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# Findhorn Terraces, Highland

[NH 844 364]

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## Highlights

This site demonstrates a particularly good assemblage of glacial outwash and river terraces formed, respectively, during and following the melting of the Late Devensian ice-sheet.

## Introduction

The site is located on the southern side of the middle River Findhorn, within the Streens Gorge, 20 km south of Nairn, near the settlement of Ballachrochin. It is notable for a series of glaciofluvial and fluvial terraces (Figure 2.51), which occupy the lower part of the north-west-facing slope of Carn Torr Mheadhoin (543 m) and are cut into the extensive glacial and glaciofluvial deposits found throughout the Streens Gorge (Young, 1980). The area is described by Horne (1923), Young (1980) and Auton (1990).

## Description

Horne originally identified 11 terrace levels, but more recent mapping by Auton (1990) has shown that there are 13 terraces, of which the lowest five occur at 245–75 m and exhibit downvalley gradients of 35–50 m km<sup>-1</sup>. These terraces locally abut terrace 6 at 285 m. In section this flat-topped feature comprises 1.0 m of clast-supported, well-rounded gravel, underlain by 1.5 m of a horizontally laminated, low-angle cross-bedded, silty, fine-grained sand. This sand in turn passes down into 2.0 m of finely interlaminated sandy silt and clay with dropstone cobbles and sparse interbeds of diamicton. Above terrace 6, terraces 7–11 extend from 287 to 310 m, with the terrace at 305 m containing a small steep-sided circular kettle hole 5 m deep. By contrast, terrace 12 (at 340 m) is cut into bedrock. The sequence ends at 365 m with a small outwash fan on the western side of the Allt a' Choire Bhuidhe.

This site is 3 km upstream of Allt a' Choire, a small catchment in which severe gullying during the Lateglacial and Holocene has resulted in the formation of a complex alluvial fan with at least five identifiable surfaces.

## Interpretation

Horne (1923) interpreted the terraces as fluvial features, although accepting that some of the higher levels were probably glaciofluvial in origin. Young (1980) regarded them as eskers. Auton (1990), in the most recent investigation, interpreted the land-forms as kame terraces and thus of glaciofluvial origin, being closely related to the downwasting of an isolated mass of stagnant ice.

A key part of the sequence in Auton's interpretation of the site is terrace 6 (at 285 m). He considers this to be the remains of a glaciolacustrine delta, since the sedimentary sequence closely resembles that of the lower part of the Malaspina delta in Alaska, as described by Gustayson *et al.* (1975). Such an interpretation is not new, having already been anticipated in part by Horne (1923). However, this reconstruction clearly requires the presence of a temporary glacial lake. Young (1980) claimed that the higher terraces are eskers and as such do not require the existence of a glacial lake within the valley, as suggested earlier by Bremner (1939) and Charlesworth (1956). Auton rejected Young's interpretation and developed a model in which most of the landforms in this middle part of the Findhorn Valley are of paraglacial origin; that is, they were formed by 'non-glacial processes that are conditioned by glaciation' (Church and Ryder, 1972). In particular, he considered that the terrace sequence at Ballachrochin developed in response to a stagnating ice mass in the Streens Gorge, which steadily downwasted during the Late Devensian and in so doing created local, temporary

glacial lakes. Successive ice margins have been reconstructed by Auton at 460 m, 400 m, 380–350 m, 340–300 m (310 and 305 m benches cut at this stage), 300–260 m (benches between 255 and 287 m cut at this stage) and 250 m (final benches cut after this stage).

All of the major river valleys in upland Scotland possess sets of terraces which are of fluvial and glaciofluvial origin. It is unusual, however, to find staircases of terraces which extend 80 m above the valley floor and possess 13 identifiable benches. This site on the River Findhorn is notable on both accounts.

The flight of terraces is one of the highest and most remarkable in Scotland, the sequence of 13 levels being related to a complex pattern of deglaciation in this part of the middle Findhorn Valley. Although the site has recently been investigated in considerable detail in terms of its glacial history, the Holocene development of the lower, fluvial, terraces has yet to be attempted. Only when this has been completed will the full significance of the site be disclosed. Harvey, Werritty and Whittington are reconstructing the history of the development of the alluvial fan at Allt a' Choire (3 km downstream of the Ballachrochin terraces) based on geomorphological mapping, sediment analysis, pollen analysis and radiometric dating. These results (reported in part in the account of Allt a' Choire in this volume) should assist in interpreting the development of the lowest of the terraces at Ballachrochin.

## Conclusion

The principal landforms at this site comprise a sequence of glacial outwash and river terraces, which are remarkable for the number of levels present and their altitudinal extent. The development of the glacial outwash terraces reflects the complex pattern of melting and wastage (deglaciation) of the last (Late Devensian) ice sheet in the area (approximately 14 000–13 000 BP). Following deglaciation, river terraces developed during the Lateglacial and Holocene. The site represents a striking example of terraces formed by glacial meltwater and river processes during and following deglaciation.

## References



(Figure 2.51) The Findhorn terraces at Ballachrochin (British Geological Survey photograph C1415, reproduced by permission of the Director, British Geological Survey. © NERC. All rights reserved).