5 Tom Mheadhoin and Doire Ban

[NN 071 610]–[NN 091 631] and [NN 097 634]–[NN 089 645]

J.E. Treagus

Published in: The Dalradian rocks of the central Grampian Highlands of Scotland. PGA 124 (1–2) 2013 https://doi.org/10.1016/j.pgeola.2012.07.009. Also on NORA

5.1 Introduction

The GCR site at Tom Meadhoin and Doire Ban occupies a summit ridge between Loch Leven and Gleann Righ to the north (Figure 3.12). It is important for the placing of major folds into the regional deformational picture, establishing in particular the Tom Meadhoin Antiform as the closure of the major F1 Kinlochleven Anticline, which is here upward facing as a result of refolding by D2 structures. Information from this site has also allowed a revision of the stratigraphical identity of lithological units on the north side of Loch Leven, which in turn has lead to a refinement of the structural interpretation. One of the major dislocations of the area, the Ballachulish Slide, which separates the Kinlochleven Anticline from the structurally overlying Ballachulish Syncline, is also exposed.

The rocks were described in some detail by Bailey (1960), who identified the Tom Meadhoin Antiform as an ‘early’ structure, but a stratigraphical revision was made by Roberts (1976) who also provided the structural detail reported here.

5.2 Description

The stratigraphical succession of this site (Figure 3.12) is in the Appin Group. It progresses from the Binnein Quartzite (oldest) through the Binnein Schists and the Glen Coe Quartzite into the Leven Schists (all Lochaber Subgroup) and then across the Ballachulish Slide into the abbreviated Ballachulish Limestone and Ballachulish Slates of the Ballachulish Subgroup. The Binnein Quartzite is the best-seen unit, being prominently exposed on the crags of Tom Mheadhoin, where it forms the core of a doubly-plunging antiform, the Tom Meadhoin Antiiform (Bailey, 1960) The rock is a well-bedded, pure-white quartzite in which the dip can be readily measured to demonstrate the north-easterly and south-westerly plunges at its north-eastern and south-western ends respectively. The craggy outcrops between [NN 099 629] and [NN 084 620] exhibit many examples of cross-bedding, unambiguously younging up towards the boundary with the surrounding schists.

The transitional facies from the Binnein Quartzite to the Binnein Schists consists of impure quartzites (commonly cross-bedded) and dark pelite and semipelite (commonly graded), as seen in the *Rubha Cladaich* GCR site. These lithologies are well seen at the north-eastern end of the antiform [NN 095 637], and on both limbs of its south-western closure at [NN 620 088] and [NN 083 620]. At these three exposures the angular relations between the steep NW-dipping penetrative cleavage and the shallower dipping bedding clearly shows that the cleavage is axial-planar to the major fold. The cleavage/bedding intersections plunge at about 35° to the north-east at the north-eastern closure of the antiform and at less than 20° to the south-west at its south-western end.

A thin feldspathic quartzite can be traced from the shore at Loch Leven, north-eastwards along the south-east side of the outcrop of the Binnein Quartzite and Binnein Schists on Tom Mheadhoin (Figure 3.12). This outcrop of the Glen Coe Quartzite is also well exposed to the south-east of Doire Ban, from about [NN 097 636] to [NN 092 641], where it defines a synform and an antiform. These folds plunge to the north-east, as is seen from the changing dip of bedding and the plunge of the intersection of a crenulation cleavage with the bedding. The crenulation cleavage is axial-planar to the major fold-pair.

The Leven Schists and younger formations to the east and north of the succession described above are not well exposed in the area of this GCR site. However, the Ballachulish Slide, which brings the younger formations (the Ballachulish

Limestone, the Ballachulish Slates and the Appin Quartzite) against the Leven Schists can be located within the area. In a gully of a burn draining east from Doire Ban, about [NN 096 645], the Leven Schists are in contact with the Ballachulish Slates, with an intervening thin remnant of Ballachulish Limestone in places. The location of the slide can be followed south-west around the antiform/synform pair discussed above. To the north-east of Tom Meadhoin the slide can also be located at the head of a burn at [NN 091 625], where the Ballachulish Limestone is missing and the Ballachulish Slates are brought against the Leven Schists. The flagginess of the rocks at these exposures of the Ballachulish Slide appears to be parallel to the penetrative cleavage in the adjacent rocks.

5.3 Interpretation

Perhaps the most important aspects of this GCR site are the re-interpretation of the quartzite of Tom Meadhoin as the Binnein Quartzite, surrounded by the Binnein Schists, and the identification of the dominant structure as an F1 fold core by Roberts (1976). Bailey (1960) had interpreted both this outcrop of quartzite and the quartzite outcrop to its south-east as the Glen Coe Quartzite, occupying two antiformal cores, with a synform in the intervening schists (his Leven Schists). He interpreted the three folds as comprising the upward-facing hinge of the Kinlochleven Anticline, one of the major early recumbent nappes folded into an upright position by the secondary Stob Ban Synform (see the *Stob Ban* GCR site report). The relations of the S1 penetrative cleavage to bedding seen at this GCR site confirm that the Tom Meadhoin Antiform is indeed a D1structure and a true anticline (Roberts, 1976). However, the quartzite in the fold core on Tom Meadhoin is undoubtedly the Binnein Quartzite, from its clean, white, well-bedded character and its characteristic transition to the Binnein Schists. This revision of the stratigraphy removes the need for the two folds to the south-east of Tom Meadhoin. It also confirms the progressive thinning of the Glen Coe Quartzite from 2 km at its type locality on the south side of Loch Leven, to a few hundred metres north of Mam Gualainn (118 638) (Figure 3.12), as described by Treagus (1974), to a few tens of metres at Doire Ban. Furthermore, to the north-west of this GCR site, the expanse of pelite identified as Leven Schists by Bailey (1960) must represent a direct passage from the Binnein Schists into the Leven Schists, in which the Glen Coe Quartzite is not represented at all.

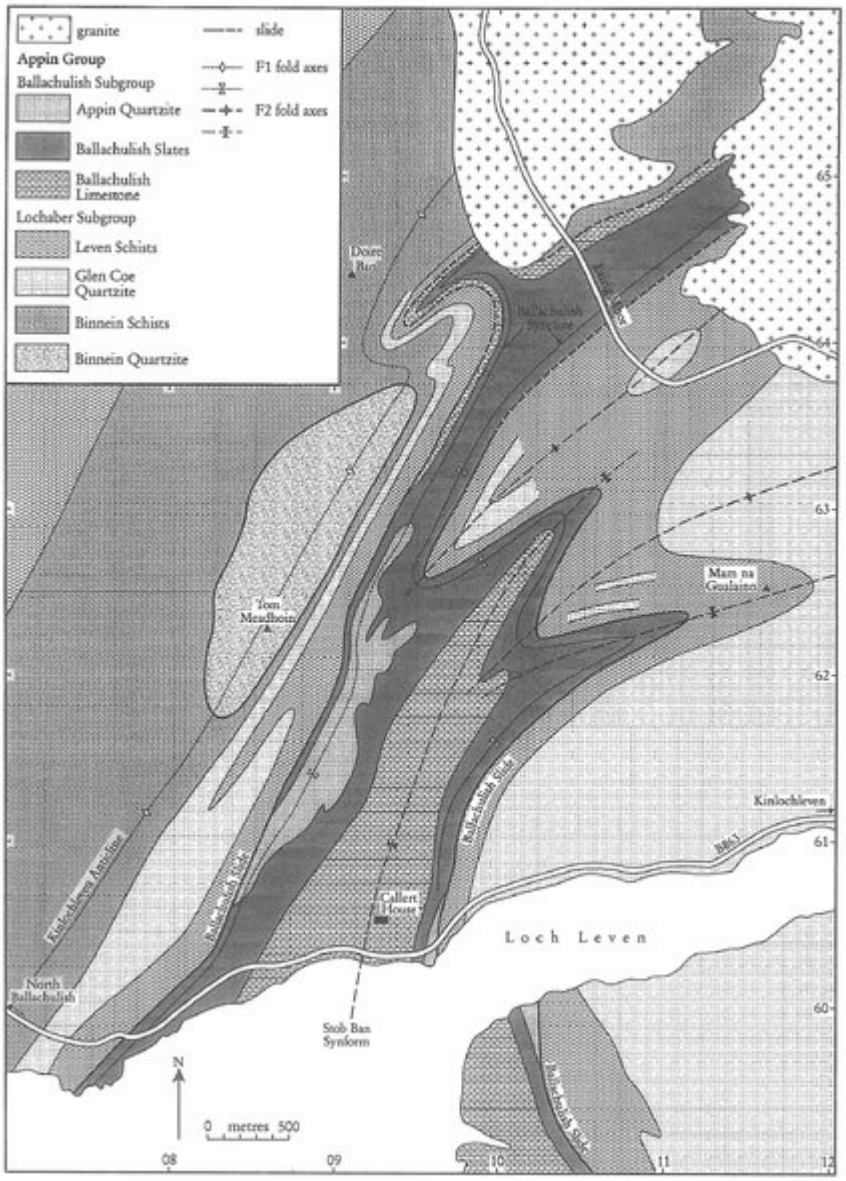
A second important structural observation is that the two NE-plunging folds of the outcrop of the Glen Coe Quartzite on Doire Ban are associated with a crenulation cleavage and are therefore of D2 age in the regional deformation sequence. These folds are subsidary folds to the regional SW-plunging F2 Stob Ban Synform, which crops out to the south-east (see (Figure 3.12) and the *Stob Ban* GCR site report). This F2 fold is responsible for the folding of the once-recumbent Kinlochleven Anticline to its upward-facing position at Tom Meadhoin and its downward-facing attitude farther east (see the *Rubha Cladaich* and *Nathrach* GCR site reports).

As Bailey (1960) pointed out, the Ballachulish Slide appears to be contemporary with the early (D1) deformation in this area, which is confirmed by the observations at this GCR site. However, as Bailey also pointed out, the slide must be an original low-angle normal fault rather than a thrust, as it thins the upper limb of a major anticline, the Kinlochleven Anticline. Soper and Anderton (1984) have suggested that such movements may have taken place during sedimentation. Further research at the site might help to shed more light on this problem.

5.4 Conclusions

The Tom Meadhoin and Doire Ban GCR site is of critical importance for the light that it sheds on both stratigraphical and structural arguments in the Dalradian on the west side of the Grampian fold-belt. As well as clarifying the local stratigraphical succession, it enables the dramatic thinning of one formation, the Glen Coe Quartzite, to be reconstructed. It also provides an unusually complete view of the hinge area of one of the major folds of the region, the F1 Kinlochleven Anticline. This fold, which was originally flat-lying, extends over a distance of at least 15 km from Tom Meadhoin eastwards to the *River Leven* GCR site. A further period of deformation was responsible for the bending of this fold from its original flat-lying attitude into its present upright position and the superimposed structures associated with this D2 event can be well demonstrated. One of the major structural dislocations of the region, the Ballachulish Slide, is contemporary with the earlier folding and is also well seen. This GCR site promises to be important for future investigations of the structure of the region.

References



(Figure 3.12) Regional geological context of the Tom Meadhoin and Doire Ban GCR site. After Roberts and Treagus (1977b, figure 5).