Clogwynygarreg

Highlights

A key site that provides a rare record of Late Devensian pollen, and thus vegetation changes, with independent radiocarbon dates. These confine precisely the dating of the wastage of the main Devensian ice-sheet and the onset of the last, Younger Dryas, glacial event.

Introduction

Clogwynygarreg [SH 560 538] is an important palynological site which yields evidence from the Late Devensian late-glacial and the Holocene. The site is one of very few in Wales where a detailed late-glacial pollen sequence has been calibrated with a radiocarbon timescale (Ince 1981).

Description

The site lies west of the main Snowdon (Yr Wyddfa) massif, in the lowlands to the east of the rocky outcrop of Clogwynygarreg, and immediately north of Llyn Dywarchen. It consists of an infilled lake basin covering approximately 4ha and occupies what has been interpreted as a glacial meltwater channel (Ince 1981). The site lies at an altitude of 235m, and is about 2 km outside the Younger Dryas ice limit mapped by Gray (1982a).

The following succession was recorded by Ince (1981) at [SH 560 538]:

8 Peat and organic deposits (too wet to sample with piston corer)

7 Dark brown, wet peaty gyttja

6 Dark brown, coarse clastic gyttja

5 Compact, fine clastic gyttja

4 Compact grey clay with angular slate gravel

3 Compact, fine, clastic, grey-brown mottled gyttja with sporadic small angular stones

2 Dark grey lake mud, coarse sand fraction towards base

1 Compact grey clay with angular slate gravels

Detailed pollen analyses together with counts of deteriorated pollen and spores were carried out by Ince (1981), and four radiocarbon assays were provided for significant levels in the sequence. The results provide the basis for detailed interpretations of vegetational change in the Snowdonian foothills during the Late Devensian late-glacial and early Holocene. Ince (1981) also provided comparable data from a late-glacial to early Holocene sequence at Llyn Goddionduon [SH 753 583] and at two sites, Llyn Llydaw [SH 632 543] and Cwm Cywion [SH 632 604], with early to mid Holocene sequences — see Snowdon and Y Glyderau site reports respectively for details of these last two sites.

Interpretation

Prior to 13,670 ± 280 BP (Birm 884), clays and silts (with occasional small stones) were deposited at Clogwynygarreg as the Late Devensian ice-sheet wasted. Pollen assemblages from the basal clastic deposits show that sedimentation occurred in a sparsely vegetated landscape characterised by areas of unstable ground and perhaps stagnant ice wastage. The Late Devensian late-glacial at Clogwynygarreg was then characterised by a prolonged period of vegetation

development commencing with pioneer herbaceous

communities and culminating in the establishment *of Juniperus* scrub. During this development, the trend towards soil stability is marked by sedimentation of an increasingly organic character, with pollen spectra indicating changes from a mosaic of pioneer herbaceous communities to a dominantly grassland community. Further diversification of the pollen spectra and the establishment of juniper scrub, reflect a marked climatic improvement in this part of the sequence. Birch was also present at this time, but the evidence for establishment of birch woodland is doubtful (Ince 1981).

The succession of plant communities proved by the pollen record at Clogwynygarreg was taken by Ince to indicate a response to climatic amelioration following disappearance of the Late Devensian ice-sheet. This period, he termed the 'late-glacial interstadial'.

By *c.* 11,020 ± 150 BP (Birm 886), a marked decline in juniper pollen in the succeeding local pollen zone and a change in lithology, commencing with deposition of a stone layer, mark a regression in environmental conditions and vegetational development. This is correlated with the Younger Dryas, when glaciers reoccupied many of the highland cirques of Snowdonia (Gray 1982a). At that time, widespread solifluction and increasingly severe conditions led to the break up of existing plant communities and the proliferation of open-habitat and disturbed ground taxa; and the renewed inwashing of clays and silts containing an increase in degraded pollen grains (Ince 1981)

The vegetation of the Younger Dryas and early Holocene transition at Clogwynygarreg is marked by a change in lithology from clastic to organic sediment, accompanied by a sudden rise in *Juniperus* pollen. These changes mark the transition from periglacial conditions to the milder climate of the early Holocene. An early radiocarbon date of 10,760 ± 140 BP (Birm 887) at this lithological transition is believed to be too old because of hardwater error (Ince 1981).

Following development of an open-grassland community during the period of transition, tree birches became established, and extensive woodland developed around the site. A fall in juniper pollen, which has been interpreted as marking its shading out by larger trees such as birch, was followed by a sudden expansion of *Catylus* and *Myrica* pollen, which denotes the arrival and dispersal of hazel in the local woodlands. These taxa also displaced birch. Continued diversification of the woodland taxa marks progressive vegetational development through the Holocene (Ince 1981).

Subsequent to this stage of woodland development, Ince noted a change in the arboreal and non-arboreal pollen ratio, with an increase in degraded pollen grains showing changes in the vegetation resulting from disturbance or a change in hydrological conditions in the lake basin. At this time, *Ulmus* and *Betula* pollen declined and Ince speculated that this may have been caused by local human activity. The age of these sediments, however, is unknown and it is not possible to correlate the elm decline with Neolithic activities discussed widely elsewhere. Woodland recovery, however, was rapid with *Pinus* and *Quercus* becoming important elements. Continued changes in the woodland community are also reflected by the local arrival of *Alnus* and the development of damp woodland in which *Alnus, Corylus* and *Betula* formed the dominant components (Ince 1981).

Clogwynygarreg provides an important radiocarbon calibrated pollen record of late-glacial and early Holocene environmental changes in the Snowdonian foothills. Organic sedimentation began after about 13,670 BP, a date which provides a minimum age for wastage of Late Devensian ice in the area. The pollen record shows a gradual improvement in thermal and environmental conditions associated with the 'late-glacial interstadial'.

A later decline, particularly in *Juniperus* pollen, is thought to mark deteriorating conditions culminating in the Younger Dryas. During this period, small glaciers again occupied cirques in the Snowdon massif, and Clogwynygarreg lay in the periglacial zone. A change to organic sedimentation and a rapid expansion of *Juniperus* pollen marks the transition from this cold stadial period to milder environmental conditions in the early Holocene. The site provides a contrasting record to that of nearby upland cirques at Llyn Llydaw and Cwm Cywion, and thereby helps to place limits on the age of the final cirque glaciation of North Wales. Clogwynygarreg shows no evidence of the Bølling 'oscillation' which has been recorded at some Welsh sites in the early part of the late-glacial sections (for instance, Cors Geuallt and Nant Ffrancon).

The radiocarbon dated pollen sequence at Clogwynygarreg is one of the most extensive and detailed in Wales, and it provides important evidence for changing Late Devensian late-glacial and Holocene environmental conditions in North

Wales. The site yielded radiocarbon dates which provide a minimum age for the wastage of the Late Devensian ice-sheet and for the onset of cold conditions in the Younger Dryas. Together with adjacent sites in the uplands which provide radiocarbon dates for the cessation of cold conditions in the Younger Dryas, Clogwynygarreg helps to constrain the duration and timing of the final cirque glaciation of North Wales,

Conclusions

The Clogwynygarreg site is important because it shows a sequence of climatic changes over the last 14,000 years which have been dated by radiocarbon. It is an important site in a network of complementary ones throughout the British Isles and Europe which demonstrate vegetation and climatic change.

References