Redkirk Point

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Highlights

The coastal section at Redkirk Point displays a sequence of estuarine deposits and buried peat. Analysis of these deposits, and the pollen and coleopteran remains they contain, has provided detailed information about palaeoclimatic conditions, environmental change and coastline development during the Lateglacial and early Holocene.

Introduction

Redkirk Point [NY 301 652] is located on the coast of the Solway Firth, 11 km east of Annan. It shows a sequence of interbedded organic and marine sediments exposed on the foreshore and in the backing cliff. These deposits are important for interpreting the patterns of Lateglacial and early Holocene environmental history and sea-level change in south-west Scotland. The sediments exposed at Redkirk Point have been described by Jardine (1964, 1971, 1975, 1980b) and in greatest detail by Bishop (Bishop and Coope, 1977).

Description

Bishop and Coope (1977) recorded the following sequence partly infilling a shallow channel cut in the New Red Sandstone bedrock (see also (Figure 18.3)) (see also Jardine, 1980b):

9. Disturbed ground and soil profile	0.15 m
8. Sandy silts and alluvium	0.40 m
7. Grey clays and silts (carse clays) with thin peat layer	3.00 m
6. Grey clays and fine sands with several discontinuous peat lenses and disturbed bedding	3.0 m
5. Highly compacted and disturbed woody peat with in situ tree stumps	0.15 m
4. Grey silts and fine sands with disturbed bedding	1.60 m
3. Highly compacted and disturbed peat, with local peat lens below	0.25 m
2. Carbonaceous silts and fine sands	0.30 m
1. Red, sandy and pebbly till	1.50 m

The peat layers are typically deformed and buckled under the weight of the overlying clays (carse). Five radiocarbon dates have been obtained on material from the organic layers (Bishop and Coope, 1977): 12,290 ± 250 BP (Q–816) from the peat lens below bed 3 (Godwin *et al.,* 1965); 11,205 ± 177 BP (Birm–41) from the bottom 0.06 m of bed 3 (Shotton *et al.*, 1968); 10,898 ± 127 BP (Birm–40) from the top 0.03 m of bed 3 (Shotton *et al.,* 1968); 10,300 ± 185 BP (Q–815) from wood (*Populus*)from the eroded top of bed 3 (Godwin *et al.,* 1965), and 8135 ± 150 BP (Q–637) from the outer rings of an *in situ* tree stump in bed 5 (Godwin and Willis, 1962).

Interpretation

Bishop (Bishop and Coope, 1977) interpreted the sequence of events beginning with a period of low sea level following glaciation, during which a shallow channel was eroded in the till and sandstone. Sedimentation of the carbonaceous silts and sands (bed 2) under fluvial conditions began before 12,000 BP. The pollen of the peat lens below bed 3 indicates a typical Lateglacial floral assemblage with abundant herbaceous types (including *Selaginella, Empetrum, Thalictrum* and cf. *Saussurea alpina*)and limited arboreal types (*Betula, Pinus* and *Salix*)(Godwin and Switsur, 1966). The peat of bed 3

probably attained a thickness of about 1.25 m before compression. Its development was curtailed by freshwater ponding associated with a rising sea level around 10,300 BP, followed by deposition of the grey silts and fine sands of bed 4. Thereafter, a relative fall in sea level allowed reestablishment of vegetation and development of a tree cover (represented in the deposits of bed 5). A subsequent rise in relative sea level after about 8100 BP associated with the Main Postglacial Transgression (Jardine, 1964, 1971, 1975, 1980b) was accompanied by deposition of over 6 m of carse clays (beds 6, 7 and 8).

The peat beds in the sequence at Redkirk Point preserve a valuable record of changing environmental conditions. The pollen record has not been investigated in detail, although the regional pattern of the Late Devensian and Holocene vegetational succession has been established from studies at a number of other lowland sites in south-west Scotland (Moar, 1964, 1969b; Nichols, 1967). The key palaeoecological evidence at Redkirk Point lies in the remains of Coleoptera preserved in the sediments. These, together with the fossil assemblages from Bigholm Burn (see above) and other sites, each covering a slighty different time period, provide critical information on Lateglacial climatic conditions (Bishop and Coope, 1977).

The assemblage of fossil Coleoptera in bed 2 at Redkirk Point, below the peat dated at 12,290 ± 250 BP, is characterized by a relative abundance of species of running water (e.g. Elminthidae and *Hydraena gracilis* Germ.) and stream bank (e.g. *Bembidion schueppeli* Dej. and *Hypnoidus riparius* F.) habitats. The presence of species with both northern (e.g. *Bembidion schueppeli* Dej. and *Arpedium brachypterum* Gr.) and southern (e.g. *Bembidion gilvipes* Sturm, *Cymindis angularis* Gyll. and *Esolus parallelepipedus* MUM) distributions today suggests a temperate climate similar to that of south-west Scotland at present, reflecting moderately oceanic conditions and a mean July temperature of about 15°C. Sparse vegetation cover is also indicated by the rarity of phytophagous species, and the overall environmental conditions are similar to those deduced by Coope (Bishop and Coope, 1977) from the assemblage in a peat layer at Roberthill [NY 110 797] dated at 12,940 ± 250 BP (Q–643) (Bishop, 1963). The remains from the horizon in bed 3, dated at 11,205 ± 177 BP, at Redkirk Point are of species which have overall northern affinities (e.g. *Diacheila arctica* Gyll., *Elaphrus lapponicus* Gyll., *Patrobus septentrionis* Dej., *Amara torrida* III., *Agonum consimile* Gyll., *Hydroprous tartaricus* Lec., *Ilybius anqustior* Gyll., *Olophrum boreale* Payk., *Acidota quadrata* Zett., *Boreaphilus henningianus* Sahlb. and *Otioynchus nodosus* mato, and eastern affinities (e.g. *Chlaenius costulatus* Mtsch. and *Bembidion transparens* Gebl.), reflecting a marked contrast in environmental conditions compared with those indicated by the sample from bed 2. Climatic deterioration was accompanied by increased continentality, a fall in average July temperatures to about 12°C and widespread development of acid bog and wetlands. Similar conditions at this time are also implied by the Coleoptera in a bed, dated at 11,580 ± 180 BP to 11,820 ± 180 BP (Q–694,) at Bigholm Burn (see above). Further climatic deterioration is indicated by increased numbers of the northern species in the horizon in bed 3 dated at 10,898 ± 127 BP. The greater abundance of species such as *Pycnoglypta lurida* Gyll., *Olophrum fuscum* Gr., *Arpedium brachyerum* Gr. and *Boreaphilus benningianus* Sahib. is indicative of increasingly more open tree cover. However, the absence of species characteristic of alpine and tundra environments suggests average July temperatures of about 10°C.

The organic deposits at Redkirk Point from which the beetle assemblages have been studied span the period from prior to 12,290 BP to about 10,890 BP, covering much of the Lateglacial Interstadial and the beginning of the Loch Lomond Stadial. Redkirk Point is one of only a few sites in Scotland where Lateglacial environmental conditions have been interpreted from beetle remains (see Bigholm Burn). The significance of the coleopteran evidence from these sites is that it points to a pattern of Lateglacial climatic conditions quite distinct from that suggested by pollen assemblages for the same period (Bishop and Coope, 1977). The beetles indicate that climatic amelioration occurred early in the interstadial, with temperatures as warm as those of the present day attained by about 13,000 BP (or possibly later — cf. Atkinson *et al.,* 1987). Subsequently, climatic deterioration began about 12,500 BP and intensified between 11,000 BP and 10,500 BP during the Loch Lomond Stadial. Conversely, the pollen record shows open habitat, treeless conditions prior to 13,000 BP followed by the main expansion of vegetation between 11,800 BP and 11,000 BP. The pattern of Lateglacial climatic change inferred from the evidence at Redkirk Point is similar to that established from beetle evidence elsewhere in Britain (Coope, 1977; Atkinson *et al.,* 1987) and reflects the great sensitivity and response rate of the beetle populations to changing environmental conditions (cf. Coope and Brophy, 1972; Coope, 1975, 1981; Coope and Joachim, 1980).

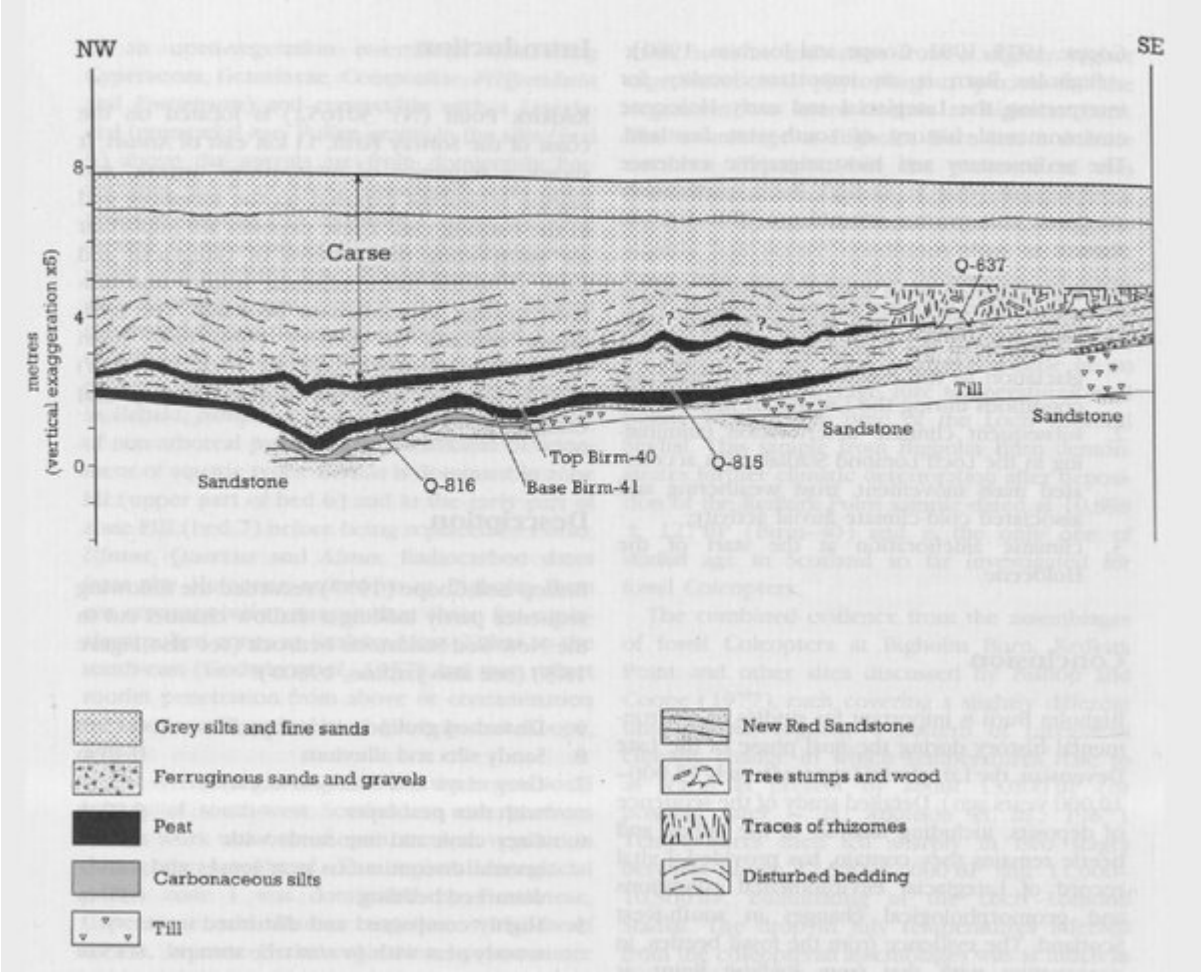
Redkirk Point is also a key site providing stratigraphic and geochronometric evidence for the pattern of Lateglacial and early Holocene sea-level change in south-west Scotland, complementing the interest at Newbie. This evidence demonstrates that from the time of deglaciation (prior to 13,000 BP) and throughout almost the whole of the Lateglacial, sea level was below that of the present day. The first evidence of marine influence apparently occurs at the end of the Lateglacial and the start of the Holocene (bed 4), which invites comparison with the marine transgression that occurred at this time in the Western Forth Valley (see above). Subsequently, sea level fell and peat (bed 5) accumulated. During the Main Postglacial Transgression grey silts and clays (beds 6 and 7) were deposited on top of the peat.

These last events have been studied in greater detail at Newbie (see below).

Conclusion

The deposits at Redkirk Point provide important evidence for changes in sea level and coastal environmental conditions in south-west Scotland during the phase which closed Devensian times (the Lateglacial) and the succeeding and warmer early Holocene (between approximately 13,000 and 8000 years ago). This evidence is derived from detailed analysis of the sediments and the pollen and beetle remains they contain, and is supported by radiocarbon dating. The length and detail of the record, and in particular the combined evidence from the pollen and beetles, make Redkirk Point a key reference site for studies of Lateglacial environmental history in south-west Scotland and an integral component in the national site network.

References



(Figure 18.3) Redkirk Point: sediment succession (from Bishop and Coope, 1977).