
AUCHENECK

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OS Grid Reference: NS478830

Highlights

The landforms at Aucheneck demonstrate important aspects of the geomorphology of the Loch Lomond Readvance; they include one of the best examples of an end-moraine ridge in the type area for the readvance

Introduction

The site (NS 478830) is located west of Aucheneck athwart the Finnich Glen and covers an area of *c.* 1 km². It is important for an assemblage of landforms associated with the Loch Lomond Readvance glacier in the Loch Lomond basin, the area in which the readvance was first recognised (Simpson, 1933). In particular, it contains one of the finest segments of a till moraine ridge associated with the former Loch Lomond glacier. It is also notable for good sections in the moraine and clear contrasts in landform patterns and soil development 'inside' and 'outside' the ice limit. The only detailed account of the site is by Rose (1981), although the moraine as a whole is discussed in a number of publications (Renwick and Gregory, 1907; Gregory, 1928; Simpson, 1933; Dickson *et al.*, 1978; Rose, 1980d).

Description

The geomorphology of the Aucheneck area is shown in Figure 13.2. The terminal moraine is best developed on the west side of the glen where it forms a prominent landform, 5–7 m high and about 40 m wide, on the otherwise subdued relief Cameron Muir. Immediately inside the terminal ridge three further ridge fragments occur, then an area of hummocky drift and meltwater channels. On the east side of Finnich Glen (NS 482828) there are good stream sections in the moraine. These show dark, reddish-brown, sandy till, locally with flow banding (Rose, 1981). Clast fabrics are orientated parallel to the ridge (Rose, 1981). Several subglacial meltwater channels occur on the north side of the ridge, trending towards the north and east. The channels appear to form two groups (Rose, 1981): those aligned west-east were formed by meltwater draining directly from the ice, whereas those aligned north-south may have received part of their discharge from the Carnock catchment.

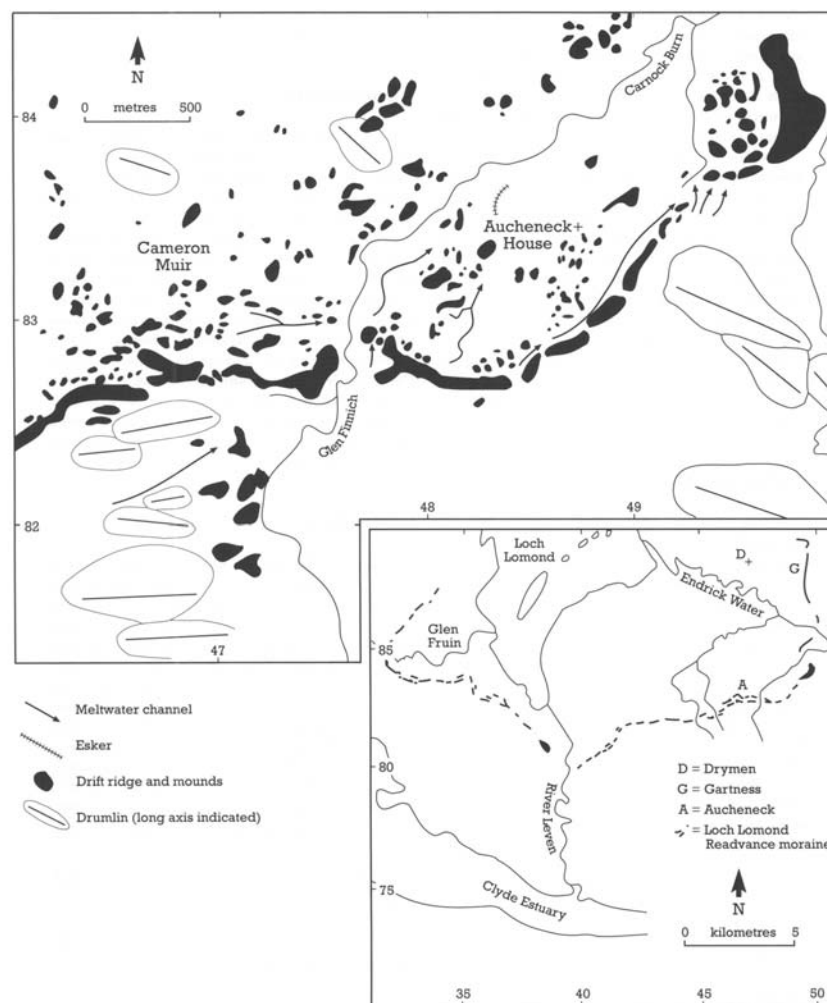


Figure 13.2: Landforms and deposits associated with the Loch Lomond Readvance ice limit at Aucheneck (from Rose, 1981). Inset shows the wider extent of the moraine that marks the ice limit at the southern end of Loch Lomond (from Dickson *et al.*, 1978).

At NS 483834 one of the channels leads into an esker. Of further interest is the contrast in landform type and development 'outside' and 'inside' the moraine limit (Figure 13.2). On the south side, there are low, drumlins with ridge crests orientated west-east; on the north side, the drift has a sharper, more irregular, hummocky form, and drumlins (outside the site) have long axes aligned NW–SE. There is also a contrast in the form of the Carnock valley on either side of the ice limit; on the south side, the valley is relatively wide, and bedrock is exposed along the sides; to the north, an earlier valley has been infilled with till, and the present burn occupies a narrow course cut in this material and locally a bedrock gorge. Simpson (1928, 1933) recorded shells in the till close to the moraine in the Carnock Burn west of Aucheneck House (NS 487835), but failed to find any "outside" the moraine. There is also a contrast in soil development "inside" and "outside" the ice limit with higher levels of podsolisation and indurated layer development on the "outer" side (J. Rose, unpublished data).

Interpretation

The Aucheneck moraine is part of a near continuous end-moraine system extending around the south end of Loch Lomond from Conic Hill to Glen Fruin (Renwick and Gregory, 1907; Gregory, 1928; Simpson, 1928, 1929, 1933; Dickson *et al.*, 1978; Rose 1980d). Gregory (1928) considered that the best remnant on the east side was at Aucheneck. Renwick (1895) first recognised that the fragment in Glen Fruin was associated with Loch Lomond basin ice rather than ice coming from the west, as postulated by Bell (1891b, 1893c, 1894, 1896b). Subsequently, from the evidence of the moraine itself and the distinctive shelly till (see Croftamie and Jack, 1875) that occurred inside the line of the moraine, but not outside it, Simpson (1933) inferred a readvance of ice during the wastage of the last ice sheet, which he

called the Loch Lomond Readvance. Charlesworth (1956) identified the moraine as part of his late-glacial "Stage M" or "Moraine glaciation". From pollen studies Donner (1957) placed the readvance during the climatic deterioration represented in Lateglacial Pollen Zone III of the Jessen-Godwin scheme. Subsequently radiocarbon dating has confirmed that the readvance occurred between c. 11,000 – 10,000 BP (see Gartness and Croftamie), and the period of climatic deterioration has been called the Loch Lomond Stadial (Gray and Lowe, 1977a) after the area where the readvance was first named by Simpson (1933). A summary of the stratigraphic evidence justifying the designation as a type area is given in Rose (1989).

Rose (1981) considered that the moraine at Aucheneck formed by a combination of debris pushed up at the ice margin and also material that slumped off the glacier surface. The ice limit is clearly defined, not only by the moraine, but also by the contrast in landforms "inside" and "outside" it. "Outside", the drumlins have a west-east orientation associated with the last movement of the Late Devensian ice sheet across the area (Rose, 1981, 1987) and their relatively subdued appearance reflects the effects of gelifluction during the Loch Lomond Stadial. The landforms inside the limit are associated with a north-west to south-east ice movement of the piedmont lobe of the Loch Lomond glacier and have not been modified to the same extent by periglacial mass movement.

Single and multiple end moraines were widely formed during the Loch Lomond Readvance in the Highlands and Southern Uplands of Scotland, the Lake District and North Wales (see Cnoc a'Mhoraire, Tauchers, Gribun, Lochnagar, the Cairngorms, and An Teallach) (Sissons, 1974c, 1979e, 1980a; Gray, 1982a). The particular significance of Aucheneck centres on it being one of the best examples of a till ridge in the type area for the readvance (Simpson, 1933; Jardine, 1981; Rose, 1989) and the clear assemblage of evidence it provides for ice readvance: the end moraine itself and the contrasts in till lithology (shell content), landforms and soils inside and outside the ice limit. The exposures, additional landform assemblage, including meltwater channels, hummocky drift and an esker, and proximity to dated biostratigraphy make Aucheneck a better representative site than, for example, the equally fine moraine in Glen Fruin. Moreover, the multiple end-moraine sequence at Aucheneck may be significant in illustrating local fluctuations of the ice margin during the stadial. Aucheneck complements the sites at Gartness where Loch Lomond Readvance end moraines were formed subaqueously and Croftamie where the local shelly till of the readvance is well represented.

Conclusions

Aucheneck provides an excellent representative assemblage of landforms formed by a Loch Lomond Readvance glacier (approximately 11,000–10,000 years ago) in the type area where this readvance was first recognised. In particular, it includes one of the best examples of an end moraine ridge in the area and is important in demonstrating other characteristic landforms produced by the ice readvance.

Reference list

- Bell, D. (1891b) On a glacial mound in Glen Fruin, Dumbartonshire. *Geological Magazine*, dec. 3, vol. 8, 415–8.
- Bell, D. (1893c) On a glacial mound in Glen Fruin, Dumbartonshire. *Transactions of the Geological Society of Glasgow*, **9**, 345–54.
- Bell, D. (1894) On the glaciation of the west of Scotland. *Proceedings of the Philosophical Society of Glasgow*, **25**, 118–36.
- Bell, D. (1896b) Additional notes on Glen Fruin. *Transactions of the Geological Society of Glasgow*, **10**, 380–1.
- 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.
- Dickson, J.H., Stewart, D.A., Thompson, R., Turner, G., Baxter, M.S., Drndarsky, N.D. and Rose, J. (1978) Palynology, palaeomagnetism and radiometric dating of Flandrian marine and freshwater sediments of Loch Lomond. *Nature*, **274**, 548–53.
- 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.
- Gray, J.M. (1982a) The last glaciers (Loch Lomond Advance) in Snowdonia, North Wales.

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- Geological Journal*, **17**, 111–33.
- Gray, J.M. and Lowe, J.J. (1977a) Introduction. In *Studies in the Scottish Lateglacial Environment* (ed. J.M. Gray and J.J. Lowe). Oxford, Pergamon Press, xi-xiii.
- Gregory, J.W. (1928) The geology of Loch Lomond. *Transactions of the Geological Society of Glasgow*, **18**, 301–23.
- Jack, R.L. (1875) Notes on a till or boulder clay with broken shells, in the lower valley of the River Endrick, near Loch Lomond, and its relation to certain other glacial deposits. *Transactions of the Geological Society of Glasgow*, **5**, 5–25.
- Jardine, W.G. (1981) Status and relationships of the Loch Lomond Readvance and its stratigraphical correlatives. In *The Quaternary in Britain* (eds J. Neale and J. Flenley). Oxford, Pergamon Press, 168–73.
- Renwick, J. (1895) Notes on an excursion to Glen Fruin, with a description of the moraine on its south side. *Transactions of the Geological Society of Glasgow*, **10**, 96–104.
- Renwick, J. and Gregory, J.W. (1907) The Loch Lomond moraines. *Transactions of the Geological Society of Glasgow*, **13**, 45–55.
- Rose, J. (1980d) The western side of Loch Lomond. In *Glasgow Region Field Guide* (ed. W.G. Jardine). Glasgow, Quaternary Research Association, 37–39.
- Rose, J. (1981) Field guide to the Quaternary geology of the south eastern part of the Loch Lomond basin. *Proceedings of the Geological Society of Glasgow 1980–81*, 1–19.
- Rose, J. (1987) Drumlins as part of a glacier bed continuum. In *Drumlin Symposium* (eds J. Menzies and J. Rose). Proceedings of the Drumlin Symposium, First International Conference on Geomorphology, Manchester, 16–18 September 1985. Rotterdam, A.A. Balkema, 103–16.
- Rose, J. (1989) Stadial type sections in the British Quaternary. In *Quaternary Type Sections: Imagination or Reality* (eds J. Rose and C. Schlüchter). Rotterdam, A.A. Balkema, 45–67.
- Simpson, J.B. (1928) In *Summary of Progress of the Geological Survey of Great Britain and the Museum of Practical Geology for the year 1927*. Part 1. Geological Survey of Great Britain. London, HMSO, 59–60.
- Simpson, J.B. (1929) The valley glaciation of Loch Lomond. *Report of the British Association for the Advancement of Science for 1928*, 547–8.
- Simpson, J.B. (1933) The late-glacial readvance moraines of the Highland border west of the River Tay. *Transactions of the Royal Society of Edinburgh*, **57**, 633–45.
- Sissons, J.B. (1974c) The Quaternary in Scotland: a review. *Scottish Journal of Geology*, **10**, 311–37.
- Sissons, J.B. (1979e) The Loch Lomond Stadial in the British Isles. *Nature*, **280**, 199–203.
- Sissons, J.B. (1980a) The Loch Lomond Advance in the Lake District, northern England. *Transactions of the Royal Society of Edinburgh. Earth Sciences*, **71**, 13–27.