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## Excursion 13 Tarbet

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*Purpose:* To study the rocks around the Laxford Shear Zone, a probable terrane boundary in the Lewisian Gneiss Complex.

*Aspects covered:* Lewisian ortho-and paragneisses, large mafic bodies within the Lewisian, a Pre-cambrian shear zone, Laxfordian granites.

*Maps:* OS: 1:50,000 Landranger sheet 9 Cape Wrath; 1:25,000 Explorer sheet 445 Foinaven, Arkle, Kylesku and Scourie. BGS: 1:50,000 Sheet 107, Glencoul.

*Terrain:* This excursion involves a relatively short walk (5 km), but it is strenuous in that it crosses rough, undulating, heathery and locally boggy ground without a clear path. Some steep, rocky and vegetated slopes must be ascended and descended.

*Time:* The excursion will occupy most of a day.

*Access:* There should be no problems with access to this area, but please ensure that you leave all gates as you find them on this crofting land, and keep dogs on leads.

Park just above the pier at Tarbet, where there are abundant parking spaces. Go through the gate behind and to the right of the public toilets, and walk through the field behind the Shorehouse Restaurant to reach the rocky knoll immediately on the north side of the bay. These outcrops lie on the south side of the Laxford Shear Zone, and are thus within the Assynt Terrane. However, this area has been largely retrogressed to amphibolite-facies during the Laxfordian event. The excursion represents a traverse north-eastwards, towards and across the Laxford Shear Zone (Figure 84).

### Locality 13.1 North side of Port of Tarbet. [NC 1615 4902]

Outcrops on both sides of the low fence are of mafic and felsic gneisses with bands of rusty-weathering, medium- to coarse-grained garnet-biotite-plagioclase-quartz schist (Figure 85). These 'brown schists' are interpreted as being metasedimentary. They form a unit running along the southern side of the Laxford Shear Zone, and along strike to the south-east they are associated with large meta-mafic bodies. Their age is not known, though they are cross-cut by, and thus undoubtedly pre-date, the Scourie Dykes. The foliation in this unit dips steeply toward the south-west; the rocks are strongly lineated. Discontinuous outcrops of coarse-grained, foliated pink-weathering rock containing quartz, K-feldspar and biotite may represent a deformed granite sheet within the metasedimentary rocks.

From there, walk north-east across strike of the gneisses, crossing rocky knolls and gullies that are typically eroded along narrow, discrete Laxfordian shear zones. The second gully [NC 1615 4915] separates the meta-sedimentary gneisses from more typical quartzofeldspathic Lewisian gneisses of the Assynt Terrane to the north-east. These gneisses have a strong, steeply-dipping foliation and an intense lineation, which are considered to be the products of Inverian deformation, whilst Laxfordian deformation is concentrated in the discrete shear zones (Figure 86).

Some layers and lenses of more mafic hornblende-rich gneiss are seen within the felsic gneisses. Around [NC 1638 4932], on the sides of a shallow valley, amphibole-rich gneisses are cut by thin, pink-weathering, medium-grained, strongly foliated granitoid sheets (Figure 87). The south-west-dipping foliation is defined principally by elongated 'ribbons' of quartz. Both gneisses and granitoid sheets are folded into tight, upright folds that are axial planar to the main Inverian foliation. Across the valley at [NC 1635 4940], relatively undeformed Laxfordian pegmatitic granite sheets cut the deformed lithologies (Figure 88); this is essentially the most southerly extent of the Laxfordian granites, and provides clear evidence that they cut the Assynt Terrane (Goodenough *et al.*, 2010).

Continue northwards along that shallow valley past further tightly folded gneiss outcrops, and then drop down a steep scarp to a flat area with several lochans. Beyond this flat area are the steep slopes of Cnoc Gorm.

### **Locality 13.2 Cnoc Gorm. [NC 1675 4985]**

The hill of Cnoc Gorm (blue hill) is composed of coarse-grained, dark grey weathering garnet-bearing metagabbro (Figure 89). This is part of a large-scale belt of Archaean meta-mafic bodies, locally associated with meta-sedimentary rocks, which extends south-east along the southern side of the Laxford Shear Zone. The Cnoc Gorm metagabbro is characterised by areas with dark red garnet crystals up to 5 cm. across, which are commonly surrounded by albitic rims formed during decompression. The metamafic bodies in this zone show a range of mineral assemblages; granulite-facies (Badcallian) mineral assemblages (cpx + plagioclase  $\pm$  garnet  $\pm$  opx) are locally preserved, although parts of the unit have been retrogressed, with the growth of amphibole. The metamafic rocks are veined by a number of tonalite sheets, up to about a metre in thickness. The metagabbros show a strong south-west dipping foliation and south-east plunging lineation, and the foliation can be seen to wrap round the garnets. The metagabbro is cut through, and bounded by, a number of narrow, curving shear zones of Laxfordian age.

From the summit of Cnoc Gorm, continue northwards over more rocky knolls towards Rubha Ruadh. The outcrops in this area are of tightly folded gneisses, cut by scattered pegmatitic granite sheets. A north-west trending Scourie Dyke can be shown to cut across the folds, constraining them to be Inverian rather than Laxfordian in age. However, the Scourie Dyke itself is locally folded. This area thus shows evidence for reactivation of an Inverian shear zone during the Laxfordian.

Descend down a heathery gully towards the coast, and then walk west towards Rubha Ruadh.

### **Locality 13.3 Rubha Ruadh. [NC 1650 5115]**

Rubha Ruadh (Red Point) is formed of a sheet of coarse-grained, foliated pink Laxfordian granite, about 1 km in width and north-west to south-east trending. Within the granite sheet are abundant pegmatitic patches. The mafic minerals in this thick granitic sheet include a blue-green alkali amphibole and grass-green aegirine-augite; this contrasts with the thinner granitic sheets and pegmatitic granites occurring in this area, in which biotite is the main mafic mineral. An example of a biotite-bearing granitic sheet from near Laxford Bridge has been dated at  $1854 \pm 13$  Ma (Friend and Kinny, 2001).

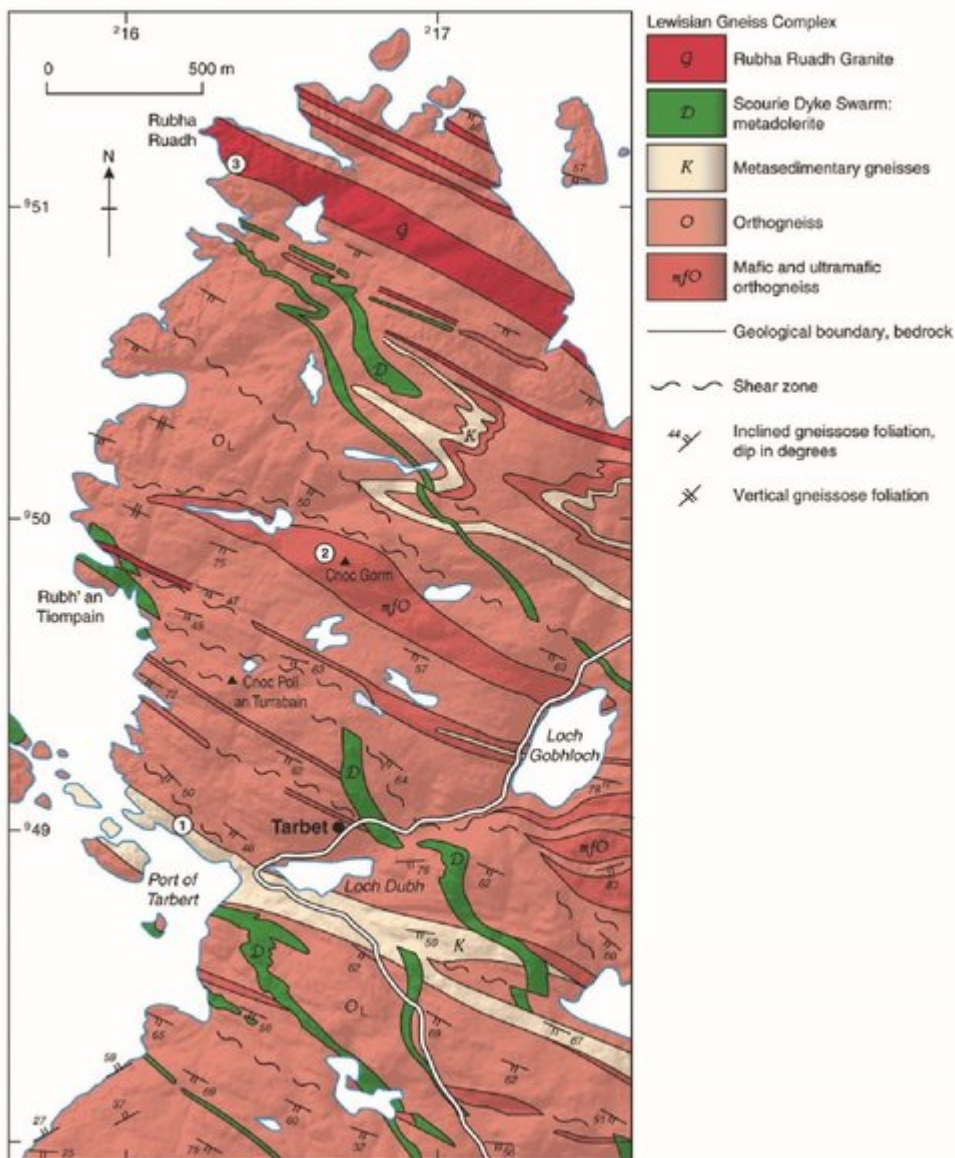
The southern margin of the Rubha Ruadh granite sheet is sharp and broadly parallel to the gneissic banding in the host rocks. This margin has been considered by some authors to represent the boundary between the Assynt and Rhiconich terranes at this point. In this area there are a number of schistose, ultramafic lenses, consisting mainly of biotite with subsidiary hornblende, formed by metasomatism of mafic bodies along the shear zone that represents the terrane boundary.

On the north side of the granite sheet, the gneisses of the Rhiconich Terrane (exposed to the east of Rubha Ruadh) are biotite- and hornblende-bearing quartzofeldspathic gneisses. The gneisses are foliated, but lack the distinct lineation seen in many outcrops to the south. These gneisses are typically migmatitic, with abundant patches and irregular sheets of granite and granitic pegmatite. Geochemical analyses have shown that the gneisses of the Rhiconich Terrane have higher average  $K_2O$ , Rb, Th and U contents than the gneisses of the Assynt Terrane (Sheraton *et al.*, 1973).

From Rubha Ruadh, one possibility is to retrace your steps to Tarbet. A diversion can be taken on the way to see an interesting example of a wide composite Scourie Dyke on the coast at Poll an Turrabain [NC 161 495], which thins rapidly inland. This spectacular dyke was described by Beach (1978) as a complex mixture of three rock types: felsic, mafic and 'normal' dolerite. It has a discordant contact with the host rock gneisses, of which it contains a number of xenoliths. It shows variable Laxfordian deformation that ranges from a marginal strong penetrative foliation to anastomosing shear zones and areas that retain an igneous texture. From the south end of the dyke follow a rough path up the obvious gully south-east and rejoin the outwards route.

Alternatively, walk along the coast from Rubha Ruadh as far as [NC 175 503], then turn south to join the road to Fanagmore and return along the road.

## References

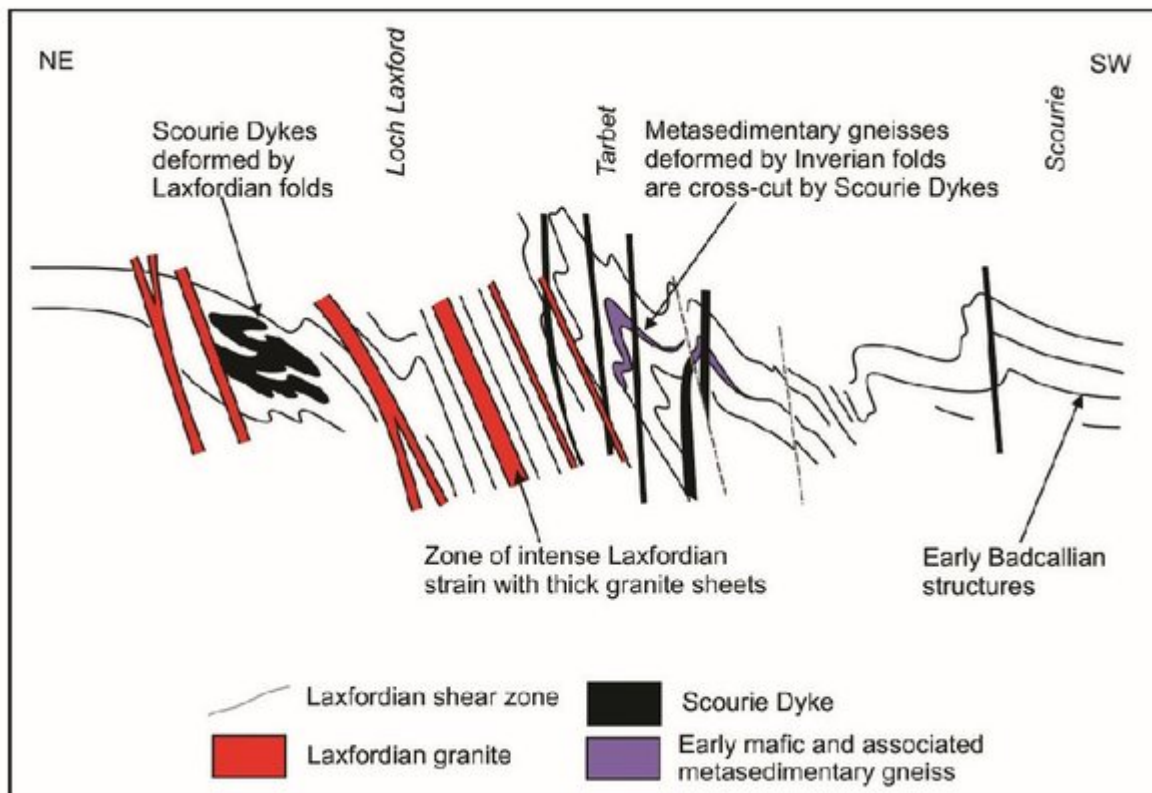


(Figure 84) Simplified geological map of the Tarbet area, after Mendum et al. (2009), showing the localities described in Excursion 13.

85



(Figure 85) Outcrops of brown-weathering metasedimentary rocks on the north side of Port of Tarbet, Locality 13.1. (BGS photograph P593106, © NERC)



(Figure 86) Schematic cross-section through the Laxford Shear Zone, showing the major structures, after Goodenough et al. (2010).





*(Figure 87) Thin, pink granitic sheets cutting amphibolitic gneisses, strongly foliated and tightly folded by Inverian deformation, [NC 1638 4932]. (BGS photograph P618228, © NERC)*



*(Figure 88) Coarse-grained, essentially undeformed Laxfordian granite sheet cutting across gneisses with a strong Inverian foliation, [NC 1635 4940]. (BGS photograph P593114, © NERC)*





*(Figure 89) View from south to Cnoc Gorm (Locality 13.2), showing the larger, dyke belongs to the ophitic-textured, distinctive dark-coloured mafic quartz-bearing, microgabbroic type gneiss which gives the hill its name. (Tarney and Weaver, 1987) and is one of the (BGS photograph P593116 © NERC)*