DORES

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OS Grid Reference: NH598354

Highlights

The landforms at Dores comprise an exceptional suite of raised shingle ridges of lacustrine origin. These shorelines provide important evidence for interpreting geomorphological changes that occurred in the Loch Ness area during the Loch Lomond Stadial.

Introduction

The site at Dores (NH 598354), located on the eastern side of Loch Ness 12.5 km south-west of Inverness, is notable for a series of raised shorelines. In early accounts,Horne and Hinxman (1914) and Ogilvie (1923) commented on the clarity of the "100 ft raised beach' (a marine terrace) around the northern shores of Loch Ness, and the former suggested that fragments of three raised shorelines were present near Dores. J.S. Smith (1968, 1977), Synge (1977b), Synge and Smith (1980) identified three shingle ridges and proposed that the highest feature was marine in origin. In contrast, Firth (1984) identified four additional shoreline terraces at this locality and suggested that all the features were lacustrine in origin.

Description

The low ground beween Dores and Inverness was noted by Horne and Hinxman (1914) for its extensive glaciofluvial deposits that merge eastward into till. They suggested that the deposits adjacent to Loch Ness up to an altitude of 33 m (100 ft) OD, had been modified by wave action, with three distinct levels of wave activity being recognized nearDores.

J.S. Smith (1968, 1977),Synge (1977b) and Synge and Smith (1980) also identified three distinct levels in the deposits at Dores, each level represented by a shingle ridge. The lowest ridge at 17.9–18.1 m OD is related to present loch level (16 m OD), whereas the features at 19.9–20.3 m OD and 28.3–29.0 m OD are indicative of higher water levels (Figure7.19).

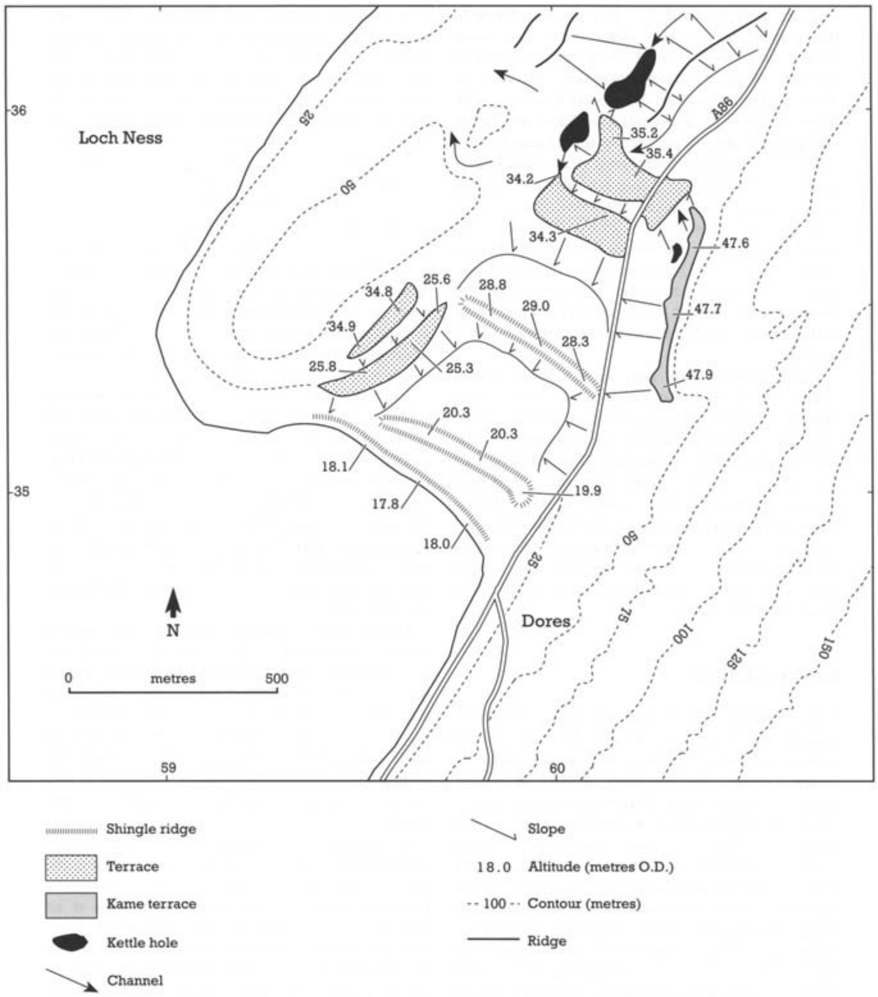

Figure 7.19: Geomorphology of the Dores area (from Firth, 1984).

In addition to the three shingle ridges, Firth (1984) identified a series of outwash and shoreline terraces at Dores (Figure 7.19). On the slopes to the east of the highest ridge there is a kame terrace at 47.6–47.9 m OD, and to the north-east of the shingle ridges, shoreline terraces at 35.2–35.4 m OD and 34.2–34.3 m OD are present. These terraces lie above adjacent kame and kettle topography and have meltwater channels descending to them. It is inferred that these higher terraces were formed while ice remained in the area. Poorly developed shoreline terraces at 34.8–34.9 m OD and 25.3–25.8 m OD have also been identified on the slopes west of the shingle ridges (Firth, 1984). Firth (1984) proposed that the 25.3–25.8 m OD terrace was formed at the same time as the 28.3–29.0 m OD shingle ridge and provided a better indication of former loch level.

Cores of sediments have been obtained from Loch Ness in Dores Bay (Pennington *et al.*, 1972; Haggart, 1982). Pennington *et al.* (1972) identified grey microlaminated glaciolacustrine clay, but no organic lake sediments. They inferred that the absence of the latter was due to strong currents. Analysis of the cores for total halide content (Pennington *et al.*, 1972) and diatoms (Haggart, 1982) suggested that the sediments were of freshwater origin, although one sample had a total halide content that was double that found in other layers.

Interpretation

It is generally agreed that the lower shoreline features (17.9–18.1 m OD and 19.9–20.3 m OD shingle ridges) in the Dores area are lacustrine in origin (Synge, 1977b; Firth, 1984). However, there is debate over the origin of the higher shoreline fragments. J.S. Smith (1968, 1977), Synge (1977b) and Synge and Smith (1980) proposed that the 28.3–29.0 m OD shingle ridge is a Lateglacial feature formed during a marine incursion into Loch Ness dated to 12,800 BP. Synge and Smith (1980) proposed this marine origin for several reasons. First, they argued that there was no rock bar or evidence of a former outlet to suggest the presence of ormer lake at this high level. Second, they considered the sediments fromDores Bay and,in particular,the layer with a high halide content as being evidence in support of a marine incursion. Third, they identified marine terraces at a corresponding altitude throughout the Ness Valley, thus providing a former link between Loch Ness and the sea.

In contrast Horne and Hinxman (1914) and Firth (1984) proposed that the highest shingle ridge (28.3–29.0 m OD) was of lacustrine origin.Firth (1984) reinterpreted the landforms in the Ness Valley and concluded that there is no evidence to support a marine incursion into Loch Ness and that consequently all the terraces around the shores of Loch Ness were lacustrine in origin. This view was supported by Pennington *et al*. (1972) and Haggart (1982) in their interpretation of the sediments from Dores Bay. Firth (1984, 1986) suggested that the ridge was of Loch Lomond Stadial age. He proposed that no outlet associated with a lake at this level had been recognized because it was destroyed during a catastrophic flood which resulted from the drainage of the former ice-dammed lake in Glen Spean and Glen Roy (Sissons, 1979c).

The shoreline terraces at 34–35 m OD occur at a higher elevation than the adjacent kame and kettle topography, and hence Firth (1984) concluded that they were apparently formed while Late Devensian ice remained in the area. However, there was insufficient evidence from around the shores of Loch Ness to determine the extent of the former lake that formed this shoreline, and Firth considered it possible that the 34–35 m lake may have been localize to the northern end of Loch Ness.

The evidence at Dores indicates that only a single lacustrine shoreline occurs at 25–26 m OD in contrast to more southerly sites in the Great Glen (see Fort Augustus) where two shorelines are associated with this level. This pattern is central to the interpretation that the build-up of Loch Lomond Readvance glaciers was sufficient to halt and reverse the isostatic rebound at the south-west end of Loch Ness (Firth, 1986, 1989b).

The sequence of changes in lake level may be summarized as follows (Firth, 1984). During the decay of the Late Devensian ice-sheet, a lake was formed at the northern end of Loch Ness at an altitude of around 35 m OD. During the Loch Lomond Stadial, lake level stood at 25–26 m OD in the Dores area and subsequently fell to 18–19 m OD (associated shingle ridge at 19.9–20.3 m OD) after a catastrophic flood resulted in the erosion of the outlet along the Ness Valley. During the Holocene, lake level fell to 15 m OD as a result of further downcutting at the outlet, only to be raised to the present day 16 m OD level as a result of the construction of the Caledonian Canal.

The landforms and deposits at Dores provided a key record of Lateglacial and Holocene changes in the level of Loch Ness near its outlet. In particular, the site is of considerable importance in the determination of regional patterns of isostatic uplift in northern Scotland. The evidence from Dores and other sites in the Great Glen (see Fort Augustus) indicates that the build-up of Loch Lomond Readvance glaciers was sufficient to halt and reverse the isostatic rebound at the south-west end of Loch Ness (Firth, 1986, 1989b).

Although marine shingle ridges are arguably better developed on theWest Coast of Jura and Northern Islay (see below), the three shingle ridges at Dores are noteworthy due to their lacustrine origin. As raised lacustrine features they are the only landforms of this type identified in Scotland.

Conclusions

The raised shorelines at Dores indicate the changing water levels of Loch Ness during the Lateglacial and Holocene (approximately the last 13,000 years). They provide important evidence that shows how the level of the loch changed when the floodwaters from the ice-dammed lakes in Glen Roy discharged into it. Evidence from the shorelines also contributes towards understanding the wider pattern of isostatic rebound (the result of the release of pressure as the ice melted, following the depression of the land surface by the weight of the ice-sheet on it) at the end of the last glaciation, and the interruption of isostatic rebound during the Loch Lomond Stadial (approximately 11,000–10,000 years ago).

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