Brora Gorge

[NC 706 107]–[NC 717 099]

N.J. Soper

Introduction

On the north-east margin of the Rogart Pluton the migmatitic envelope is much narrower and is expressed as a ridge of higher ground. The Brora Gorge GCR site is located where the River Brora has cut through this ridge. Here the migmatite envelope is little more than 300 m wide and the inner migmatite zone is absent (Figure 6.46). The site provides an almost continuous river gorge section from the outer quartz-monzodiorite of the central Rogart intrusion through the narrow migmatitic envelope into unmigmatized Moine psammites.

Description

The section extends upstream from Braegrudie croft [NC 717 099] and commences in the outer quartz-monzodiorite. A typical sample from this locality has a modal composition of plagioclase An_{24} (53%), quartz (19%), biotite (13%), hornblende (7%), perthitic K-feldspar (7%), sphene and other accessory minerals (1%) (Soper, 1963). The quartz-monzodiorite has a steep, S-dipping foliation and gently ESE-plunging lineation defined mainly by hornblende. The quartz-monzodiorite carries non-migmatitic psammite xenoliths and is cut by a large aplitic microgranite dyke that trends parallel to the river and crosses the contact described below.

The contact of the quartz-monzodiorite with stromatic migmatites dips steeply to the south, concordant with the foliation in both rock-types, and is transitional over a few metres. For the next 100 m of section, sheets of quartz-monzodiorite are interleaved with a variety of migmatite lithologies, hosted by psammite, semipelite and pelite with a leucosome of rather variable biotite granodiorite (quartz, potash feldspar, oligoclase, biotite). Agmatite occurs in the sparse amphibolitic metabasic bodies in the Moine rocks. Farther upstream, for about 100 m, similar steeply inclined migmatites without quartz-monzodiorite intercalations strike ENE. The final 100 m of the gorge are composed of stromatic migmatites in which the leucosome portion is subordinate to the generally psammitic palaeosome, and there are several discrete amphibolite sheets, presumably originally early, pre-tectonic mafic dykes or sheets. Upstream from the gorge there is a gradational passage into flaggy Moine psammites that comprise the strip of non-migmatitic country rocks, about 0.5 km wide, that separates the Rogart Complex from the regional migmatite complex of central Sutherland.

Interpretation

The foliation and lineation within the outer quartz-monzodiorite of the Rogart Pluton at the Brora Gorge GCR site and elsewhere along unfaulted eastern and northern contacts, has been interpreted by Soper (1963) to be caused by the ballooning effect of the distending pluton prior to its final consolidation. At Brora Gorge the quartz–monzodiorite–migmatite contact is intrusive and sheeted and the following features are seen: the inner migmatite zone is missing, presumably having been breached; the quartz-monzodiorite carries psammite xenoliths, showing that during intrusion it 'sampled' non-migmatitic Moine country rocks; and the migmatite envelope is narrow, subvertical and attenuated. These features tend to support the view that the distending intrusion invaded, distorted and in places punched through its own migmatite envelope. In the extreme north-west of the Rogart Complex the quartz-monzodiorite is in direct contact with unmigmatized Moine country rocks (Figure 6.42).

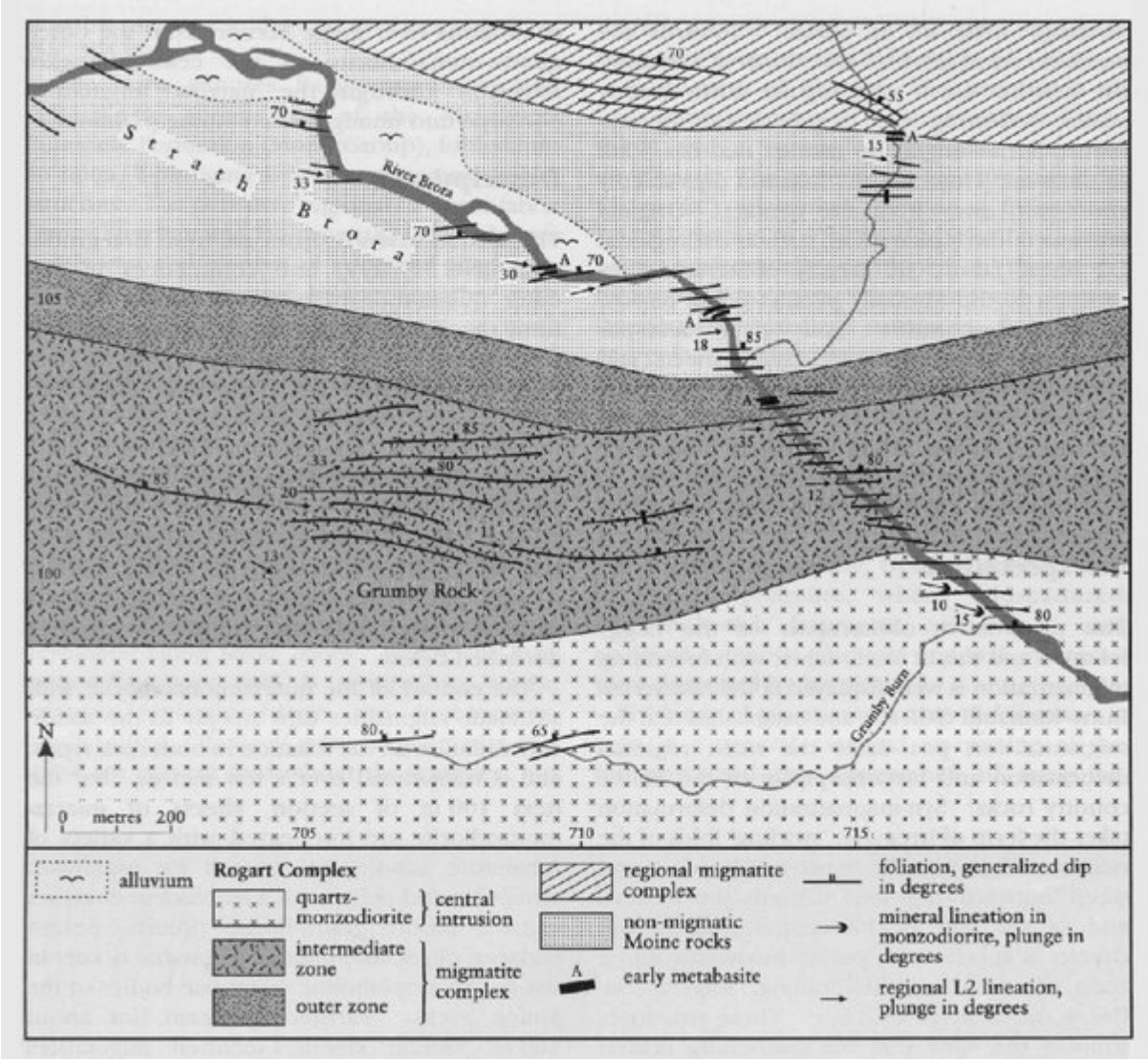
Rogan Pluton and Migmatite Complex — general conclusions

The Rogan Complex is the best example in Britain of a granitoid intrusion with an envelope of country rocks that have been transformed to migmatite – an apparent mixture of granite and more-refractory residual metasedimentary rocks.

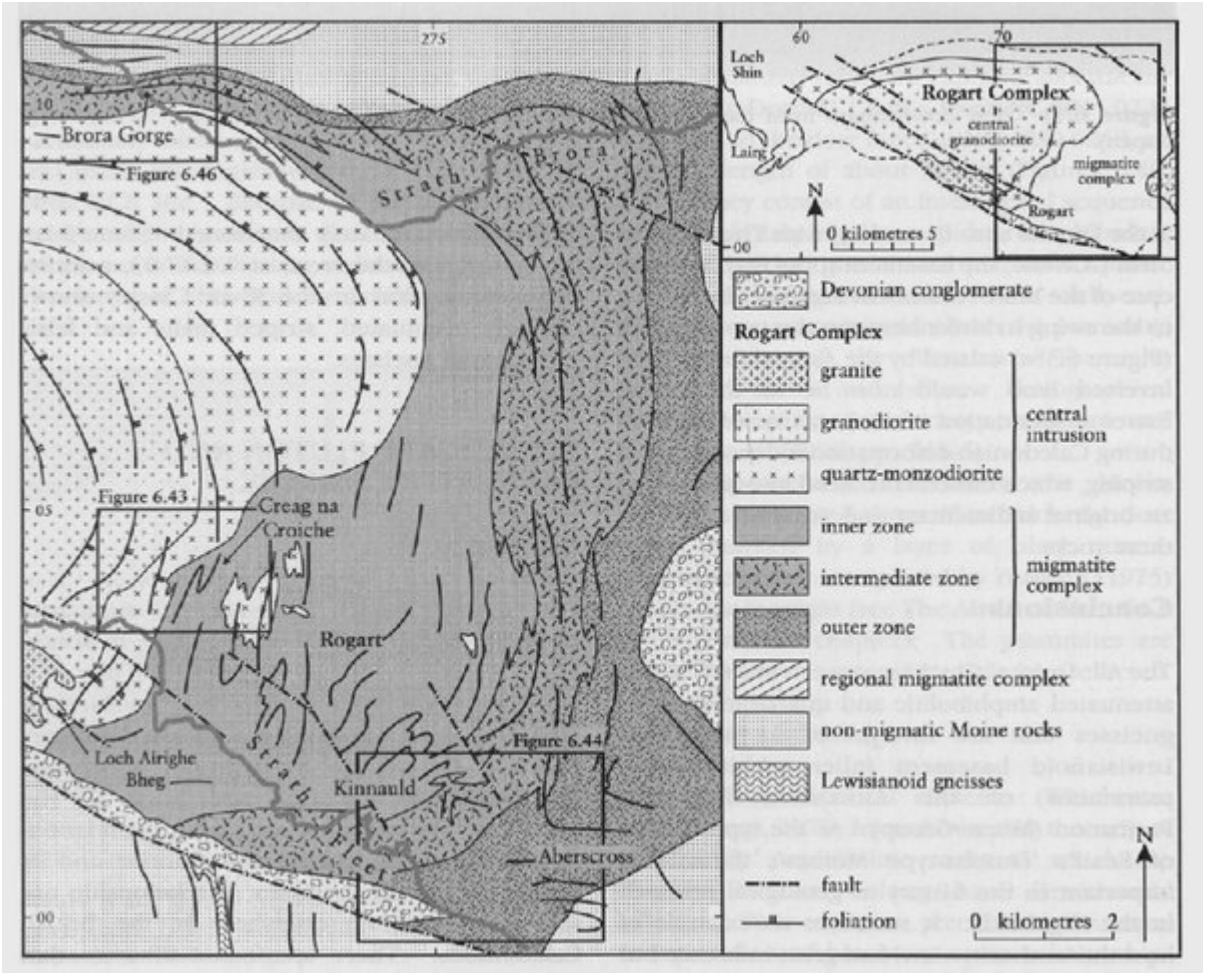
While the phenomenon of regional-scale migmatization has been studied for a century, 'contact migmatization' has received little attention. It is clear that the central intrusion at Rogart is somehow responsible for the production of its migmatitic envelope, which it subsequently intruded and deformed. However, the geochemical changes of the migmatization process have not been investigated. The three designated GCR sites provide excellent exposures on which such a study could be based.

At Creag na Croiche the central granodiorite/ quartz-monzodiorite intrusion is in gradational contact with the migmatite envelope comprising nebulitic migmatitic granodiorite and stromatic migmatites developed from a range of metasedimentary lithologies. In contrast, at Aberscross Burn–Kinnauld the outer part of the migmatite complex is seen, flaggy Moine psammites becoming progressively migmatized westwards, with a concomitant obliteration of regional tectonic structures and the incoming of both cross-cutting veins and concordant sheets of granitic material. At the Brora Gorge a complete section is exposed through the migmatite complex, whose outcrop here is only some 300 m wide. A variety of relationships are preserved that support the view that the central granodiorite invaded and deformed its own migmatite envelope during the final 'ballooning' phase of its emplacement.

References



(Figure 6.46) Geological map of the Brora Gorge area.



(Figure 6.42) Geological map of the eastern part of the Rogart Complex.