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# Hangman's Bridge

[NG 856 298]

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## Introduction

Although the Moine Thrust can be traced over a distance of nearly 200 km from Eriboll in the north to the Sleat peninsula of Skye in the south, the actual thrust plane is exposed at relatively few localities along its whole length. The stream section at Hangman's Bridge, on a remnant of the old road from Auchtertyre to Stromeferry in Gleann Udalain, is one of two such localities in Lochalsh.

In the Lochalsh area, the Moine Thrust can be traced along the eastern slopes of Auchtertyre Hill, north of Auchtertyre village, and northwards into Coire Buidhe, but is unexposed in this segment (Figure 5.52). In addition to the exposure at Hangman's Bridge, the Moine Thrust plane is seen in a stream section near Braeintrà [NG 864 323] to the north, at the base of a small klippe (Peach *et al.*, 1910).

At Hangman's Bridge (Figure 5.56), the footwall to the Moine Thrust is formed by mylonitized Lewisian gneisses of the Balmacara Nappe (see Ard Hill GCR site report, this chapter). The immediate hangingwall to the thrust across the Lochalsh area is formed by a narrow strip of mylonitized Moine rocks, in total about 200 m thick, which can be traced northwards to Stromeferry and southwards through Coire Buidhe and into the scarp faces of Maol Mor and Maol Beag, near Auchtertyre (Figure 5.52). The Moine rocks are overlain by Lewisianoid gneisses of the Glenelg–Attadale Inlier. This inlier experienced a very different geological history from the Lewisian gneisses of the foreland in that it was reworked during the Grenvillian Orogeny at c. 1000 Ma (see Chapter 7). The relict eclogite-facies metamorphic assemblages testify to its burial to a crustal depth of at least 60 km (Sanders *et al.*, 1984).

The area around Hangman's Bridge was mapped by B.N. Peach and J. Horne during 1892–1893 as part of the primary mapping of Lochalsh (Sheet 71; Geological Survey of Scotland, 1909) and was described in the accompanying memoir (Peach *et al.*, 1910). Barber (1965, 1968) remapped the southern part of Lochalsh, including the Moine Thrust Belt, and this account is based on this later work.

## Description

The section occurs in a tributary burn of the Allt Loch na Smeòraich that extends north from Hangman's Bridge on the old Auchtertyre-Stromeferry road. To the north of Hangman's Bridge, the Moine Thrust plane is exposed, together with its immediate footwall and hangingwall (Figure 5.56). About 100 m upstream from the bridge, the stream is incised into the southern slope of Carn Fada in a small gorge. The bed of the stream, about 2 m wide, is composed of pink, grey and green, finely laminated, mylonitized Lewisian gneisses. Their uppermost surface, which slopes downstream to the south at 14°, is the exposed footwall of the Moine Thrust. The thrust itself is exposed at the base of the cliff on the eastern side of the stream, marked by a zone of clay gouge, a few centimetres thick. It is overlain by flaggy, mylonitic Moine psammite, again with a foliation parallel to the thrust surface.

The Lewisian-derived mylonites below the thrust show few, if any, structural complexities at this locality. The lamination corresponds to a pervasive mylonitic foliation, which dips at c. 20° to the south-east and contains a strong ESE-trending mineral lineation. The mylonites form part of the extensive outcrop at Carn Fada and Auchtertyre Hill. Their petrographical features and minor asymmetrical- and kink-folds are similar to those documented at the Ard Hill GCR site.

The flaggy mylonitized Moine psammite above the thrust plane is well exposed on the western side of the stream. The Moine rocks break easily into flat slabs 2–3 cm thick, due to spaced foliation surfaces covered by lustrous flakes of white mica and pale-green chlorite. Compositional layering is not conspicuous, but some lithological striping is clear in polished

slabs where locally it outlines tight to isoclinal fold hinges (Barber, 1968, fig. 14). A strong ESE-plunging mineral lineation is developed on the foliation surfaces parallel to the fold hinges. The flags are folded by large numbers of later small-scale kink-folds. A later gentle synclinal flexure of the Moine Thrust plane and the overlying Moine rocks is reflected in their arcuate outcrop and the inward dips of the foliation surfaces (Figure 5.52)a.

In thin section the Moine-derived mylonites show small (< 0.1 mm) sutured quartz crystals with scattered large (1–3mm) pink feldspar porphyroclasts, white mica flakes, and more rarely biotite and epidote. Feldspar grains include microcline, several types of micro-perthite, and plagioclase ranging from albite to andesine. Feldspar and white mica flakes are enclosed in augen, often surrounded by sheaths of sericite. Relict feldspar crystals may be broken, and the fragments pulled apart in the foliation and partially or completely replaced by aggregates of sericite (Barber, 1968). These are features typical of mylonitization under greenschist-facies conditions.

Immediately to the south of Hangman's Bridge a prominent knoll exposes coarse-grained but sheared Lewisianoid gneisses, which form part of the outcrop of the western unit of the Glenelg–Attadale Inlier. These are well exposed for a distance of 300 m in the cliffs of Maol Mor and Maol Beag, c. 2 km to the southwest. To the north-east of Hangman's Bridge, exposures of Moine rocks occur above the A890 on the eastern slopes of Carn Fada. These exposures include the basal Gleann Udalain Conglomerate, which lies directly on the Lewisianoid gneisses (Peach *et al.*, 1910; Bailey and Tilley, 1952). The conglomerate has been the subject of discussion as to its tectonic or sedimentary origin (see Avernish and Attadale GCR site reports, Chapter 7).

## Interpretation

The Lewisian-derived mylonites below the Moine Thrust plane at Hangman's Bridge show a mylonitic foliation, an ESE-plunging stretching lineation, and a range of features similar to those seen at the Ard Hill GCR site, implying an extended history of deformation. The Moine rocks above the thrust are interleaved with deformed, but not mylonitic, Lewisianoid gneisses and amphibolites, which here form a tectonic slice within the Moine outcrop. As elsewhere in the Glenelg–Attadale Inlier, the earliest phase of Caledonian deformation appears to have been the interleaving of Moine and Lewisian rocks either by isoclinal folding or by thrusting. This phase of deformation is represented in the Moine-derived mylonites by the isoclinal folds of the compositional layering. There is evidence of early ductile thrusting followed by later brittle movements.

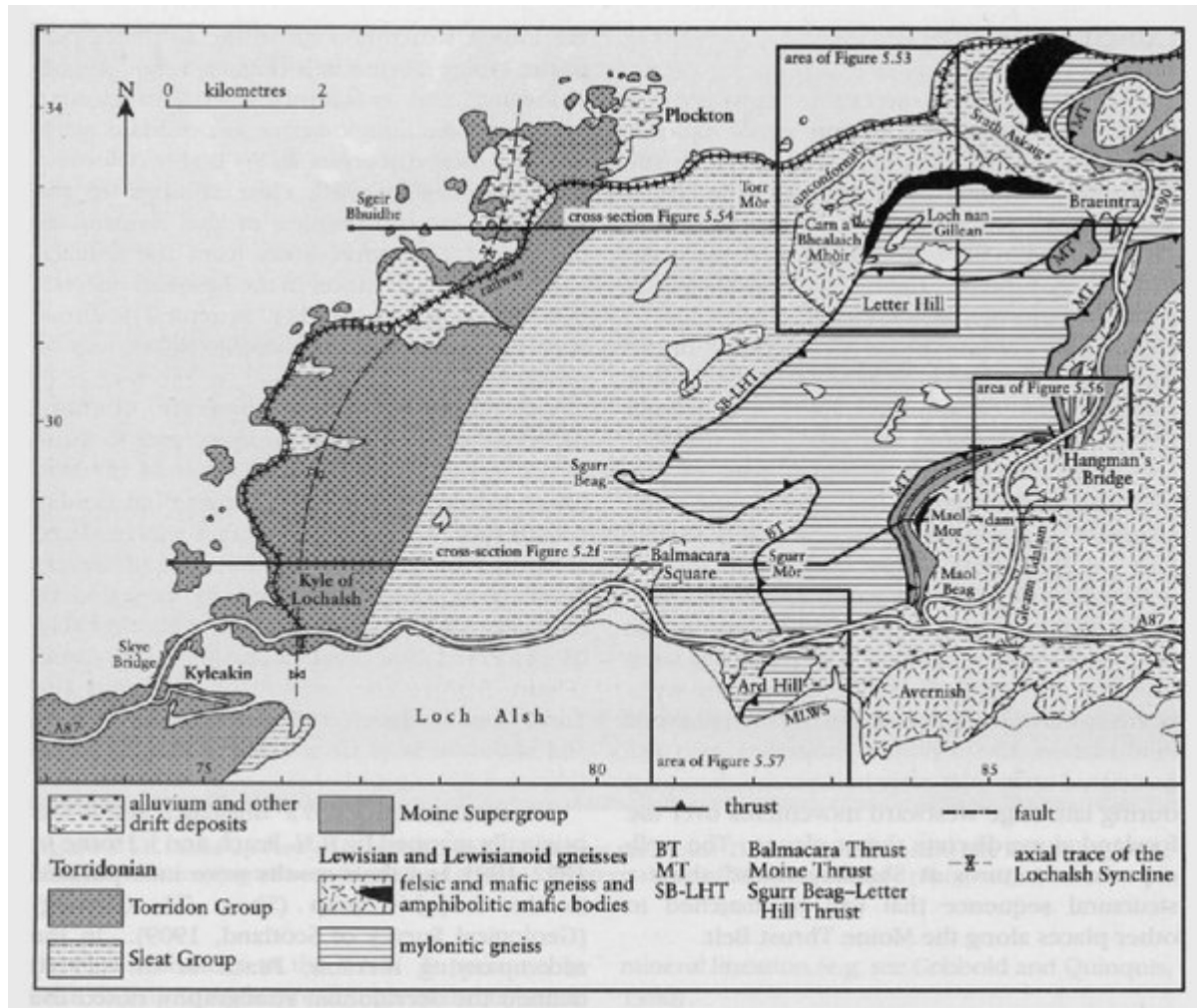
The mylonitic Moine psammites contain a variety of feldspar clasts, indicating that these rocks were originally feldspathic sandstones. The presence of the feldspar clasts and the greenschist-facies assemblages link these mylonites to those developed in the Torridonian sandstones of the Kishorn Nappe or possibly to (?Moine) psammites of the Tarskavaig Group rocks on Sleat (Skye). They contrast with the high-grade amphibolite-facies psammites of the main outcrop of the Moine to the east. Thus, the mylonitic Moine psammites at Hangman's Bridge are transitional in character between the Torridonian sandstones to the west and Moine psammites to the east, reflecting a gradual eastward increase in intensity of deformation and of metamorphic grade. Any discontinuities in this progression are due to later disruption along the thrust planes.

## Conclusions

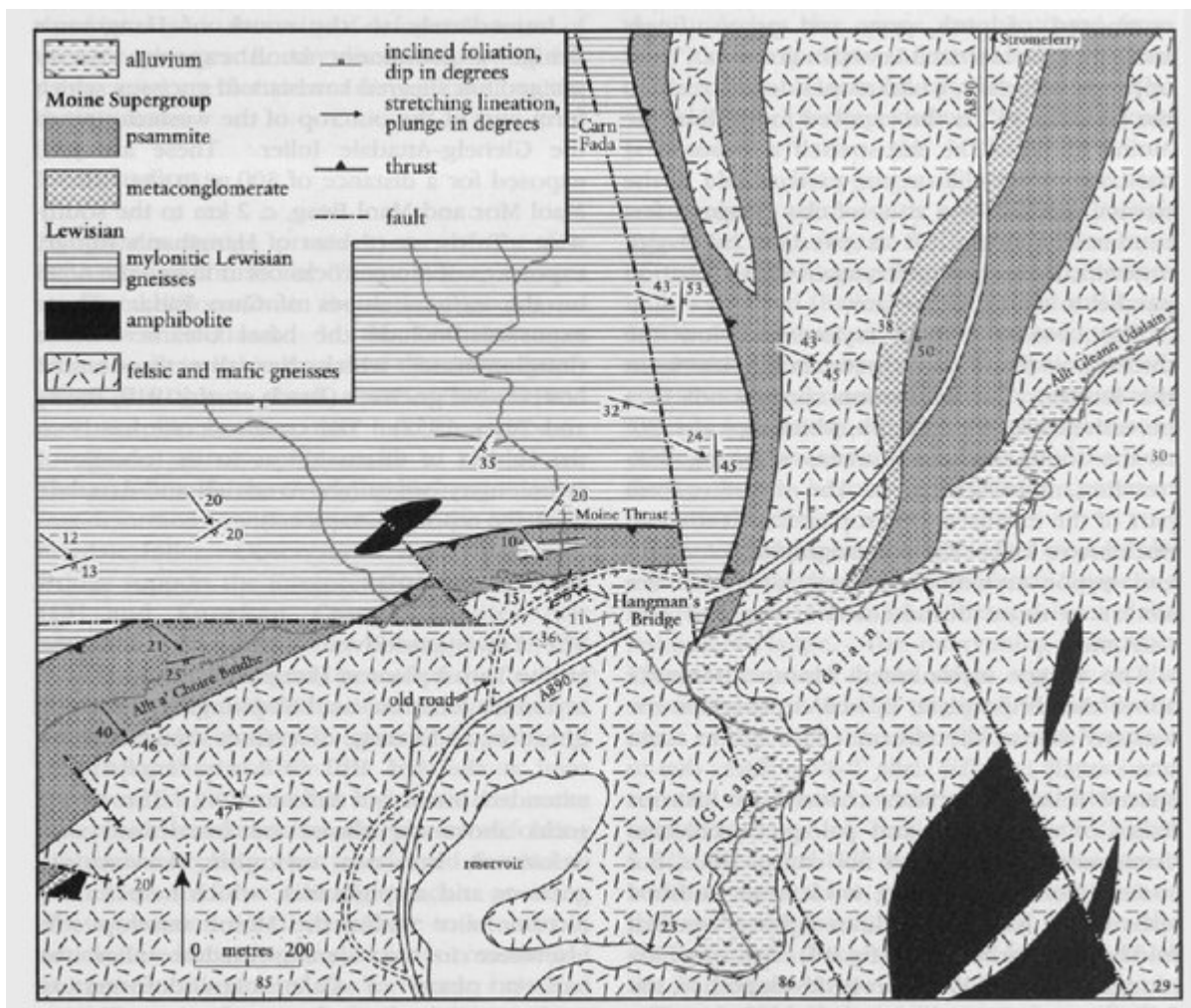
Hangman's Bridge provides one of the few exposures of the Moine Thrust plane, a major structural dislocation in the regional geology of north-west Scotland. In the Lochalsh area, Moine rocks in a thin structural slice immediately above the thrust plane show structural and metamorphic features that link the mylonitic low-grade metamorphic rocks of the Moine Thrust Belt with the overlying higher-grade but less-deformed Lewisian gneisses of the Glenelg–Attadale Inlier. Observations near Hangman's Bridge support the interpretation from the Ard Hill and Knockan Crag GCR sites that movement along the Moine Thrust plane in this area was a late event, preceded by a long sequence of deformational events, at progressively shallower crustal levels. In particular, they confirm the conclusions from the Avernish GCR site that mylonitization in the thrust belt was later than the phases of folding and metamorphism that interleaved the Moine psammites and the Glenelg–Attadale gneisses. These observations all contribute to a model in which Caledonian orogenic events commenced in the central part of the orogenic belt and spread westwards towards the foreland, resulting

in progressively more-brittle deformation with time.

## References



(Figure 5.52) Map of the Lochalsh peninsula, showing the overall geology. Positions of Figures 5.53, 5.54, 5.56 and 5.57 are indicated. Based on Barber and May (1976) and Institute of Geological Sciences (1976a). Trace of Lochalsh Syncline after Coward and Potts (1985).



(Figure 5.56) Map of the area around the Hangman's Bridge GCR site. The location of this figure is shown on Figure 5.52.