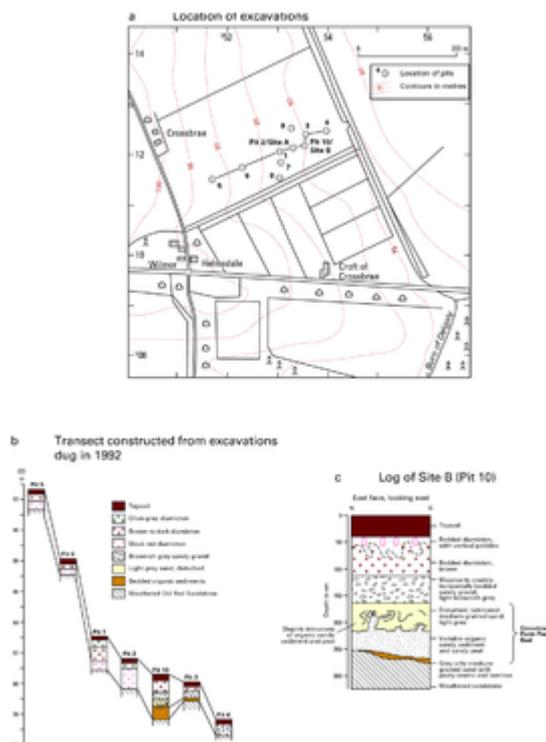


during an interstadial episode immediately before the build up of the last ice sheet in Buchan, thus constraining the timing of its expansion. Thirdly, the organic deposits were thought to be overlain only by solifluction deposits (Hall, 1984). The site was therefore cited as part of a body of evidence that this part of Buchan had escaped glaciation during the Late Devensian (Sutherland, 1984a). The results of further excavations at Crossbrae in 1992 ([P915308](#) b) and a multidisciplinary investigation of the sediments have been reported by Whittington et al. (1998).



Crossbrae Farm site (after Whittington et al., 1998). P915308.

The **Crossbrae Farm Peat Bed** locally rests on weathered Devonian pebbly sandstone ([P915308](#) c). The peat may also rest on till, as the drainage contractor for the 1980 excavation reported a 'hard, reddish-coloured boulder clay' (Crossbrae Till Formation of [P915347](#), at least 20 cm thick, beneath the peat, but only weathered bedrock was encountered in the 1992 excavations.

The Crossbrae Farm Peat Bed reaches a maximum known thickness of 55 cm and comprises sandy peat with interbedded silty sands and sand laminae. Pollen analysis has revealed a former dwarf shrub tundra vegetation, with *Betula nana* and *Salix herbacea*. *Bruckenthalia spiculifolia* was also present in the flora. Supporting evidence of an interstadial environment is provided by a range of plant macrofossil remains and by a total of 40 coleoptera taxa, including *Olophnum boreale* (Payk.), *Acidota quadrata* (Zett.) and *Boreaphilus henningianus* (Sahlb.). None of these beetles live today in the British Isles, but each is found in the present-day fauna of northern Fennoscandia. Based on the overlap of the climatic envelopes of 23 coleoptera species, the average temperature at the time of the formation of the Crossbrae Farm Peat Bed is estimated as:

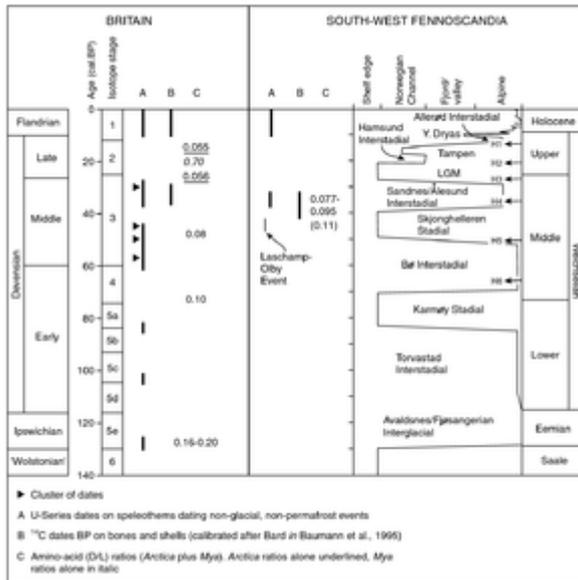
- Mean temperature of the warmest month $10^{\circ}\text{C} \pm 1^{\circ}\text{C}$
- Mean temperature of the coldest month $-9^{\circ}\text{C} \pm -3^{\circ}\text{C}$

Further radiocarbon age determinations for the Peat are as follows:

SRR-5706 'Humic carbon' 44 030 + 910/-820 yr BP

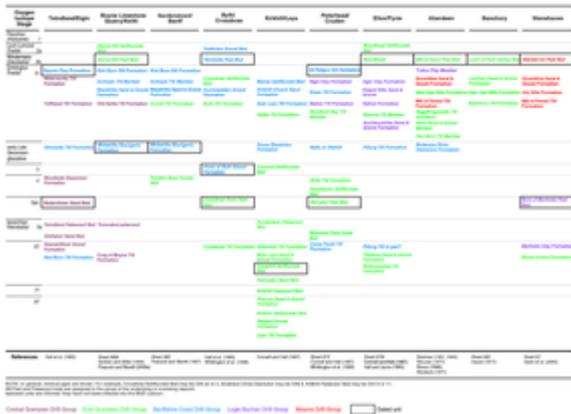
'Humin carbon' >53 630 yr BP
 SRR-5707 'Humic carbon' 47 180 + 1390/-1190 yr BP
 'Humin carbon' >61 900 yr BP

These dates must be seen as minima for the Crossbrae Farm Peat Bed. The dates obtained earlier therefore appear to be anomalously young, probably owing to contamination by younger carbon in groundwater.



Devensian-Weichselian events in Britain and south-west Fennoscandia. P915290.

The Crossbrae Farm Peat Bed clearly predates the Late-glacial and the Sourlie Interstadial around 30 ka (possibly equivalent to the Ålesund Interstadial of western Norway, [P915290](#)). Crossbrae is one of only five sites in Scotland from which pollen of the Balkan heath *Bruckenthalia* has been recovered, the others being Camp Fauld (Whittington et al., 1993) and Burn of Benholm (Auton et al., 2000) in north-east Scotland (see below), and Sel Ayre (Birks and Peglar, 1979) and Fugla Ness (Birks and Ransom, 1969) on Shetland (Whittington, 1994). The organic deposits at Allt Odhar (Walker et al., 1992), Sel Ayre and Camp Fauld (Hall, 1993c) all appear to relate to an Early Devensian interstadial in which an early warm phase is succeeded by significantly colder conditions. Available dating evidence suggests correlation of organic sediments at Allt Odhar, Sel Ayre and Burn of Benholm with the Brørup Interstadial, equivalent to OIS 5c ([P915347](#)). The flora and coleoptera at Crossbrae preclude correlation with the warm stages of OIS 5a or 5c, but may represent the later colder phases. The remarkable similarity between the coleopteran assemblages at Crossbrae and Allt Odhar provides support for a common age. The Crossbrae Farm Peat Bed is tentatively regarded as being of OIS 5c age (Whittington et al., 1998).



Correlation of lithostratigraphical units in north-east Scotland. P915347.

Excavations in 1992 showed that the Crossbrae Farm Peat Bed is directly overlain by coarse gravel up to 1.2 m in thickness. This clast-supported pebble and cobble gravel unit has a strongly erosive base and is dominated by quartzite and quartzose psammite clasts. It is succeeded by crudely stratified, clast-rich diamictons up to 2.5 m thick. The diamictons contain striated pelite clasts and show a strong down-slope clast fabric. They are interpreted as soliflucted tills.

The significance of the Crossbrae Farm site is the presence of a peat deposit that apparently represents an Early Devensian interstadial. The most recently obtained radiocarbon dates indicate that the peat is older than the Middle Devensian and therefore cannot constrain significantly the age of the last glaciation of this part of Buchan. The presence of coarse gravel of possible glaciofluvial origin is important. This gravel unit is most likely to be of Late Devensian age and as such provides no support for the view that part of Buchan escaped glaciation in the Late Devensian. However, it is possible that the gravel is older, as glacial deposits at the Howe of Byth site in Buchan (Hall et al., 1995b) and in the vicinity of Teindland in lower Strathspey (Hall et al., 1995a) have been ascribed to cold stages in Oxygen Isotope Stages 4 and 3.

References

[Full reference list](#)

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