
Excursion 9 Glen Oykel and the Loch Ailsh Pluton

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Purpose: To study the syenites of the Loch Ailsh Pluton and the folded Lewisian Gneiss Complex–Torridon Group unconformity within the Ben More Thrust Sheet.

Aspects covered: Syenites of the Loch Ailsh Pluton; Diabaig Formation conglomerates and Lewisian gneisses in the Ben More Thrust Sheet; folds within the Ben More Thrust Sheet.

Maps: OS: 1:50,000 Landranger sheet 15 Loch Assynt; 1:25,000 Explorer sheets 440 Cassley and Glen Oykel, and 442 Assynt and Lochinver. BGS: 1:50,000 special sheet, Assynt district.

Terrain: The route is a 12 km walk up the little-visited valley of Glen Oykel. The first part of the excursion is on good paths, but it then enters some fairly remote country and crosses rough, often wet ground. Many of the outcrops are in stream sections, so this excursion will be most interesting after a period of dry weather.

Time: This excursion requires a full day.

Access: Permission for access to the glen, and for use of the private road, must be obtained from Assynt Estates at any time of the year; and during the stalking season (July to November) it will probably also be necessary to confirm access with the stalker on the day.

Turn off the A837 at [NC 296 083] onto the private track to Ben More Lodge. Vehicular use of this track, and parking of cars at Ben More Lodge, is only by prior permission from the Assynt Estate Office. Use of a mountain bike would provide the best alternative to driving, and bikes could be taken as far as Locality 9.3.

Locality 9.1 Track to Ben More Lodge.

En route along the track there are several exposures of minor intrusions, cutting rocks of the Cambro-Ordovician succession. At [NC 306 092] there are outcrops of pink peralkaline rhyolite, part of a large sill cutting dolostone.

Locality 9.2 Loch Ailsh syenites in the River Oykel. [NC 326 127]

From Ben More Lodge [NC 323 115], walk up the landrover track along the River Oykel, passing scattered outcrops of Durness Group dolostone. A wide stream, the Allt Cathair Bhàn, can be crossed at a ford or at a small, rickety footbridge just upstream from the track. Further up this stream, exposures of pyroxenite have been found, but the abundant plantations that have grown up in recent years have made the outcrops very inaccessible and not worth visiting. Geophysical studies (magnetic anomalies) have shown that these pyroxenites form a sub-vertical sheet extending along the margin of the Loch Ailsh Pluton ((Figure 64); Parsons, 1965b). The anomaly dies out where the pyroxenites pass beneath the Moine Thrust.

At [NC 324 125] outcrops of coarse-grained syenite are seen in the river and the track. These are typical outcrops of the S3 phase of the Loch Ailsh Pluton. A little distance further up the river, at [NC 326 127], a large area of rock outcrop forms a waterfall, which provides excellent exposures of a variety of different facies of the Loch Ailsh syenites. Here, coarse-grained pyroxene-rich syenites are heavily veined by, and in places enclosed within, grey-pink leucosyenites (Figure 65). The pyroxene syenites contain abundant several cm across and have sharply defined margins. There are at least two generations of later leuco-syenite veins or sheets, which have sharp boundaries with the host pyroxene-rich syenites. These later intrusions include red syenite veins and later, grey leucosyenites that are related to the S3 syenites. Late-stage shear zones run through all the rocks, indicating deformation subsequent to the intrusion of the syenites.

Locality 9.3 Syenite outcrops at stream confluence. [NC 328 129]

Return to the track and continue north-east. A few hundred metres further up the river, the confluence of the Allt Sail an Ruathair and the River Oykel is reached. A few scattered outcrops in the stream at this point are of red, pyroxene-bearing S2 syenite, which forms a dome-shaped mass in the centre of the Loch Ailsh Pluton (Figure 64). Between here and the last locality, the boundary between the S2 and S3 syenites is gradational, with red feldspar xenocrysts from S2 included within grey S3 syenite. Rock exposures in the track are of grey S3 syenite with red feldspar xenocrysts, cut by many narrow shear zones.

Locality 9.4 Allt Sail an Ruathair. [NC 332 134]

Cross the Allt Sail an Ruathair by the footbridge and then turn right to follow the stalker's path up the stream, crossing again at a ford. A slight diversion from the track can be made to see outcrops of typical coarse-grained, red-weathering S2 syenite in the river at [NC 332 134]. Follow the track to [NC 337 141], where it crosses the river by a ford or a footbridge. Outcrops in the river here are of grey-weathering S3 syenite. An outcrop just above the ford is cut by a 10 cm. red dyke, probably a peralkaline rhyolite. Carry on along the track until it crosses the outflow from Loch Sail an Ruathair at [NC 337 143], then follow this stream up to the loch and walk round the eastern side. Across the loch, the contact between an early dome of S1 syenite and the later S3 syenite can be seen on the slopes of the Sail an Ruathair ridge (Figure 66).

Locality 9.5 Metamorphic Burn. [NC 334 154]

Continue to the north side of the loch, where two sizeable streams flow into it. Follow the more westerly of these two streams, which runs into a narrow gully with good rock exposures. This stream was termed the 'Metamorphic Burn' by Phemister (1926) because it shows grey-brown S3 syenites enclosing metamorphosed blocks of the Cambrian sedimentary succession, which are apparently in correct stratigraphical order, but the wrong way up: *i.e.* with dolostone at the base of the slope. This is because the dip of the sedimentary succession is steeper than the fall of the stream. Screens of the earlier syenites have also been recognised within the S3 syenites in the burn.

Walking up the burn, the first rock exposures are reached about 400 m above the loch at [NC 333 154]. These exposures are of grey syenite (reddened in the stream) containing isolated, altered xenoliths of dolostone, which have been converted to diopside-and phlogopite-bearing calc-silicate rocks. These xenoliths are most easily recognised by the abundant flakes of phlogopite mica. In places the syenite enclosing the calc-silicate rocks shows signs of alteration, and mafic pyroxene-rich patches are common.

Continue upstream past syenite outcrops. After a short gap in exposure, more calc-silicate xenoliths are seen at [NC 334 154]. Syenites with white-weathering calc-silicate xenoliths, some up to a metre across, continue up-stream. Within this succession is a roughly 20 m thick sheet of red S1 syenite, which has sharp upper and lower contacts with the surrounding S3 syenites.

Further up the stream, at [NC 330 158], is a smooth, slabby exposure of hard grey quartzite, taken to be a xenolith of the Salterella Grit Member.

This is in contact with a layer of fine, flinty, dark-green rock with conspicuous pink feldspars. Slightly above, about midway up the steep section of the stream, is a thick layer of baked grey shale (the Fucoïd Beds Member) with black streaks and folded and fractured bedding. Immediately above the Fucoïd Beds is a 2 m thick body of dark green pyroxenite, which is in sharp contact with grey S3 syenite above. From here upwards, the rocks in the burn are pale grey S3 syenites, enclosing massive tabular quartzite xenoliths [NC 335 157] that have been fenitised. Xenoliths of red syenite (probably S2) are also present.

The xenoliths in the Metamorphic Burn are considered to represent remnants of an undisturbed, southerly dipping Cambrian succession into which the Loch Ailsh syenites were intruded. The preservation of the sequence suggests that

the mode of intrusion of the syenites was relatively passive. However, the country rocks nearby are Lewisian gneisses, suggesting that these sedimentary xenoliths must have moved from their original position.

From the top of the Metamorphic Burn, walk roughly north-west over the peaty ridge towards the stream flowing out of Dubh Loch Beag, passing scattered outcrops of Lewisian gneiss. Across the glen, Eriboll Formation quartzites thickened by thrusting can be clearly seen on the slopes of Breabag. In places, major rockfalls have occurred where large slabs of quartzite have slipped downwards along thrust and bedding planes.

Locality 9.6 Sgonnan Mòr Syncline and basal Torridon Group. [NC318 158]

Follow the outflow stream of the loch downhill into Glen Oykel, past outcrops of Lewisian gneiss. At [NC 3187 1584] the gneiss overlies sheared Torridon Group sandstone along the Oykel Thrust. This thrust was first identified by Milne (1978) and considered to cut the Loch Ailsh Pluton, but is now thought to be of limited extent, representing the sheared-out common limb between the Sgonnan Mòr Syncline and Anticline (British Geological Survey, 2007). There is no evidence that this thrust actually cuts the Loch Ailsh Pluton.

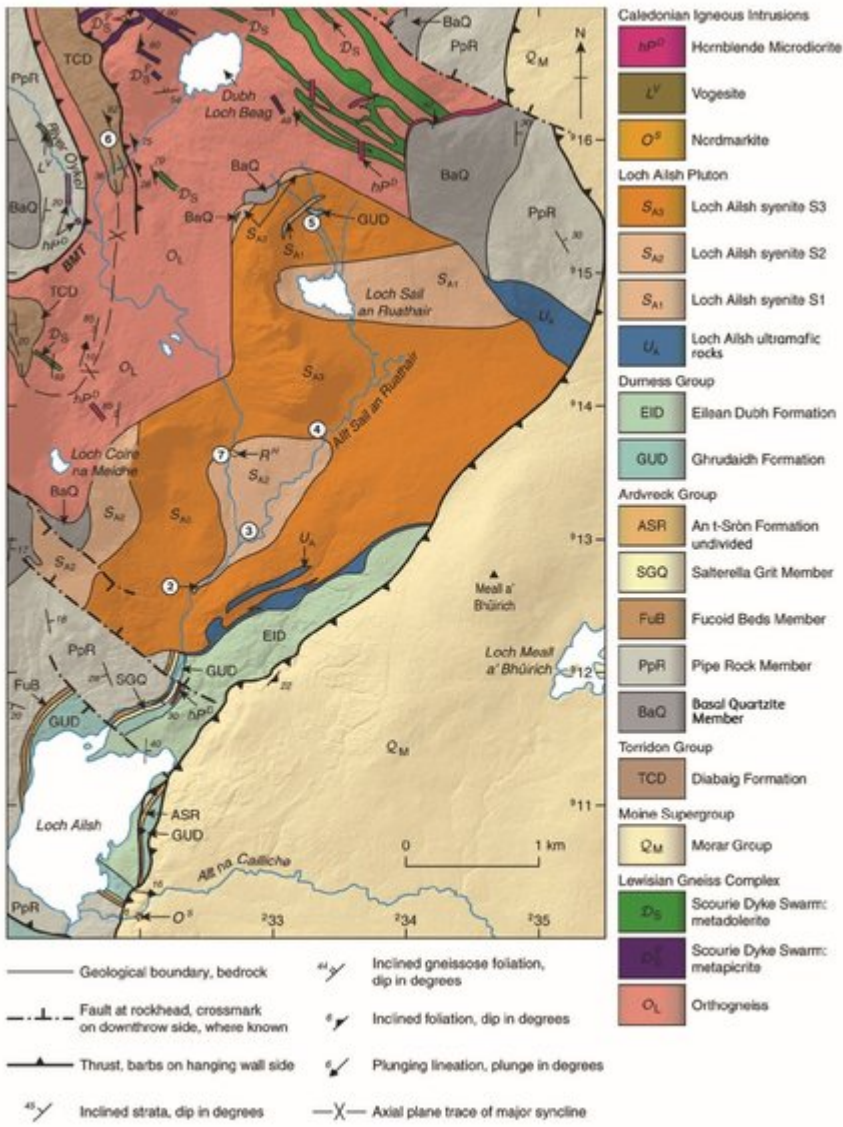
A little further downhill, just above the path, are excellent ice-polished outcrops of the basal Torridon Group conglomerate and sandstone, with a distinct near-vertical to north-easterly-dipping cleavage (Figure 67). The bedding and cleavage are at roughly right angles to each other; these basal Torridon Group rocks lie in the broad fold-hinge of the Sgonnan Mòr Syncline.

Locality 9.7 Peralkaline rhyolite dykes. [NC 327 136]

From the Dubh Loch Beag outflow, follow the path down Glen Oykel, noting a brick-red rhyolite dyke which cuts Lewisian gneisses just above the path at [NC 3195 1570]. The route crosses back into the Loch Ailsh Pluton at about the point where the path rejoins the river bank. At [NC 3270 1360], another c.4 m thick dyke of reddish-brown, fine-grained rhyolite cuts reddish, coarse-grained S2 syenites (Figure 68). These dykes are members of the Peralkaline Rhyolite Swarm. These intrusions are found as dykes and sills throughout the Assynt Culmination, although concentrated in the Ben More and Glencoul Thrust sheets. In some localities (such as on Cnoc an Droighinn above Inchnadamph) they have been deformed by thrust related folds, and thus they are considered to have been intruded during or prior to movement on the thrusts in the Moine Thrust Zone. The cross-cutting evidence here in Glen Oykel shows that these dykes are clearly younger than the Loch Ailsh Pluton, which has been dated as 430.6 ± 0.3 Ma (Goodenough *et al.*, 2011). Thus movements in the thrust belt must have occurred after c.430.6 Ma. This is one of the few constraints in existence on the age of movement on the thrusts, making this an important location.

Follow the track down Glen Oykel to return to Ben More Lodge.

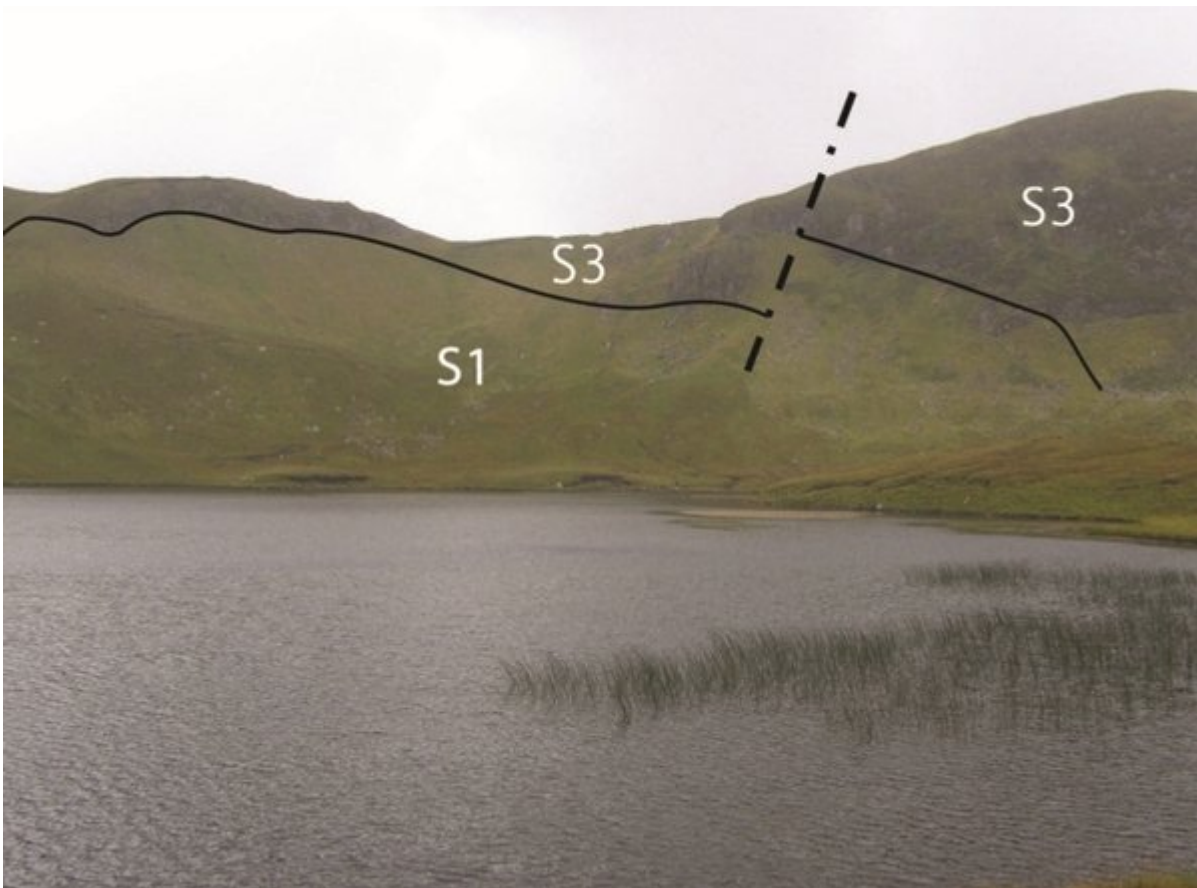
References



(Figure 64) Simplified geological map of Glen Oykel, after British Geological Survey (2007), showing the localities described in Excursion 9. BMT = Ben More Thrust.



(Figure 65) Outcrops in the waterfall in the River Oykel (Locality 9.2), showing medium-grained grey leucosyenite veins cutting coarse-grained pyroxene syenites. (BGS photograph P506429, © NERC)



(Figure 66) View west across Loch Sail an Ruathair to the dome of S1 syenite surrounded by S3 syenite, after Parsons (1999). (BGS photograph P693860, © NERC)



(Figure 67) Diabaig Formation conglomerate with a strong cleavage, in the core of the major syncline in Glen Oykel, Locality 9.6. (BGS photograph P693864, © NERC)



(Figure 68) Peralkaline Rhyolite dyke cutting fractured and quartz-veined syenites of the Loch Ailsh Pluton in the River Oykel at Locality 9.7. (BGS photograph P693870, © NERC)