Radiocarbon dating and palaeoecology of the intertidal lower peat and forest bed at Dove Point, Meols, Wirral

J B Innes, R J Nelms and P R Tomlinson

Introduction

Intertidal exposures of woody peat, including tree stumps and roots as well as branches, have been occasionally visible at low tide on the beach of north Wirral, and are persuasive evidence of past changes in relative sea level on this coast. Such exposures were more extensive prior to the building of modern sea defences intended to prevent marine erosion of the low lying north Wirral shore. In the latter half of the nineteenth century, however, and in the early part of the twentieth, intertidal 'peat and forest beds' were a characteristic feature of the coast and were the subject of considerable antiquarian and, latterly, scientific interest. The greatest exposures of the 'submerged forest' were in the vicinity of Leasowe and Dove Point, Meols, where they extended over hundreds of square metres. Initial interest in the intertidal peat successions was geological, with the aim of relating the coastal exposures stratigraphically with the postglacial sedimentary record inland, and detailed observation and description of the coastal exposures allowed a secure understanding of their local and regional stratigraphic context (Reade 1871; De Rance 1871). The intertidal peats at Leasowe were studied botanically by Erdtman (1928) and those at Dove Point by Travis (1929). Cultural material derived from the intertidal sequences stimulated early archaeological interest (Hume 1863; Smith 1865; Potter 1868) and encouraged discussion regarding the context of the recovered archaeology and the status of the peat beds as ancient land surfaces (Morton 1897), an interest in the environmental archaeology of the sediments which has continued in modern times (Chitty and Warhurst 1977; Kenna 1979; Jones 1980; Cowell and Innes 1994).

Kenna (1986) has reviewed the history of the geological investigations of the peat and forest beds, and using pollen, diatom and radiocarbon dating evidence has correlated them within a wider study of the postglacial (Flandrian) geological sequence of north Wirral. He has also presented a transect of stratigraphic sections with radiocarbon datings which summarises the postglacial sedimentary history of the Wirral coastal zone. Huddart *et al.* (1999) have reproduced his sections from Leasowe and Dove Point, together with sections from the North Wales and Sefton coasts, as part of their study of the environmental context of intertidal footprints preserved at Formby Point. Kenna (1986) identified two main peat units in the Wirral lithostratigraphy, separated by a thick marine clay, which are termed the lower peat and forest bed and the upper peat and forest bed respectively. The lower peat and forest bed is separated from the glacial till in places by a thin clay stratum which includes marine shells (Greenwood 1910) and fragmentary marine-estuarine diatoms (Kenna 1986). Radiocarbon dates of 6460±60 and 6420±60 BP from peat and tree stumps are available for the lower peat and forest bed from sites adjacent to Dove Point, while wood from the upper peat and forest bed at Dove Point is dated 3910±100 and 3800±70 BP. This stratigraphic sequence of a mid-Flandrian near-basal lower peat and a later Flandrian intercalated upper peat, separated and covered by marine beds, remains the basis for understanding the history of sea-level changes in the Wirral peninsula (Tooley 1978, Kenna 1986, Innes *et al.* 1990, Cowell and Innes 1994, Plater *et al.* 1999).

The opportunity is taken here to report previously unpublished radiocarbon dates and environmental data from the lower peat and forest bed slightly south-west of Dove Point, so that these may be included in current and future consideration of the intertidal sequences of Liverpool Bay. Samples were recovered in 1981 from a thin peat, containing *Phragmites* (reed) macrofossils and wood remains including small *in situ* stumps, exposed after foreshore erosion. The peat lay at +1.0m Ordnance Datum. A thin silty grey clay lay between the peat and forest bed and the glacial till. The section is at SJ 232906. Nearby, to the north-east, a sample was taken from the lower peat and forest bed which has been dated to 6420±60 BP (Kenna 1986).

Palaeoenvironmental Evidence

Samples were analysed for pollen content at two-centimetre intervals through the ten-centimetre thick peat, and results are shown on figure 39 as percentages of total land pollen (trees, shrubs and herbs). Aquatic pollen and spores are not included within this land pollen sum, but are calculated as percentages of it. Pollen types follow Moore *et al.* (1991), and diatoms van der Werff and Huls (1958-74). Total tree and shrub pollen frequencies are consistent at almost 70% of total land pollen, and individual curves show little fluctuation. *Quercus* (oak), *Alnus* (alder), *Corylus* (hazel) and *Ulmus* (elm) are the major taxa, which agrees with the early Flandrian II (mid-Holocene) radiocarbon age of about 7000 BP (Hibbert *et al.* 1971). A diverse herb assemblage is recorded, and includes taxa, such as *Aster*-type, Chenopodiaceae, *Artemisia*, *Taraxacum*-type and *Rumex*, which in association indicate nearby saltmarsh environments. Although present throughout the peat most of these decline up-profile away from the contact with the underlying clay. Several herbs indicative of freshwater wetland conditions occur, while Gramineae (grass) pollen, consistently over 30% of total pollen, may be derived from either of these depositional environments. Diatoms were recovered in small numbers from the peat/clay boundary and from three centimetres above it, although many were fragmentary and badly preserved. A marine influence is hinted at by *Coscinodiscus* sp. at the peat/clay boundary, and several of the types within the peat are brackish water tolerant. Overall, however,

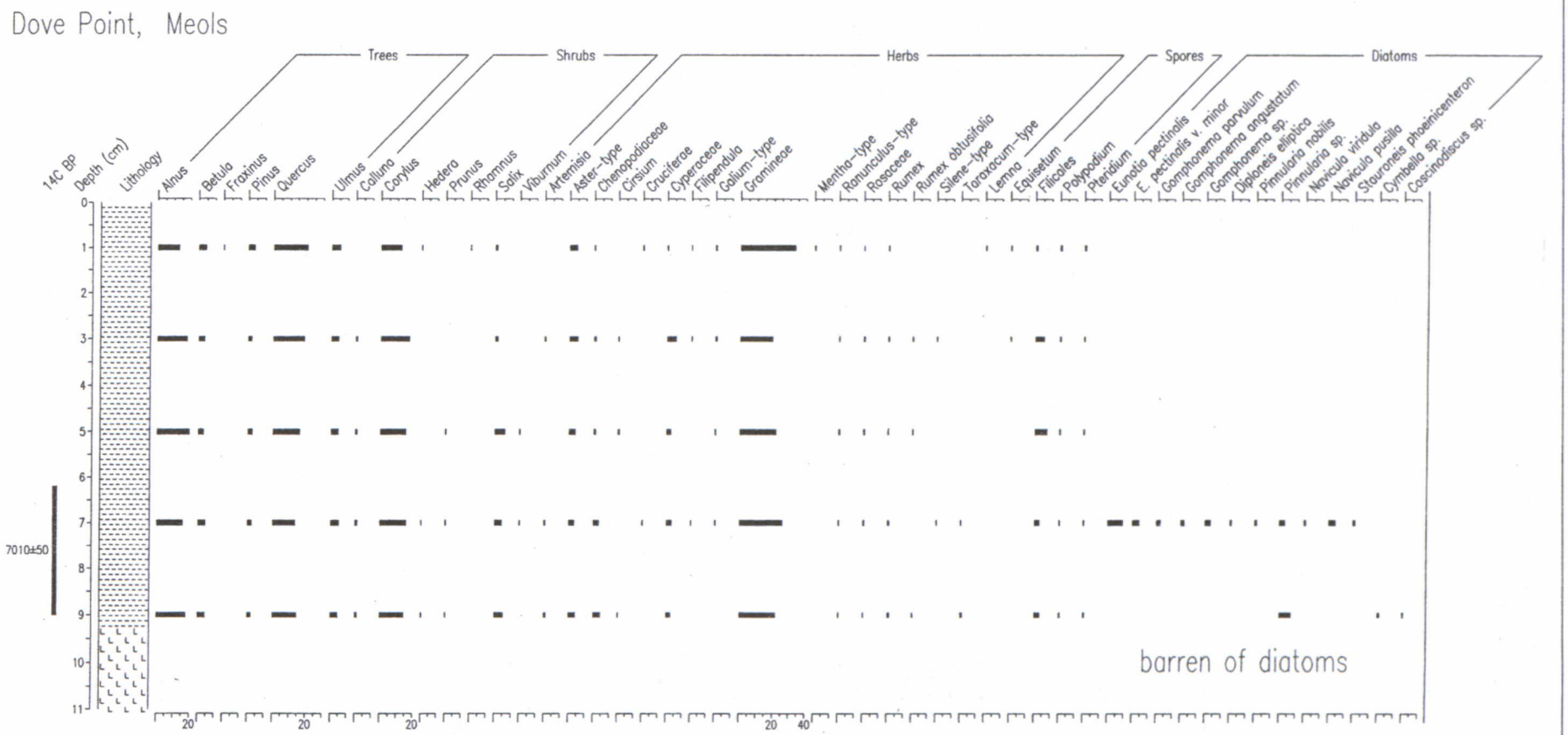

Figure 39: Pollen diagram from Dove Point, Meols.

diatom ecology within the peat appears to be freshwater oligotrophic, suggesting acidic conditions. The underlying blue clay itself was found to be barren.

Radiocarbon Dates

Two samples from the sequence were submitted for radiocarbon dating. The first was from the base of the peat where it rested upon very thin blue clay. This sample was dated 7010±50 BP (SRR-2927). Calibration of this date (Stuiver and Reimer 1993) provides a mean calibrated age of 7796 BP, with ranges of 7910-7670 cal. BP. The second sample was on wood from a *Betula* (birch) tree stump preserved within the peat bed and with roots passing down into the underlying clay. This wood sample was dated 6510±50 BP (SRR-2928). Calibration of this radiocarbon date provides a mean age of 7386 cal. BP, with ranges of 7510-7273 cal. BP.

Discussion

The consistent record of several halophyte taxa suggests that saltmarsh conditions existed very close by, although the more acidic freshwater diatom and pollen component in its upper levels argues against all of this sediment having formed as a true saltmarsh peat. The presence of *Phragmites* macrofossils suggests that transitional back saltmarsh to reedswamp conditions may be represented here, although rhizomes of the common reed may have penetrated from higher sediment now removed by erosion. The peat was very compact and saltmarsh organic deposition may be represented by its basal few centimetres, where saltmarsh and brackish indicators are clearest. The thin underlying blue clay is probably marine in origin, analogous to similar thin layers recorded on this coast (Greenwood 1910; Kenna 1986), and the clay/peat contact is likely to be a regressive sea-level index point dated around 7010±50 BP, the whole sequence reflecting a negative movement in relative sea level. The failure to recover microfossil evidence from the thin clay beneath the peat means, however, that its environment of deposition can not be known for sure, and further samples of this deposit should be examined if they become available by future exposure of this sediment sequence.

The presence of the *Betula* stump in the peat supports the microfossil evidence of a transition to more acid conditions, and its radiocarbon date of 6510±50 BP points to the colonisation of the peat by moderately acidic carr woodland some centuries after the withdrawal of estuarine conditions and the formation of saltmarsh then reedswamp peats. Roots of this later woodland grew down to penetrate the underlying sediments, rather than the stumps representing an older woodland swamped by estuarine then freshwater wetland sedimentation. This radiocarbon date is very similar to those obtained on tree remains from the lower peat and forest bed elsewhere on this coast (Kenna 1986). The oak-elm-alder-hazel woodland recorded at this site as the regional dominant vegetation conforms with evidence from other pollen profiles in Wirral and the wider region (Hibbert *et al.* 1971; Cowell and Innes 1994).

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