

CNOC A'MHORAIRE

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OS Grid Reference: NH284755

Highlights

Cnoc a'Mhoraire is a representative example of a large end-moraine ridge formed during the Loch Lomond Stadial. Its importance is enhanced by the availability of indirect dating evidence from nearby deposits at Loch Droma.

Introduction

Cnoc a'Mhoraire (NH 284755) is a large end moraine located at the mouth of the Allt Lair valley where the latter enters the Dirrie More, one of the major glacial breaches cut through the watershed of the north-west Highlands (Linton, 1951a; Dury, 1953). It is important as one of the largest and most accessible end moraines associated with Loch Lomond Readvance glaciers in northern Scotland and has been described by Geikie (1901), Peach *et al.* (1913a), Kirk and Godwin (1963), Kirk *et al.* (1966), Sissons (1977a), Smith (1977), and Synge and Smith (1980). It is also significant through its proximity to the Lateglacial pollen site at Loch Droma (Kirk and Godwin, 1963).

Description

The end moraine is an impressive landform up to 25 m high, 200 m wide and 800 m long. It dams Loch a'Gharbhrain and was formed by a Loch Lomond Readvance valley glacier fed from sources in the Beinn Dearg massif to the north (Sissons, 1977a). The lateral limits of this glacier are demarcated along both sides of Loch a'Gharbhrain by lateral moraines, hummocky moraines and a notably fine drift limit (Sissons, 1977a).

Interpretation

In an early reference, Geikie (1901) mentioned the striking moraines of the Dirrie More, referring in particular to the terminal feature at the southern end of Loch a'Gharbhrain. Later, Peach *et al.* (1913a) also made special reference to the moraine, noting its great height and conspicuous rampart when viewed from the Garve–Ullapool road. They related its formation to their valley glacier stage following ice-sheet glaciation and an episode when glaciers were confluent. Surprisingly, Charlesworth (1956) did not specifically refer to the Cnoc a'Mhoraire moraine in his extensive exposition of glacial retreat stages in the Highlands. However, he placed the limit of his Stage M glaciation, later related by Donner (1957) to Pollen Zone III (Loch Lomond Stadial) of the Lateglacial, well to the east, in the vicinity of Contin.

The Cnoc a'Mhoraire moraine assumed considerable significance following the discovery of Lateglacial organic deposits nearby at Loch Droma (Kirk and Godwin, 1963). These deposits contained Lateglacial Interstadial pollen and provided a radiocarbon date of 12,810 ± 155 BP (Q-457). Together with the sedimentary record of the site, this evidence has profound implications for the deglaciation chronology of the area. It apparently demonstrates that no active ice had passed down the Dirrie More after about 12,800 BP and that deglaciation of the area had taken place much earlier than previously suspected. The features to the east mapped by Charlesworth as Stage M were therefore older than the Loch Lomond Stadial.

Although comparison of the pollen stratigraphy with other radiocarbon-dated sites in northern Scotland (for example, Cam Loch) suggests that the Loch Droma date may be as much as 1000 years too old (Sutherland, 1987c), the main conclusion of Kirk and Godwin (1963) remains valid. Of additional note is that, at Loch Droma, laminated sediments were deposited throughout the Lateglacial, suggesting that glaciers were present in the surrounding mountains during this time. A coarsening upwards sequence in the sediments deposited in the basin during the Loch Lomond Stadial would accord with ice readvance closer to the Loch Droma site (Sutherland, 1987c).

The evidence for local glaciation following decay of the ice-sheet is confined to the tributary glens of the Dirrie More, notably at Loch a'Gharbhraín and the northern side of the Fannich mountains (Kirk and Godwin, 1963; Kirk *et al.*, 1966). Kirk and Godwin (1963) and Kirk *et al.* (1966) termed this readvance 'the Gharbhraín stage', and the latter authors inferred it to be the local equivalent of the Zone III (Loch Lomond) Readvance. This has subsequently been supported by Sissons (1977a) following his systematic mapping of Loch Lomond Stadial glaciers in the northern Highlands and by Ballantyne *et al.* (1987) and Reed (1988). Smith (1977) and Synge and Smith (1980), however, have retained the local name of the Gharbhraín stage.

The Cnoc a'Mhóraire moraine is distinguished from the many others produced during the Loch Lomond Readvance in the northern Highlands (Sissons, 1977a) by its great size and relative ease of accessibility. The most comparable feature is probably in Strath Oykeil, but it is partly afforested. In addition, Cnoc a'Mhóraire is significant for its close association with the Loch Droma site. Historically, the latter was a critical locality demonstrating early ice-sheet deglaciation of the northern Highlands and providing a maximum date for the Loch Lomond Readvance represented by the Cnoc a'Mhóraire moraine.

Conclusions

This site comprises a large end-moraine ridge formed by a glacier during the Loch Lomond Stadial (about 11,000–10,000 years ago). It is a well-known and representative example of its type. The age of the moraine has been inferred indirectly from a sequence of Lateglacial deposits nearby at Loch Droma.

Reference list

- Ballantyne, C.K., Sutherland, D.G. and Reed, W.J. (1987) Introduction. In *Wester Ross Field Guide* (eds C.K. Ballantyne and D.G. Sutherland). Cambridge, Quaternary Research Association, 1–63.
- Charlesworth, J.K. (1956) The late-glacial history of the Highlands and Islands of Scotland. *Transactions of the Royal Society of Edinburgh*, **62**, 769–928.
- Donner, J.J. (1957) The geology and vegetation of Late-glacial retreat stages in Scotland. *Transactions of the Royal Society of Edinburgh*, **63**, 221–64.
- Dury, G.H. (1953) A glacial breach in the north-western Highlands. *Scottish Geographical Magazine*, **69**, 106–17.
- Geikie, A. (1901) *The Scenery of Scotland Viewed in Connection with its Physical Geology* 3rd edn. London, Macmillan and Co. 540pp.
- Kirk, W. and Godwin, H. (1963) A late glacial site at Loch Droma, Ross and Cromarty. *Transactions of the Royal Society of Edinburgh*, **65**, 225–49.
- Kirk, W., Rice, R.J. and Synge, F.M. (1966) Deglaciation and vertical displacement of shorelines in Wester and Easter Ross. *Transactions of the Institute of British Geographers*, **39**, 65–78.
- Linton, D.L. (1951a) Watershed breaching by ice in Scotland. *Transactions of the Institute of British Geographers*, **15**, 1–15.
- Peach, B.N., Horne, J., Gunn, W., Clough, C.T., Greenly, E., Hinxman, L.W., Cadell, H.M., Pocock, T.I. and Crampton, C.B. (1913a) The geology of the Fannich Mountains and the country around upper Loch Maree and Strath Broom. (Explanation of Sheet 92). Memoirs of the Geological Survey of Scotland. Edinburgh, HMSO, 127pp.
- Reed, W.J. (1988) The vertical dimensions of the last ice sheet and Late Quaternary glacial events in northern Ross-shire. Unpublished PhD thesis, University of St Andrews.
- Sissons, J.B. (1977a) The Loch Lomond Readvance in the northern mainland of Scotland. In *Studies in the Scottish Lateglacial Environment* (eds J.M. Gray and J.J. Lowe). Oxford, Pergamon Press, 45–59.
- Smith, J.S. (1977) The last glacial epoch around the Moray Firth. In *The Moray Firth Area Geological Studies* (ed. G. Gill). Inverness, Inverness Field Club, 72–82.
- Sutherland, D.G. (1987c) Loch Droma. In *Wester Ross Field Guide* (eds C.K. Ballantyne and D.G. Sutherland). Cambridge Quaternary Research Association, 94–7.
- Synge, F.M. and Smith, J.S. (1980) *A Field Guide to the Inverness Area*. Aberdeen, Quaternary Research Association, 24pp.