19 Allt Druidhe

[NN 6422 5723]–[NN 6423 5662]

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19.1 Introduction

The lower part of the Allt Druidhe, which drains into Loch Rannoch 3 km south-west of Kinloch Rannoch, has been selected as offering the best section across the Boundary Slide, the most important synmetamorphic high-strain zone and dislocation to affect the Dalradian rocks of Scotland. The Boundary Slide is known to extend for at least 90 km from the Dalmally district (see the *Ben Oss* GCR site report) to the Schiehallion district, although demonstrable dislocation and excision of strata decrease towards the north-east (see the *Strath Fionan* GCR site report). If proposed correlations with similar structures are correct (e.g. the Benderloch and Ballachulish slides; see the *Camas Nathais* and *St John's Church* GCR site reports; Roberts and Treagus, 1977c) the dislocation can probably be traced for most of the length of the Scottish Dalradian outcrop from the Appin district in the south-west to the North-east Grampian Highlands (see the *Bridge of Brown* GCR site report in Stephenson et al., 2013b).

In its outcrop between Dalmally and Loch Errochty (9 km north-east of this GCR site), the slide marks a hiatus in the Dalradian stratigraphical succession (Table 1), juxtaposing Grampian Group psammites below, against quartzites, semipelites and pelites of the Argyll Group above. It is only in the area south and east of Loch Errochty that members of the missing Appin Group gradually appear between the other two groups, until the complete succession is restored locally in Strath Fionan (Roberts and Treagus, 1977c; Treagus, 1987, 2000).

The slide was first recognized in the Schiehallion area, to the north-east of this GCR site, by Anderson (1923) and its outcrop was mapped throughout the district by Bailey and McCallien (1937). Its origin was discussed further by Rast (1958) and Treagus (1987, 2000). The present account is based on the mapping and descriptions of P.A.R. Nell (BGS 1:10 000 Sheet NN65NW, and in Treagus, 2000).

19.2 Description

The description below is taken principally from the almost continuous exposures in the Allt Druidhe [NN 6419 5731] to [NN 6420 5604], complemented by information from the hillside on its two sides, especially that towards Meall Druidhe to the west.

From [NN 6419 5731] to [NN 6421 5713], the course of the burn is controlled by a steep NNW-trending fault with SE-dipping Grampian Group psammites exposed on its two sides (Figure 3.46). Bedding on a 1 to 30 cm scale is evident; cross-sets are also seen, but way-up has not been determined. At [NN 6421 5713], south of a prominent microdiorite dyke, the psammites become more schistose and flaggy and are seen for a further 100 m as far as [NN 6421 5704], where the fault crosses the bed of the burn. The psammites are succeeded, as far as [NN 6423 5690], by a sequence of pink and white quartzites, interbedded with platy psammites and semipelites containing a highly muscovitic pelite; several concordant sheets of microdiorite cut these beds. In the lower part of this sequence, the lowest pink, feldspathic quartzite can be correlated clearly with the Dunalastair Quartzite, the lowest formation of the Lochaber Subgroup, and the highly muscovitic pelite is correlated with the Beoil Schist. Striped biotite-muscovite psammites and semipelites below and above the Beoil Schist must represent the Dunalastair Semipelite and Meall Dubh Striped Pelite formations respectively, both of the Lochaber Subgroup. Above these units, a few centimetres of graphitic kyanite schist, an upper 15 m-thick unit of pebbly quartzite and a 50 m-thick unit of banded semipelite and pelite can be equated with the Meall Dubh Graphitic Schist, the Meall Dubh Quartzite and the Strath Fionan Banded Semipelite formations,

respectively, of the Ballachulish Subgroup as seen in the *Strath Fionan* GCR site. The Meall Dubh Limestone Formation is not represented.

At [NN 6421 5704], the Strath Fionan Banded Semipelite Formation (Ballachulish Subgroup) is in contact with strongly deformed and boudinaged strata that can be assigned to the Easdale Subgroup of the Argyll Group, thereby marking a major dislocation and excision of strata. Some 40 m of strongly deformed, schistose, rusty-coloured, feldspathic quartzite with thin interbeds of amphibolite (equivalent to the Carn Mairg Quartzite), followed by a few metres of graphitic schist (equivalent to the Ben Eagach Schist) are followed by a major sequence of calcareous schist, calcareous quartzites and interbedded amphibolites. The latter sequence can be traced laterally, to the north and south into outcrops of certain Ben Lawers Schist Formation (see, for example, the *Slatich* GCR site report). Above the Ben Lawers Schist outcrop, at [NN 6421 5638], are 10 m of graphitic schist (better seen on the hillside to the north-east) followed by a major unit of schistose pebbly quartzite, a repetition of the Ben Eagach Schist and Carn Mairg Quartzite formations.

From the uppermost psammites of the Grampian Group southwards, throughout the section, a 30–40° SE-dipping, penetrative schistosity, is parallel to bedding where the latter is visible. The schistosity planes in the amphibolites and the pebbly quartzites exhibit a strong lineation of hornblende and of the pebbles, generally pitching at a high angle (over 50°) to the south-west. Amphibolite boudins, intersection lineations and rare isoclinal fold hinges pitch with the same general reclined attitude.

The Lochaber Subgroup formations in particular are cut by fault-planes, usually associated with brecciation, dipping at lower angles to the south-east than the schistosity and pre-dating the microdiorite sheets.

19.3 Interpretation

The Boundary Slide occurs here on the short common limb of the regional Meall Reamhar Synform–Balliemore Antiform F2fold-pair, the latter being represented at the GCR site by the repetition of the Ben Eagach Schist and Carn Mairg Quartzite about the Ben Lawers Schist in the fold core. The penetrative schistosity at the site (the regional S2) is essentially parallel to bedding but can be demonstrated to be axial planar to the fold-pair elsewhere (e.g. in the *Strath Fionan* GCR site).

No measurement of the scale of displacement on the slide is possible, nor have directional movement indicators been identified. The apparent parallelism of the intersection lineations, the fold-hinges and the extension direction is attributed to the high strains in the slide-zone. The locally strong pebble and hornblende stretching lineations, pitching steeply to the south-west on the S2 schistosity planes, give an indication of the intensity of the strain, as do the common boudinage axes pitching in the same direction. These features together suggest strong flattening strains in the slide-zone with a finite extension direction pitching steeply to the south-west on the schistosity.

Some of the telescoping of the stratigraphical succession of the Appin Group at the GCR site is considered to be the result of small movements (metre-scale) on the low-angle SE-dipping faults, which cut down section. Evidence in similar sections to that seen at the GCR site, between Loch Rannoch and Loch Errochty, suggest that such thrusts are numerous in the slide-zone and are commonly occupied by the later, slightly discordant, microdiorite sheets.

There can be little doubt concerning the stratigraphical assignations given above for the formations of the Appin Group, as the formations can be traced north-eastwards into the type formations of the Loch Errochty and Strath Fionan areas (Treagus, 2000). Similarly, the formations belonging to the Argyll Group can be traced southwards into type areas in Glen Lyon. Thus it is clear that a major hiatus exists between the Strath Fionan Banded Semipelite and the Carn Mairg Quartzite formations, in this highly strained sequence. The missing formations include the metalimestones and graphitic semipelites of the upper Appin Group, together with the Schiehallion Boulder Bed, the Schiehallion Quartzite and Killiecrankie Schist of the Argyll Group, certainly representing several hundred metres thickness of the type stratigraphical succession seen in the *Strath Fionan* GCR site and to the south of Schiehallion. In addition to this major hiatus, it is considered that the whole section from the top of the Grampian Group into at least the lower part of the Ben Lawers Schist represents a zone of high strain, in which there are probably many planes of discrete movement.

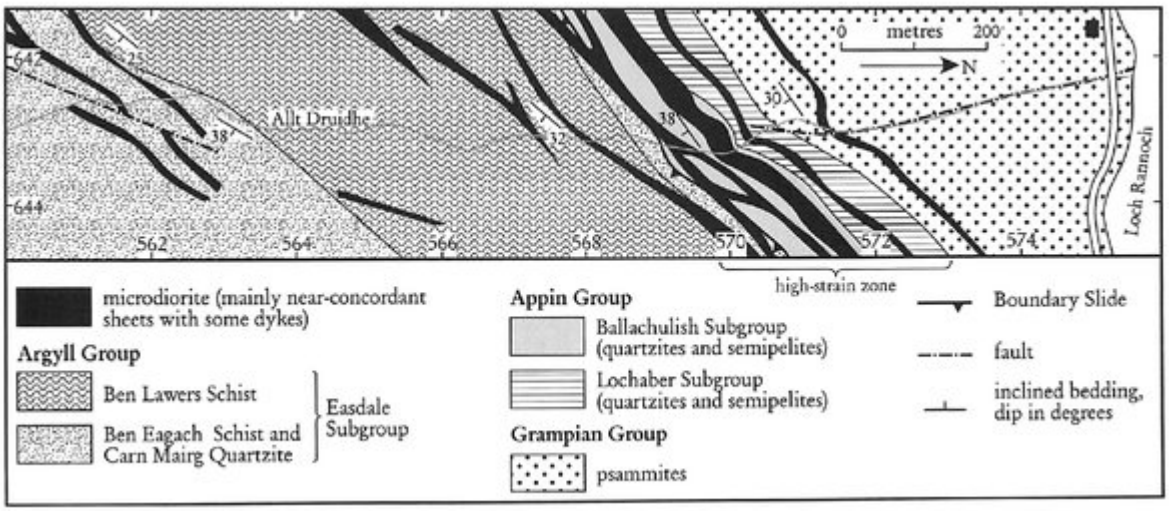
From consideration of evidence along the Boundary Slide-zone elsewhere in the Schiehallion area (Treagus, 1987, 2000), it is clear that the stratigraphical hiatus can be explained, at least in part as a result of top-to-the-NW thrust-like movements during the regional D2 deformation. However, this does not exclude the possibility of movements contemporary with the D1 deformation, which have been identified elsewhere in the Schiehallion area.

It is not clear to what extent any, or indeed all, of the hiatus can be attributed to sedimentological causes. Treagus (2000) provided evidence, from elsewhere in the Schiehallion district, that some substantial thinning of parts of the succession is an original sedimentary variation and suggested that such parts were preferentially thinned tectonically. Soper and Anderton (1984) have suggested that movements on some Dalradian slides might have originated as low-angle normal faults during sedimentation, and Anderson (1923) most-perceptively considered the possibility that the hiatus could represent an original normal fault, later subjected to intense shear. Both Anderson (1923) and Bailey and McCallien (1937) considered, but rejected, the idea that the slide might have originated as an unconformity and essentially favoured the explanation of a synmetamorphic dislocation, as presented here. Further research at this GCR site could well help to resolve these matters.

19.4 Conclusions

The Allt Druidhe GCR site provides a rare opportunity to observe the zone of rocks that contains the Boundary Slide, a high-strain zone critically important in the development of the structure of the Dalradian and contemporary with folding and metamorphism. It can be demonstrated within this GCR site that there is a major gap here in the normal stratigraphical succession, with several hundreds of metres of rocks missing. It is likely that there are many discrete dislocations within a zone of strongly deformed rocks. The evidence for this high strain is in the unusual nature of the small-scale structures seen in the section. It is considered possible that some of the movements on the slide might be associated with early faulting and changes of thickness during the deposition of the sediments, a hypothesis that could be tested by further work in the area of this GCR site.

References



(Figure 3.46) Map of the lower part of the Allt Druidh, after P.A.R. Nell (BGS 1:10 000 sheet NN65NW).