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# Cors Geuallt

## Highlights

A unique site showing controversial evidence of climatic fluctuations during the early Devensian late-glacial, a warmer interstadial oscillation, the Bølling Interstadial, during the otherwise cold Older Dryas.

## Introduction

Cors Geuallt is an important pollen site recording detailed vegetational changes in North Wales during the Devensian late-glacial and Holocene. It is one of a few sites in Britain that provide possible evidence for a pre-Allerød climatic oscillation during the Late Devensian, possibly equivalent to the Bølling Interstadial. Cors Geuallt is also the only site in Wales where a detailed record of diatoms extending back into the late-glacial has been studied. Detailed accounts of the pollen biostratigraphy and diatoms at the site have been provided by Crabtree (1969, 1970, 1972). The possible record of the Bølling Interstadial has also been discussed by Moore (1975b) and Ince (1981). Thomas (1972) referred to the site in a survey of diatomaceous deposits in Snowdonia.

## Description

Cors Geuallt [SH 734 596] lies north-east of Capel Curig, in the foothills of the Carneddau. With dimensions of about 400m by 250m and lying at a height of some 255m OD, this former lake basin is now a mire. It has an irregular rocky floor generally not deeper than 4m, although in the central southern area, through which Nant-y-Geuallt flows, there is a deeper region (about 275m by 110m) which could not be bottomed with a 7.6m auger (Thomas 1972). Here, the mire is floating on a layer of water, and augering in this deeper area suggests the presence of a saucer-like deposit of mud, up to 2m thick, over an area of some 27,000 m<sup>2</sup> (Thomas 1972). The site lies well outside the ice limits of the last cirque glaciation in Snowdonia (Seddon 1957; Gray 1982a).

Levelling and boring was carried out at Cors Geuallt by Crabtree (1970, 1972) to determine the stratigraphy of the superficial deposits within the basin. The generalised sequence consists of:

6 Hillwash and alluvium

5 Reed swamp, wood, *Eriophorum* and *Sphagnum* peats

4 Coarse mud

3 Fine mud

2 Coarse mud and clay

1 Varved clays

The distribution and relative thicknesses of the beds are shown in (Figure 39).

Two cores, referred to as the 1964 and 1969 cores, were taken by Crabtree (1969, 1970, 1972). These were analysed for their chemical, diatom and pollen characteristics. Crabtree (1970, 1972) zoned the pollen spectra in the standard manner (Pollen Zones I -VIII) but used additional local pollen sub-zones where appropriate. Detailed pollen diagrams for the two cores were presented, although these have no radiocarbon calibration.

## Interpretation

Based on the relative frequency of *Betula* and herbaceous pollen types in the 1964 core, Crabtree (1970) assigned the lower pollen assemblages to the Late Devensian late-glacial, and the upper ones to the Holocene. Values of juniper pollen peak at the end of Pollen Zone II and again at the end of Pollen Zone III. Importantly, beneath sediments with a Pollen Zone II assemblage, Crabtree recorded a single organic band within the clastic, varved basal clays (bed 1). This band contained both rich pollen and diatom assemblages, which were tentatively ascribed to Pollen Zone Ib, with the implication that the bed had formed during the 'warm' Bølling Interstadial described from sites elsewhere in North-West Europe.

Pollen collected from the 1969 core made it possible to recognise a similar full Devensian late-glacial sequence, with a clearly defined Pollen Zone II flora (Allerød) and Pollen Zone I flora (pre-Allerød). Crabtree (1970) suggested that the pollen diagram constructed from work on the 1969 core showed the salient features proved in Devensian late-glacial sequences elsewhere in upland Britain. He noted that there was no correlative of the Pollen Zone Ib that had been identified in the other core. The core indicated a normal progression of vegetation without any such indication of a climatic oscillation. Crabtree (1972) suggested that the earlier identified Ib pollen assemblages might have been produced from a contaminated sample, although at the time there was every indication that the thin organic band, with its well developed pollen and diatom flora, was *in situ*.

With the pollen diagram constructed from work on the 1969 core largely in mind, Crabtree charted the following sequence of vegetational and environmental changes from the deposits at Cors Geuallt. First, the varved clays (bed 1) were deposited following wastage of the Late Devensian ice-sheet. The pollen spectra indicate development of open-grassland with many herb taxa, giving the overall impression of a restricted pioneer flora with a general absence of thermophilous taxa. Towards the end of this period, a gradual rise in *Juniperus* pollen occurs, indicating that juniper may have occupied areas with snow patches or formed an incomplete shrub cover.

The second main pollen zone (Pollen Zone II) was correlated by Crabtree with the Allerød, widely recognised in Britain and elsewhere in North-West Europe by a sequence of a juniper pollen maximum followed by a rise in birch, including tree birches. At this time, there is also an increase in thermophilous herb pollen types, such as *Filipendula*, and a decrease in shade intolerant taxa. The pollen spectra generally indicate an improvement over the preceding period: and this phase can be correlated with the phase described by Ince (1981) at nearby Clogwynygarreg as the 'late-glacial interstadial'.

Towards the end of Pollen Zone II at Cors Geuallt, *Betula* and *Filipendula* percentages fall markedly and a corresponding increase in taxa characteristic of open and disturbed ground habitats is also noted. These changes are accompanied by the change from organic sedimentation to deposition of clays. Both pollen and sedimentary evidence point to a period of intense cold with soil instability during Pollen Zone III, which may be correlated with the recrudescence of glacier ice in many of the upland cirques (Ince 1981; Gray 1982a). Towards the end of this event, the rapid decline in open and disturbed ground taxa suggests a very rapid change to the milder conditions of the Holocene (Crabtree 1972). However, many herb taxa persist into the early Holocene despite the increase in *Betula* pollen, and it is only with the rise of *Corylus*, in Pollen Zone V, that many of these heliophytic taxa disappear from the record.

The remaining record provides a clear picture of the infilling of the lake basin at Cors Geuallt. The pollen evidence shows a large amount of wood peat dating to the sub-Boreal and suggests that upland forest destruction began at this time. By the beginning of the sub-Atlantic, much of the uplands at this altitude had developed blanket or hill peat (Crabtree 1970).

Diatom counts were also made from samples taken from the Devensian late-glacial and Holocene deposits at Cors Geuallt, with samples chosen to cover the pollen zones already identified (Crabtree 1969, 1970). Peak diatom frequencies occurred in Pollen Zones II–III and in the Holocene. The organic band within the basal clays in the 1964 core also contained a well developed diatom flora (Crabtree 1970). The sequence shows rapidly changing diatom communities, both in terms of total numbers and in floral composition, during the late-glacial. The early Holocene is characterised by a period of *Fragilaria* dominance, and of peak diatom productivity. This peak was accompanied by a decline in base tolerant species, leading to a final stage where acid tolerant species dominate, but during which there was an overall decline in diatom numbers.

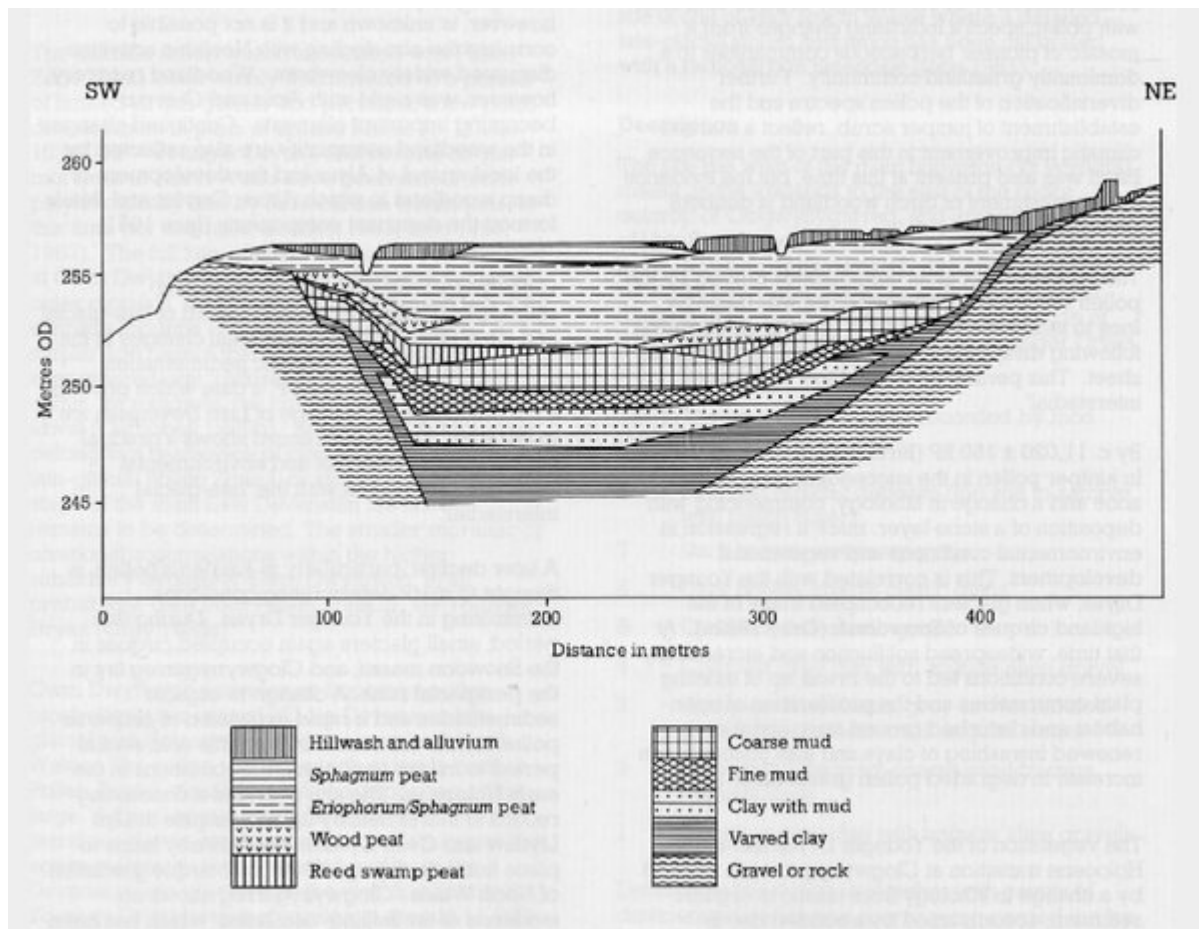
Cors Geuallt provides a pollen record of Late Devensian late-glacial and Holocene vegetational changes in North Wales. The site has also yielded a record of diatom floras extending back into late-glacial time, and, in this respect, the site is unique in Wales. The controversial organic band described from the early part of the late-glacial sequence may provide important evidence for a climatic oscillation, perhaps equivalent to the Bølling Interstadial. Indeed, Burrows (1974, 1975) published radiocarbon and fossil plant evidence from a nearby late-glacial site in the Nant Ffrancon Valley, which he also claimed indicated a climatic oscillation at this time. Moore (1975b) and Ince (1981), however, believe these data to be equivocal and see no evidence for a Bølling Interstadial in these profiles. Cors Geuallt, therefore, may prove to be an important site for establishing a framework for early Late Devensian late-glacial events in Britain, and for the presence of an interstadial before the Allerød.

The sequence of Late Devensian late-glacial and Holocene deposits at Cors Geuallt preserves important pollen and diatom assemblages that record changing environmental conditions in upland North Wales. The site is important in establishing regional variations in Devensian late-glacial conditions, and in particular, demonstrates controversial evidence for a climatic oscillation in the early late-glacial, that has been correlated with the Bølling Interstadial. The pollen record therefore contrasts with other sites in Wales which show evidence for only one warm episode in late-glacial times.

## Conclusions

Cors Geuallt is important because not only does it contain evidence for climatic change from pollen but also from diatom fossils in sediments dating from the end of the last ice age. As such it has unique qualities particularly because the evidence suggests a climatic variation (warming) not generally detected elsewhere in the Welsh upland.

## References



(Figure 39) Devensian late-glacial and Holocene sequence at Cors Geuallt (after Crabtree 1972)