Chapter 8 Karst in Scotland

Introduction

Karst is a very minor component of Scotland's landscape. Only at Assynt has underground drainage left significant lengths of dry valley floor and limestone solutional features on a scale where they create distinctive landforms. Elsewhere, the very small outcrops of various limestones are almost lost in landscapes dominated by erosional and depositional products of Pleistocene glaciations on a grand scale.

The Assynt karst

A narrow belt of carbonate outcrops extend north-south through the hills immediately east of Inchnadamph, at the head of Loch Assynt; the outcrops are discontinuous due to complexities of the geological structure, and are nowhere more than 3 km wide. The main karst features and caves are in the Traligill and Allt nan Uamh basins, both close to Inchnadamph (see (Figure 8.2)), but there are also caves in the Knockan basin 10 km to the south and on the Achmore plateau 3 km to the north (Lawson, 1988).

All the carbonates are in the Durness Group, a sequence of grey, bedded dolomites, 100 m thick, of Cambrian and Ordovician age (Johnson and Parsons, 1979). They are underlain by Cambrian quartzites. These rocks lie within a zone of major Caledonian thrusts, of which the Moine Thrust is the highest. Thrust planes have left klippen of Eocambrian sandstones forming the summit outliers of Beinn an Fhuarain and Beinn nan Cnaimhseag on top of the Durness carbonates. Curvature of the thrust planes creates a broadly basinal structure within the dolomites south-east of Inchnadamph, but bedding planes within the thrust sheets dip at various angles. Many of the caves are formed on the planes of the thrusts and faults, and groundwater flow is also constrained by a number of igneous intrusions.

Each Pleistocene glaciation covered the area with ice and largely removed earlier karstic landforms (Atkinson *et al.,* 1995). Glacial till, glaciofluvial debris and blanket peat bogs mask much of the carbonate outcrop, and periglacial weathering during the Loch Lomond Stadial created areas of frost-shattered debris and solifluction flows. A few rocky gorges expose the carbonates and there are a few high crags (Figure 8.1), but there are no extensive doline fields. There are few limestone pavements, because the complex geological structure has not allowed the glacial stripping of extensive stratimorphs.

The sinks, dry valleys and risings are the most conspicuous features of the karst. Allogenic drainage is from the higher ground of Breabag and Conival in the east, and most of it sinks where it crosses onto the dolomite. Both the Traligill River and the stream of Allt nan Uamh flow entirely underground, except in very wet weather, though some streams maintain surface courses over the dolomite, mainly supported on mantles of glacial till. The associated caves carry water in postglacial stream trenches and flooded passages, and they also contain many passages which pre-date the last glaciation.

Outlying limestone areas

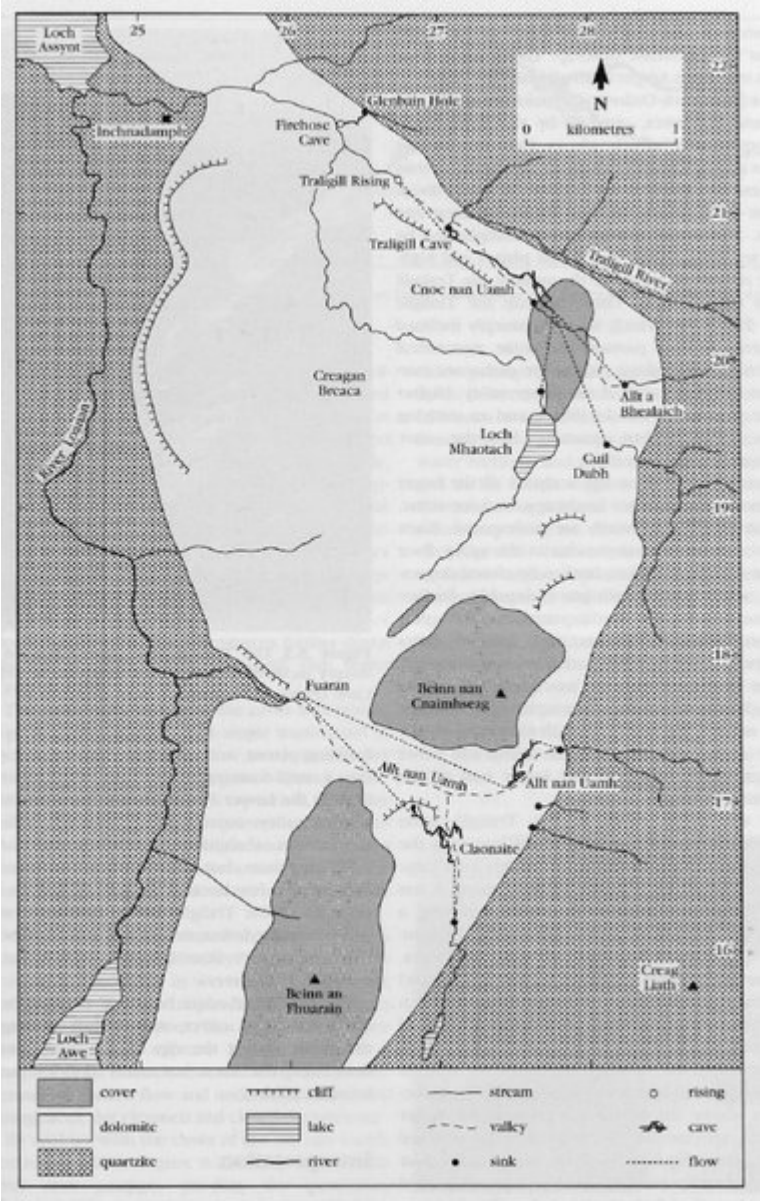
The Durness dolomites extend both north and south of Assynt, but with fewer karst features. Smoo Cave lies beneath a raised beach platform on the north coast; it has a large entrance chamber at the head of a tidal inlet, and an inner chamber with a stream cascading though its roof; the karstic passages and chambers were modified by wave action when sea levels were higher (Ford, 1959). Many small sinks and caves occur in the Durness dolomites just east of Loch Slapin, on the Isle of Skye; they include the stream cave of Uamh Cinn Ghlinn where the Allt nan Leac flows underground for 350 m (Ryder, 1974). The same carbonates have more small caves in the hills around Kishorn and some caves and limestone pavements in Glen Creran (Jeffreys, 1975, 1984).

Thin Jurassic limestones contain several small caves around Broadford, on Skye, and also the cave of Uamh nan Breagaire which has over 500 m of rift and bedding plane passages beneath a small limestone gorge at Applecross

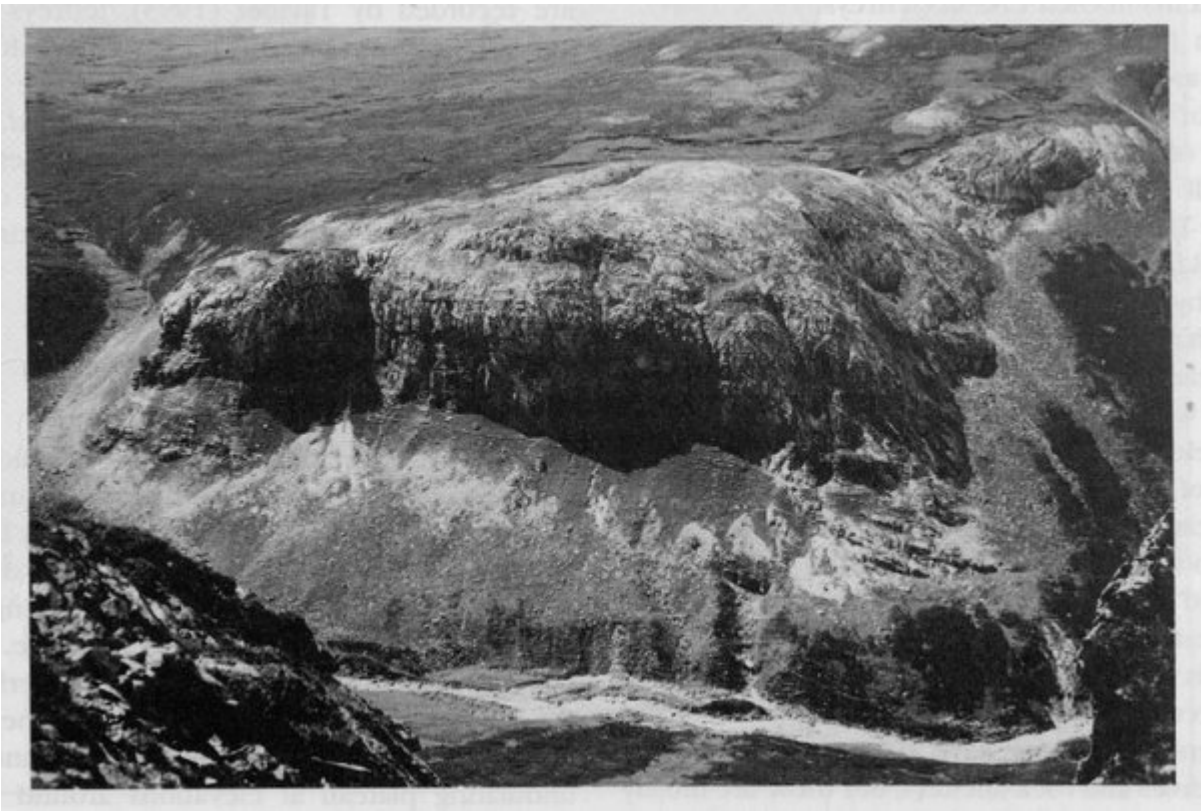
(Ryder, 1982). The mountain of Schiehallion, south-east of Loch Rannoch, is formed in Dalradian quartzites and phyllites with thin bands of marble; short caves have been formed where these are crossed by streams (Jeffreys, 1984). Uamh nan Uachdar is a cave with 60 m of passage in a Dalradian marble at an elevation of about 900 m in the Grampians south of Glen Spean (Young, 1992). There are no significant, recorded karst features in the thin limestone units in the Carboniferous of the Midland Valley.

Limestones are poorly represented in Scotland, and this short list of karst features is unlikely ever to become much longer. Pleistocene and Holocene sediments have been excavated from many caves and rock shelters, but these are mostly marine features preserved in fossil cliff lines behind raised beaches, and are not in limestone.

References



(Figure 8.2) Geological map of the main karst belt in Assynt, containing the caves of the Traligill and Allt nan Uamh Valleys. The dolomites belong to the Durness Group and are underlain by the Lower Palaeozoic quartzites. The cover rocks are klippe of Cambrian quartzite and Eocambrian sandstone lying over major thrust planes.



(Figure 8.1) The limestone crags of Creag nan Uamh containing the Bone Caves, south of the Allt nan Uamh, seen from Beinn nan Cnaimhseag, with the Claonaite valley on the left. (Photo: TJ. Lawson.)