
Cwm Dwythwch

Highlights

A key site that provides evidence of Late Devensian glaciation prior to the last, Younger Dryas, glacial event; either during a readvance of the dwindling Devensian ice-sheet or as part of a separate glacial pulse.

Introduction

Cwm Dwythwch [SH 570 580] is a unique site in North Wales with evidence for a possible stadial early in the Devensian late-glacial. It is the most northerly cirque in the Snowdon (Yr Wyddfa) massif and is occupied by a large lake impounded behind an impressive moraine. The moraine is more subdued (rounded and indistinct) in appearance than many of the typically steep-sided Younger Dryas moraines in the region. Pollen analysis from an infilled part of the lake has revealed a late-glacial profile dating back to Pollen Zone I. This is the only moraine in Wales that has been shown, by pollen analysis, to date from the early part of the Devensian late-glacial. The site has been mapped and described by Seddon (1957) and Unwin (1970), and a detailed study of the pollen biostratigraphy was carried out by Seddon (1962).

Description

Cwm Dwythwch is a massive compound cirque with four subsidiary cirques, and a lake, Llyn Dwythwch, situated at about 280m OD (Seddon 1957). The subsidiary cirques with floors at approximately 450m OD, also contain possible morainic accumulations (Gray 1982a). The main and the subsidiary cirque forms show a strong orientation to the north-east, towards the Llanberis Valley. The compound cirque back wall is cut into the peaks of Moel Eilio (726m), Foel Gron (593m) and Foel Goch (605m). A broad tract of alluvium covered by *Sphagnum*–*Polytrichum* bog extends from the west side of the lake to the head of the cirque. Boulder strewn areas surround the lake, except on its east side, where the base of the massive terminal moraine impounds the lake (Seddon 1962).

From a borehole core, Seddon (1962) described an 8.4m thick sequence (at [SH 568 580]), commencing with a basal layer of stiff blue clay, overlain by the friable grey-buff mud, succeeded by a further clay layer; making up the three-fold sequence that Seddon suggested was typical of late-glacial sites elsewhere in North-West Europe. The upper clay was succeeded by a sequence of wholly organic muds derived from successive phases in the development of aquatic vegetation (Seddon 1962).

Interpretation

Seddon (1962) interpreted the basal blue clay at Cwm Dwythwch as material soliflucted from surrounding slopes during a relatively cold climatic phase. Pollen from this bed shows a dominance of herb vegetation with few trees, with sea buckthorn, juniper and dwarf birch forming a low scrub in the otherwise open swards of herbs. Seddon correlated this assemblage with conditions characteristic of Pollen Zone I of the Late Devensian late-glacial.

The succeeding highly organic muds showed pollen characteristic of climatic improvement in the Allerød (Pollen Zone II). The Cwm Dwythwch pollen shows a marked increase of tree birches at that time, perhaps to a state best described as 'park-tundra' rather than true birch woodland; with herb vegetation still predominant but with a notable increase in meadowsweet *Filipendula*, indicating warmer conditions.

The beginning of Pollen Zone III is marked by a rapid decline of *Betula* pollen and of the ratio of arboreal pollen to non-arboreal pollen. Seddon considered this indicated the onset of less favourable climatic conditions and a tundra environment, with trees perhaps surviving only in the most sheltered locations. The end of this zone is terminated abruptly by almost pollen-barren clastic sediments, reworked by solifluction into the lake. Seddon argued that it was at this time that a recrudescence of glacier ice occurred in many of the cirques in Snowdonia. Pollen in the succeeding

sediments shows an amelioration of climate and demonstrates the course of forest development through the Holocene (Seddon 1962).

The interpretation and relative dating of the landforms at Cwm Dwythwch are based entirely on pollen biostratigraphic and geomorphological evidence. No radiocarbon calibration is yet available for the sequence.

Although pollen analysis has revealed a detailed record of Devensian late-glacial and Holocene environmental changes in upland Wales, it is the geomorphological implications of these data that make the site particularly important. The palynological and stratigraphical evidence shows that the vegetation of the Devensian late-glacial first formed in a tundra environment (Pollen Zone I), with arctic-alpines, notably dwarf birch. This is followed by a period of park-tundra associated with warmer conditions in the Allerød. No evidence exists at Cwm Dwythwch in the late-glacial profile for the Bølling oscillation described from some Continental and British sites. A deterioration of climate in Pollen Zone III is clearly marked in the section.

The climatic deterioration associated with Pollen Zone III has been widely documented as a period of limited cirque glacier and perennial snow patch development in parts of upland Britain (c. 11,000–10,000 BP — Younger Dryas), and several cirque moraines in North Wales have been dated, both palynologically and by radiocarbon techniques, to this time (for example, Seddon 1962; Ince 1981, 1983). The full late-glacial succession accumulated at Cwm Dwythwch within the confines of the large outer moraine, and therefore provides evidence for a cirque moraine of pre-Younger Dryas age. A similar age cannot therefore be ruled out at other sites where large 'diffuse' cirque moraines also occur, for example, the outer moraine at Cwm Idwal (Campbell 1985b). Whether such moraines belong to a readvance of cirque ice in Devensian late-glacial Pollen Zone I, or simply to a recessive stage of the main Late Devensian ice-sheet, remains to be determined. The smaller morainic or nivational accumulations within the higher subsidiary cirques at Cwm Dwythwch, in all probability, date from Pollen Zone III, the Younger Dryas (Gray 1982a).

Cwm Dwythwch provides an important pollen biostratigraphic record of Late Devensian late-glacial and Holocene conditions in upland North Wales. The pollen record, which extends back to Pollen Zone I, clearly post-dates deposition of the large 'diffuse' cirque moraine at the site. It therefore shows important evidence to suggest that active glaciers possibly existed earlier in the Devensian late-glacial than the well documented Younger Dryas cirque glaciation at around 11,000–10,000 BP, when the majority of cirque moraines in the region was formed.

Conclusions

Cwm Dwythwch is one of only two sites in Wales which provide evidence for events between the disappearance of the last ice-sheet and the onset of the minor glaciation between 11,000 and 10,000 years ago. It is an important site for research on climatic change.

[References](#)