The Rogart Pluton and Migmatite Complex

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The Rogart Pluton and related migmatite complex extend over about 115 km^2 in southeast Sutherland (see (Figure 6.42)). The pluton is a zoned quartz-monzodiorite–granodiorite–granite body, emplaced into metasedimentary rocks of the Moine Supergroup, which are migmatized to the east and north of the intrusion. The main interest lies in the relationship between the 'central granodiorite' and its fringing 'migmatite complex', a relationship not seen on this scale elsewhere in the British Caledonides. There are four GCR sites that illustrate the various features of the pluton and its migmatized envelope. The Loch Airighe Bheg GCR site illustrates mainly features of the pluton itself and is described in Stephenson *et al.* (1999). The three other GCR sites, described below, deal with various aspects of the migmatized envelope. As the conclusions relate to the whole pluton and its envelope, they are presented following the descriptions and interpretations specific to the three individual sites.

The Rogart Pluton belongs to the Argyll and Northern Highlands Suite and its intrusion has been dated by the TIMS zircon U-Pb method as 425 ± 1 Ma, i.e. Late Silurian (R.A. Strachan, pers. comm., 2003). Brown *et al.* (1968) obtained K-Ar biotite ages of *c.* 420 Ma from the pluton suggesting that the pluton cooled relatively rapidly. Emplacement was coincident with a period of pronounced uplift and erosion of the Scottish Highlands at the end of the Caledonian Orogeny. The pluton and migmatite complex are overlain unconformably at their south-east extremities by conglomerate and sandstones of the Langwell Conglomerate Member, the basal unit of the Devonian Lower Old Red Sandstone succession. The concordant and gradational contact of the central granodiorite against its migmatized envelope contrasts with the abrupt and discordant contacts shown by many of the Late Silurian 'Newer' Granites, for example the Helmsdale Granite of eastern Sutherland (Figure 6.4), suggesting a deeper and more-ductile environment of emplacement of the Rogart Pluton.

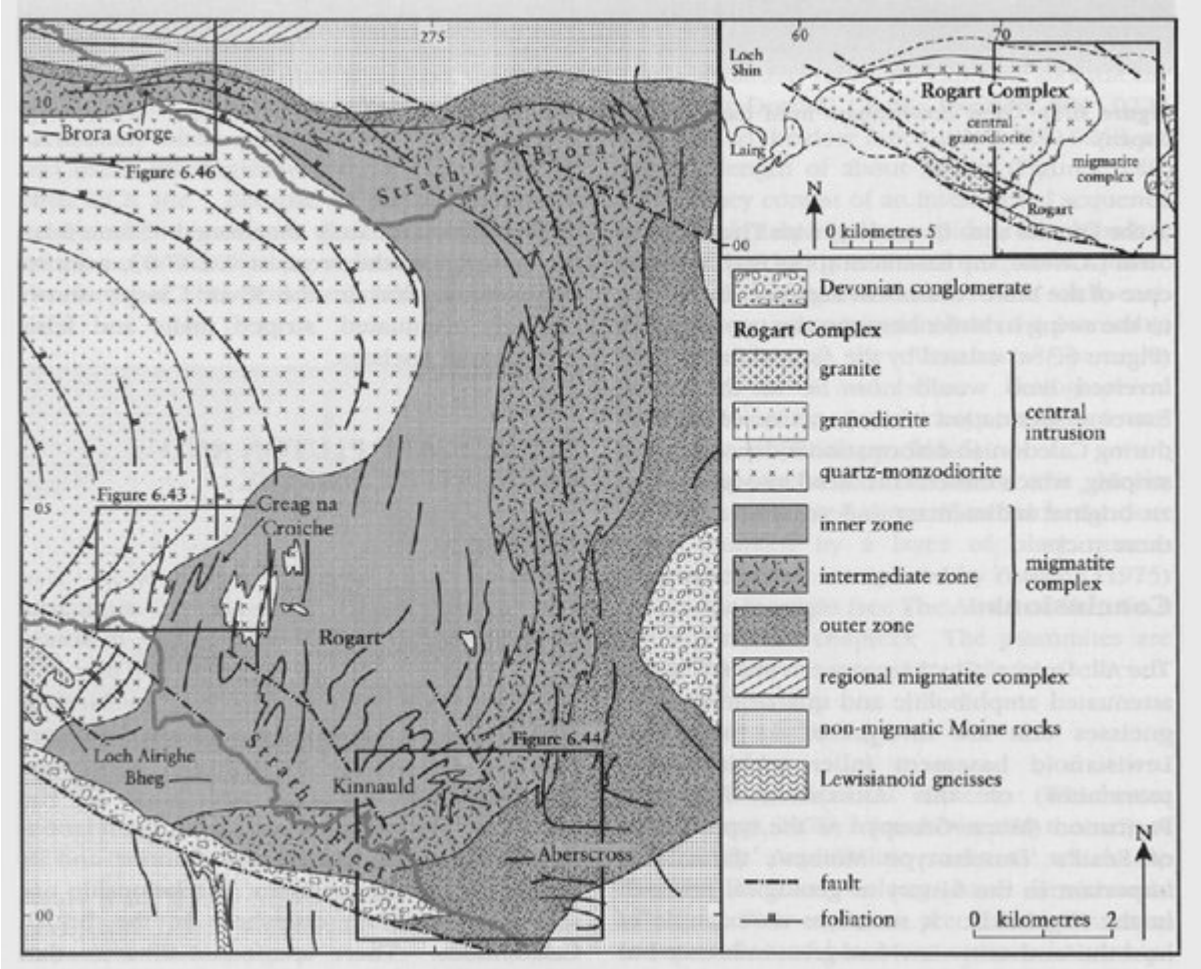
The Rogart Complex lies immediately to the south of the major regional migmatite complex of central Sutherland, termed the 'Loch Coire Complex' by several authors (Read, 1931; Brown, 1967; Barr, 1985). These regional migmatites are developed in dominantly semipelitic Moine rocks, whereas the Rogart Migmatite Complex formed in psammitic andsemipelitic rocks of the Morar Group. A narrow strip of unmigmatized rocks separates the two areas of migmatitic rocks (Figure 6.42). The spatial association of the Rogart migmatites with the central granodiorite and the inwardly increasing degree of migmatization towards the pluton imply that the migmatites are related to the intrusion of the pluton, rather than part of the regional migmatite complex that happened to be intruded by the Rogan Pluton. A narrow fringe of migmatitic rocks on the eastern margin of the Migdale granite, a few kilometres south of Rogart (Figure 6.4), is also interpreted as a 'contact migmatite'.

The complex was originally surveyed by Hugh Miller, part of whose report of 1893 (quoted in Read *et al.,* 1925) described the process of conversion of Eastern (Moine) Schists into granitic gneiss. It was re-examined by H.H. Read, who divided the fringing migmatite complex into an inner 'zone of inclusions' and an outer 'zone of veins' (Read *et al.,* 1925, 1926). H.H. Read accepted Miller's view that the granitic portion of the migmatites originated by transformation of Moine country rock. He envisaged assimilation of parts of the 'granulite' (psammite) roof of the intrusion by 'pegmatite magma' expelled from the consolidating central granodiorite, to produce streaky biotite granite (now recognized as the neosome portion of the migmatite complex). Today, this is seen as the 'magmatic' end-member of a range of migmatization processes, the other end being entirely subsolvus (non-magmatic) metasomatism (Ashworth, 1985).

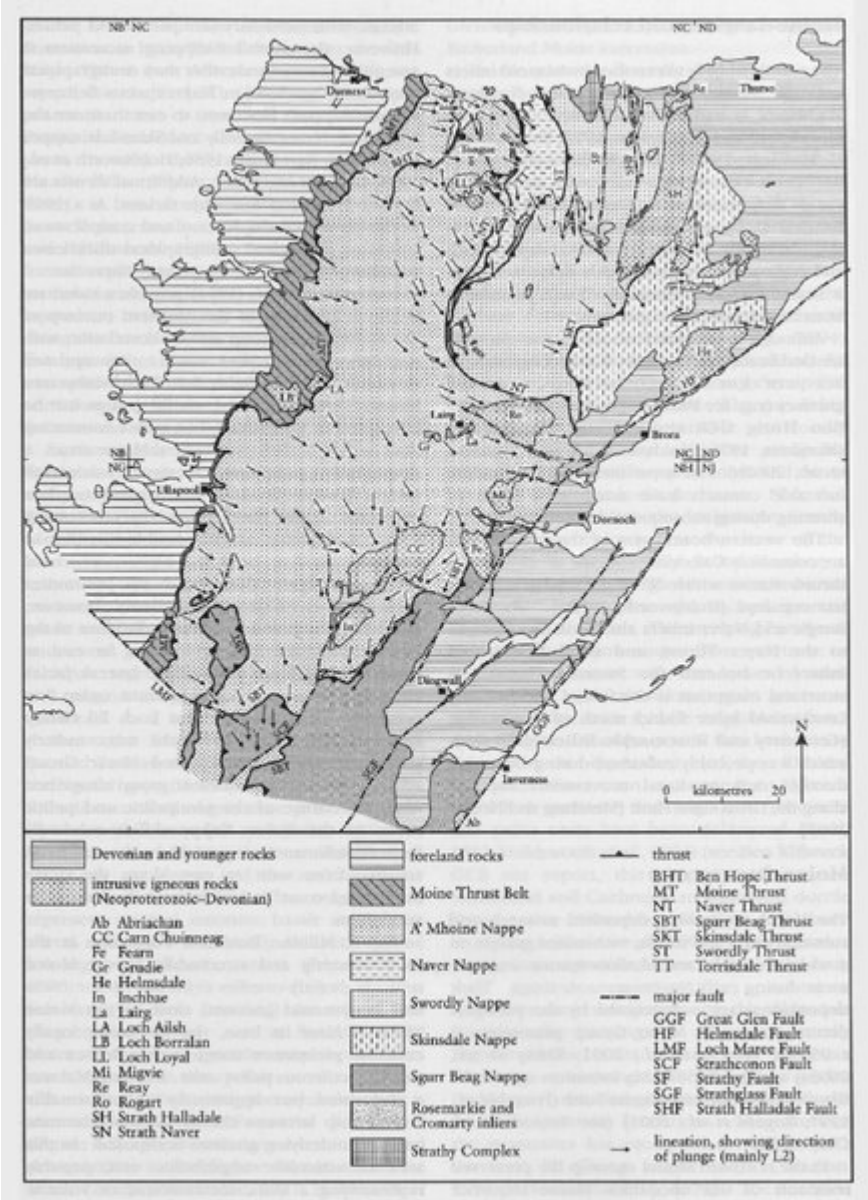
Structural mapping by Soper (1963) revealed a funnel-shaped foliation pattern in the central granodiorite and a subhorizontal amphibole alignment in the marginal quartz-monzodiorite. A small component granite intrusion cross-cuts the two main rock-types in Strath Fleet. Soper envisaged a ballooning emplacement mechanism, whereby the central granodiorite deformed its own migmatitic envelope, eventually punching through it on the north-western side. He divided the migmatite complex into three zones (Figure 6.42): an outer zone of weakly migmatized Moine rocks with regional structures preserved and with numerous aplite, granite and pegmatite veins; an intermediate zone with granodioritic neosome and Moine palaeosome in roughly equal proportions; and an inner zone with streaky migmatitic granodiorite

(neosome) dominant, in which regional structures have been obliterated and new structures developed parallel to the contact with the central granodiorite intrusion.

References



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



(Figure 6.4) Tectonostratigraphy of the Moine (North) area.