4 Glen Ey Gorge

[NO 0867 8834]–[NO 0884 8630]

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4.1 Introduction

Glen Ey in upper Deeside provides one of the best-exposed sections through the Boundary Slide, a zone of highly strained rocks, which separates the Grampian Group from other, more lithologically variable, parts of the Dalradian throughout much of the Grampian Highlands. At one time the slide was regarded as a fundamental tectonostratigraphical boundary separating the Moine and Dalradian successions, but the re-assignation of most of the Moine south-east of the Great Glen Fault to the Dalradian has lessened its potential importance. Discussion now centres upon whether or not the high-strain zone coincides with a major dislocation and whether any stratigraphical units or major structures have been excised (see 1.2.1 in *Introduction*). The Glen Ey gorge section is particularly valuable since, unlike some sections to the south-west, there is continuity from the top of the Grampian Group, through increasingly strained rocks, into highly deformed schistose rocks assigned to the Lochaber Subgroup at the base of the Appin Group. Here, at least, there would appear to be no reason to suggest that large parts of the succession are missing.

The area around Glen Ey was first mapped by the Geological Survey in 1898–99 and the results were incorporated into the one-inch Sheet 65 (Balmoral, 1904) and the accompanying memoir (Barrow and Cunningham Craig, 1912). This area of the present BGS 1:50 000 Sheet 65W (Braemar, 1989), is for the most part based on the mapping and re-interpretation of Upton (1983, 1986), who was the first to recognize the Boundary Slide in the Braemar area. Much of the ensuing geological description and interpretation is based on Upton's work.

4.2 Description

The Ey Burn is a major tributary on the south side of the River Dee, approximately 7 km south-west of Braemar. To the north of the ruins of Auchelie [NO 0875 8630], as far as the bridge at [NO 0867 8834], the burn flows for about 2 km through a narrow gorge, generally less than 10 m deep but with steep to vertical sides. The best-known part of the gorge, between [NO 0872 8718] and [NO 0875 8695], includes a historical curiosity known as the Colonel's Bed. This rocky recess in the western wall of the gorge is where John Farquharson of Inverey, the 'Black Colonel', reputedly hid while being pursued after the Battle of Killiecrankie in 1689.

The Boundary Slide in the Ey Gorge separates essentially arenaceous rocks of the Grampian Group from the more-varied pelitic and calcareous lithologies of the Lochaber and Ballachulish subgroups of the Appin Group (Figure 6.8).

The northernmost 600 m or so of the section are entirely within Grampian Group rocks, which dip consistently at low angles (less than 20°) to the south-east or east. These uppermost units of the Grampian Group are probably equivalent to the Struan Flags of the Blair Atholl area (see the *Gilbert's Bridge* GCR site report). In Glen Ey they have been termed the Deeside Quartzites and Psammites by Upton (1983, 1986). These comprise units of pale slabby quartzite and quartzose psammite, 5–15 cm thick, interbedded with pale-green and buff colour-banded psammite and thin beds of semipelite (up to 5 cm thick). The semipelites contain poikiloblastic garnet aligned parallel to the schistosity, indicating syn- to late-D2 growth. Heavy-mineral laminae are commonly seen in the quartzites and Upton (1983) recorded south-easterly younging evidence in the psammites, confirming that the succession is the right way up.

The quartzite and psammite contain bedding-parallel pelitic laminae dominated by thick felts of porphyroblastic muscovite and titaniferous biotite, which define the S2 fabric and whose spacing reflects proximity to the Boundary Slide. Thus, by the bridge at the lowest point in the section, these partings are widely spaced with an interval of 20–30 cm, whereas at [NO 0880 8800], where a small tributary enters from the east, the spacing reduces from 10–20 cm at river level to 3–7 cm at the lip of the gorge. Approximately 20 m upstream on the east bank, at [NO 0879 8797], psammite becomes increasingly flaggy upwards and is overlain by quartz schist, marking a transition into the Tom Anthon Mica Schist Formation, the lowest unit of the Appin Group. South of this, the contact between the two formations descends gradually to reach river level at [NO 0885 8776].

Roughly 200 m to the south, the gorge turns to the west and the rocks dip gently to the east or, more rarely, to the north-east. As a result of this slight change in overall strike, the gorge cuts down the succession upstream and Grampian Group rocks crop out to form an elongate ‘window’ up to 100 m wide and 500 m long. As in the lower part of the gorge, the quartzites and psammites demonstrate an upward increase in flagginess and pass up into the Tom Anthon Mica Schist Formation at stream level just to south of the Colonel’s Bed.

The Tom Anthon Mica Schist, which in this area is estimated to be 40–70 m thick, is a very distinctive platy silvery grey rock. It is essentially a quartz-feldspar-muscovite-biotite schist dominated by thick porphyroblastic muscovite felts, which give the rock its particularly distinctive appearance. Isolated garnets crystallized late, during the D2 deformation. The thick mica foliae are compressed around augens of recrystallized porphyroblastic plagioclase, the lamellar twinning of which has been accentuated by the high strain. Also present are augen-shaped lenses of calcite and calcsilicate-rich hornblendic amphibolites. The lithology at the base of the formation is dominated by mica foliae with only rare lenses of quartz, feldspar and amphibolite. The mica foliae contain heavy minerals such as tourmaline, zircon, apatite and rare small poikiloblastic garnets. There is an upward increase in the quartz-feldspar content of the matrix and at the top of the formation the mica felts are separated by quartzofeldspathic microlithons. This partly reflects a more-arenaceous protolith and partly the effects of high D2 strain producing a pressure-solution striping in the rock.

The top of the Tom Anthon Mica Schist is not exposed in the gorge, but small exposures of epidote-tremolite-dolomite-bearing calcsilicate rock occur in an eastern tributary at around [NO 0900 8782] and mark the location of the overlying Baddoch Burn Dolomite. These rocks are easily recognizable and form an important marker horizon. Here they consist of green calcsilicate rocks, dominated by tremolite laths with subordinate amounts of quartz, feldspar and muscovite or phlogopite. The tremolite laths are preferentially aligned, forming a rough schistosity.

The succeeding Glen Clunie Graphitic Schist Formation crops out in the gorge section to the south of the major NE-trending Tom Anthon Fault (see below). This formation is dominated by dark-grey graphitic pelite with porphyroblasts of garnet, staurolite and kyanite. It is evident from these rocks that garnet and staurolite formed early during D2, whereas kyanite porphyroblasts, which marked growth at the peak of metamorphism, developed statically after D2 but before D4. The formation also includes minor beds of calcsilicate rock and rare psammite units and is cut by hornblendic sheets thought to represent metamorphosed basic intrusions.

Close to the Tom Anthon Fault, the dip of the foliation in the Tom Anthon Mica Schist steepens and is predominantly to the north. At around [NO 087 869], the Ey Burn swings sharply to the north-east and for about 80 m follows the trace of the fault, which is well seen in this section. The Tom Anthon Mica Schist is exposed on the north bank of the burn, whereas to the south there are good exposures of intensely tectonized and strongly folded pale-green and grey calcsilicate rocks. The two contrasting lithologies are separated by a breccia zone, over 2 m wide, of pale-green rock cut by anastomosing calcite veins. A further 30 m or so to the south another breccia zone separates the calcsilicate rocks from the Glen Clunie Graphitic Schist, which crops out upstream for a further kilometre.

4.3 Interpretation

In common with Dalradian rocks elsewhere, at least three of the regional episodes of deformation (D1, D2 and D4) have been recognized in the rocks of the Glen Ey area. They were also affected by two major dislocations of contrasting style and age, the ductile Boundary Slide, which is equated with D2 and the later, more-brittle Tom Anthon Fault. The main fabric/schistosity is recognized as being S2, although evidence of an earlier, S1 fabric is present locally. There is little

evidence of early folds in the section, but from the regional synthesis of Upton (1986; (Figure 6.9)) it can be established that the rocks all lie on the lower, inverted limb of a major F1 isoclinal anticline, possibly equivalent to the Tay Nappe, or on a parasitic fold on the lower limb of the nappe. The present disposition and attitude of the rocks is largely attributable to D2, when a stack of tight recumbent downward- and SE-facing folds was created. These F2 folds are broadly equivalent to the Ben Lui folds below the Tay Nappe in the South-west Grampian Highlands. Thus the right-way-up Grampian Group rocks of Glen Ey lie on the upper limb of a major F2 synformal anticline that faces downwards to the south-east. The rocks overlying the Boundary Slide are also right way up, being on the lower limb of the F2 Morrone Antiform, which also faces downwards to the south-east. Only minor, near upright F4 folds occur in this area.

The nature of the Boundary Slide at this GCR site is ambiguous. There is a well-exposed, gradual, possibly sedimentary, transition from the Deeside Quartzites and Psammites of the Grampian Group into the Tom Anthon Mica Schist of the Lochaber Subgroup, implying little or no dislocation or excision of strata. However, elsewhere in upper Deeside, Upton (1983) has recognized a higher unit of the Grampian Group, the Linn of Dee Banded Pelites and Psammites, which is absent from this section. Has it been excised due to truncation of the upper limb of the F2 fold by the Boundary Slide or is it absent as a result of facies changes or an unconformity? Above the inferred position of the slide, the Tom Anthon Mica Schist appears to be analogous to the Beoil Schist of the Schiehallion area (see the *Strath Fionan* GCR site report in Treagus et al., 2013). These highly schistose lithologies are thought to have developed as a result of high strain on pelitic rocks in the area of the Boundary Slide. As is the case elsewhere along its trace, there is undoubtedly high strain focussed upon the marked contrast in lithology and competence at the Grampian–Appin group boundary, but it is not possible to prove any dislocation or excision.

The Tom Anthon Fault is a major dislocation, trending north-east–south-west, which can be traced for over 15 km from Braemar on Deeside to Fealar Lodge in the upper Glen Tilt area. It might be considered as one of several splays of the Loch Tay Fault, which to the north-east of upper Glen Tilt departs from its usual single straight course. The fault plane is considered to be near vertical, as its straight trace is unaffected by considerable topography throughout the area. The movement on the fault is hard to estimate, but it almost certainly includes both strike-slip and dip-slip components. However, the evidence regarding the sense of movement in the Glen Ey area is conflicting. The stratigraphy suggests a downthrow to the south-east. However, Upton (1983) proposed that the rocks to the south-east of the Tom Anthon Fault are at a lower structural level, below the Morrone Antiform. There, the dips of the S2 fabric are much steeper, and the outcrop thickness of the Glen Clunie Graphitic Schist is increased significantly as a result of repetition about the F2 An Socach Fold trace and an F1 fold-pair. This structural interpretation would imply a downthrow to the north-west on the Tom Anthon Fault.

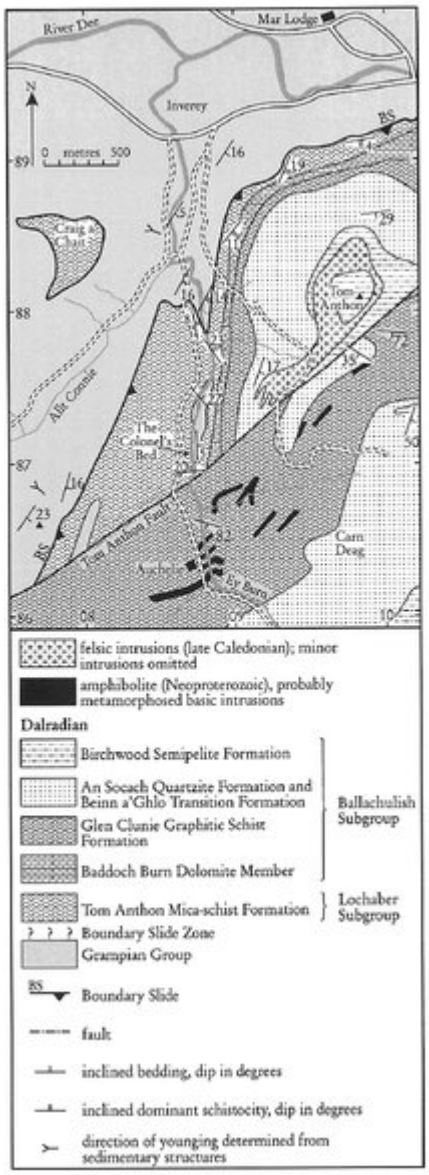
4.4 Conclusions

The Glen Ey Gorge encompasses one of the most complete sections through the Boundary Slide, in terms of degree of exposure, accessibility and continuity of Dalradian lithostratigraphy. The perceived importance of the slide has diminished in recent years, as it no longer represents a fundamental tectonostratigraphical boundary between the Moine and Dalradian successions. However, it does comprise a zone of intense ductile deformation that, throughout much of its length, is focussed upon the boundary between arenaceous rocks of the Grampian Group and the more-varied lithologies found in higher parts of the Dalradian succession.

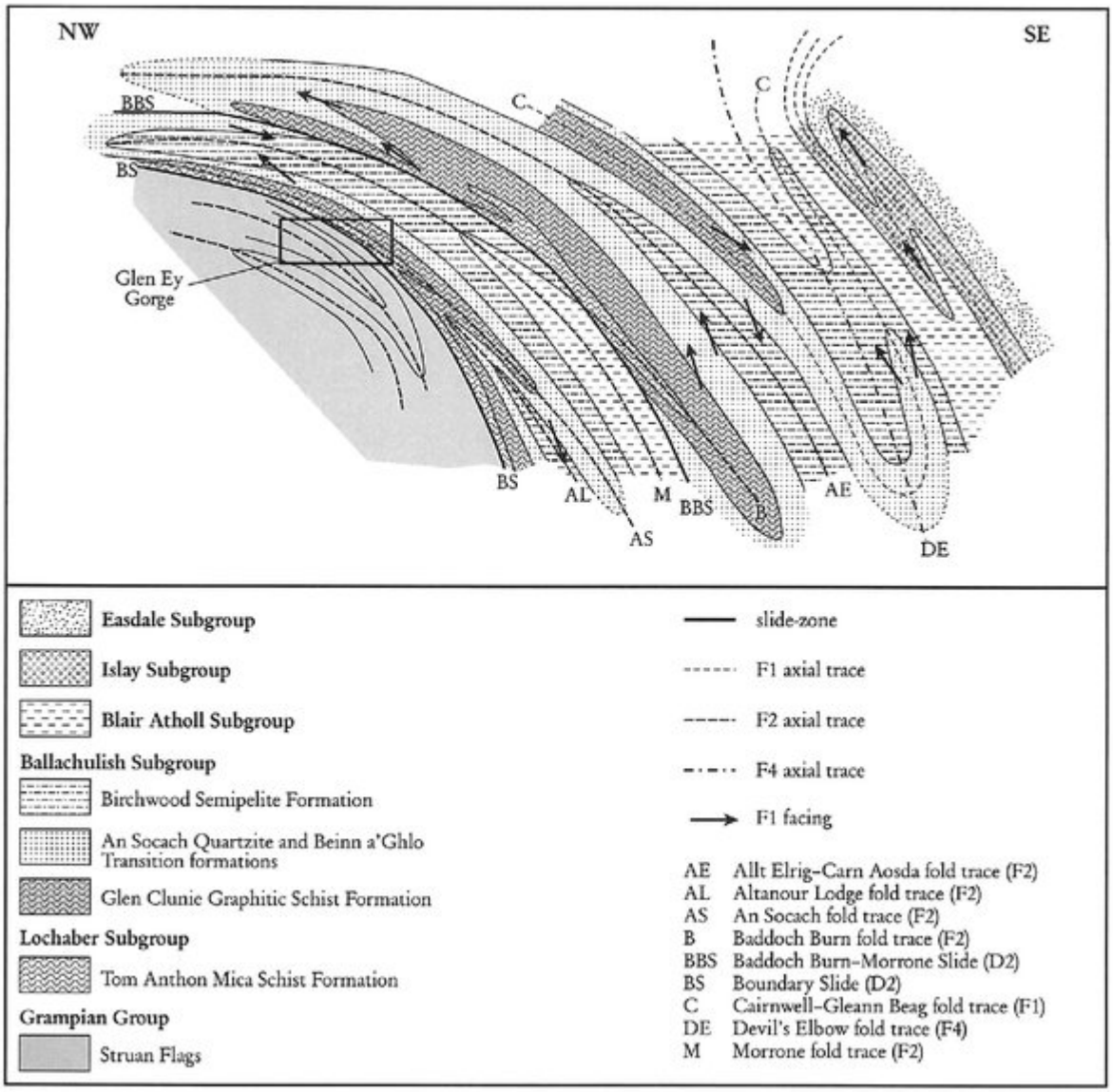
In Glen Ey there is a continuous section, in a right-way-up sequence, from increasingly flaggy quartzites and psammites of the Grampian Group, into the highly sheared Tom Anthon Mica Schist Formation of the Lochaber Subgroup (Appin Group). Large-scale, isoclinal F2 folds have been identified in the area, and the main deformation fabric is S2, but it is not possible to establish whether any stratigraphical units or any fold limbs have been excised by movement on the shear-zone. The so-called ‘slide’ could merely be a zone of high strain with no significant displacement.

A later NE-trending brittle fault, possibly related to the Loch Tay Fault, is well exposed in the gorge and is marked by breccia zones cut by calcite veins.

References



(Figure 6.8) Map of the area around lower Glen Ey adapted from the BGS 1:50 000 Sheet 65W (Braemar, 1989). In this area most of the information used for the BGS compilation was taken from Upton (1983).



(Figure 6.9) Schematic structural cross-section across the area between Deeside and Glen Shee. Reproduced from Upton (1986, figure 3). The rectangle indicates the approximate position and exposure level of the Glen Ey Gorge GCR site.