

Early basic and intermediate rocks within the Caledonides, Northern Highlands of Scotland

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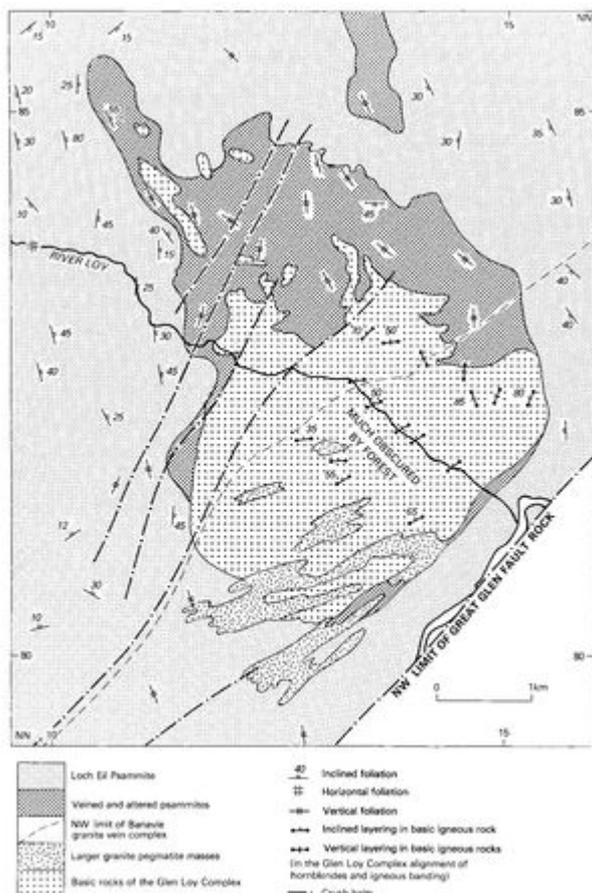
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The Glen Scaddle Intrusion



Glen Loy Complex and surrounding schists.
P915480.

The Glen Scaddle mass and its associated intrusions (of which that of Coire nam Muic is the largest) was first described by J. S. Grant Wilson (*in* Bailey and others, revised edition, 1960). They were classed as epidiorite on the one-inch map (Sheet 53) but it was noted in the memoir that the rock

was 'originally a diorite [which had] to a large extent escaped conspicuous alteration'. The Scaddle mass, and more particularly that in Coire nam Muic, was subsequently studied by Drever (1940) who stated that the rock was best called a gabbrodiorite of appinitic affinities. He noted that the rock was mainly massive in character, although in many places it was sheared and granulitised.

Drever considered that the intrusions were part of one sheet, emplaced more or less at the junction of Moine psammites (which would now be referred to as the Loch Eil Psammite) and an overlying group of mixed schists, including feldspathic psammite, (marble and calc-schist, which he likened to Dalradian rocks. To this list BGS surveyors have added a group of black schists, the whole assemblage resembling that of the Ballachulish Subgroup of the Spean Bridge/Glen Roy area (see Chapter 7).

The Glen Scaddle and associated intrusions comprise a variable twopyroxene gabbro-diorite which shows various degrees of amphibolitisation; it is possible that some of the hornblende is primary in places. Within the mass of relatively unaltered rock, however, lie narrow zones of intense shearing along which the rocks have a much reduced grain-size and have been converted to hornblende schist. These shear zones commonly contain lentils of granulitised — even mylonitic — remnants of granite pegmatite which may in places be continuous with transgressive pegmatite veins outside the shear zone. Minor constituents of the intrusions include appinite and quartz-mica diorite, the latter probably being a reaction product between the appinite and surrounding schists; in places (as in the case of the Glen Loy Complex) the diorite grades into a sillimanite-bearing contact rock. Drever also describes small masses of serpentinite, a few tens of metres in length, which are contact-altered by the diorite. It seems likely that these are not part of the intrusion itself but are associated with the Dalradian-like rocks mentioned above.

The long axes of hornblendes in the gabbro-diorite are commonly aligned, and in the Coire nam Muic mass they lie parallel to the foliation of the folded schists round the margin, strongly suggesting that they share at least some of the regional fold history. Stoker (1983) has found evidence that the intrusions of Glen Scaddle and Coire nam Muic lie at two different structural levels, and has shown that the Glen Scaddle Intrusion has been folded during the regional D_2 and D_3 episodes. Its apparent small degree of reconstruction must therefore be due in part to its size, and possibly to the relatively resistant nature of the underlying Loch Eil Psammite. Like Drever, Stoker considers that the masses were originally sheet-like.

A 'feldspathised sedimentary gneiss' surrounds the Glen Scaddle/Coire nam Muic mass and its satellite intrusions. It is uncertain to what extent the characteristics of this rock are the result of contact effects adjacent to the gabbrodiorite, but Bailey (1960) and Drever both consider it to represent a distinct sedimentary unit 'that originally differed from the underlying more siliceous Moines' (Bailey, 1960, p.125). The rock is a massive, tough, pink psammite in which relict compositional variations can be made out; it is interbedded with siliceous psammitic material, itself coarsely recrystallised. Around Coire nam Muic, a strong lineation and mullion-structure have developed, related to tight SE-plunging minor folds. The fabric is defined by streaks of compositional variation (mainly more or less of biotite), disrupted hornblendic lenses and other 'xenolithic' material (including sillimanite gneiss) all flattened in the plane of foliation.

The Glen Scaddle intrusion is cut by late sheets of non-foliated granite pegmatite, whose relationship to the sheared pegmatites has not yet been established, and by members of the microdiorite suite (p.113) which have their own internal foliation.

The Glen Loy Complex

The basic complex of Glen Loy has been emplaced within the rocks of the Loch Eil Division, although certain rocks of unusual facies for that division occur around the margin of the complex in places and as xenoliths within it. It has strong petrological similarities to the Glen Scaddle-Coire nam Muic intrusions, and shows comparable features in the enclosing psammite envelope. Unlike the Glen Scaddle-Coire nam Muic intrusions, however, the rocks of the Glen Loy Complex show little sign of alteration; they appear to have retained their primary igneous composition, although there is a strong suggestion that the mass has undergone at least one, and possibly two, periods of folding.

The outcrop of the complex is more or less circular, about 4 km in diameter and comprises hornblende gabbro, appinite and mica diorite ([P915480](#)). It is surrounded by a zone of altered rocks in which veins and minor masses of the types represented in the main complex have been emplaced, while the country rock itself is locally metasomatised, reformed or hornfelsed. This aureole is asymmetrically disposed, being narrow around the east and west sides of the outcrop of the complex but extending for 2.5 km to the north. The complex is cut by the late Caledonian dykes of the microdiorite suite (D. I. Smith, 1979) and by post-tectonic granite-pegmatite veins of the Banavie Vein Complex (see below).

The hornblende gabbro of the complex consists of labradorite feldspar and conspicuously prismatic hornblendes (a few millimetres to about 15 mm in length). Variations in the proportions of these minerals give rise to rhythmic banding, in places on a decimeter scale, but coarser banding is also inferred. The range in composition is from a feldspathic rock with sparse hornblendes to a hornblende-rich mafic end member. Individual layers commonly show grading, with a sharply defined base. This banding is interpreted as a primary igneous feature resulting from gravitational settlement of crystals in a residual melt. In the mafic layers, the long axes of the hornblendes lie within the plane of the banding but have no linear arrangement. In the more felsic parts of the layers the hornblendes are progressively less well orientated upwards from the mafic layers, suggesting that the mafic layers formed by crystal settlement. The rhythmic banding and alignment of hornblendes shows a semicircular disposition on the south-east half of the complex, parallel to the strike of the composite foliation of the surrounding schists. It is steep to vertical at the margin, decreasing towards the centre of the exposed mass. Grading indicates that progressively younger layers come towards the centre.

Although the rock has been described as a hornblende gabbro it is more basic than a typical gabbro and Dr N. Rock (personal communication) has termed it a 'mafraite' (Lacroix) and suggested that it is in fact a member of the appinite suite. The appinite of the complex occurs mainly, but not exclusively, on the north-west side of the outcrop and is characterised by the presence of hornblendes commonly about 5 mm in length. The feldspar content is variable, and some varieties of the appinite are almost ultramafic, including a black, ophimottled clinopyroxene-bearing variety. While spatially the appinite appears to be a late phase of the intrusion, the junctions between it and the hornblende gabbro are gradational.

A minor constituent found on the north-west side of the complex and in the surrounding schists is a biotite-diorite, interpreted as a hybrid of gabbro and country rock; various stages of assimilation are seen in xenoliths within the hornblende rocks.

Within the broad zone of veining and alteration surrounding the complex, the dominant igneous phase is the biotite diorite, although smaller outcrops of both appinite and hornblende gabbro are found. The country rock, however, is extensively feldspathised with the development of porphyroblasts of oligoclase, commonly forming nebulous vein-like concentrations which are very

difficult to distinguish from intrusive biotite diorite and which, in places, appear to pass into true igneous veins. Locally the psammitic rocks show rheomorphic characteristics with disoriented blocks of psammite set in a mobilised and recrystallised matrix.

Within the complex there are sparse 'rafts' of garnet-cordierite-staurolite hornfels, derived from a parent rock apparently more pelitic than any seen commonly in the adjoining Loch Eil Division. On the north-west margin lies an extensive area of sillimanite schist and hornfels in which sillimanite aggregates (up to 150 mm across) may make up to 30% of the rock.

The form of the complex is uncertain. If the igneous banding was originally horizontal (which would be expected if it formed by crystal settling as postulated above) then the south-east part of the complex lies in the closure of a steep-sided synform. No detailed structural mapping of the surrounding psammites was carried out during the original survey, but an examination of the strike and dip of foliation suggests that this synform has itself been bent by later folding. If the complex has been subjected to two episodes of deformation, then its lack of shear zones and metamorphic reconstruction (as seen in the case of Glen Scaddle) is difficult to account for. The only evidence of alteration noted comes from local examples of partial granulation of quartz and feldspar in the appinite, and from thermal clouding of plagioclase.

The Glen Urquhart Complex

The Glen Urquhart Complex is an ultrabasic body of serpentinite, approximately 3.5 km² in area, intruded into semipelites and psammites of the higher exposed units of the Loch Eil Division. However, around the complex unusual lithologies are developed, including kyanite schist and pink psammitic gneiss, and thick bands of limestone (marble). This whole assemblage, including the serpentinite, resembles that at Glen Scaddle-Coire nam Muic. Amphibolite bands, probably of the early basic suite are common.

The serpentinites and surrounding schists have previously been identified as an infold of Lewisian rock (Home and Hinxman, 1914) but G. H. Francis (1958; 1964) took them to be Moine. Studies by Rock (1983) have not confirmed this conclusion, and their stratigraphic position is still under investigation. They may comprise a separate lithostratigraphic assemblage including serpentinites; they may in fact occupy a syncline, similar to the synclines of the Glen Scaddle and Glendessarry complexes.

The outcrop is characterised by a varied assemblage of calc-silicate rocks and 'skarns', the product of contact metasomatism related to the intrusion of the serpentinite. Rock (1983) has pointed out that the skarns and serpentinite comprise an assemblage of over 60 mineral species, and in this respect they are unique in the Highlands.

[Selected bibliography](#)

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