Moine geology of North Sutherland. Craig Ruadh to Glaisgeo - an excursion

By Rob Strachan, Bob Holdsworth, Clark Friend, Ian Burns and Ian Alsop

Fig. 13.9 Geological map of Localities 13.9, 13.10 and 13.11 (from Burns, 1994).

Contents

- **1 Excursion 13 Moine geology of North Sutherland is composed of the following articles:**
- **2 Excursion 13 North Sutherland . Craig Ruadh to Glaisgeo**
  - 2.1 Locality 13.9 Creag Ruadh [NC 6970 6316]
  - 2.2 Locality 13.10 Farr Bay [NC 7147 6265]
  - 2.3 Locality 13.11 Glaisgeo [NC 7146 6360]
- **3 References**

Excursion 13 Moine geology of North Sutherland is composed of the following articles:

- **Excursion 13 North Sutherland - introduction**
- **The Melness area. Locality 13.1**
- **South and east side of Tongue Bay. Localities 13.2 to 13.5**
- **Loch Cormaic and Borgie peat cuts. Localities 13.6 to 13.7**
- **Torrisdale Bay. Locality 13.8**
- **Craig Ruadh to Glaisgeo. Localities 13.9 to 13.11**
- **Swordly Bay, Kirtomy Bay and Cnoc Mor. Localities 13.12 to 13.14**
- **Port Mor to Portskerra. Localities 13.15 to 13.18**
Excursion 13 North Sutherland . Craig Ruadh to Glaisgeo

Locality 13.9 Creag Ruadh [NC 6970 6316]

Creag Ruadh (Fig. 13.9). Strongly deformed Moine gneisses and amphibolites of the Naver Nappe within the Torrisdale Steep Belt.

If driving into Bettyhill from the west, turn left at the Post Office, and take the next turn left at a T-junction. At [NC 7025 6213] turn right and drive to the end of the track. Parking for a minibus or three to four cars is available at [NC 7005 6231]. Allow 1-1½ hours for this locality. Walk through a gate, follow the path and then walk northwards along the western side of the headland to reach the outcrops at [NC 6970 6316]. These are of psammitic gneisses with concordant bands of amphibolite and augen granite, intruded by numerous sheets and pods of pegmatitic granite. The composite foliation is steep and associated with a prominent $L_4$ lineation that plunges gently to the SSE - structures typical of the Torrisdale Steep Belt. The dextral kinematic indicators that are associated with $L_4$ elsewhere (e.g. Localities 13.8, 13.12) are not evident here, and the linear fabric is instead defined by rodding and mullion structures. On a steep, west-facing outcrop [NC 6971 6314], the gently curvilinear nose of a relict $D_3$ isocline folds a NW-trending mineral and extension lineation, probably of $L_2$ age. Please do not hammer these outcrops. Cross a small gully to the northwest to see other example of a NW-trending lineation ($L_2$?) folded by a tight, $D_3$ fold that is itself wrapped by $L_4$ mullions [NC 6970 6317]. Walk out to the end of the headland and look back to the cliffs to the southeast to see prominent pink granite sheets, some folded, intruding complexly deformed gneisses. Similarly, the views to the northwest to Aird Torrisdale show large-scale intersheeting of Moine lithologies by steeply-dipping granite sheets.

Locality 13.10 Farr Bay [NC 7147 6265]

Farr Bay (Fig. 13.9). Farr basement inlier; Moine gneisses and intrusive granites.

Abundant parking space is available on the grassy area adjacent to the Farr Bay Inn at Bettyhill [NC 7163 6223]. Allow 0.5-1 hour for this locality. Walk up the narrow track alongside the parking area, go through the first gate on the right and head through the sand dunes to Farr Bay. In the east corner of the beach [NC 7147 6265], close to the sand dunes, are banded hornblendeic mafic gneisses of the Farr basement inlier that is thought to occupy the core of an early isoclinal fold within the Naver Nappe (Moorhouse, 1979; Moorhouse et al., 1988). U-Pb SHRIMP dating of zircons from the Farr inlier has yielded an Archaean age of c.2900 Ma that is interpreted to date crystallization of the igneous protolith (Friend et al., 2008). Gneissic layering is deformed by early ‘eye’ structures ($D_2$?) and later asymmetric folds ($D_3$?); the hinges of both sets of folds are broadly parallel to a gently-plunging $L_4$ lineation. Low-lying (and somewhat sand-dependent) outcrops a few metres to the NNW show hornblendeic gneisses and slightly discordant intrusive amphibolites tightly interfolded by asymmetric folds ($D_3$?). Outcrops on the east side of the bay are of steeply-dipping, banded psammitic and semi-pelitic gneisses with numerous granite sheets in varying states of deformation from concordant and mylonitic to crosscutting and essentially undeformed. At least two sets of folds can be identified: early isoclinal folds ($D_3$?) and later asymmetric ($D_3$?) types.

Locality 13.11 Glaisgeo [NC 7146 6360]

Glaisgeo (Fig. 13.9). Contemporaneous mafic and acid magmas deformed and metamorphosed within the Torrisdale Steep Belt.

Turn off the A836 onto a minor road 2.5km east of Bettyhill; after 250m take the left-hand fork and
follow the road for 1.5km. Parking for three to four cars is available at the end of the road by the houses at [NC 7147 6265] (please ask permission). Allocate 1 hour for this locality which is best viewed at low tide. Descend the steep, grassy slope and when on the beach walk east over the first rocky ridge to access a small stony beach. Aim for the notch in a second ridge of rock to the east; scramble over this notch into another stony beach. On the east side of this beach [NC 7146 6360] steeply-dipping psammitic gneisses are interbanded with slightly discordant sheets (10-30cm wide) of a foliated horn-blende-bearing granitoid characterized by distinctive K-feldspar augen. This zone represents the eastern margin of a complex intrusive suite. The augen are interpreted as relict igneous megacrysts that have been modified by metamorphic recrystallization and associated deformation. Numerous boulders on the beach provide excellent examples of this intrusive facies. At the back of the beach are hornblende mafic gneisses, and flat surfaces on the west side of the beach expose mafic and ultramafic streaks and schlieren within felsic hornblende gneiss. These outcrops are interpreted as deformed mixed and/or mingled magmas. Traverse westwards towards the western margin of the intrusive complex, noting the large-scale alternation of augen granite and mafic sheets, some containing screens of metasediment. Late, discordant pink granite veins and sheets intrude the meta-igneous rocks throughout the section. The steep fabric within these meta-igneous rocks is parallel to the composite fabric within the D₄ Torrisdale Steep Belt, although the associated lineation is absent, perhaps as a result of the partitioning of strain into the host metasedimentary rocks (Burns, 1994). The field relations indicate that the igneous protoliths were intruded after regional migmatization of the host Moine gneisses but prior to formation of the Torrisdale Steep Belt.

These meta-igneous rocks were first described by Cheng (1942, 1943) who thought that they belonged to the pre-Moine basement. U-Pb SHRIMP dating of zircons from a sample of augen granite from this locality has yielded a Silurian crystallization age (Strachan & Kinny, unpublished data). The intrusive suite is thus probably a pre-to syn-tectonic member of the Caledonian 'Newer Granites'. Muscovite sampled from within Moine psammitic gneiss at Glaisgeo has yielded a ⁴⁰Ar/³⁹Ar age of c.419 Ma (Dallmeyer et al., 2001) and again most probably dates cooling after formation of the Torrisdale Steep Belt.

Also worthy of note at these outcrops are the NE-SW trending normal faults and calcite-filled fractures cutting these rocks. Minor structures associated with these faults are consistent with their development as a result of NW-SE extension during the Permian (Wilson et al., 2010).

References

At all times follow: The Scottish Access Code and Code of conduct for geological field work


Category:

- 2. Northern Highlands

Navigation menu