# Rhughasinish, South Uist

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## Introduction

At Creag Loisgte, in the Rhughasinish area of South Uist, a metadolerite pod is enclosed within an ultramafic body. Both rock-types are assigned to the 'Younger Basic' Suite and the contact between the two is exposed. Their juxtaposition is unusual in the Lewisian gneisses of the Outer Hebrides and shows that the metadolerites post-date the ultramafic members of the suite. Internally the bodies are little deformed and retain granulite- and upper-amphibolite-facies assemblages, but the margins of the ultramafic body show evidence of amphibolite-facies retrogression. Ultramafic bodies are relatively uncommon in the Uists so the Rhughasinish GCR site is also important in furnishing an example.

The ultramafic body forms a roughly rectangular pod some 600 m long by 400 m across, whereas the metadolerite body is ovoid, measures some 150 m by 100 m, and forms the small hill of Creag Loisgte itself (Figure 2.19). Both bodies are elongated with their long axes orientated north-west. The host rocks are the grey to white and cream, biotitic and hornblendic felsic orthogneisses typical of the Lewisian Gneiss Complex.

Jehu and Craig (1925) were the first to describe the locality and it has been mapped subsequently by Coward (1969) and by the Geological Survey (Fettes *et al.,* 1992).

## Description

The area of interest is centred on a small area at the head of the small inlet of Bàgh na Creige Loisgte on the north coast of South Uist. Rock is exposed on the foreshore near the mouth of the inlet and on the adjacent low rocky knolls. Creag Loisgte is a small rocky hill, about 15 m in height, which lies on the east side of the inlet. Its western side provides a short section through the metadolerite body and its steep contact with the ultramafic mass.

The metadolerite body is typical of the mafic rocks of the 'Younger Basic' Suite in the area. It is a dark grey-green; medium-grained rock with small reddish garnets visible in hand specimen. In thin section it consists of an equigranular assemblage of clinopyroxene, garnet, amphibole and feldspar. In parts the feldspar has been altered to a cloudy, fine-grained, sericite-rich aggregate. The metadolerite does show a variation in feldspar content on the scale of about 0.5 m, which probably reflects original igneous layering. Although pervasively recrystallized, the rock retains some relict igneous features with mafic aggregates and larger pyroxene plates probably reflecting a primary igneous texture. In contrast, the ultramafic body has a relatively uniform texture. It has a characteristic yellowish-brown weathered crust but is dominated by coarse-grained black clinopyroxene crystals on fresh surfaces. In thin section it consists of large clinopyroxene plates and finer-grained equigranular aggregates of hornblende and pyroxene; minor flakes of biotite are also present. The original rock was a pyroxenite, probably of cumulate origin, which has undergone considerable recrystallization. The contact between the two rock-types is sharp. Thin-section studies show that in the metadolerite there is no variation in overall grain-size or mineralogy towards the contact. In the pyroxenite there is merely a thin (*c.* 1 mm) selvage of equigranular amphibole at the contact. The contact of the ultramafic mass with the gneisses has not been recorded, but it is Likely to be marked by a sheared or altered rim of retrogressed actinolitic and talcose material.

## Interpretation

Mafic and ultramafic rocks of the 'Younger Basic' Suite occur throughout the Outer Hebrides. Mafic rocks, notably dyke-like bodies, are particularly abundant and they exhibit a great variety of structural states and varied amphibolite- and granulite-facies metamorphic assemblages (Fettes *et al.,* 1992). The ultramafic bodies are far less abundant. They occur characteristically as isolated lensoid pods, normally several tens of metres long, and only rarely up to several

hundred metres long. Their greatest development is in central Lewis where they are relatively abundant and define a broadly east–west belt some 10 km long and 3 km wide. In the Uists they are sparse, being confined mainly to a few bodies in the eastern half of South Uist. Both mafic and ultramafic bodies post-date the Scourian deformation and metamorphism, but have been modified by deformation and recrystallization during the Laxfordian event. The majority of the ultramafic bodies are dunites and peridotites with minor pyroxenites. They exhibit cumulate textures and mineralogical banding, but are normally dissociated from the mafic intrusions. Both mafic and ultramafic bodies can be correlated with the Scourie Dyke Suite of the mainland, which shows a similar range of compositions. However, the ultramafic members in the mainland Lewisian gneisses occur mainly as dykes rather than as pods (Tarney, 1973).

Most members of the 'Younger Basic' Suite were intruded as dykes and would not be expected to exhibit igneous layering. However, a few of the larger bodies, probably originally thick sheets or laccoliths, do show crude layering, even where their mineralogy and texture have been largely recrystallized (Fettes *et al.,* 1992). The layering is generally evidenced by variations in the plagioclase feldspar content but may also be indicated by the abundance of garnet or indeed by the partial retrogression of garnet to plagioclase. A large layered ultramafic cumulate body of 'Younger Basic' Suite age has been documented at Maaruig in North Harris (Soldin, 1978). There, no felsic units are present and the mafic elements are subsidiary. A layered igneous body ranging from ultramafic cumulates to leucogabbro has been described also from East Gerinish, some 5.5 km SSE of Rhughasinish in South Uist (Fettes *et al.,* 1992). That body is unique in that its chemistry shows a strong calc-alkaline trend, in contrast with the normal tholeiitic trends shown by both the 'Younger Basic' and the pre-Scourian banded 'Older Basic' suites (see Cnoca Breac GCR site report, this chapter). Hence, it is difficult to be definitive on the age and affinities of the East Gerinish body (Coward, 1969; Fettes *et al.,* 1992). In general, 'Younger Basic' layered complexes are rare, and hence the petrogenetic relationship of the ultramafic cumulate bodies to the more-uniform metadolerites of the 'Younger Basic' Suite is generally unclear.

Although the Rhughasinish site is one of the few localities where a contact between the 'Younger Basic' ultramafic and mafic rock-types may be examined, unfortunately definitive evidence of their relative age and petrogenetic relationship is absent. Internally the intrusions show little evidence of Laxfordian deformation, but the two rock-types have clearly been recrystallized during or after emplacement. The mafic dykes and sheets are interpreted as having been intruded at mid-crustal levels into relatively hot rocks. As a result they have either crystallized directly from the basic magma to a garnet-pyroxene-bearing, granulite-facies mineralogy, or have recrystallized in the relatively anhydrous metamorphic environment subsequent to solidification and cooling (see Fettes *et al.,* 1992). Similarly, in the pyroxenite the large early-formed clinopyroxene crystals have recrystallized to equigranular pyroxene-amphibole aggregates.

There are three possible models for the relationship between the two rock-types at Rhughasinish. First, the contact is tectonic; second, the metadolerite pod has intruded the pyroxenite body; and third, the contact is an example of primary igneous layering. The first possibility is unlikely because there is no evidence of shearing or alteration at the margin. Even though the rocks are pervasively recrystallized, relict primary igneous textures are still found up to the contact. There is no evidence of 'chilling' in either body to support intrusion of one into the other. However, their probable intrusion into already 'hot' gneisses would inhibit the development of such marginal 'chill' textures. Nevertheless, it is difficult to imagine that basic magma would have intruded an existing ultramafic body when the regional evidence suggests that they have behaved as rigid coherent masses. It is also improbable that an ultrabasic cumulate mush could have picked up a lump of unrelated basic material, particularly given the absence of any other xenoliths. The third possibility of a partial layered sequence is compatible with the evidence. Although there is no evidence elsewhere in 'Younger Basic' intrusions of massive ultramafic cumulate layers in association with discrete layered mafic sequences, the balance of the evidence does point towards the Rhughasinish rocks as forming part of a disrupted layered mafic–ultramafic sequence of the 'Younger Basic' Suite.

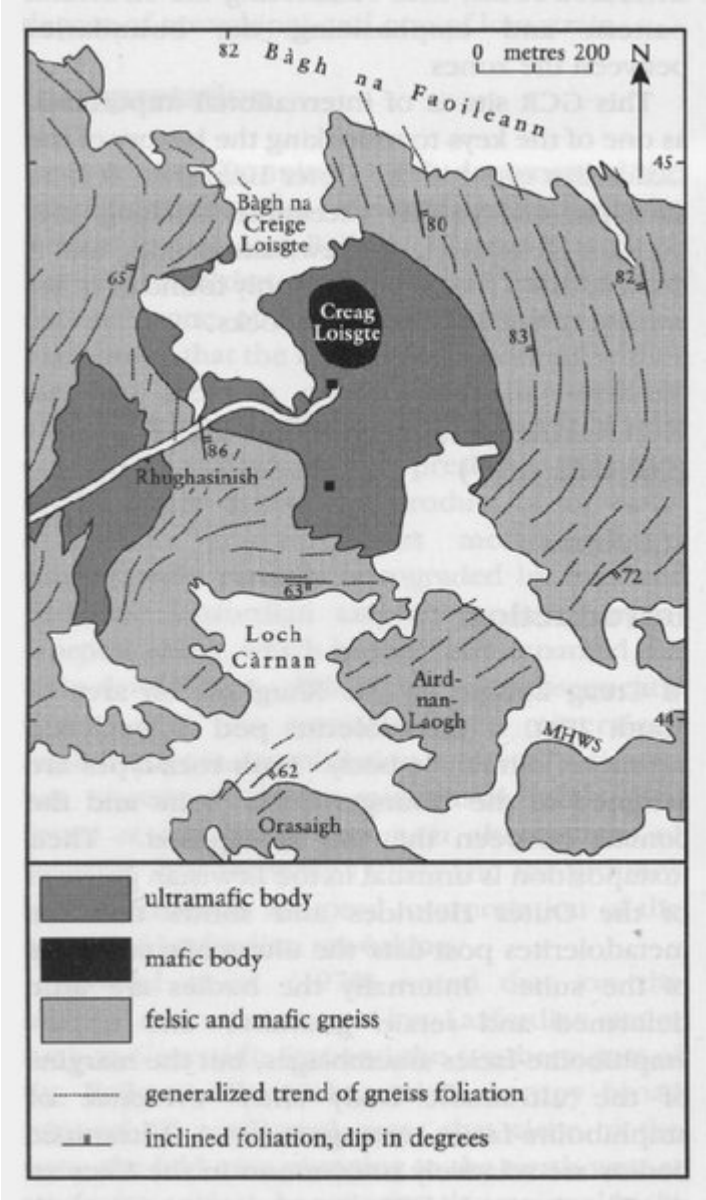
## Conclusions

At Rhughasinish an ovoid metadolerite pod, some 130 m across, lies enclosed within a larger pyroxenite body. This mafic–ultramafic body of the 'Younger Basic' Suite has been intruded into typical quartzofeldspathic Lewisian gneisses, which in this region show moderate degrees of Laxfordian tectonic and metamorphic reworking. The mafic and ultramafic rocks are largely undeformed but show equigranular metamorphic textures and granulite-or sub-granulite-facies

metamorphic assemblages. The contact between the mafic and ultramafic rocks is sharp with no evidence of chilling or marginal alteration. This relationship is interpreted as most consistent with primary igneous layering, with the ultramafic fraction representing a cumulate layer.

The mafic and ultramafic rocks of the 'Younger Basic' Suite are interpreted as analogous to the Scourie Dyke Suite of the mainland Lewisian. Although such mafic intrusions are very abundant throughout the Outer Hebrides and ultramafic pods are common in parts, the two rock-types are rarely in contact. Hence, the exposed section through the contact at Rhughasinish is of regional importance and merits further detailed work. The easy accessibility of the site makes it a useful teaching locality.

## References




*(Figure 2.19) Simplified geological map of Rhughasinish, South Uist. After Coward (1969).*