forming conditions as sediment infilling of the lake progressed. There is evidence of some human forest clearance after the *Ulmus* Decline, with *Tilia* also reduced and moderate frequencies of clearance herbs such as *Plantago lanceolata.* Intensive forest clearance occurs in zones RB8 and RB9, with tree pollen reduced to very low values. Cereal agriculture is significant in the later clearance phase. Without radiocarbon support these phases cannot be attributed to any particular culture, although it is probable, from regional. comparisons, that this clearance began in the Bronze Age and intensified in the Iron Age (Flenley, 1990; Dinnin, 1995). More dating control is required. The uppermost levels are dominated *by Alnus, Betula* and *Salix* pollen derived locally from bog-surface scrub. These local taxa mask any pollen signal from further away from the site at that time. That Bronze Age and Iron Age people were active near The Bog, Roos is demonstrated by the recovery of much archaeological material during survey of the locality (Head *et al.,* 1995b). Of national significance are the early Iron Age Roos Carr wooden figurines, dated 2460 ± 70 years BP recovered from beneath estuarine alluvium not far to the north of the site (Coles, 1990, 1993; Van de Noort and Davies, 1993).

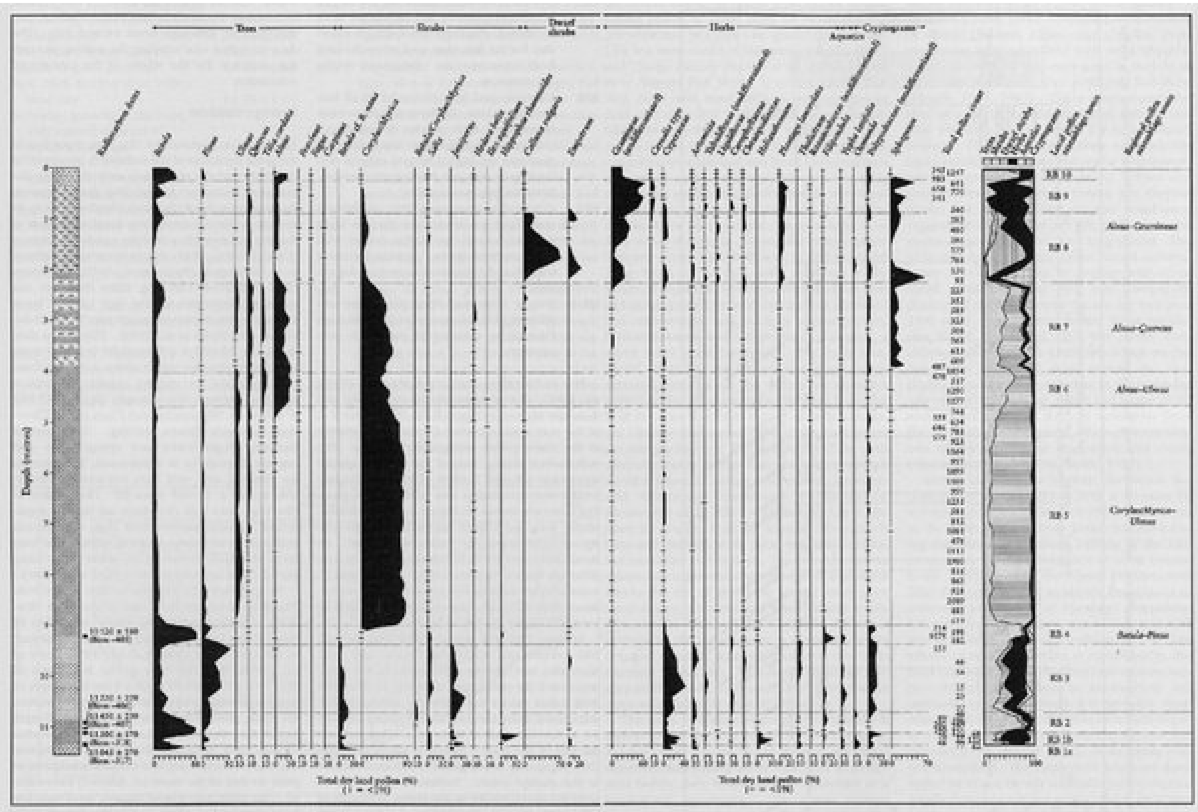
Conclusions

The Bog, Roos is a classic site for the reconstruction of Late-glacial and Holocene vegetation history and provides a regional standard for the increasing body of palaeoenvironmental data yielded by recent research in Humberside and environs (Dinnin, 1995). For the Late-glacial in particular, it remains one of the key lowland sites for palaeoecological syntheses in eastern north England (Catt, 1977b; Rose, 1989a; Greig, 1996). The lack of radiocarbon dates for the Holocene succession reduces its value, but the potential for research on this apparently hiatus-free, 9 m-long Holocene palaeoenvironmental record is very high indeed.

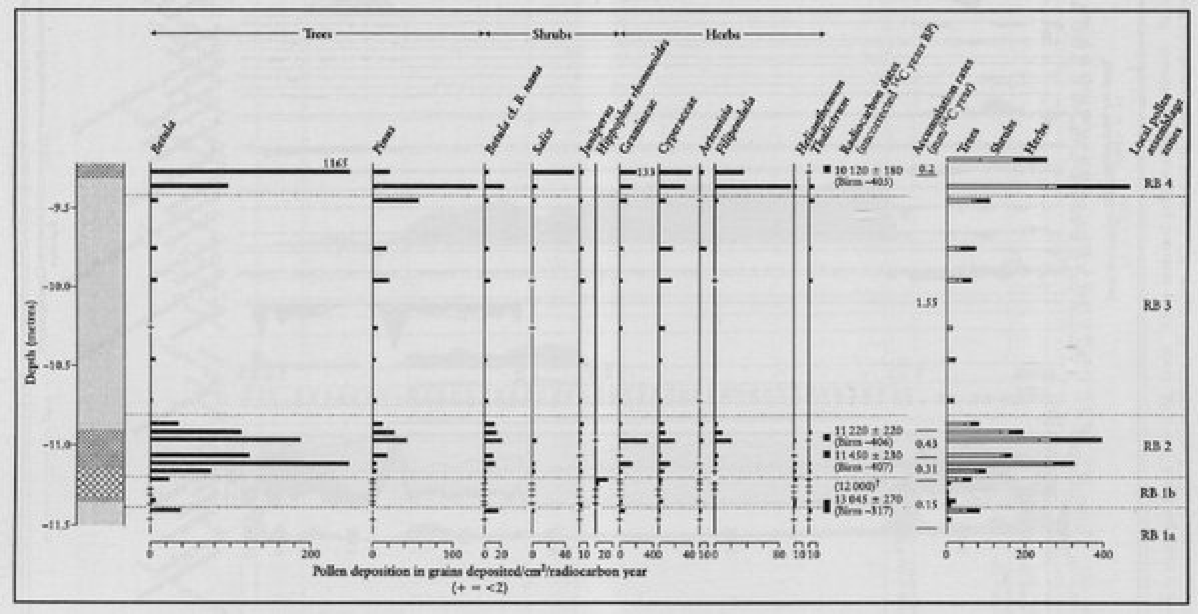
References



(Figure 8.31) Stratigraphy of the deposits along a SE–NW transect.



(Figure 8.32) Pollen diagram from The Bog, Roos. Only selected pollen taxa are shown. Recalculated and redrawn from Beckett (1981) and Flenley (1984). See (Figure 8.1) for key to the stratigraphical log.



iagram of Late-glacial sediments from The Bog, Roos. Selected taxa only. See (Figure 8.1) for key to the stratigraphical log.