Excursion 8 Conival and Ben More Assynt

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Purpose: To study the Ben More Thrust Sheet, including outcrops of the thrust plane, together with large-scale folding and structures such as the 'double unconformity' within the thrust sheet. On a clear day, an excellent overview of the Assynt region can be obtained from the summit of Conival.

Aspects covered: Ben More Thrust, minor intrusions, the double unconformity in the thrust sheet, and superb views of Assynt.

Maps: OS: 1:50 000 Landranger sheet 15 Loch Assynt; 1:25,000 Explorer sheet 442 Assynt and Lochinver. BGS: 1:50,000 special sheet, Assynt.

Terrain: This is a strenuous excursion, involving a climb of some 900 m and a walk of around 16 km. It should only be undertaken in good weather, by well-equipped and well-prepared parties. In low cloud there is little geological point in any party ascending beyond the Coire a' Mhadaidh outcrops (Locality 8.4). Localities 7.1 and 7.2 can be taken in as part of an excursion to Conival.

Time: This excursion requires a full day and is one of the longest routes in this guide.

Access: There are no constraints on access for this excursion at most times of the year, but during the stalking season (July to November) it is advisable to contact Assynt Estates before setting out.

Park at the large public car-park at the Inchnadamph Hotel [NC 251 216], with an interpretation panel pointing to the Peach and Horne monument on the far side of the road. From the car-park, turn right onto the main road and then right again on a track past Inchnadamph Lodge and a group of cottages. Pass through a gate and follow the path up Gleann Dubh, passing abundant Durness Group dolostone outcrops in the valley of the River Traligill. Excursion 7 (Localities 7.1 and 7.2) contains descriptions of some of the features en route. Follow the path as far as a wooden footbridge [NC 2713 2098]. Do not cross the bridge but take the left-hand path, which continues along the left (northern) bank of the Traligill River.

Locality 8.1 Traligill River. [NC 2734 2093]

Along the path and in the Traligill River are outcrops of Eilean Dubh Formation (pale grey dolostone) succeeded by Ghrudaidh Formation (dark grey dolostone). The strata dip steeply to the south-west. Farther to the north-east, and higher up, are dip slopes of Eriboll Formation, also south-west dipping (Figure 58). The dolostone lies structurally above the Eriboll Formation quartz arenite (in stratigraphical order) and all strata here form part of the south-west limb of the Poll an Droighinn Antiform.

Locality 8.2 Traligill River. [NC 2794 2064] to [NC 2800 2061]

The stream here cuts obliquely through the strata and progressively lower units are encountered. On the right-hand (south-west) side of the stream are poor outcrops of Fucoid Beds Member, typified by brown-weathering dolomitic siltstone and lush vegetation. To the left are outcrops of quartz arenite of the Pipe Rock Member, although *Skolithos* pipes are difficult to discern.

Locality 8.3 Traligill River. [NC 2867 2039]

Here the path turns left. The outcrops around this junction of stream valleys are of steeply eastward-dipping dolostone on the north-east limb of the Poll an Droighinn Antiform (Figure 58). The antiformal trace strikes NW–SE, oblique to the

thrust direction. Rocks underneath this antiform are not exposed, but it is likely the antiform is an anticlinal stack, pushed up by the formation of imbricates below. Composition of these imbricates is unknown.

Follow the path, which is very boggy for some distance above here, and climbs fairly steeply in an ENE direction.

Locality 8.4 Path west of Allt a'Choinne Mhill. [NC 2894 2049]

Stop where the path becomes blocky and offers a wide view (in good weather!). To the left (north-west) is a large-scale nick in the slope below the plateau of Beinn an Fhurain. This marks the position of the Beinn an Fhurain Thrust, which emplaces Eriboll Formation rocks over the Poll an Droighinn Antiform and the Traligill thrust system (see Excursion 7). To the east is the steep east face of Conival. This 400 m high face is mainly composed of Eriboll Formation quartz arenite, almost tripled in thickness by thrust repetitions on the Beinn an Fhurain Thrust and subsidiary thrusts.

Keep following the path upwards.

Locality 8.5 Path west of Allt a'Choinne Mhill. [NC 293 206] to [NC 299 212]

The rocks exposed along the path are mainly eastward-dipping quartz arenites of the Basal Quartzite Member within the Beinn an Fhurain Thrust Sheet. At [NC 2927 2057], the Basal Quartzite Member dips more steeply to the north-east, indicating the presence of a subsidiary thrust.

The quartz arenites are cut by a variety of prominent intrusive sheets. A yellow-brown weathering sill of hornblende microdiorite occurs on the path at [NC 2948 2075]. A more conspicuous, brick-red intrusive sill occurs at [NC 2968 2083], where the path crosses the stream. This intrusion is a porphyritic trachyte; similar intrusions elsewhere can be seen to cut across foliations associated with the Ben More Thrust, and so are considered to post-date movement on the thrusts. They are chemically similar to some of the rocks of the Loch Borralan Pluton to the south. Some other red sills that outcrop on these slopes are peralkaline rhyolites; these are difficult to distinguish from the porphyritic trachytes in the field, but are actually part of a slightly earlier phase of magmatism (Goodenough *et al*., 2004).

Locality 8.6 Pipe Rock steps and the upper corrie. [NC 297 208] to [NC 300 210]

The path climbs up some steep rock steps adjacent to a waterfall. As one climbs the rock steps, it can be clearly seen that these are composed of Pipe Rock, with distinct vertical *Skolithos* burrows (Figure 59). Above the steps, the path flattens out and skirts a small corrie. Look out for clear glacial striae on some of the quartzite slabs in this area. At [NC 2992 2090] the Basal Quartzite Member is encountered again, and has been emplaced over the Pipe Rock Member by another thrust.

At [NC 2997 2089], not far from the path, is a large blocky outcrop in which Pipe Rock is sheared and folded in west-vergent recumbent folds. Strained *Skolithos* are seen on open folded bedding surfaces a short distance to the SSE.

Continue upwards towards the prominent col on the ridge. In outcrops just below that col, further intrusive sheets of porphyritic trachyte cut across deformed Pipe Rock in which the pipes have been strongly sheared (Figure 60).

Locality 8.7 Conival–Beinn an Fhurain col. [NC 3005 2080]

Climb to the col, and turn right towards low outcrops on the southern side of the col. These outcrops, which are of strongly sheared Basal Quartzite Member, mark the plane of the Ben More Thrust, which has brought the Basal Quartzite over the underlying Pipe Rock. The thrust dips eastwards into Coire a' Mhadaidh, where the lower parts of the succession within the Ben More Thrust sheet can be seen.

Locality 8.8 Coire a' Mhadaidh. [NC 302 210] to [NC 306 205]

From the Conival–Beinn an Fhurain col, descend south-east across grassy slopes towards the lochan at [NC 305 205]. Care should be taken on these slopes, especially in wet weather. Quartz arenite cliffs tower above the slopes, but the ground around the lochan is underlain by the Torridon Group (Figure 61). To the east, in the lower part of Coire a' Mhadaidh, the hummocky ground is underlain by Lewisian gneiss. All these rocks lie within the Ben More Thrust Sheet.

To the north and south of the lochan there are good exposures of the Diabaig Formation of the Torridon Group, which here comprises coarse conglomerate with cobbles up to 10 cm. long. The cobbles are dominated by vein quartz, suggesting long exposure and weathering of the underlying Lewisian gneiss. These conglomerates are deformed, with clasts flattened parallel to a cleavage that dips gently to the ENE.

At [NC 3060 2038] the unconformity between rocks of the Lewisian Gneiss Complex and the overlying rocks of the Diabaig Formation can be seen. The cleavage in the conglomerates of the Diabaig Formation is clearly at an angle to the fabric in the gneisses.

In the cliffs above, on the north ridge of Conival, the unconformity at the base of the Cambrian succession can be seen. At [NC 3079 2021], below the Conival–Ben More Assynt ridge, the Cambrian quartzites overstep the basal Torridon Group unconformity to lie directly on the Lewisian. The broad architecture of this double unconformity is clearly visible from below (Figure 61), but the actual junction between the two unconformities is not exposed. Butler (1997) suggested that the Torridon Group–Lewisian gneiss contact is, at least in part, a faulted contact. The fault does not appear to cut the sub-Cambrian unconformity and so is considered to be Precambrian in age (but see Locality 7.9 for an alternative interpretation).

From this point, several options are possible. In poor weather and low cloud, many parties may wish simply to retrace their steps to Inchnadamph. Those that wish only to climb Conival may return to the Conival–Beinn an Fhurain col and ascend the north ridge to the summit (Locality 8.7). However, for parties that are comfortable on steep ground, a worthwhile route climbs south-east out of Coire a' Mhadaidh, up boulder scree slopes onto the ridge between Conival and Ben More Assynt. This route is described below, but note that it should not be followed in conditions of poor visibility.

Locality 8.9 Ben More Assynt–Conival col. [NC 308 202]

Climb south-east from the lochan up steep slopes of quartzite boulder scree, picking a route around craggy areas, and aiming for the low point on the ridge between Ben More Assynt and Conival.

A short way below the ridge the sub-Cambrian unconformity, running roughly parallel to the ridge-line, transgresses across the Torridon Group– Lewisian gneiss unconformity. Unfortunately this junction is covered in scree. On reaching the col, look back across Coire a' Mhadaidh to the dramatic face of Na Tuadhan. This face clearly displays major large-scale folds in the Cambrian quartzites in the hangingwall of the Ben More Thrust (Figure 62).

From the col, either continue east along the ridge to the summit of Ben More Assynt (this adds approximately an hour to the excursion), or turn west along the ridge toward Conival.

Locality 8.10 Ben More Assynt summit. [NC 318 203]

The summit of Ben More Assynt consists of twin knolls of coarse-grained, pebbly cross-bedded quartz arenite, belonging to the lowest part of the Basal Quartzite Member. About 50 metres southwards along the south ridge of Ben More Assynt lies the contact between the Cambrian Basal Quartzite Member and the underlying Lewisian Gneiss Complex. Beneath the contact, the gneisses are sheared over a few metres. This shear zone (informally termed the Coire a' Mhadaidh detachment) was formed by deformation along the basal Cambrian unconformity, and can be traced many kilometres to the north and south. Farther north, the Basal Quartzite Member is significantly thinned along the detachment. On the classic 1923 Assynt Map, this shear zone was erroneously mapped as a sill.

From the sheared gneisses, return over the summit of Ben More Assynt and westwards along the ridge of shattered Basal Quartzite Member (Figure 63) to Conival. The south ridge of Ben More Assynt involves scrambling and is not

recommended as a descent route.

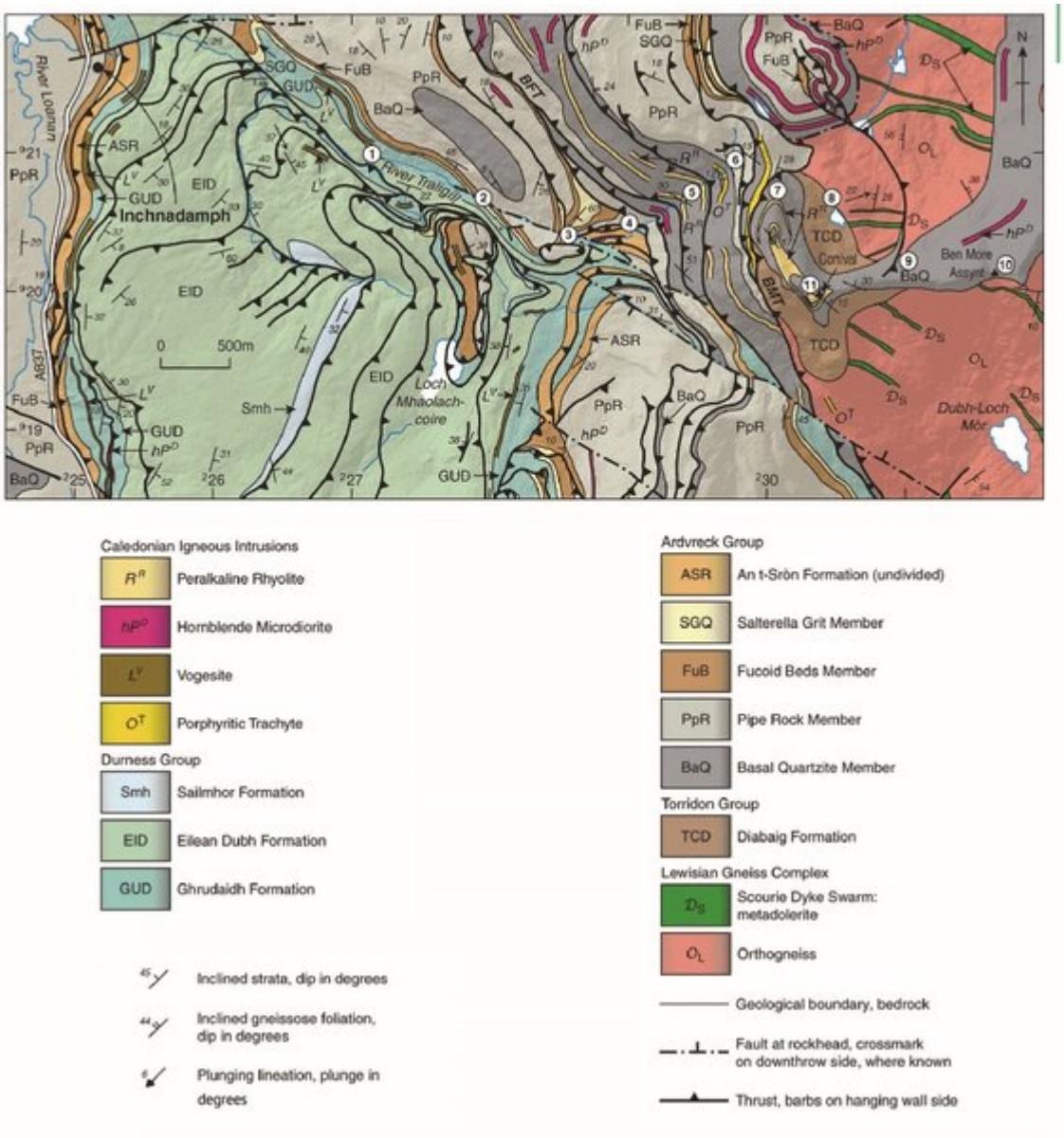
Locality 8.11 Conival. [NC 304 199]

From the summit of Conival, the views of Assynt on a clear day are particularly impressive. To the south, a steep ridge descends to the classic glacial valley of Glen Oykel, with the Breabag Dome on its west side. To the north, the southern face of Na Tuadhan dominates the view across Coire a' Mhadaidh, with spectacular large-scale folds in the Cambrian quartz arenites. To the east, a large expanse of undulating boggy ground marks the rocks of the Moine Supergroup; and to the west, the mountains of the foreland can be clearly seen.

From Conival, descend the north ridge over outcrops of Basal Quartzite Member. Close to the summit, note the local presence of agalmatolite, a pale greenish, friable muscovite-and quartz-rich rock that represents a residual saprolitic tropical soil developed locally beneath the base of the Eriboll Formation. Traces of Torridon Group sandstone can be found, suggesting that minor thrusts disrupt the basal Cambrian unconformity in this area.

Rejoin the outward route and retrace your steps back to Inchnadamph.

References



(Figure 58) Simplified geological map of the area around Glen Traligill and Conival, after British Geological Survey (2007), showing the localities described in Excursion 8.

(Figure 59) Typical pitted sur-faces of Pipe Rock Member on the slopes around the Allt a'Choinne Mhill, Locality 8.6. (BGS photograph P530557, © NERC)

(Figure 60) Outcrops of Eriboll Formation quartz arenites intruded by brick-red porphyritic trachytes at the col below Conival, Locality 8.6. (Photograph: © K. M. Goodenough)

(Figure 61) View south-east across Coire a' Mhadaidh (Locality 8.8) toward Ben More Assynt. Outcrops of Lewisian gneisses (on the left) and Diabaig For-mation conglomerates (on the right) form the rocky pave-ments around the loch, with NE-dipping Basal Quartzite Member forming the ridge above. (BGS photograph P530369, © NERC)

(Figure 62) View north-west from the Conival–Ben More Assynt ridge towards the face of Na Tuadhan, showing large-scale folding in the hangingwall of the Ben More Thrust. (BGS photograph P530512, © NERC)

(Figure 63) Outcrops of the Basal Quartzite Member on Conival, showing planar cross-bedding. (BGS photograph P530523, © NERC)